United States
Department of
Agriculture

Forest
Service

June 2013

Environmental Assessment

Hams Fork Vegetation Project

Under the Authority of the Healthy Forest Restoration Act

Kemmerer Ranger District, Bridger-Teton National Forest
Lincoln County, Wyoming

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Chapter 1: Purpose and Need for Action

Document Structure

The Bridger-Teton National Forest prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the alternatives considered for management of the Hams Fork project area on the Kemmerer Ranger District. The document is organized into four chapters:

- Chapter 1. Purpose of and Need for Action: This chapter includes information on the background of the project proposal, the purpose of and need for the project, and the Forest Service proposal for achieving that purpose and need. This section also summarizes public involvement efforts and issues raised about the proposal.
- Chapter 2. Alternatives, including the Proposed Action: This chapter provides a more detailed description of the Agency's Proposed Action and how it compares to the No Action Alternative. Alternatives considered but eliminated from detailed study are discussed. This section also provides a summary table of the environmental consequences associated with each alternative.
- Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the affected environment and effects of each alternative considered in detail. This analysis is organized by each resource area. Within each section, the affected environment is described by resource, followed by the effects of the No Action Alternative that provides a baseline for evaluation of and comparison with the Proposed Action. Lastly, the effects of the Proposed Action are provided.
- Chapter 4. Consultation and Coordination: This chapter provides a list of preparers and agencies consulted with during the development of the environmental assessment.
- References. This lists the references cited in the environmental assessment.
- Appendices. The appendices provide more detailed information that describe Alternative 2 (the Proposed Action) and support the analyses presented in the environmental assessment. Appendix A is a partial list of pertinent Forest Plan direction and applicable laws and executive orders. Appendices B, C, and D describe Alternative 2. Appendix B is a description of the treatment units and a series of maps detailing the Proposed Action. Appendix C is the description of silvicultural treatments and Appendix D provides the design features that are part of Alternative 2. Appendix E lists the past, present and reasonably foreseeable future activities considered for the cumulative effects analysis for all resources.

Additional documentation, including more detailed analyses of project area resources, may be found in the project record at the Kemmerer Ranger District office in Kemmerer, Wyoming.

Background

The Kemmerer Ranger District of the Bridger-Teton National Forest is proposing the Hams Fork Vegetation Project to address forest fuel levels and forest health concerns in the headwaters of the Hams Fork watershed, which supplies water to six communities downstream. The project area has experienced years of fire suppression and a more recent mountain pine beetle epidemic. The mountain pine beetle infestation has impacted the project area by killing mature pines across thousands of acres of forest. Mountain pine beetle-induced mortality is highest in lodgepole pine

and whitebark pine dominated stands. Whitebark pine is an Intermountain Region Forest Service Sensitive Species at high risk of decline on the Bridger-Teton National Forest, and has been substantially impacted in the Hams Fork project area by mountain pine beetles. Large areas of dead trees present an increased threat of large scale fire due to accumulated fuels. Large-scale fire, in turn, presents serious risks for important forest resources including vegetation diversity, wildlife species dependent on late successional forests and water quality.

Based on the Forest Plan, the desired condition in the Hams Fork project area is a diverse mix of vegetative composition and structure. An additionally important component of the Hams Fork ecosystem is aspen stands. Aspen has experienced recent decline and dieback attributed in part to fire suppression, forest succession, and insects and disease. Healthy aspen stands provide important wildlife habitat and serve as a natural fire break under low to moderate weather conditions. Age-class diversity of aspen, whitebark pine, and lodgepole pine communities would improve the vitality of these important forest resources. This, in addition to fuel load reductions, would help decrease the proportion of the Hams Fork project area at risk to negative effects from high intensity wildfires (see Chapter 3 Fuels and Fire section).

Project Area and Location

The 74,276-acre Hams Fork project area lies in the south-central portion of the Kemmerer Ranger District in Lincoln County, Wyoming (Figure 1) and encompasses the headwaters of the Hams Fork watershed. The project area is approximately 73 percent forested, with lodgepole pine as the predominant forest type, followed by aspen, spruce/subalpine fir, whitebark/limber pine, and Douglas-fir. The majority of stands contain a mix of tree species with the pine component significantly affected by the mountain pine beetle. Non-forested areas are willow dominated riparian areas and tall forb/sagebrush/grass communities. The landscape is naturally mosaic with forested and non-forested patches. A variety of fish and wildlife species are found in the area including elk, moose, mule deer, American marten, northern goshawk, boreal toad, and Colorado River cutthroat trout.

The headwaters of the Hams Fork watershed are located within the project area and are municipal watersheds supplying water to six communities downstream. Eighty-seven percent of the project area lies within two inventoried roadless areas and 20 percent of the project area lies within the wildland urban interface (WUI) as identified in the Lincoln County, Wyoming Community Wildfire Protection Plan (Lincoln County 2006). The WUI overlaps with the southern portion of the project area along the Bridger-Teton National Forest boundary. To the south of the project area and adjacent to the Bridger-Teton National Forest boundary is a combination of Bureau of Land Management, private and state lands. The main Hams Fork travel route (Forest Road 10062) is designated as a Scenic Backway. The project area is popular with campers, fisherman, hunters, and firewood cutters. Figure 2 displays these designations in the project area.

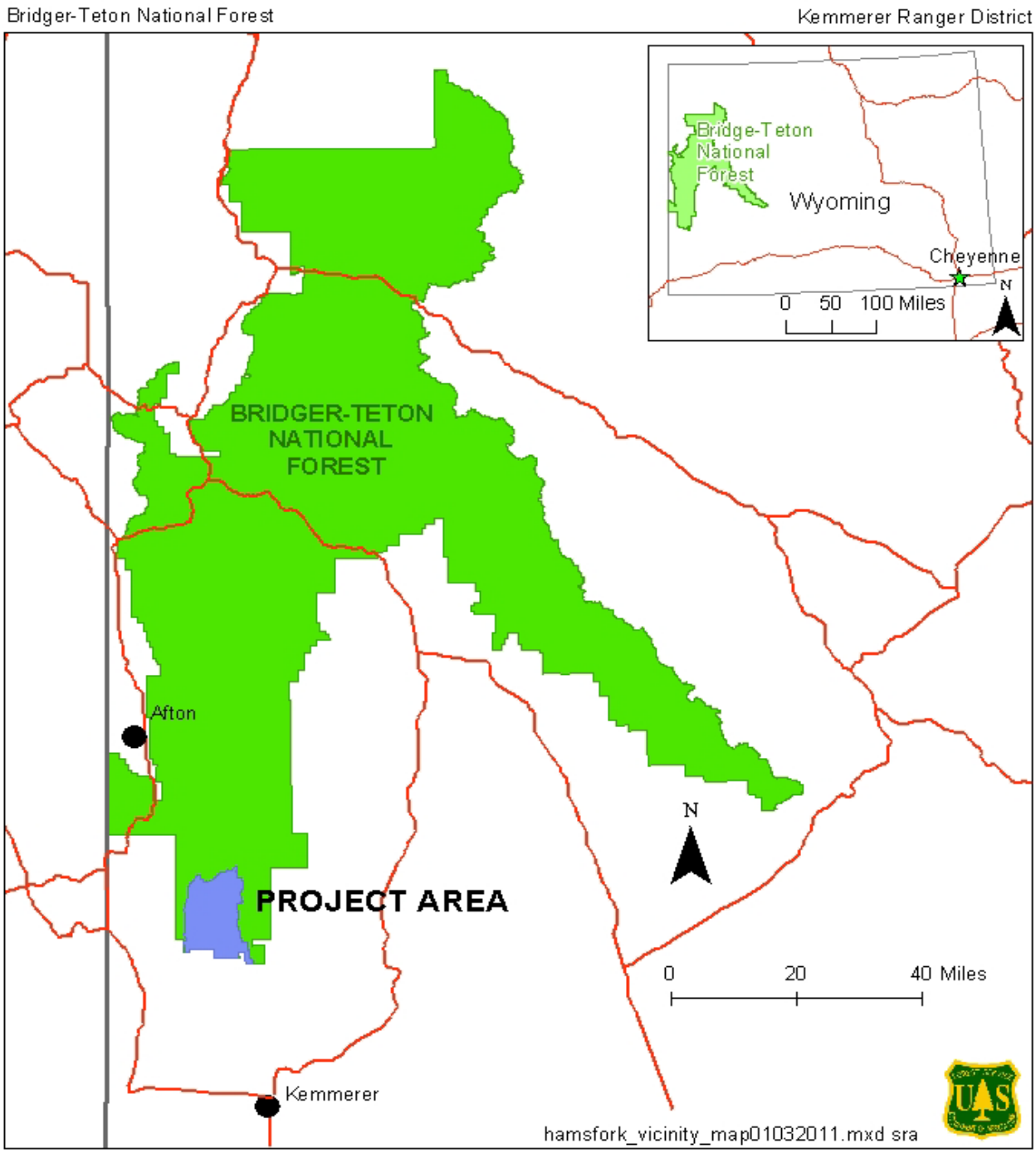


Figure 1. Vicinity map: Hams Fork Vegetation Project located in Bridger-Teton National Forest.

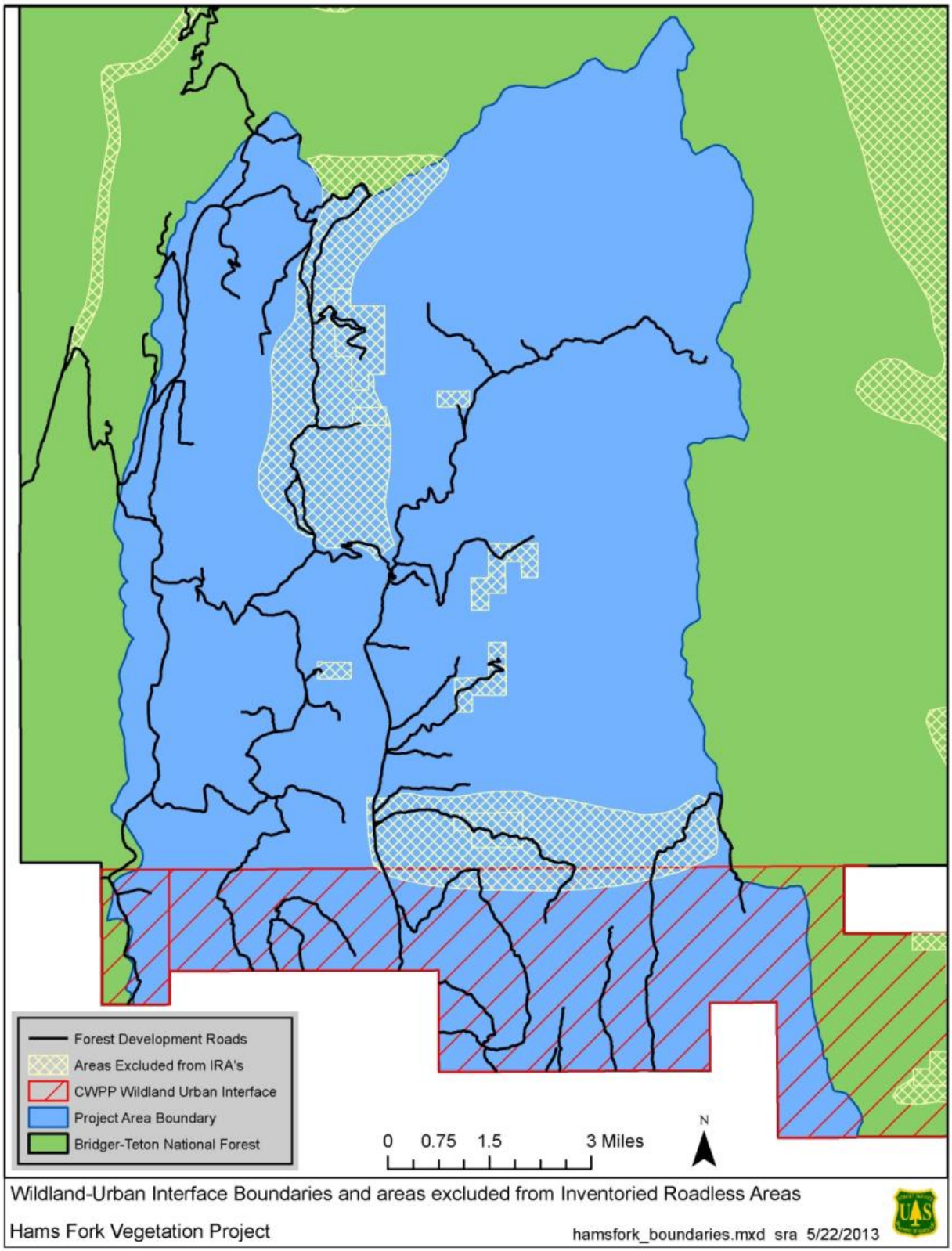


Figure 2. Hams Fork Vegetation project area with wildland urban interface and inventoried roadless area (IRA) boundaries.

Healthy Forests Restoration Act of 2003 (HFRA)
The Hams Fork Vegetation Project is proposed under the authority of the Healthy Forests Restoration Act of 2003 (HFRA), Public Law 108-48, 16 USC Chapter 84. This legislation contains a variety of provisions to expedite hazardous-fuel reduction and forest-restoration projects on Federal land that are at risk of wildland fire or insect and disease epidemics. Title I provides authorities for expedited vegetation treatments on certain types of Forest Service lands that are at risk of wildland fire; have experienced wind throw, or ice-storm damage; are currently experiencing disease or insect epidemics; or are at imminent risk of such epidemics because of conditions on adjacent land.

The Hams Fork Vegetation project qualifies as an authorized hazardous fuel reduction project because it addresses a threat to an ecosystem component or forest resource on Federal land due to an epidemic of the mountain pine beetle (HFRA, 16 USC 6512(a)(4)) The Forest Health Protection, Ogden Field Office, determined that the mountain pine beetle epidemic peaked in 2007 and killed nearly one half of the susceptible lodgepole pine component throughout the Hams Fork project area (Hebertson 2012). The project addresses a threat to forest diversity (species composition and age-class diversity) and wildlife species dependent on early successional forests. Additionally, this project is in keeping with the direction set in the Lincoln County, Wyoming Community Wildfire Protection Plan of 2006. The Lincoln County, Wyoming, Community Wildfire Protection Plan identifies approximately 20% of the Hams Fork project area as wildland urban interface. The Lincoln County, Wyoming, Community Wildfire Protection Plan gives direction that "[w]here applicable, use harvests and thinning to maintain diversity in both age-class and stand densities to curtail epidemic insect and disease outbreaks and to reduce the potential for large scale stand replacement wildfires."

Collaboration:

The Healthy Forests Restoration Act (HFRA) requires collaboration between Federal agencies and local communities, particularly when a Community Wildfire Protection Plans has been prepared. The Hams Fork Vegetation project was developed in collaboration with local and State governments and interested persons in accordance with the Healthy Forests Restoration Act sec 6514(f). The collaborative planning effort for the Hams Fork Vegetation Project is further described in the Public Involvement section (p. 16).

Consideration of Alternatives:

The Healthy Forests Restoration Act sets out requirements for the range of alternatives to be considered in projects authorized under the act. The environmental analysis must describe the Proposed Action, a no action alternative, and an additional action alternative, if one is proposed during scoping or the collaborative process. This additional alternative must still meet the purpose and need of the project (16 USC Sec. 6514(c)(1)) .

This environmental assessment provides for and analyzes two alternatives - Alternative 1: No Action Alternative and Alternative 2: the Proposed Action. A collaboratively developed proposal was developed during the collaborative process and was detailed in the 2012 scoping document. This alternative is not analyzed in detail in this environmental assessment because the collaborative group felt that it did not meet legal requirements of the 2001 Roadless Rule associated with temporary road construction within an inventoried roadless area. Additional alternatives were considered during the collaborative process and during the comment period. These alternatives were not analyzed in detail because: 1) they did not fully meet the purpose and need for the project or 2) the alternative proposed only minor changes to the Proposed Action and

did not warrant a separate alternative. See section Alternatives Considered but Eliminated from Detailed Analysis (p. 19) for further discussion.

Maximize Retention of Larger Trees:

The Healthy Forests Restoration Act states that when carrying out HFRA projects, ... "the Secretary shall fully maintain, or contribute toward the restoration of, the structure and composition of old growth stands according to the pre-fire suppression old growth conditions... and retaining the large trees contributing to old growth structure" (16 USC Sec. 6512(e)(2)). Under Alternative 2, there are no treatments in old growth. Hams Fork Vegetation project area contains 1,059 acres of designated old-growth forest. There were 27 acres of designated old growth that overlapped with treatment areas. These 27 acres were ground verified and were determined to be misclassified as old growth and were actually lodgepole pine stands (see Chapter 3 Forested Vegetation section, p. 66). The Healthy Forests Restoration Act also requires HFRA projects on National Forest System land to maximize retention of larger trees in areas other than old-growth stands, as appropriate for the forest type, to the extent that the trees promote fire-resilient stands (16 USC Sec. 6512(f)(1)). The Hams Fork Vegetation Project complies with this requirement by targeting small diameter trees for removal. See Chapter 3, Silviculture Section (p. 66) for more information.

Predecisional Administrative Review Process

Projects authorized under the HFRA are subject to a "Predecisional Administrative Review Process" (36 CFR 218). Under this process, individuals or agencies who commented on the proposal during the opportunity for public comment will have 30 days to submit written objections. Such opportunities for public comment were fulfilled during the collaborative planning process in the summer of 2011 and during comment period initiated on February 18, 2012. The objection-filing period will begin the day after a legal notice announcing the availability of the Hams Fork Vegetation Project Environmental Assessment is published in the Casper Star-Tribune. The objection process provides an opportunity for the Forest Service and any objectors to discuss a potential resolution of disagreements prior to a decision. A decision notice for this project will not be issued until the Forest Service responds, in writing, to all valid objections received within 30-days. A decision notice would specify which alternative is selected for implementation and the rationale for the decision.

Purpose and Need for Action

The purpose and need for the Hams Fork Vegetation Project was derived from the differences between the desired conditions and existing conditions related to forest vegetation and fuels.

Purpose 1

Purpose 1 is to develop a diverse mix of vegetative composition and structure and increase a mosaic pattern on the landscape of different fuel types, fuel loadings, forested communities and stand age-classes to decrease the proportion of the landscape that would be affected by high intensity wildfires.

Historically, lodgepole pine, Engelmann spruce, Douglas-fir, subalpine fir, aspen and whitebark pine were dominant tree species in the Hams Fork project area. These forest types would have experienced fires every 35-100 years with fire severity resulting in the loss of greater than 75 percent of the overstory. Historically stand replacement fires created a mix of age-classes and

patch sizes in a mosaic pattern across the landscape in which irregularly shaped stands were dominated by even-aged trees arising after high intensity (Arno and Fiedler 2005).

Within their natural fire regime, these ecosystems would have been classified by vegetation characteristics such as (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g. insect and disease mortality, grazing, and drought). Accelerated departure from these ecosystem characteristics would have the potential to result in the loss of one or more key ecosystem components. Under condition class one these ecosystems would have supported a fire regime that would have maintained each environmental component at a desired level.

A century of fire suppression coupled with the recent mountain pine beetle outbreak, has resulted in a change to the desired components that defines each stand's condition class. These changes include decreases in structural stages which comprise the composition of the forest, changes to fuel types, increases in fuel loadings, decreases in stand age diversity, and changes in the mosaic patterns associated with patch size dynamics.

In Intermountain West lodgepole pine forests, Page and Jenkins (2007) found that mountain pine beetles at epidemic levels induced substantial changes in species composition and highly altered fuels complexes. An intensive field inventory was completed between 2004 and 2011 on 214 forested stands (Keefe 2010, Ainsley 2011, Konen 2010). Species composition of these stands were generally mixed, with primarily mature (>100 years) lodgepole pine overstory and primarily subalpine fir in the lower canopy layers. All conifer stands examined contained active mountain pine beetle activity and pine mortality. Mortality was highest in stands dominated by lodgepole pine and whitebark/limber pine, but mortality ranged widely from minimal levels to near total overstory mortality. At endemic levels, bark beetles beneficially remove older, weaker individuals from stands of trees, causing less than 2 percent mortality per year (Samman and Logan 2000). Surveys completed within the stands proposed for treatment indicate the following approximate mortality ranges: 11% of the stands are estimated to have >60% mortality; 26% of the stands have an estimated 40-60% mortality; 37% of the stands have an estimated 20-40% mortality; and 26% of the stands are estimated to have 5-20% mortality. This indicates that conifer mortality in the Hams Fork project area is higher than endemic levels. Analysis of aerial survey detection data indicate that mountain pine beetle-caused tree mortality peaked in 2007 and has declined in the following years with the exception of 2010. To date, mountain pine beetles have killed approximately 475,000 lodgepole, whitebark, and limber pines on 160,000 acres throughout the Kemmerer Ranger District (Hebertson 2012).

Along with changes in species composition, mountain pine beetle infested stands have been found to have increases in subalpine fir and shrub regeneration which increases the amounts of fine surface fuels in recently infested stands (<5 years) and increases in the amounts of large dead woody fuels in stands 20 years after an epidemic. This increase in conifer mortality and change in species composition over time is resulting in a shift in how the fuel load is distributed from the forest canopy to the forest floor and from a live foliar fuel to a dead fuel.

Trees killed by mountain pine beetle may remain standing for a number of years, but as they progressively decay and fall to the ground, the fuel structure changes once again. In this phase, a large amount of biomass becomes available as fuel within flame heights that can be generated by fine surface fuels. Some of the biomass is elevated above the ground where it dries out easily and becomes available to support fire with high intensity (Kaufmann et al. 2008). Large amounts of fallen, dead trees increase the likelihood that a high intensity fire would affect a larger proportion of the landscape than under pre-mountain beetle epidemic conditions. Under elevated fuel loads,

firefighters have increased difficulty managing fires, protecting identified resources, and managing fires to mimic historic fire sizes to achieve desired patch size dynamics.

As a result of fire suppression, old stands with an abundance of shade tolerant trees cover a higher than normal proportion of the landscape (Arno and Fiedler 2005). This condition is evident within the Hams Fork project area in which a higher proportion of mature stands exists than are desired (Table 1). Many forested stands in the project area are largely mature, dense stands of lodgepole pine with a shade-tolerant subalpine fir understory. Species composition is shifting, favoring late-seral species (e.g. subalpine fir) compared to early seral species (e.g. lodgepole pine and aspen). Early seral species, such as aspen can act as a natural fire break under moderate weather conditions and aid in creating a mosaic pattern across the landscape. In the Hams Fork project area, aspen has declined by 43% from 1913 to 1993 (Hill 2004) resulting in a more homogenous coniferous forest. This reduces habitat diversity and allows fires to burn larger contiguous areas rather than the patchy mosaics that resulted when fuel-filled old stands were fewer and farther between (Arno and Fiedler 2005).

Table 1. Desired and existing forested mix of succession stages in the Hams Fork project area.

	Desired Mix of Age-Classes[a]				Existing Mix of Age-Classes		
Vegetation type	Seedlings Saplings (Early Seral)	Young to Mid-Age (Mid Seral)	Mature Forests (Late Seral)		Seedlings Saplings (Early Seral)	Young to Mid-Age (Mid Seral)	Mature Forests (Late Seral)
Aspen	20-40% (0-10 yrs.)	30-50% (11-40 yrs.)	30-40% (>40 yrs.)		3% [a]		97% [a]
Whitebark pine	≥ 15%	45%	40%		5 % [c]	5% [c]	90% [c]
Lodgepole pine	≥ 10% (0-25 yrs.)	30 – 40% (25-45 yrs.)	30 – 50% (>70 yrs.)		10% [b]	20% [b]	70% [b]
Spruce-Fir[d]	5-10% *(0-40 yrs.)*	30% *(41-80/110 yrs.)*	60-65% *(>80-110 yrs.)*		5% e	1% [e]	94%[e]
All Forest Types (total)	≥15-20%	30-40%	40-50%				

[a] conditions based on Bridger-Teton National Forest Five Year Monitoring Report (US Forest Service 2009)
[b] condition based on stand data
[c] condition based on Commissary Ridge/Tunp Range Landscape Scale Assessment (US Forest Service 2001) and the Bridger-Teton National Forest Properly Functioning Condition (US Forest Service 1997)
[d] based on LANDFIRE (2007)
e based on DeLong (2013)

There is a need to create a mosaic pattern of different fuel types, fuel loadings, forested communities and stand age-class structures to decrease the proportion of the landscape that would be affected by high intensity wildfires. Fire occurrence data in the project area indicates that fire suppression has had an effect on the patchy, mosaic character of the landscape. Between 1960 and 2008, 67 fire starts were documented in the Hams Fork project area, of which approximately half (33 fire starts) were caused by lightning strikes (Figure 3). Three fires were managed for resource benefits, the Hams Ridge, Kelly and Shingle Mill fires (42 acres, 363 acres and 1,376 acres,

respectively). These fires occurred during low to moderate burning conditions and fire suppression response was not taken. The size of these three fires could be considered a low estimate of average fire patch size (593 acres) within the project area. With the current increase in available fuels associated with the recent mortality, natural fires could burn a larger portion of the landscape than historically.

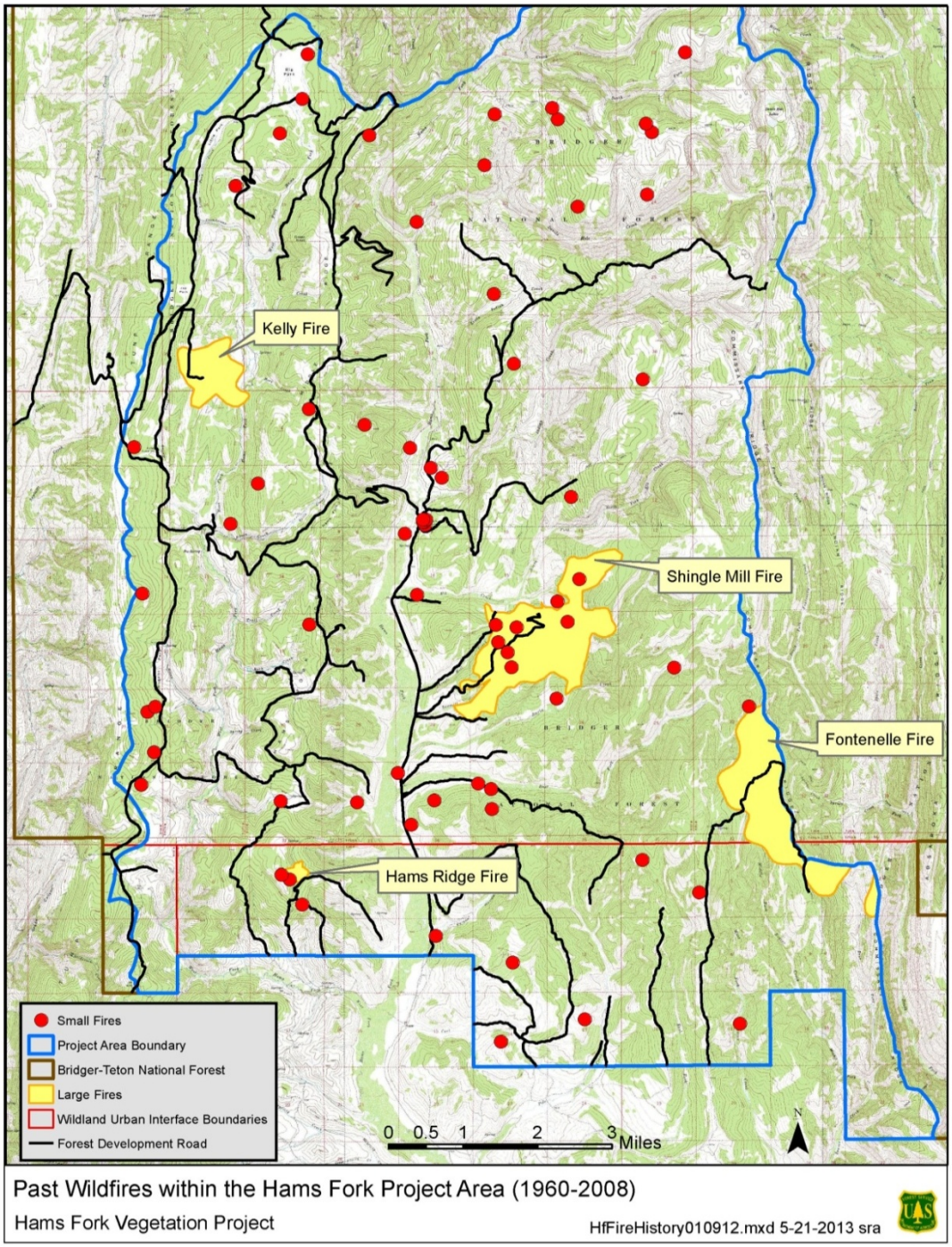


Figure 3. Fires that occurred in the Hams Fork project area from 1960 through 2008.

Purpose 2

Purpose 2 is to reduce, to an acceptable level, hazards associated with standing dead trees in the vicinity of roads, campgrounds, dispersed campsites, and administrative sites, while continuing to provide for the safe access to and use of these facilities and sites.

Widespread pine mortality in the project area poses a safety threat to people using forest system roads, recreational and administrative sites (e.g., Hams Fork Campground and Big Springs Picnic Area), and dispersed camping areas. Falling trees could strike people or property, cause road hazards, and reduce access. As the condition of dead trees deteriorate, the risk of trees falling and damaging personal property, and/or injuring people increases. Safety is a critical consideration in road operation and maintenance and should be taken into account along with other considerations, such as environmental protection (FSH 7709.59.40.3(1)). Roadways and recreational sites are managed for safety in part by identifying and mitigating dangerous trees. If mitigation is not possible, roadways and recreational sites are closed.

During a wildfire, hazardous trees and hazardous fuel loads pose a safety threat. Trees that fall across roadways, impede road access, lengthen response time of firefighters and can compromise firefighter safety by preventing an escape route. Large fuel loads significantly hamper control efforts, and increases firefighter exposure to hazardous working conditions. A reduction in fuel loading would improve firefighter safety as lighter fuel loads generally lead to easier control actions.

Purpose 3

Purpose 3 is to enhance aspen and whitebark pine communities by reducing competition, enhancing regeneration, and increasing age-class diversity.

Aspen communities support a diversity of plant and wildlife species and serve as a natural fire break. Since European settlement, however, about half of Wyoming's aspen-dominated stands have succeeded to more shade-tolerant conifer species, through lack of disturbance caused by fire suppression and natural forest succession. Aspen is a fire-adapted species that regenerates primarily through sprouting of the root system following a disturbance such as fire. In the Hams Fork project area, aspen is rated at a high risk of loss (U.S. Forest Service 1997). Aspen has declined 43% in the area from 1913 to 1993 mainly due to conifer encroachment (Hill 2004). Currently approximately 97% of aspen stands in the project area are mature age-class. Field reconnaissance conducted in 2010 confirmed that aspen is in the older to mature stage (>80 years) with moderate to high levels of conifer developing in the mid-canopy and understory. Approximately three percent of aspen stands are in early seral stage compared to the desired condition of 20 to 40 percent (Table 1). Much of the aspen component in the Hams Fork project area has become decadent with insect and diseases which contribute to the decline and dieback of aspen (Hebertson 2012).There is a need to improve aspen communities on the Hams Fork project area by reducing conifer competition, enhancing aspen regeneration, and increasing aspen age-class diversity. Aspen regeneration treatments should be as large in scale as feasible in order to avoid over browsing by big game and livestock.

Whitebark pine forests are declining across most of their range in North America due primarily to mountain pine beetle outbreaks; white pine blister rust infections and fire suppression have reduced suitable conditions for whitebark pine regeneration. This pine species is important to wildlife because of the large and nutritious seeds it produces. Restoring resilience in the whitebark pine community means promoting selection of natural blister rust resistance, reducing competing vegetation, enhancing regeneration opportunities, and minimizing losses to bark

beetles. In the Bridger-Teton National Forest, a downward trend for whitebark pine has been reported and this species has been rated at a high risk of loss across the BTNF (U.S. Forest Service 1997). This rating was based on limited habitat, anticipated increase in blister rust, the dominance of older-aged trees, and the lack of regeneration. Since 1997, whitebark pine has also been impacted by the mountain pine beetle. In the Hams Fork project area, 90% of stands are in the mature age-class compared to the desired condition of 40% mature whitebark pine stands (Table 1). Field reconnaissance indicated high mortality and a threat of losing whitebark pine stands within the project area exists. There is a need to rehabilitate whitebark pine communities on the Hams Fork project area by reducing competition from other pine species, enhancing regeneration, and increasing age-class diversity.

Purpose 4

Purpose 4 is to improve lodgepole pine communities by increasing age-class diversity, reducing stand densities and reducing incidence of infested trees to promote conditions that are more resilient to the effects of fire, insects, disease, and drought.

Lodgepole pine communities in the project area are largely mature, dense stands of lodgepole pine with a shade-tolerant subalpine fir understory. Approximately 70% of lodgepole pine stands are in a mature age-class compared to 30-50% desired (Table 1). Field reconnaissance data (2010 – 2011) and stand inventory data (2004 - 2010) indicated that a considerable number of trees are infested with mountain pine beetle, dwarf mistletoe, and other diseases. Homogeneous, dense lodgepole pine stands are more susceptible to undesirable effects of fires, insects, disease and drought. This is evident in the Hams Fork project area where mountain pine beetles have killed nearly one half of the susceptible lodgepole pine (>80 years with average diameters > 8” dbh, basal areas >120 ft^2/acre, Hebertson 2012). There is a need to enhance lodgepole pine communities by increasing age-class diversity, reducing stand densities, and reducing infested trees to promote conditions that are more resilient to the effects of fire, insects, disease, and drought.

Secondary Benefit

The secondary benefit is to support social and economic needs of local communities by providing forest products from areas affected by mountain pine beetle.

Wyoming Governor Mead and the Lincoln County Commissioners have expressed their concern regarding the extent of pine mortality and fuel loading in the Hams Fork project area, and have expressed their desire to put these trees to economic use for the benefit of the local communities. Supporting community prosperity by providing forest products is a desired condition of the Forest Plan (Goal 1.1, US Forest Service 1990, pp. 112-113). It is also more cost effective for the Forest Service to implement vegetation treatments through timber sales than service contracts. Lodgepole pine is generally a smaller diameter tree species, as compared to Douglas fir and Engelmann spruce, but does provide merchantable wood products. There is a limited timeframe available to capture economic value of beetle affected trees while they are still merchantable. Harvest of dead, dying, and infested trees would reduce future forest fuel loads, reduce the proportion of the landscape that is likely affected by high-intensity wildfire, improve aspen, whitebark pine, and lodgepole pine communities, enhance public safety, and contribute to local economies.

The Forest Service recognizes that the 2001 Roadless Rule does not allow for the cutting of timber in inventoried roadless areas for the purposes of providing forest products to local

communities. However, trees removed from the inventoried roadless areas to meet Purposes 1-4 have a secondary benefit of providing forest products to local communities.

Proposed Action

This section briefly summarizes the Proposed Action (Alternative 2), which is described in detail in Chapter 2.

The Forest Service proposes to meet the purpose and need of the project by conducting mechanical silvicultural treatments and prescribed burning on approximately 8,622 acres within the Hams Fork project area over 2 to 10 years. The Proposed Action stems from the work done through a collaborative process in the summer of 2011 (Western Wyoming Resource Conservation and Development Council et al. 2011).

Silvicultural treatments in the inventoried roadless areas include salvage, salvage/sanitation, salvage/sanitation with aspen improvement, whitebark pine improvement, prescribed burning and hazard tree removal. Hazard tree removal would generally occur up to 300 feet from both sides of forest system roads. Outside of the inventoried roadless areas, additional silvicultural treatments are proposed: aspen improvement, clearcut with reserves, patch clearcut with salvage/sanitation, salvage/sanitation/commercial thinning, and salvage/sanitation/commercial thinning with aspen improvement. These silvicultural treatments are described in detail in Appendix C.

The Forest Service would use existing roads for silvicultural treatments within the inventoried roadless areas. Construction of approximately 4 miles of temporary roads would occur outside of the inventoried roadless areas and would be reclaimed upon completion of the silvicultural treatments. Additionally, 4 miles of unauthorized roads outside of the inventory roadless areas would be added to the Forest transportation system as level 1 roads. Level 1 roads are for administrative use and are closed to public access.

Treatments would occur primarily in the western portion of the project area which offers relatively low quality roadless character due to existing roads, facility development and previous timber harvest. The eastern portion of the Hams Fork project area (Figure 4), although partially roaded, has a higher quality roadless character; therefore, proposed treatments are limited. The Proposed Action was also designed to avoid impacts to potential Canada lynx habitat by limiting treatment in areas with a dense understory preferred by snowshoe hares.

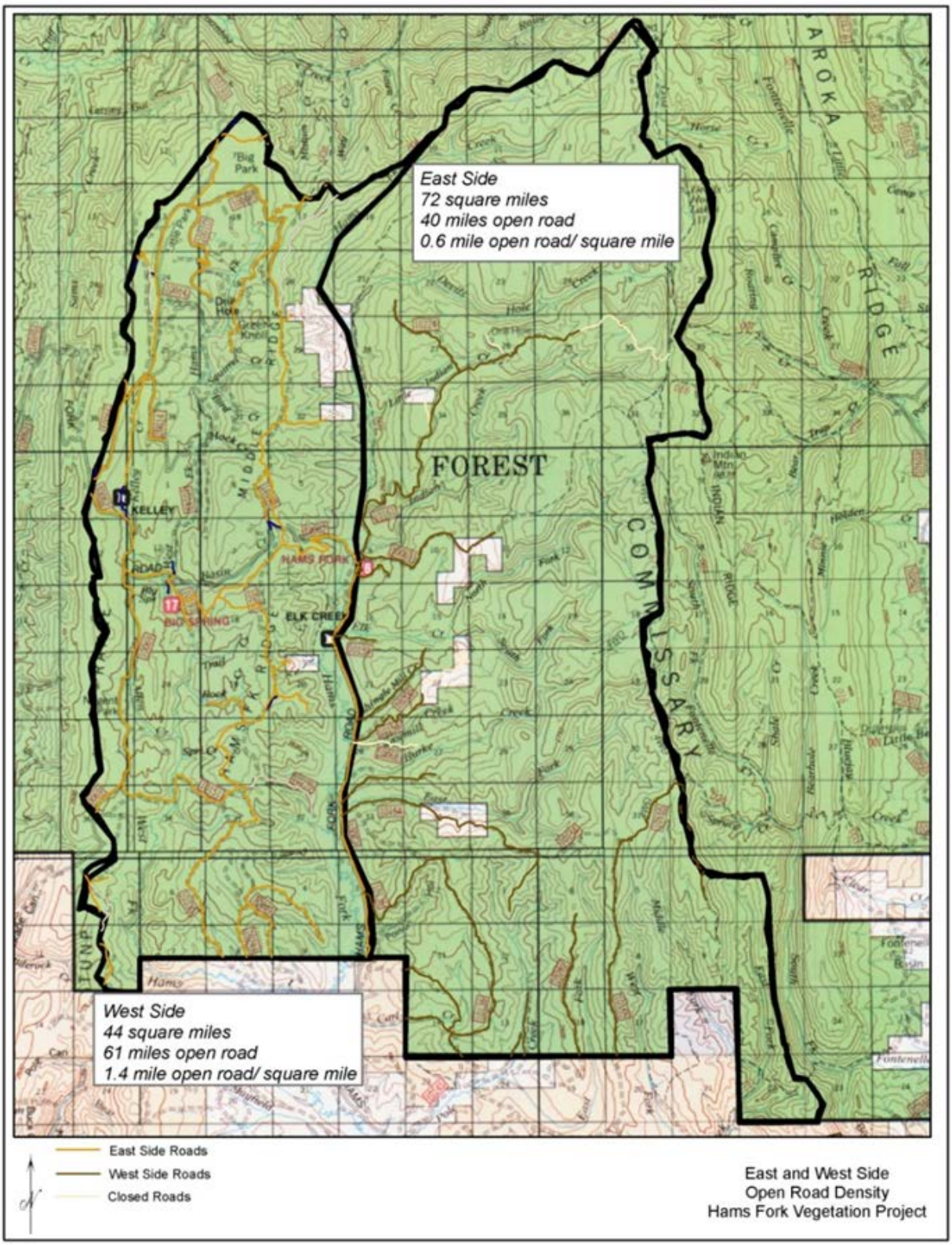


Figure 4. Road density by west side and east side of the Hams Fork project area.

Laws, Regulations, Policies, and Forest Plan Direction

The Hams Fork Vegetation Project addresses the applicable laws, regulations, and executive orders summarized in Appendix A. In addition, the project is consistent with the direction laid out in Bridger-Teton Land and Resource Management Plan (Forest Plan, U.S. Forest Service 1990, pp. 112-121) with sections highlighted in Appendix A and further discussed in specialist reports.

Inventoried Roadless Area

Eighty-seven percent (64,647 acres) of the Hams Fork project area is located within the Lake Alice-Commissary Ridge Roadless Area (3001) and the Nugent Park-Hams Fork Roadless Area (3001A). The inventoried roadless areas (IRA) were identified and mapped during the 1979 Roadless Area Review and Evaluation (RARE II, U.S. Forest Service 1979). In 1979 when these areas were identified as inventoried roadless areas, they contained a developed road system as well as a timber management program. Today, approximately 85 miles of open roads are maintained in the inventoried roadless areas with a total of approximately 102 miles of open roads are maintained within the entire project area. In general, road densities are highest in the western portion of the Hams Fork watershed with approximately 1.4 miles of open road per square mile occurring compared with 0.6 miles of open road per square mile in the eastern portion. The eastern portion of the watershed has large, contiguous areas with few miles of road.

Management direction for inventoried roadless areas was established in the Roadless Area Conservation Final Rule (36 CFR Part 294), commonly known as the 2001 Roadless Rule. This rule generally prohibits road construction, reconstruction, and timber harvest in inventoried roadless areas. However, forest health treatments for the purposes of maintaining or restoring the characteristics of ecosystem composition and structure, such as reducing the risk of uncharacteristic wildfire effects are allowed where access can be gained through existing roads (with certain exceptions) or by equipment not requiring roads. Under the 2001 Roadless Rule timber cutting, sale, and removal may occur in inventoried roadless areas under certain conditions.

The Hams Fork Vegetation Project meets the following exemptions to the prohibition on timber cutting, sale, or removal in inventoried roadless areas as allowed for in the 2001 Roadless Rule:

> *(§294.13(b)(1)) Cutting, sale, or removal of generally small diameter timber is needed for one of the following purposes and will maintain or improve one or more of the roadless area characteristics as defined in §294.11.*
>
> *(ii) to maintain or restore the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period;*
>
> *(§294.13(b)(3)) The cutting, sale, or removal of timber is needed and appropriate for personal or administrative use, as provided for in 36 CFR part 223;*

The 2001 Roadless Rule requires the Regional Forester to review proposed cutting, sale, or removal of timber in inventoried roadless areas. The Regional Forester determined that the Hams Fork Vegetation Project's Proposed Action complies with the 2001 Roadless Rule and that the Bridger-Teton National Forest may proceed with an environmental analysis of the project (Finley 2013, memo in project record). The rationale for project compliance with the 2001 Roadless Rule is found in the Special Areas (Inventoried Roadless Areas) section (p. 199) and the Forested Vegetation section (p. 65).

Travel Management

According to 36 CFR 212.51(d), motor vehicle use on National Forest System roads needs to be designated by vehicle class unless the road is limited to administrative use. A project level transportation analysis was completed according to 36 CFR 212.5 (B)(1) and the road system was identified for safe and efficient travel for administration, utilization, and protection of National Forest System lands. This procedure was conducted according to the Forest Service Handbook 7709.55 Chapter 20 and Forest Service Manual 7712. Under the Proposed Action, four miles of existing unauthorized roads would be added to the Forest transportation system as level 1 roads (administrative use) because they are useful for vegetation treatments and fire suppression and they do not present harmful environmental effects. These roads are located outside the inventoried roadless areas and would be closed and not open for public use.

Forest Plan Goals and Objectives

The Hams Fork Vegetation Project is designed to move the project area towards the following Forest Plan goal and objectives.

Goal 4.3 - Overall diversity of [forest] and riparian habitats within the Bridger-Teton National Forest are enhanced as timber is removed. (US Forest Service 1990, Bridger-Teton Land and Resource Management Plan, p. 119)

Objective:

- 4.3(a): Provide for vegetative species and age diversity, genetic quality, and forest appearance.
- 4.3(b): Provide for diverse habitats to ensure viable populations of Management Indicator Species.

In meeting the Forest Plan Goal 4.3 and Objectives 4.3(a-b), the Hams Fork Vegetation Project would secondarily contribute to the Forest Plan Goal 1.1 and Objectives 1.1(a-b).

Goal 1.1 – Communities continue or gain greater prosperity. (USDA Forest Service 1990, Bridger-Teton Land and Resource Management Plan, p. 112-113)

Objective:

- 1.1(a): Provide an average annual volume of 12 million board feet of green sawlogs for mills in operation.
- 1.1(b): Provide at least 5 million board feet of timber annually to allow continued use of forest products and employment in commercial firewood, house logs, and similar industries.
- 1.1(c): Provide timber volumes at costs that reflect current market values and as small and large product sales to meet local demand.

Decision to be Made

This environmental assessment is not a decision document. The environmental assessment discloses the environmental consequences of implementing the two alternatives. The Responsible Official will select an alternative based on information in this document, on public comments, and on how well the alternative meets the purpose and need for the project and complies with applicable state and Federal laws, agency policy, and Forest Plan direction. This decision and its rationale will be documented in a decision notice. Decisions to be made include:

- Whether vegetation treatments should be implemented and, if so, in what manner and in which locations.
- What resource protection measures will be required for project implementation?
- What monitoring requirements will be used to evaluate project implementation?

Public Involvement

The Bridger-Teton National Forest in partnership with the Western Wyoming Resource Conservation and Development Council, under the Natural Resource Conservation District, hosted a series of meetings during the summer of 2011 to develop a collaborative proposal to address pine mortality, increased future fuel loads, forest health and public safety concerns in the upper Hams Fork watershed. The collaborative process was initiated with a notice of public meeting published in the Casper Star-Tribune on May 22, 2011 (Legal No.: 917130). Four public meetings (June 1, June 23, July 13, and August 4, 2011) were held in Kemmerer, Wyoming and a field tour of the Hams Fork project area (July 7, 2011) was conducted. The public was invited to all public meetings via news releases published in local newspapers and emails sent to participants and individuals who had expressed an interest in the project and the Bridger-Teton National Forest general email list. In addition, Lincoln County posted the meetings on their calendar at http://www.lcwy.org/calendar.

The collaborative group, consisting of interested individuals, organizations, state and Federal agencies, and elected officials, developed a proposal described in the Collaborative Agreement: Framework for Proposed Action (Western Wyoming Resource and Development Council et al. 2011) which is available on the Bridger-Teton National Forest website at http://www.fs.usda.gov/goto/btnf/projects . This framework was intended to guide the Forest Service in developing a final proposed agency action. The collaborative proposal was presented in Appendix A of the Scoping Document and Request for Public Comment (U.S. Forest Service 2012).

On February 14, 2012 the Scoping Document and Request for Comment was mailed to 217 individuals including representatives of state and local governments, State and Federal agencies, Tribes and interested persons. A legal notice requesting comments on the Hams Fork Vegetation Project was published in the Casper Star-Tribune on February 18, 2012 (Legal No.: 937022) and with its publication, a 30-day comment period was initiated. The scoping document and other information relevant to the project were made available on the Bridger-Teton National Forest website (http://www.fs.usda.gov/goto/btnf/projects). Fourteen comment letters or emails were received during the comment period.

Issues

Issues are potential unintended effects of the project alternatives. Scoping comments were reviewed to identify issues relevant to the project proposal. The comments were summarized in the content analysis of public comment located in the project record.

Key Issues

The following “key issues” were identified through internal and public comments on the proposed project. Key issues are those upon which the environmental analysis is focused. They are important factors for comparing effects of the alternatives.

1. Change in forested communities

The change in the distribution and abundance of forested species and age-classes, as a result of the Proposed Action, could negatively affect wildlife species.

Resolution: Disclose the change in mix of succession and the potential effects on wildlife species dependent on late and early successional stages.

Effects indicators for comparison of alternatives:

Vegetation indicators used in the Forest Vegetation section:

- Stand structure: Conversion to single storied/early succession
- Species composition: Conversion to aspens and pines
- Stocking levels: Changes in stand density index, basal area, and trees per acre
- Successional stages: Changes towards early seral species
- Aspen and whitebark pine enhancement: Total acres treated

Vegetation indicators used in the Wildlife Habitat section:

- Mix of succession: the percent of the forest types in early, mid and late seral
- Changes towards increases in early seral species and decreases in late-seral stages.

2. Proportion of landscape affected by high intensity wildfire

The Proposed Action may affect fire behavior and the ability to control and/or utilize fire in the area.

Resolution: Alternative 2 was designed to reduce fuel loads by removing dead, dying and diseased trees near roads in the project area with the intent of enhancing fire management through improved fire fighter capabilities.

Effects indicators for comparison of alternatives:

Fire indicators used in the Fuels/Fire section:

- change in fuel models over the project area
- fireline fire intensity
- initiation of ground fire to crown fire
- percent of the forested area predicted to burn as a high intensity fire

3. Impacts to Canada lynx habitat

The Proposed Action may reduce Canada lynx foraging habitat.

Resolution: Alternative 2 was designed to minimize impacts to lynx foraging habitat or snowshoe hare habitat. Snowshoe hare habitat is multi-story mature or late successional forests with a horizontal cover of greater than or equal to 48 percent. Project treatments would not occur in stands with horizontal cover measurements of greater than or equal to 48 percent. Project treatments would occur in stands with horizontal cover measurements of greater than or equal to 35 percent and less than 48 percent on a limited bases restricted to only salvage and hazard tree removal treatments. Skid trails and landings would be less than 10 percent of the treatment area and no broadcast or jackpot burning would be conducted to minimize

impacts to snowshoe hare habitat (design feature WL-5). Disclose changes in lynx foraging habitat.

Effects indicators for comparison of alternatives:

- Percent of lynx habitat in the Hams Fork lynx analysis unit (LAU) that exists in a stand initiation stage.
- Percent of lynx habitat, within the Hams Fork LAU, that has been regenerated by timber management activities in the last 10 years.
- Percent horizontal cover within treatment stands.

4. Impacts to Inventoried Roadless Area

The Proposed Action may affect the wilderness and roadless characteristics of the inventoried roadless areas (IRA).

Resolution: Disclose the potential effects of the alternatives on wilderness attributes and roadless characteristics.

Effects indicators for comparison of alternatives:

- Effects on the wilderness attributes and roadless area characteristics by inventoried roadless area
- Acres of treatment and treatment type within the IRA
- Miles of road construction/reconstruction in inventoried roadless areas

Other Issues

Additional public concerns were considered in the analysis of issues; however, they did not rise to the level of key issues. Additional indicators were identified by resource area to determine compliance with the Forest Plan and in response to other issues raised. For some of these issues, potential impacts are limited through project design features. The analysis of potential effects related to other issues is discussed in Chapter 3 by resource areas.

Chapter 2: Alternatives

Chapter 2 describes alternatives for the Hams Fork Vegetation Project. This chapter begins by describing alternatives considered but eliminated from detailed study, followed by a detailed description of two alternatives: Alternative 1 (No Action) and Alternative 2 (the Proposed Action). The Proposed Action (Alternative 2) was developed to meet the purpose and need in the Hams Fork project area as detailed in Chapter 1. The No-Action alternative (Alternative 1) provides a baseline from which to compare the action alternative. In addition, this chapter compares Alternatives 1 and 2 with respect to effects on resources and compliance with the Forest Plan standards and guidelines

Alternatives Considered But Eliminated from Detailed Analysis

There were four alternatives considered but eliminated from detailed analysis. The first was the Collaboratively Developed Proposal which was proposed in the Collaborative Agreement (Western Wyoming Resource Conservation and Development Council et al. 2011). This alternative proposed to treat approximately 10,414 acres located both within and outside of inventoried roadless areas. Included in this alternative was the construction of approximately twelve miles of roads. Four miles of roads were located outside of the inventoried roadless areas and eight miles were located inside the inventoried roadless areas. This alternative was not analyzed in detail because it proposed construction of eight miles of temporary roads within the inventoried roadless areas which the Forest Service and collaborative group decided did not meet the legal requirements of the 2001 Roadless Rule.

The second alternative considered but eliminated from detailed study was proposed by the Forest Service. This alternative proposed to treat 7,164 acres and remove hazard trees within one tree length plus 10 percent of the tree length from both sides of open roads. This alternative was not analyzed in detail because comments received during the scoping period requested that the hazard tree removal treatment retain the 300 foot area along each side of the road to reduce fuels, enhance fire control measures along roads, and enhance safety of dispersed campers as proposed in the Collaborative Agreement (Western Wyoming Resource Conservation and Development Council et al. 2011). As a result, it was determined that this alternative did not meet the purpose and need associated with the removal of hazard trees needed to provide for public safety and may not meet the desire to increase fire management flexibility.

The third alternative entailed dropping all proposed mechanical treatments with the exception of aspen treatments, whitebark pine treatments, and the removal of hazard trees within approximately 100 feet along each side of the road (i.e., the distance of the tallest tree length plus 10 percent). This alternative was not analyzed in detail because it did not meet the purpose and need associated with the reduction of forest fuels and the need to enhance safety for forest visitors. The hazard tree removal within 100 feet addresses trees that may fall into the roadway; however, this buffer distance is inadequate to address safety for disperse campers who may camp 300 feet from roads. In addition, fuel reduction along roads is more effective as a defendable fireline when there is a 300 foot buffer along roads rather than a 100 foot buffer.

The fourth alternative proposed to drop approximately 482 acres identified as “Areas of Wilderness Potential”. This alternative was not analyzed in detail because this alternative did not warrant a separate alternative. “Areas of Wilderness Potential” were identified in a working

document prepared by the Bridger-Teton National Forest during efforts associated with Forest Plan revision in 2008. “Areas of Wilderness Potential” have no special laws or regulations which govern the management of these areas. .

Description of the Alternatives Analyzed in Detail

Alternative 1: No Action

No silvicultural treatments would occur under this alternative other than incidental hazard tree removal. The Forest Service would continue to maintain 43 miles of open roads and control noxious weeds. Various road projects necessary for forest management activities would occur. The No Action alternative does not preclude future proposals in the project area.

Hazard Tree Removal

Evaluation of dead, dying and other hazardous trees along travel corridors open to the public in the Hams Fork project area would be conducted by forest employees as they perform their other duties. Reporting of these trees and correction of the hazard would depend on the severity of the hazard and availability of personnel and would be addressed on a case by case basis. A systematic removal of hazard trees along roadsides would not occur under this alternative. Hazard tree removal would occur through nonsystematic approaches such as firewood removal by the public.

Ongoing Actions:

General Road Maintenance:

Surface blading, ditch cleaning and reshaping, roadside brushing, aggregate placement, installation of drain dips and cross drains for surface erosion control, minor culvert cleaning or installation, dust abatement, mulching and seeding of disturbed areas would occur. Road maintenance would occur mainly on maintenance level 3 roads and on some level 2 roads as needed for resource protection. Maintenance of some roads may occur only on sections of the road needing work to improve safety or for resource protection. Table 2 summarizes the miles of road maintenance by road level inside and outside of inventoried roadless areas. Figure 5 displays the road maintenance that would occur under Alternative 1. Approximately 43 miles of road maintenance would occur under Alternative 1.

- Gravel Source Development: As part of road maintenance, the Big Spring pit along the Kelley–Hams Fork road east of the Kelly Guard station would continue to be used as a gravel source for road maintenance in the project area.
- Bridge Replacements: Elk Creek and West Fork Hams bridges would eventually be replaced as financial opportunities arise.

Table 2. Proposed road work under Alternative 1.

Proposed Road Work	Road Level	Miles inside IRA	Miles outside IRA	Total road miles within project area
Maintenance	2	5	6	11
Maintenance	3	29	3	32
Total Maintenance	2 and 3	34	9	43

Additional Actions

- Control of noxious weeds would continue to occur within the project area.
- There would be no roads added to the Forest Service Transportation system.
- No construction of fire control lines would occur.
- No project design features would be implemented for this project; however Forest Plan standards and guides and other law, regulation, and policy required for National Forest management would continue to be implemented for ongoing activities in the project area.

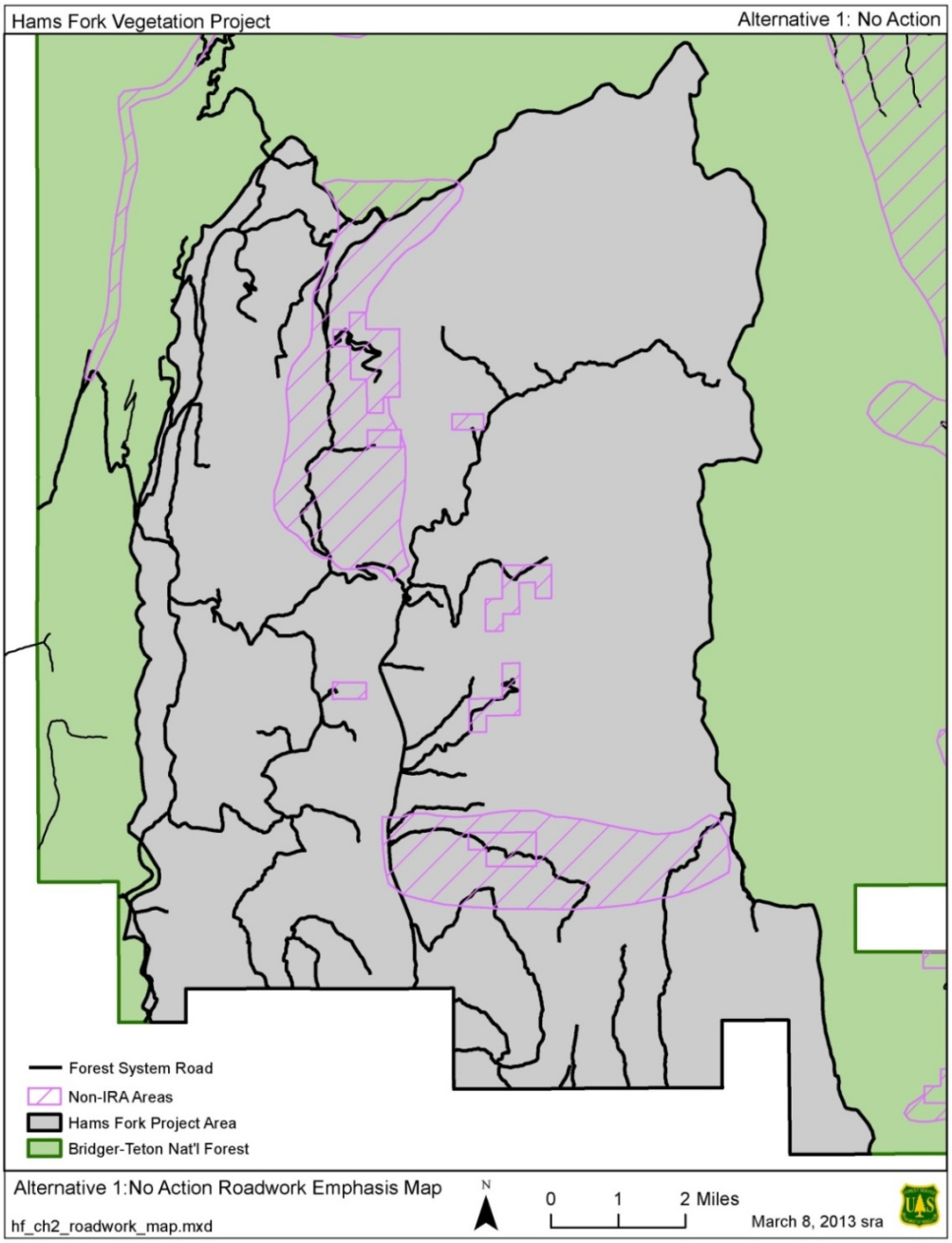


Figure 5. Road maintenance under Alternative 1 (No Action).

Alternative 2: Proposed Action

Overview

Under Alternative 2, the Forest Service proposes 8,622 acres of mechanical silvicultural treatments and prescribed burning in the Hams Fork project area. Of the total acreage, approximately 5,176 acres are proposed for salvage, salvage/sanitation, aspen improvement, whitebark pine improvement and other silvicultural treatments, 2,716 acres are proposed for hazard tree removal, and 730 acres are proposed for prescribed burning. Appendix C describes the silvicultural treatments. Hazard trees would be removed within 300 feet from both sides of the road (i.e. effective 600 foot buffer) to address safety concerns and to enhance firefighting capabilities along roads. Treatments would occur primarily in the western portion of the Hams Fork project area which offers relatively low quality roadless character due to existing roads and facility development and previous timber harvest. The eastern portion of the Hams Fork project area, although roaded, has a higher quality roadless character; therefore, proposed treatments are limited.

Alternative 2 was designed to avoid treatment of potential lynx habitat, areas with a dense understory preferred by their prey base, snowshoe hares. Field visits were conducted in 2011 and 2012 to determine horizontal cover measurements for all proposed treatment units with the exception of hazard tree removal along roads. No treatments are proposed in stands with horizontal cover greater than 48 percent because of their potential value as lynx/snowshoe hare habitat. In stands with an average of 35 to 48 percent horizontal cover, silvicultural treatments would be limited to salvage treatments only as allowed for in the Northern Rockies Lynx Management Direction (US Forest Service 2007). Skid trails and landings would be designed to impact less than 10 percent of the area in salvage and hazard tree removal treatments (design feature WL-5).

The Forest Service would use existing roads for silvicultural treatments within the inventoried roadless areas. Construction of approximately 4 miles of temporary roads would occur outside of the inventoried roadless areas to access units and would be reclaimed upon completion of the silvicultural treatments. Additionally approximately 4 miles of unauthorized roads also outside of the inventory roadless areas would be used to implement treatments, closed upon project completion, and would be added to the Forest Transportation System as level 1 roads. A total of 112 miles of road would be used for the project (104 miles of system road, 4 miles of new system road, and 4 miles of temporary road). Alternative 2 is comprised of varying amounts of the actions listed below.

Proposed silvicultural treatments:

- salvage
- salvage/sanitation
- salvage/sanitation/commercial thin
- salvage/sanitation/commercial thin with aspen improvement
- salvage/sanitation with aspen improvement
- aspen improvement
- clearcut with reserves
- patch clearcut with salvage/sanitation
- whitebark pine improvement
- prescribed burning
- hazard tree removal
- facility protection

Appendix B provides detailed information by unit including treatment type and location. Definitions of silvicultural treatments are in Appendix C.

Mechanical treatments would include cutting trees with chainsaws or mechanical feller bunchers, and skidding trees using tractor based logging systems such as rubber tire skidders with grapples, skid steers or bulldozers. Trees would be hauled from the site with log trucks. Masticating, chipping, mulching or piling may be used to treat slash and logging debris. Slash may be removed for biomass and/or piled and burned to meet resource objectives. Slash treatment may also include lopping and scattering to provide for wildlife habitat and nutrient cycling. Fuels may also be reduced through whole tree yarding, slash-piling, jackpot burning, and broadcast burning where feasible.

Project implementation would take 2 to 10 years to accomplish and would be completed through a combination of non-commercial service contracts, stewardship contracts, commercial timber sale contracts, free-use timber authorities, and/or Forest Service crews. The proposal could be implemented as early as the summer of 2013.

Table 3 displays the treatment acres proposed by Desired Future Condition (DFC) as described in Chapter 1.

Table 3. Summary of treatment acres by Desired Future Condition (DFC) for the Hams Fork Vegetation Project proposed under Alternative 2.

Treatment	DFC 1B (acres)	DFC 2A (acres)	DFC 9A (acres)	DFC 10 (acres)	DFC 12 (acres)	Total Acres
Mechanical Treatment	833		68	4,262	11	5,174
Prescribed Burn	156			574		730
Facility Protection			2			2
Hazard Tree Removal	306	1	26	2374	9	2716
All treatments combined	1,295	1	96	7210	20	8,622

Table 4 is a summary of the acres proposed for each treatment type (primary treatment) and includes the secondary treatments that may be necessary, depending on the site-specific conditions following the primary treatments. Secondary treatments are developed to further ensure that the purposes and needs of the project are accomplished as described in Chapter 1. Figure 6 displays treatments proposed under Alternative 2. Appendix B provides a detailed map series of the Proposed Action.

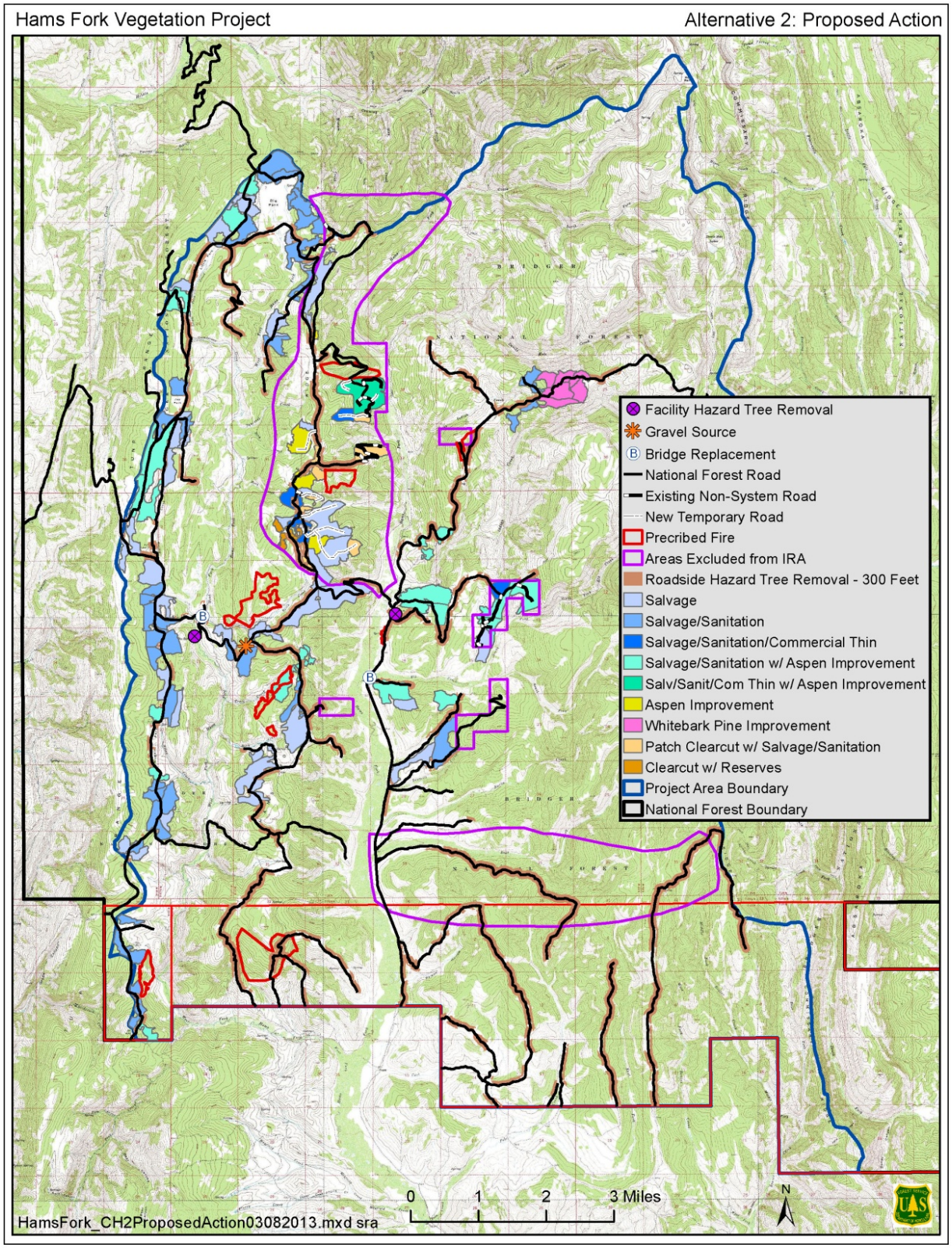


Figure 6. Silvicultural treatments proposed under Alternative 2 (Proposed Action).

Table 4. Summary of the proposed primary and secondary treatments under Alternative 2.

	Primary Treatment	Secondary Treatments as Needed	Acres Inside IRA	Acres Outside IRA	Total
Conifer Conifer/ Aspen	Clearcut with Reserves	broadcast burn activity fuels pile and burn activity fuels jackpot burn activity fuels plant to meet tree stocking requirements removal of slash from site lop and scatter activity fuels	0	39	39
	Patch Clearcut with Salvage/Sanitation	broadcast burn activity fuels pile and burn activity fuels jackpot burn activity fuels removal of slash from site lop and scatter activity fuels plant to meet tree stocking requirements	0	175	175
	Salvage/Sanitation/ Commercial Thin	broadcast burn activity fuels pile and burn activity fuels jackpot burn activity fuels removal of slash from site lop and scatter activity fuels	0	146	146
	Salvage/Sanitation/ Commercial Thin with Aspen Improvement	broadcast burn activity fuels pile and burn activity fuels jackpot burn activity fuels removal of slash from site lop and scatter activity fuels	0	174	174
	Salvage/Sanitation with Aspen Improvement	broadcast burn activity fuels pile and burn activity fuels jackpot burn activity fuels lop and scatter activity fuels	939	161	1100
	Salvage/Sanitation	broadcast burn activity fuels pile and burn activity fuels jackpot burn activity fuels removal of slash from site	1402	5	1407

	Primary Treatment	Secondary Treatments as Needed	Acres Inside IRA	Acres Outside IRA	Total
		lop and scatter activity fuels			
	Salvage	pile and burn activity fuels removal of slash from site lop and scatter activity fuels	1320	453	1773
Whitebark Pine	Whitebark Pine Improvement	broadcast burn activity fuels pile and burn activity fuels jackpot burn activity fuels removal of slash from site lop and scatter activity fuels plant disease-resistant seedlings in openings apply Carbaryl or verbenone to surviving mature seed-bearing whitebark pine	207	0	207
Aspen	Aspen Improvement	lop and scatter activity fuels broadcast burn activity fuels jackpot burn activity fuels	0	153	153
Facility Protection	Hazard tree removal and fuels reduction - thin from below and sanitation	pile and burn existing and activity fuels pile and burn existing dead and down fuels prune ladder fuels 6 feet from ground on residual trees Included Hams Fork campground (acreage covered under Hazard tree removal acreage) and Big Springs picnic area and trailhead (2 acres)	2	0	2
Conifer/ Aspen	Prescribed Burn	fell, lop and scatter trees prior to ignition to create a fuel bed	561	169	730
	Hazard Tree Removal (300 feet)	pile and burn activity fuels removal of slash from site lop and scatter activity fuels	2023	693	2716
TOTAL			**6454**	**2168**	**8622**

Connected Actions:

- Access
- Landings and skid trails
- Fire control line construction
- Road maintenance, reconstruction, new construction (temporary roads only outside of inventoried roadless area) and road maintenance associated with hazard tree removal
- Bridge replacements
- Gravel source development
- Road additions to the Forest Transportation System (level 1 administrative use) located outside of the inventoried roadless areas
- Noxious weed control

Accessing Treatment Units:

Mechanical treatment units would be reached via state, local, and Forest Service roads. Prescribed fire units which are not near a road would be reached by foot. Use of ATVs and equipment for personnel may be considered where existing low-standard roads or trails exist.

Landings and Skid Trails:

Landings, generally about one-half acre in size, would be used as needed for decking logs from harvest units and hazard tree removal, with specific locations to be determined during project implementation. Locations, construction, reconstruction, and decommissioning would adhere to Forest Plan standards and guidelines and best management practices developed to protect resources as prescribed in the project design features. For analysis purposes, 380 landings (190 acres) were assumed under Alternative 2 based on an estimate conducted by a resource specialist (project record, Dasher 2012). For the majority of treatment types, skid trails would be designated and not exceed 15 percent of the unit in area (design feature Soils-5). The exception to this is the salvage and hazard tree removal treatments where skid trails and landings would be designed to impact less than 10 percent of the area to minimize impacts to hare habitat (design feature WL-5).

Fire Control Lines:

The type of control lines used in prescribed fire units is dependent on the specific topography, vegetation, and proximity to structures, as well as the time of year and weather conditions. Existing roads, trails, ridgelines, areas of thinner vegetation, and hose-lays would be used as control lines where possible, requiring little to no preparation to contain fire within the unit boundaries. Other fire control line methods would be used as needed:

- Blackline is an area or a line in which existing fuels have been burned away using prescribed fire. This blackline is created by a backing fire which burns slowly against the wind with low intensity and it functions as an anchor for future landscape prescribed fire activities.
- Saw/handline is control line that is constructed by handcrews. Crews would utilize hand tools to scrape existing vegetative matter down to mineral soil. The width of the line would vary by fuels and location, but crews would use minimum impact techniques and the lines would generally be no wider than 24 inches. Chainsaws would also be utilized to remove small trees, brush, and low hanging branches in the immediate vicinity of the control line.
- Hand and/or machine line is control line that is constructed by handcrews and/or machinery/heavy equipment. Crews would utilize machinery and hand tools to scrape existing vegetative matter down to mineral soil. The width of the line would vary by fuels and location, but would generally be no wider than 48 inches. Chainsaws would also be

utilized to remove small trees, brush, and low hanging branches in the immediate vicinity of the control line.

Table 5 lists the total miles of each type of fire control line anticipated for Alternative 2. Note that the use of roads would require little preparation beyond incidental removal of vegetation that may be encroaching on the roadway.

Table 5. Fire control lines proposed in the Hams Fork Vegetation Project under Alternative 2.

Type	Miles
Blackline – Prescribe Fire	10
Road– Prescribe Fire	0.8
Saw/Handline– Prescribe Fire	6.5
Hand/Machine line – Activity Fuels	10.2
TOTAL	**27.5**

Roadwork

The road work listed in Table 6 would be needed to access and implement the proposed treatment units. Roads would be maintained to the existing maintenance level. Four miles of unauthorized roads would be reconstructed and closed and four miles of temporary roads would be constructed and obliterated after use to allow equipment access necessary to harvest trees and haul wood products from the project area. Road reconstruction and temporary road construction would only occur outside of the inventoried roadless areas. Descriptions of the types of road work follows

- **General Maintenance**: The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective (FSM 7705). General maintenance includes surface blading, ditch cleaning and reshaping, roadside brushing, aggregate placement, installation of drain dips and cross drains for surface erosion control, minor culvert cleaning or installation, dust abatement, mulching and seeding of disturbed areas. Maintenance of some roads may occur only on sections of the road needing work to improve safety or resource protection.
- **Road maintenance associated with Hazard Tree Removal:** General road maintenance activities as described above but at a minimal level as needed for safety and environmental protection. Hazard tree removal activities would likely require smaller equipment and a lower road standard:
- **Reconstruction**: Supervising, inspecting, actual building, and incurrence of all costs incidental to the construction or reconstruction of a road (FSM 7705). Realignment, curve widening, clearing and grubbing, excavation work to accommodate safe use of product haul and equipment transport vehicles, establishing road template, major drainage structure installation, and general maintenance activities as described above. Road reconstruction would occur on four miles of unauthorized roads that would be added to the Forest Transportation System as level 1 (closed to public use, for administrative use only).
- **Temporary Road Construction**: Temporary roads built to a minimum standard for temporary equipment and vehicle access to treatment units. Installation of temporary culvert(s) may be necessary to provide road drainage. Following project use, any culvert(s) would be removed and temporary roads would be decommissioned and rehabilitated.

- **Construction/Decommissioning/Rehabilitation of Temporary Roads**, Re-contouring surfaces, ripping the surface and to reduce compaction, seeding surface where bare mineral soil is present, placing slash and other large woody debris along surface to reduce soil erosion, assuring adequate cross-drainage, and effectively closing to off-highway vehicle use. This applies to all temporary roads, landings and skid trails.
- **Closing Maintenance Level 1 Roads**: Ripping and seeding the roadbed and constructing waterbars to reduce erosion, constructing physical road closure to prevent vehicle use. This applies to approximately five miles of maintenance level 1 roads and four miles of unauthorized roads located outside of the IRA that would be added to the Forest Transportation System as level 1 roads (administrative use).

Table 6. Summary of proposed road work under Alternative 2.

Road Work	Road Type	Number. inside IRA	Number outside IRA	Total
Maintenance	system	54 miles	14 miles	68 miles
Maintenance associated with hazard tree removal	system	29 miles	7 miles	36miles
Reconstruction	unauthorized	0 miles	4 miles	4 miles
Temporary Road Construction and Decommission	temporary, unauthorized	0 miles	4 miles	4 miles
Total road work		83 miles	29 miles	112 miles
Bridge replacement		2	0	2
Gravel source development		1		1
Roads added to the Forest Transportation System (miles)		0	4 miles level 1	

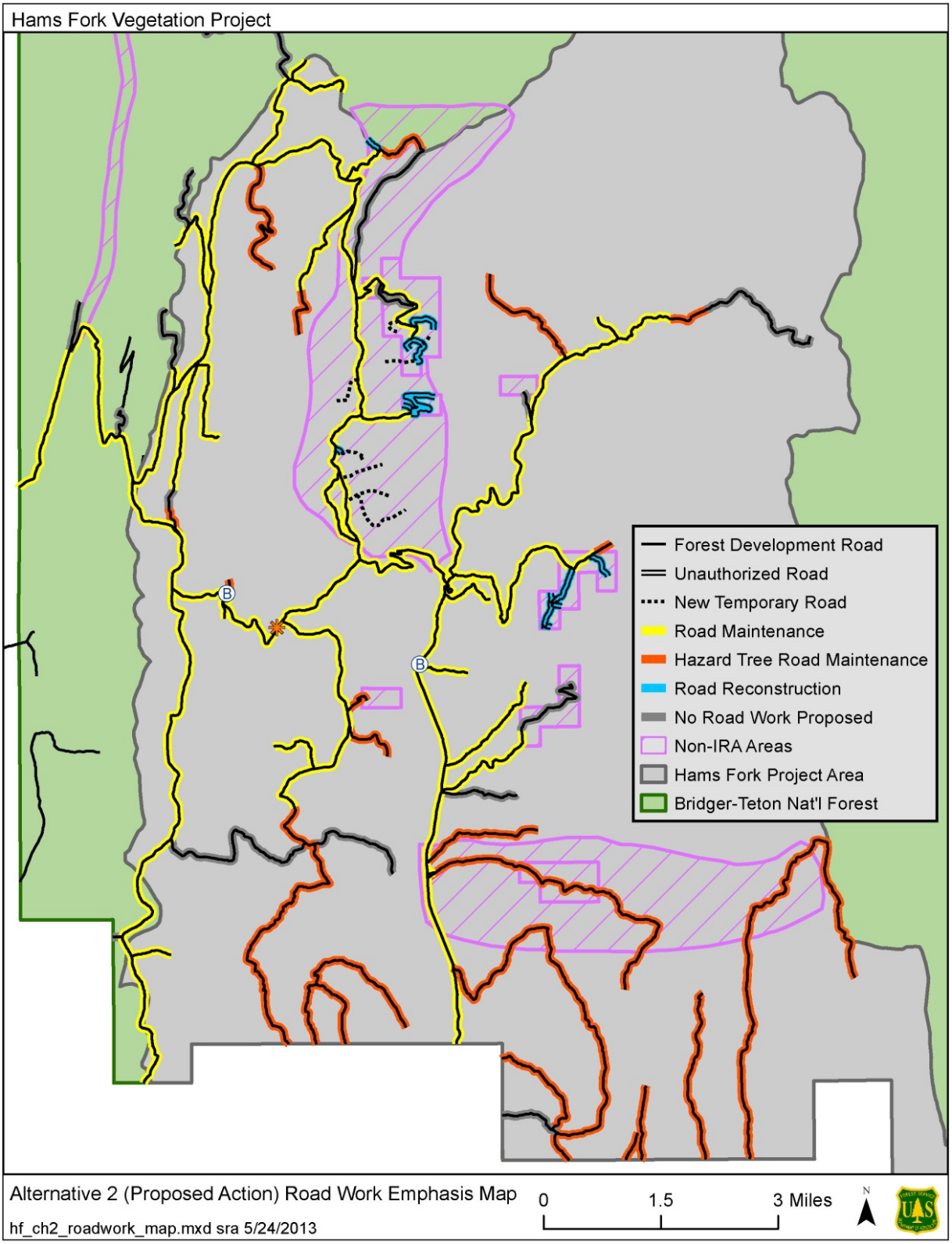


Figure 7. Road work proposed under Alternative 2.

Bridge Replacement: The Elk Creek bridge and the West Fork Hams bridge would need to be replaced before logs could be hauled over them. These bridges are in fair condition with damaged curbs, deck abrasion, deck delamination, splits and checks in substructures, broken wing wall posts, and destabilized abutments. The bridges can only safely hold 17 tons with a typical logging truck configuration (an empty logging truck typically weighs 36 tons). Haul routes are possible along roads without bridges but haul distances are increased up to 15 miles.

Bridge construction would involve dewatering the site, excavating the new, wider, abutment locations, erecting the abutments, backfilling the abutments, placing streambed simulation material and rip rap, constructing and placing the deck, and placing an asphalt wearing surface. Construction would be approximately one month per bridge with a 10 day road closure per bridge. Staging for the Elk Creek bridge would be in a clearing north of the bridge and away from the old Elk Creek Ranger Station. Staging for the West Fork Hams bridge would be at the dispersed camp area north of the bridge. Rip rap would be taken from the Big Springs gravel pit on the Kelley-Hams Fork road #10062 and the rock slope adjacent to and at the end of the Hams Fork Dispersed Recreation Site road #10196. Gravel for backfill and road base would either come from the Big Springs Gravel pit or purchased and hauled to the project. The new, wider span, asphalt surfaced bridges would be designed to improve safety, improve amphibian and terrestrial wildlife passage by including land under the bridge, improve fish passage and hydrologic function and reduced sedimentation in the long term by allowing unrestricted water flow.

- **Gravel Source Development**: Some roads used with this project would require a hardened surface either for safety or erosion control. An economic source of rock is available at the current Big Springs pit along the Kelley-Hams Fork road east of the Kelley Guard station. The Big Springs gravel pit would be expanded to provide the necessary surfacing on many of the roads in the area. Road surfacing eventually gets worn down and needs replacement after fifteen or twenty years. Many of the roads in the area have worn surfacing or have never had surfacing. Road surfacing improves vehicle safety and decreases the sedimentation.

  The rock in the Big Springs gravel pit is rippable and could be used as road base material and larger road surfacing material. There is a small parking area that could be used for a crusher set up location but may not be large enough for a stockpile. Any crushing activities would require immediate haul until space was made for a stockpile. Crushed gravel has specific gradations and is better for road surfacing because it compacts better and makes a smoother travel surface. Disturbed area of this pit would be approximately five acres. Crushing and/or borrow activities would likely occur in phases over the period of several years. Pit walls and floor would be smoothed and cleaned at the end of operations. Stockpiles of gravel may be present at the pit between crushing and spreading operations if they are also done in phases.

Additions to the Forest Transportation System

A project level transportation analysis was done according to 36 CFR 212.5 (B)(1) where the road system and unauthorized roads were identified for safe and efficient travel for administration, utilization, and protection of National Forest System lands. This procedure was done according to the Forest Service Handbook 7709.55 Chapter 20 and Forest Service Manual 7712.

Under Alternative 2, four miles of unauthorized roads would be added to the Forest Transportation System as level 1 system roads. Level 1 roads are not open to the public, are limited to administrative use, and do not increase or decrease the number of open miles of roads within the project area. Therefore, the addition of level 1 roads does not change the travel

management policy on the Kemmerer Ranger District. These roads were determined to be useful for vegetation management and fire suppression and would not present harmful environmental effects. According to 36 CFR 212.51(d), motor vehicle use on National System roads needs to be designated by vehicle class unless the road is limited to administrative use. The four miles of existing road would be closed to public use.

Table 7 lists and Figure 8 displays the unauthorized roads that would be added to the Forest Transportation System. These roads totaling approximately four miles are located within the project area and outside the inventory roadless areas. Alternative 2 would not change the existing road classification for roads in the inventoried roadless areas.

Table 7. Unauthorized roads that would be added to the Forest Transportation System under Alternative 2.

Road Number	Road Name	Miles outside of IRA	Maintenance Level	Type of Road Work
10164C	P&M Tract 1 Spur C	0.6	1	reconstruction
10164	P&M Tract 1	0.5	1	reconstruction
10160	P&M Tract 2	0.5	1	reconstruction
10160A	P&M Tract 2 Spur A	0.2	1	reconstruction
10164	P&M Tract 2 Spur A	0.2	1	reconstruction
10066M	Old Big Park	0.1	1	reconstruction
10063A	Elk Creek Ridge Spur A	1.0	1	reconstruction
10063B	Elk Creek Ridge Spur B	0.2	1	reconstruction
10063C	Elk Creek Ridge Spur C	0.2	1	reconstruction
10063D	Elk Creek Ridge Spur D	0.1	1	reconstruction
10063E	Elk Creek Ridge Spur E	0.4	1	reconstruction
10193F	Hobble Spur F	0.2	1	reconstruction
Total		4.2		

Control of Noxious Weeds

Control of noxious weeds is estimated to occur on 274 acres along 112 miles of roads associated with silvicultural treatments including hazard tree removal (10 feet on both sides of the road was assumed for seed dispersal from vehicles) and in 1,075 acres associated with skid trails and landings (maximum area allowed under design features Soils-5 and WL-5). A potential of 1,349 acres of noxious weed control would occur following the Bridger-Teton National Forest Strategy and Action Plan for Invasive Species Management (USFS 2008). The estimated acreage is likely a high estimate because weed dispersal and establishment would likely not occur along the entire length of all roads and on the maximum area allowed for skid trails and landings. Control methods would include spraying of herbicides, removing weeds by hand, and/or releasing biological control agents as authorized under the Decision Notice and Finding of No Significant Impact for Management of Noxious Weeds on Bridger-Teton National Forest Fremont, Lincoln, Sublette and Teton Counties, Wyoming (USFS 2005).

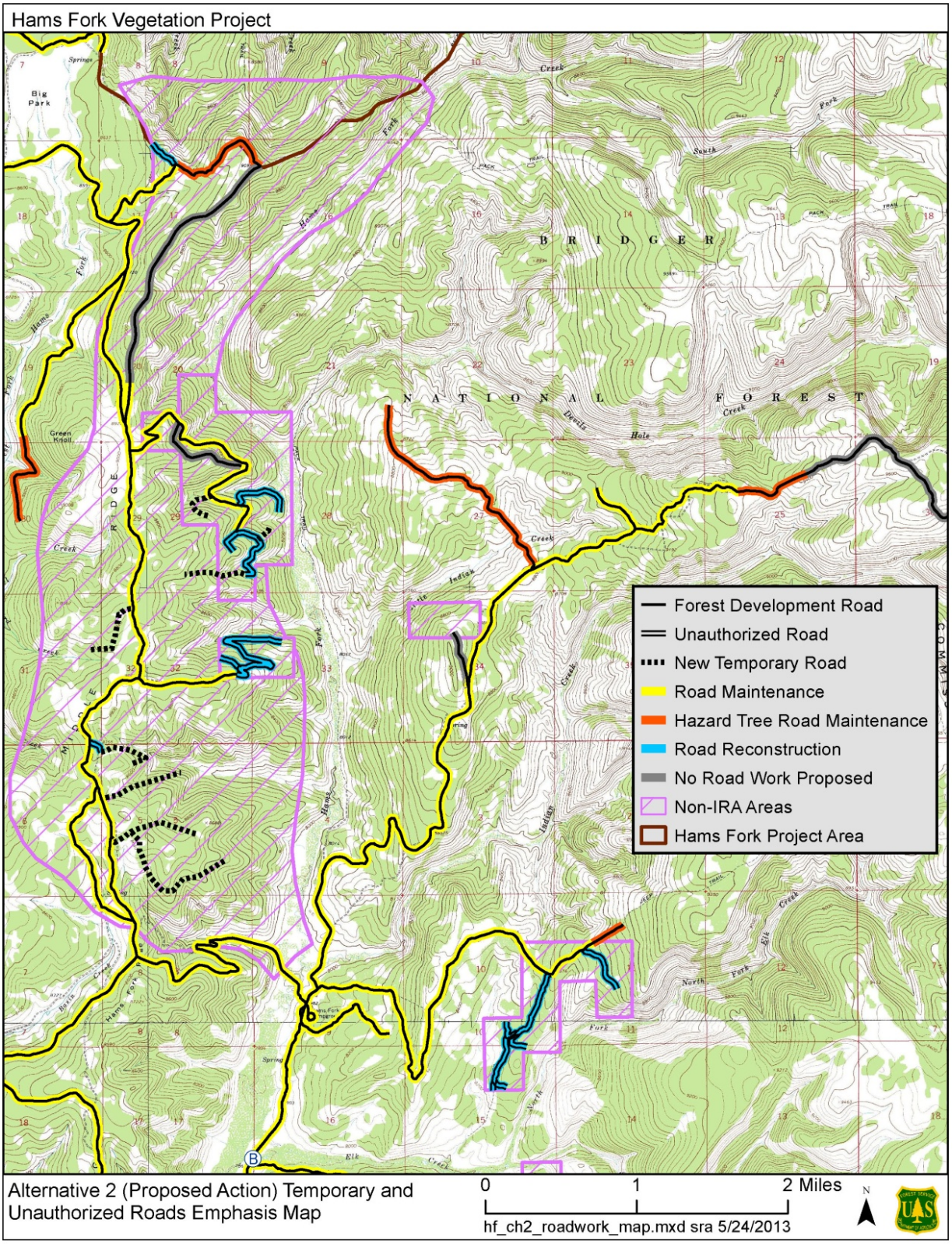


Figure 8. Unauthorized roads added to the Forest Transportation System and temporary roads under Alternative 2

Project Design Features

The project design features are part of the Proposed Action Alternative and are intended to minimize or avoid potential adverse environmental effects while meeting project objectives. Appendix D displays the project design features highlighting the standard best management practices used for silvicultural treatments. As much as possible, design features are site-specific and include rationales for including them in the Proposed Action.

Monitoring

Two types of monitoring would occur with the implementation of this Proposed Action. The first is implementation monitoring which would ensure that the design features associated with this alternative are incorporated during project implementation. Implementation monitoring would be conducted by Forest Service employees acting as contracting officer representatives and timber sale administrators. The second type of monitoring is effectiveness monitoring which would occur to ensure the project is reaching desired conditions and achieving the purposes of the project. The following effectiveness monitoring would be conducted.

- Post-treatment stand exams or walkthrough surveys within a sample of treatment units would be conducted within five years of all treatments having been completed. These would provide baseline data on area burned and vegetation response and how well implementation of treatments met the objectives and desired conditions, including response of aspen regeneration, aspen browsing levels and lodgepole pine regeneration.
- Post-treatment surveys in whitebark pine improvement units for natural and artificial regeneration would be conducted at one, three, and/or five years post treatment as needed.
- Post-treatment wildlife surveys will be completed for all required species. See the Biological Evaluation and Wildlife Report (DeLong 2013a) for more details.

Comparison of Alternatives

Table 8 is a comparison of the activities by alternative. Table 9 summarizes effects to resources by alternative. Table 10 summarizes the ability of each alternative to meet the purposes of the project. Chapter 3 describes the environmental consequences of the alternatives in detail.

Table 8. Comparison of alternatives by proposed activities.

Action	Alt. 1	Alt. 2		
	Project Area	Within IRA	Outside IRA	Total
Clearcut with reserves (acres)	0	0	39	39
Patch clearcut with salvage/sanitation (acres)	0	0	175	175
Salvage/sanitation/commercial thin (acres)	0	0	146	146
Salvage/sanitation/commercial thin with aspen improvement (acres)	0	0	174	174
Salvage/sanitation with aspen improvement (acres)	0	939	161	1100
Salvage/sanitation (acres)	0	1402	5	1407
Salvage (acres)	0	1320	453	1773
Whitebark pine improvement (acres)	0	207	0	207
Aspen improvement (acres)	0	0	153	153
Facility protection (acres)	0	2	0	2
Prescribed fire – (acres)	0	561	169	730
Hazard tree removal 300 ft. on both sides of road from center (acres)	0	2023	693	2716
Total primary treatments (acres)	0	6454	2168	8622
Road maintenance (miles)	43	54	14	68
Road maintenance associated with hazard tree removal (miles)	0	29	7	36
Road reconstruction (miles)	0	0	4	4
Temporary road construction and decommission (miles)	0	0	4	4
Total road work (miles)	43	83	29	112
Bridge replacement	0	2	0	2
Gravel source development (expansion of existing site)	0	1	0	1
Roads added to the Forest Transportation System (miles)	0	0	4 mi level 1	4
Fire control lines -- blackline (miles)	0	10		10
Fire control lines – saw/handline (miles)	0	0.8		0.8
Fire control lines – roads (miles)	0	6.5		6.5
Fire control lines – hand/machine line for activity fuels (miles)	0	10.2		10.2
Sub-total Fire control lines	0	27.5		27.5

Table 9. Comparison of alternatives by environmental effect.

Resource Area	Indicator	Alternative 1	Alternative 2
Forested Vegetation	Species Composition Mix of Succession Stand Structure	Alt. 1 would maintain the loss of compositional diversity because aspen and whitebark pine would continue to decline. Declines are due to a) mature stands dying out; b) continued increases in over represented mature age-class and no increase in young age-class stands; and c) increases in multi-storied stands across the project area and maintains a lack of diversity in stand structure.	Alt. 2: a) increases the diverse mix of forested composition by encouraging regeneration and reducing conifer encroachment in aspen (1,427 acres) and whitebark pine stands (207 acres); b) increases the under-represented young age class by 1-3% and decreases the over-represented mature age class by 1-3%; and c) increases the diversity of vegetative structure by increasing single story structure stands by increasing regeneration of pine and aspen.
Fuels/Fire	Percent of the forested area at risk to burn as a high intensity fire based on estimated acres in Fuel Model 10 and modified 10/12	71% of the forested area is at risk of burning as a high intensity fire	63% of the forested area is at risk of burning as a high intensity fire. Alt. 2 decreases the forested area in Fuel Model 10 and modified 10/12 by 8% compared to Alt. 1. The strategic location of the proposed treatments along roads results in enhanced firefighting capabilities and the ability to manage fires to mimic more natural fire sizes.
Wildlife	Percent of lynx habitat in a stand-initiation stage and percent of lynx habitat regenerated within 10-year period.	15% and 8%, respectively.	Percentages would increase to 21% and 14%, respectively, both of which are under the thresholds of 30% and 15%. While there are short-term negative effects on winter snowshoe hare habitat, there would be a net improvement when young trees are available above the snow-line (e.g., ≥20-25 years).
Wildlife	Open road density relative to potential use by grizzly bears	0.89 miles/mile^2 in the project area and 1.26 miles/mile^2 in the western 2/3 of project area, compared to an approximate threshold of 1 miles/mile^2.	No change from Alternative 1.
Wildlife	Adjusted-open-road density and roadside forest cover relative to potential elk use	0.57 miles/mile^2 in DFC 10 areas and 0.52 miles/mile^2 in project area, which translates to 73% and 75% potential elk use (compared to 100% potential elk use with 0 miles/mile^2).	0.74 miles/mile^2 in DFC 10 areas and 0.69 miles/mile^2 in project area, which translates to 70% and 68% potential elk use (compared to 100% potential elk use with 0 miles/mile^2). This remains above the 60% s intended for DFC 10 areas.
Wildlife	Proportion of forestland in early succession relative to elk, mule deer, moose, and great gray owls (foraging habitat); and for migratory	There would continue to be a major underrepresentation: 7% vs. 15-20% (natural), all forest types 12% vs. 10-20% (natural), lodgepole pine	Small improvement, but there would continue to be a major underrepresentation: 8-10% vs. 15-20% (natural), all forest types 13% vs. 10-20% (natural), lodgepole pine

Resource Area	Indicator	Alternative 1	Alternative 2
	birds	3% vs. 20-40% (natural) aspen 4% vs. ≥15% (natural) whitebark pine 5% vs. 5-10% (natural) spruce-fir	9-11% vs. ≥20-40% (natural) aspen 4-6% vs. ≥15% (natural) whitebark pine 6% vs. 5-10% (natural) spruce-fir
Wildlife	Proportion of forestland in late succession for pine marten, great gray owls (nesting), boreal owls, northern three-toed woodpeckers, goshawks, and other late-seral forestland migratory birds	There would continue to be a major overrepresentation: 91% vs. 40-50% (natural), all forest types 85% vs. 30-50% (natural), lodgepole pine 93% vs. 30-40% (natural) aspen 95% vs. 40% (natural) whitebark pine 5% vs. 5-10% (natural) spruce-fir There would continue to be 83-169% more late-seral forestland that existed under a natural fire regime.	Small improvement, but there would continue to be a major overrepresentation: 88-90% vs. 40-50% (natural), all forest types 84% vs. 30-50% (natural), lodgepole pine 85-87% vs. 30-40% (natural) aspen 93-95% vs. 40% (natural) whitebark pine 93% vs. 5-10% (natural) spruce-fir There would continue to be 49-160% more late-seral forestland that existed under a natural fire regime (i.e., continuation of long-term accrual of benefits to these species).
Wildlife	Acreage of snag-bearing forestland and density of snags for northern three-toed woodpeckers and other migratory birds	There would continue to be an estimated 83-169% more acres of late-seral snag-bearing forestland than existed under a natural fire regime.	There would continue to be an estimated 49-160% more acres of late-seral snag-bearing forestland than existed under a natural fire regime (i.e., continuation of long-term accrual of benefits to these species).
Wildlife	Treatments in 1 known active goshawk territory and 2 known active great gray owl territories	No additional impacts over baseline conditions.	No effect in the nest area (40 acres around nest trees). Potential adverse effects or treatments on post-fledgling habitat around goshawk nest, a net negative effect in the 5,400 acres around the goshawk nest, and a potential net positive effect in the 5,400 acres around the owl nests. Minimal disturbance effects due to design features WL-14, 15, and 16.
Wildlife	New and widened roads within 1/3 mile of known amphibian breeding sites	No new roads and no additional loss of riparian habitat to existing roads (e.g. road widening) within 1/3 mile of known boreal toad or spotted frog breeding sites.	No new roads and <1 acres worth of additional loss of riparian habitat to existing roads (e.g. road widening) within 1/3 mile of known boreal toad or spotted frog breeding sites. Thus, no more than negligible negative effects.
Wildlife	Tons/acre of large woody material for amphibians	Across all 54 stands examined, 64% had an estimated 4-6 tons per acre, 32% had an estimated 10-15 tons per acre, and the remaining 4% percent had an estimated 3-4 tons/acre.	100% of mechanically treated stands would have 8-10 tons/acre or more, which is an improvement over Alternative 1 in the short term (until dead trees from insect epidemic began to fall).

Resource Area	Indicator	Alternative 1	Alternative 2
Wildlife	Proportion of the aspen type in early succession, including benefits to elk, mule deer, moose, and amphibians	3% vs. 20-40% (natural) aspen	9-11% vs. ≥20-40% (natural) aspen, which is a moderate increase over conditions in Alternative 1.
Wildlife	Disturbance effects and potential for increased mortality due to felling trees, heavy equipment, log trucks, and other treatment activities	No additional impacts over baseline conditions.	Increased potential for disturbing individual animals and for increasing mortality as a result of vehicle-wildlife collisions and crushing, but not allowing heavy equipment and other treatment activities until after July 20 would minimize effects during the breeding season.
Special Areas: Inventoried Roadless Areas	Wilderness Attributes and Roadless Characteristics	No direct effects and minimal indirect effects including impacts to landscape integrity and diversity of plant and animal communities in the form of 1) increased, untreated tree mortality 2) continued conifer encroachment into aspen and whitebark pine communities, 3) continued increase in late-succession forestland which is over represented in the project area. Overall however wilderness attributes and roadless characteristics will continue to be stable in both project area portions of the IRA	Minimal direct effects that will impact a variety of wilderness attributes and roadless characteristic including the untrammeled, natural, special features, diversity of plant and animal communities, TES and Sensitive Species habitat, and landscape integrity attributes/characteristics. Although there may be negative effects to these attributes/characteristics in the form of area disturbance, visual impacts as a result of treatments, and temporary loss of habitat, it is anticipated that they will be insignificant, short term, or occur in portions of the IRAs that already exhibit moderate to low wilderness/roadless area characteristics. It is anticipated that the existing condition will remain stable. Actions proposed under Alt. 2 may result in positive effects that have the potential to trend the natural, special feature, and diversity of plant and animal communities' attributes/characteristic towards improving through increasing early seral forestland (1- 3%) and enhance aspen and whitebark pine communities through the cutting of encroaching conifers and stimulating regeneration through prescribed burns.
Special Areas: Inventoried Roadless Areas	Acres of treatment in IRAs	0 acres hazard tree treatment; 0 acres sanitation/salvage treatment; 0 acres prescribed burn gravel pit development – N/A	2,023 acres hazard tree treatment; 3,869 acres sanitation/salvage treatment; 522 acres prescribed burn 3 acres gravel pit development

Resource Area	Indicator	Alternative 1	Alternative 2
Special Areas: Inventoried Roadless Areas	Miles of road maintenance/reconstruction in the IRAs Bridge replacement	Road maintenance: 34 miles Bridge replacement: 0 Road reconstruction: 0 miles	Road maintenance: 54 miles Bridge replacement: 2 Road reconstruction: 0 miles
Hydrology	Potential sediment delivery to stream channels	Forest Service roads 10021, 10601A, 10062, and 10199 would continue to input sediment into Basin Creek, Kelley Creek, Elk Creek, and the spring fed stream adjacent to the Hams Fork Campground. Fire could have negative impacts on water quality and to the municipal watershed supply due to an increased amount of sediment, ash, and nutrients. An increased probability for erosion and landslide or debris flows could damage roads, degrade water quality, and impair the local municipal water supply.	Road maintenance of Forest Service roads 10021, 10601A, 10062, and 10199 would decrease sedimentation into Basin Creek, Kelley Creek, Elk Creek, and the spring fed stream adjacent to the Hams Fork Campground. Water quality will be impacted during the construction and reclamation of the temporary and reconstructed roads (8 miles) which are located outside the IRA. These impacts would be short-term inputs of sediment during the road work phase and would not be a long-term adverse impact to water quality. Long-term, the overall water quality to the watershed will improve due to the closure and rehabilitation of these roads. Water quality may be impacted in the short-term immediately following a burn and at least the first year following a burn until the grass/sedge vegetation regrows. Prescribed fire that implements design features H-1, H-4 and FM-2 will have minimal impacts to the riparian area and water quality. Replacing the Elk Creek and West Fork Hams Fork bridges would have minimal short-term impact (2 – 3 years) on water quality with the Implementation of project design features. Replacement of the bridges would allow for unimpeded 100-year flood flow, stream movement, and better sediment transport in the long-term.
Hydrology	Potential impacts to water yield and timing	Zero percent of the HUCs would be treated and no change in water yield and timing would be expected.	Proposed treatments are less than 30% of each HUC; therefore, no change in water yield and timing would be expected. Alternative 2 would not be expected to change water yield or runoff timing in any of the four watersheds.

Resource Area	Indicator	Alternative 1	Alternative 2
Hydrology	Potential impacts to riparian vegetation and stream channel condition	No treatments are proposed under this alternative and therefore no effect on riparian vegetation and stream channel condition would occur due to proposed treatments. Riparian areas that were observed to be impacted due to roads and grazing would continue to occur.	There would be short-term impacts during project implementation on riparian vegetation and stream channel condition; however, effects would be reduced by implementation of project design features that include the State BMPs including hardened water crossings, vegetation treatment buffers, and no pile-burning and decking logs near or within riparian areas would allow for the protection of streambank vegetation and would decrease the amount of disturbance to the stream channels within the project area.
Fisheries	Sediment	Lack of road maintenance on 61 miles of open system roads contributes to stream sedimentation in the short and long-term. Short term sedimentation would occur from road maintenance.	Short term sedimentation would occur from road maintenance and bridge/culvert replacement. This is off-set by long-term reduction in sedimentation associated with road improvements.
Fisheries	Fish passage	Two bridges and culverts would continue to impede fish passage.	Bridge and culvert replacement would improve fish passage.
Soils	Detrimental soil disturbance (total acres)	Approximately 22 acres of detrimental soil disturbance exists within the proposed treatment units (< 1% of the 8.622 acres proposed for treatment)	Up to 804.5 acres (9.3% of the 8,622 acres proposed for treatment) of detrimental soil disturbance would occur under the Proposed Action. This is below the 15% threshold of concern.
Sensitive Plants	The acres of potential or occupied sensitive plant habitat which would be impacted by thinning and burning or the lack of such treatment	The effects of no action, which is to say the current management, on whitebark pine and Payson's milkvetch are generally negative. There would be no direct effects to either species from no action. However, the no action alternative would sustain or accelerate several agents of mortality for whitebark pine (interspecific competition and beetle mortality) and would maintain the successional alteration of Payson's milkvetch habitat.	The Proposed Action would alleviate some of the negative effects from the current management of the area. Disturbance from thinning and burning would create habitat for Payson's milkvetch in the area. Removing competing trees and thinning diseased forests would remove two agents of mortality for whitebark pine. Individual plants of either species could be damaged by implementing the Proposed Action. However, the possible benefits of this alternative far outweigh the potential loss of a few individuals.
Invasive Plants	Acres with a higher potential for noxious weed establishment	Levels of new noxious weed infestations would likely continue to occur at levels similar to the past with new infestations being either eradicated and/or quickly controlled. Previously existing noxious weed sites would likely continue to be	An estimated 1,376 acres of disturbed area associated with the proposed silviculture activities, prescribed burns, and road work would have a higher potential for noxious weed establishment. It is unlikely that weeds would establish across this entire area because of the

Resource Area	Indicator	Alternative 1	Alternative 2
		controlled through implementation of the Forest's Management of Noxious Weeds (USFS 2005).	proposed activities. Any noxious weeds will be controlled through implementation of the Forest's Management of Noxious Weeds (USFS 2005).
Transportation	Miles of open road in which hazard trees are removed	Hazard tree removal would occur at a minimal scale as Forest employees identify hazardous trees. Hazard tree removal along roads would occur primarily along main routes but would be less systematic and comprehensive than under Alternative 2. The potential for trees to fall and close roads would increase over time as more trees die and rot.	Hazard trees would be removed from forested areas adjacent to 104 miles of road.
Transportation	Miles of existing unauthorized road that will be added to the Forest Transportation System as level 1 road (administrative use).	0 miles	4 miles of administrative use roads which would be closed to the public (36 CFR 212.51(d). These roads are located outside inventoried roadless areas.
Transportation	Miles of road maintenance	Alt. 1 maintains 43 miles of road. The remaining miles of open roads would continue to deteriorate.	Alt. 2 maintains 104 miles of road. The effects of road maintenance will bring road conditions to current standard.
Economics	Present net value Jobs and labor income	Cost to the Forest Service is $0. Alt. 1 would provide zero total jobs and zero dollars in total labor income. Ongoing Forest management costs associated with 43 miles of road maintenance and ongoing activities such as noxious weed treatments would continue to be incurred. Costs associated with two bridge replacements may also be necessary	The net cost to the Forest Service for timber harvest and required design features is $323,000. The net cost for timber harvest and all other planned non-timber activities (e.g. bridge replacements, noxious weed control) is $836,000. Alt. 2 would maintain approximately 880 total jobs and provide $27.8 million in total labor income.
Recreation	Effects on Developed Recreation Sites	There will be no effects on developed recreation. Current maintenance will continue with hazard trees being dealt with on a case by case basis when identified by Forest Service employees. Alternative 1 will not result in the closure of any developed sites	Alternative 2 has the potential to affect developed recreation sites in a variety of ways. There will be temporary closures to developed sites when treatments are being implemented. Additionally, access to developed sites may be closed or restricted while treatments are being implemented in the surrounding area. However, Alternative 2 will result in improved site safety as a result of hazard tree treatments.

Resource Area	Indicator	Alternative 1	Alternative 2
			Additionally, site condition may improve as gravel is available from the expanded gravel pit to maintain the sites to standard.
Recreation	Effect on Motorized and Dispersed Recreation	43 miles of roads will be maintained through the normal Forest Service road maintenance cycles; 0 miles of temporary roads; 0 miles of new roads added to the Forest System; 0 miles of roads reconstruction; 0 miles of temporary road closures. Additionally, there will be no comprehensive hazard tree removal and overall safety of dispersed camps or roads would not improve	104 miles of road maintenance – the increased number of roads maintained to standard will improve access for the public, especially sedans and other low clearance vehicles, and could increase public pressure on the recreation resource. 4 miles of temporary roads – if not decommissioned properly these temporary routes may result in increased illegal OHV use; 4 miles of roads added to the Forest System as level 1 roads; 104 miles of roads could be temporarily closed as a result of mechanical treatments and prescribed fire. Improved safety at dispersed recreation sites due to hazard tree treatments along roads.
Recreation	Recreation Opportunity Spectrum Classification	Potential degradation of visitor perception as a result of continued, untreated, tree mortality in the area – would not result in the re-classification of ROS class in the project area	Potential for effects to visual, remoteness, and access setting indicators of the ROS classification within the project area. Negative effects include increased noise, increased human presence, and increased visible manmade alterations to the visual resource. Most of these effects will be short term during project activities, and will dissipate after project activities cease. Visual effects may be slightly more long lasting, but will eventually improve as the forest regenerates. Although there is an addition of roads in Semi-Primitive Non-Motorized area, these roads will be level 1 and closed to the public and will not result in the permanent modification of ROS classification.
Visual Quality	Scenery	Current visual quality would diminish under the No Action Alt. because dead trees in large numbers would continue to be seen on much of the Hams Fork watershed and would continue to decline as vegetation dies further. Disturbance regimes and events such as wildfires, winds, insects and disease would continue to shape and change the vegetation of Forest landscapes. Therefore, the fear of fire and its effects to the scenic resources would continue.	The visual quality/ scenery of the Hams Fork project area may be affected in the short-term (less than 5 years) by actions proposed under Alt. 2, but visible effects would decrease to unnoticeable levels in the long-term (greater than five years). These visual effects would vary in duration and intensity depending upon where on the landscape the proposed activities take place and the proposed treatment type. Many of the proposed activities are visible from the main roads with the project area boundary. These actions would add

Resource Area	Indicator	Alternative 1	Alternative 2
		In time, conifers would continue to encroach upon aspen clones with the possibility of some loss of clones over the next decade. Portions of conifer stands may continue to decline and die, all of which may cause a reduction in visual variety class and textures of the project area. Although visual quality would not be improved and would continue to decline under this alternative, Forest Plan VQOs would be met. If high intensity fires were to occur, there would be a temporary loss to scenery values; but over time scenery would gradually recover over the next several decades toward partial retention and retention of visual quality.	scenic attributes to the forest that resemble a natural range of structural diversity and provide resiliency to disturbance. Under Alt. 2, mechanical treatments and prescribed burning would create a natural mosaic pattern in many areas of the Forest. These areas would have more rocky natural-appearing openings and a diverse plant understory. Other new openings would have aspen growing in them. Overall, the landscape would have an increase in diversity of age classes. This would improve visual conditions by adding variety to the landscape that is more sustainable than current conditions.
Cultural Resources	Number of National Register eligible sites effected.	No direct effects. Potential indirect effects as a result of increased fuel loads which could lead to high intensity fires resulting in damaged or destroyed sites.	No direct effects – National Register eligible sites avoided. Reduced potential for indirect effects by reducing potential for high intensity fires.
Climate Change		Continued impacts on climate change associated with ongoing human activities. Alt. 1 has increased potential for a larger high intensity wildfire which would release carbon dioxide into atmosphere.	Release of carbon dioxide during prescribed burning of 730 acres and potential secondary treatment of up to 7,892 acres would occur. Removal of dead and dying trees (85,599 ccfs) would remove stored carbon from the forest and would reduce the potential area burned under a high intensity wildfire.

Table 10. Comparison of alternatives by project purpose.

Purpose/Secondary Benefit	Alternative 1	Alternative 2
Purpose 1 is to develop a diverse mix of vegetative composition and structure and increase a mosaic pattern on the landscape of different fuel types, fuel loadings, forested communities and stand age-classes to decrease the proportion of the landscape that would be affected by high intensity wildfires.	Does not contribute to the purpose. Alternative 1 would maintain the loss of compositional diversity because aspen and whitebark pine would continue to decline. Declines are due to a) mature stands dying out; b) continued increases in over represented mature age-class and no increase in young age-class stands; c) increases in multi-storied stands across the project area and lack of diversity in stand structure d) increases fuel loads by leaving dead and dying trees and increases the acres in fuel model 10 and modified 10/12 by 4,209 acres, compared to Alt.2 and e) increases the proportion of the forested area at risk of burning as a high intensity fire during moderate burning conditions by 8% compared to Alternative 2.	Contributes to the purpose. Alternative 2: a) increases the diverse mix of forested composition by encouraging regeneration and reducing conifer encroachment in aspen (1,427 acres) and whitebark pine stands (207 acres); b) increases the under-represented young age class by 1-3% and decreases the over-represented mature age class by 1-3%; c) increases the diversity of vegetative structure by increasing single story structure stands by increasing regeneration of pine and aspen; d) reduces fuel loads by removing dead and dying trees and reducing the acres in fuel model 10 and modified 10/12 by 4,209 acres, compared to Alt.1 and e) decreases the proportion of the forested area at risk of burning as a high intensity fire during moderate burning conditions by 8% compared to Alternative 1.
Purpose 2 is to reduce, to an acceptable level, hazards associated with standing dead trees in the vicinity of roads, campgrounds, dispersed campsites, and administrative sites, while continuing to provide for the safe access to and use of these facilities and sites.	Hazard tree treatment would occur at a minimal scale as Forest employees identify hazardous trees. Treatments would be emphasized at campgrounds and administrative sites. Hazard tree removal along roads would occur primarily along main routes but would be less systematic and comprehensive than under Alternative 2. The potential for trees to fall and close roads would increase over time as more trees die and rot.	Alt. 2 contributes substantially to the purpose. Hazard trees would be removed from forested areas adjacent to 104 miles of road and at campgrounds, administrative sites, and dispersed campsites.
Purpose 3 is to enhance aspen and whitebark pine communities by reducing competition, enhancing regeneration, and increasing age-class diversity.	Does not contribute to the purpose. No action to enhance aspen or whitebark pine would maintain or accelerate the decline in these species. Proportion of the aspen type in early succession is about 3% and declining, and the proportion in late succession is about 93% and increasing. Proportion of the whitebark pine type in early succession is about 4% and declining, and the proportion in late succession is about 95% and increasing. The threats to these species include the successional replacement of aspen and whitebark pine by shade tolerant conifers	Contributes to the purpose. Thinning and burning would enhance aspen and whitebark pine habitat by mimicking the natural disturbance that these species require. Aspen and whitebark pine would be rejuvenated on as many as 830 acres and 200 acres, respectively. Proportion of the aspen type in early succession will be about 9-11%, which is closer to the desired 20-40% than under Alt. 1 (3%). Proportion the whitebark pine type in early succession will be about 4-6%, which is slightly closer to the desired ≥15% than under Alt. 1 (4%).

Purpose/Secondary Benefit	Alternative 1	Alternative 2
	and other knock-on effects from historical fire suppression.	The Proposed Action would reduce inter-specific competition from shade tolerant conifers, reduce the likelihood of insect epidemics, and create opportunities for establishment and spread of whitebark pine and aspen. The Proposed Action would alleviate some of the negative effects from historical fire suppression in the Hams Fork Area.
Purpose 4 is to enhance lodgepole pine communities by increasing age-class diversity, reducing stand densities and reducing incidence of infested trees to promote conditions that are more resilient to the effects of fire, insects, disease, and drought.	Proportion the lodgepole pine type in early succession is about 12% and this is declining, and the proportion in late succession is about 85% and this is increasing due to increasing composition of subalpine fir. Stand density is about 111 sq. ft. per acre basal area. Density of dead trees is on average 15 trees per acre.	Proportion the lodgepole pine type in early succession will be about 13%, which is closer to the desired 20-40%, and the proportion in late succession will be about 84%, which is closer to the desired 30-40%. Stand density will be reduced to about 85 sq. ft. per acre basal area across the treatment units. Density of dead trees will decline to 3 trees per acre across the treatment units.
The secondary benefit is to support social and economic needs of local communities by providing forest products from areas affected by mountain pine beetle.	Does not contribute to the purpose. Cost to the Forest Service is $0. Ongoing Forest management costs associated with 43 miles of road maintenance and ongoing activities such as noxious weed treatments would continue to be incurred. Costs associated with two bridge replacements may also be necessary.	Contributes to the purpose. The net cost to the Forest Service for timber harvest and required design features is $323,000. The net cost for timber harvest and all other planned non-timber activities is $836,000. Alt. 2 would maintain approximately 880 total jobs and provide $27.8 million in total labor income.

CHAPTER 3 – Affected Environment and Environmental Consequences

Introduction

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in the alternatives chapter.

The information presented in this chapter was derived from more detailed specialist reports, survey reports, resource inventories, and other records that are on file in the Hams Fork Vegetation project record, located at the Kemmerer Ranger District office in Kemmerer, Wyoming.

This chapter is not an encyclopedic evaluation of each resource in the area. It focuses on the key issues identified in Chapter 1, along with evaluations of effects of alternatives on resources to evaluate compliance with the Forest Plan. This approach is being used to narrow the scope of the analysis and is consistent with National Environmental Policy Act (NEPA) regulations and the National Forest Management Act.

The following resources analyses are based on the two alternatives described in Chapter 2. Each resource analysis is shaped by the site-specific character of this project as it relates to the resource. Only proposed activities that may affect the resource in some manner are analyzed in detail. Resource areas associated with the key issues or relevant to the purpose and need for action described in Chapter 1 are presented first and with greater detail.

Cumulative Effects

Appendix E lists the past, present, and reasonably foreseeable future actions considered for all resources in the cumulative effects analysis. For activities to be considered cumulative their effects need to overlap in both time and space with those of the proposed actions. In the Wildlife section, a larger cumulative effects area was used for analysis. Present and reasonably foreseeable future actions were projects listed on the Bridger-Teton National Forest's Schedule of Proposed Actions as well as projects and ongoing activities compiled by local Forest Service staff (Appendix E). The existing conditions represent the effects of past actions (36 CFR 220), however, past actions were also included in Appendix E. Individual resource specialists may have examined specific past actions and natural events if relevant and necessary to determine environmental effects for their resource. Not every resource is affected by every action, so actions assessed in each resource analysis differ.

For some resource areas, Alternative 1 (the No Action Alternative) has no direct or measureable indirect effect and therefore will have no cumulative effects.

Forest Vegetation

The following resource information and analysis summarizes the Silviculture Report (Bruch 2013.

Affected Environment- Species Composition and Mix of Succession Stages

Forest Insect and Disease Conditions

Insects and disease play a major role in shaping the character of forests on the Bridger-Teton National Forest. Insects and disease help decompose and recycle nutrients, build soils, maintain genetic diversity within tree species, create snags and down logs and provide food for birds and small mammals. Insect populations play an important role in changing species composition and structural stages in forested vegetation. Insects and most diseases are naturally occurring disturbance processes in forested ecosystems whether they are present at endemic or epidemic populations. One disease, white pine blister rust is a non-native pathogen (USDA Forest Service 2007g).

Insect and disease activity within the project area have been altering forest conditions. Recent noticeable changes are mortality to lodgepole from mountain pine beetle (MPB, *Dendroctonus ponderosae*) at outbreak levels, and the occurrence of both white pine blister rust and mountain pine beetle to both the whitebark and limber pine. The widespread damage within the project area is very typical of conditions found increasingly throughout the Bridger-Teton National Forest. The Bridger-Teton National Forest has been experiencing an epidemic of mountain pine beetle in lodgepole pine and whitebark pine starting in 2002 or 2003 (USDA Forest Service 2007g). Although MPB epidemics have played a historical role in disturbances within the lodgepole pine type, some studies indicate the current scale and intensity of mountain pine beetles throughout the western United States and Canada is larger than in the past (USDA Forest Service 2011a).

Field reconnaissance conducted in the project area observed the prevalence of mountain pine beetle in both lodgepole and whitebark pine at levels approaching total loss in the overstory. Comparison of aerial detection surveys completed from 2006 through 2011 indicate considerable observed mortality associated with mountain pine beetle in both lodgepole and whitebark pine. Aerial detection surveys are conducted to detect and monitor visible vegetation damage primarily caused by insects annually. Diseases, including blister rust and dwarf mistletoe, are not generally mapped from these aerial surveys.

Mountain pine beetle populations were first detected on the Kemmerer Ranger in 1999 in Coantag Creek and in 2003 were also detected in Hams Fork. The expansion of the epidemic, at that time, has been attributed to drought associated with above average temperatures in conjunction with the occurrence of stands that were overly stocked with mature host species, primarily lodgepole pine. As mountain pine beetle populations depleted suitable lodgepole pine resources, they began to spread up in elevation. At higher elevations, mountain pine beetles infested five-needle pine species including whitebark and limber pine.

Analysis of aerial survey detection data indicated that mountain pine beetle-caused tree mortality peaked in 2007 with beetles killing approximately 152,700 trees over 43,000 acres in the Hams Fork project area. With the exception of 2010, the amount of tree mortality declined during the following years. In 2011, roughly 9,500 new attacks were detected over 3,300 acres which amounted to a 94 percent decrease in mortality from 2007. To date, mountain pine beetles have

killed around 475,000 lodgepole, whitebark, and limber pines on approximately 160,000 acres throughout the District. (Hebertson 2012)

The loss of mature pines has resulted in a modification of stand and age-class structure, and species composition. Pine components have generally experienced a reduction in average diameter, height, basal area, and age. The natural return of mature, pine-dominated communities, particularly whitebark and limber pine, may require well over a hundred years. Such affects can either benefit or adversely impact important resource values such as water, timber, critical wildlife habitat, old-growth, aesthetics, and recreation depending upon management objectives. Dead trees pose hazards to public safety. This epidemic has also altered the amount, composition and arrangement of living and dead biomass in the pine and mixed conifer fuel complexes.

Beetle impact on lodgepole pine

The results of field observations and stand analyses indicated that during the past decade, the mountain pine beetle has caused extensive lodgepole pine mortality in the Hams Fork project area. Beetles killed on average nearly half of those trees greater than five inches in diameter in selected stands. The amount of mortality, however, was highly variable ranging from 16 to 76 percent, and largely depended on the average size and density of the lodgepole pine component. These results are consistent with the nature of mountain pine beetle mortality observed during recent epidemics elsewhere in the Interior West (Diskin et al. 2011, Kashian et al. 2011). Mountain pine beetle activity was low in young plantations from past timber harvest or immature stands from more recent fire disturbances.

Hazard rating systems are often used to evaluate stand conditions conducive to the growth and spread of damaging agents. “Hazard” or “susceptibility” is the inherent characteristics of a stand of trees that affect its likelihood of attack and damage by an insect or disease agent. Using Forest Vegetation Simulator, stands were modeled for mountain pine beetle hazard rating using the Mountain Pine Beetle in Lodgepole Pine Risk Rating Event Monitor (McMahan et al. 2002) Results of the modeling provide a numerical “risk susceptibility score” that ranks the risk of stands to attack by the mountain pine beetles. The number of stands per hazard rating is compiled for lodgepole pine based on infestation level in year 2011. The sampled lodgepole pine stands showed that 37 percent of the stands ranked as low, 63 percent of the stands ranked as moderate, and zero as high. This information demonstrates that the current stands in the Hams Fork are not at a continued risk for high levels of infestation from mountain pine beetle.

Beetle impact on whitebark/limber pine

Whitebark pine forms the dominant tree species at the highest elevations and contributed to a mix of conifer species in elevations below the ridges. A combination of blister rust (*Cronartium ribicola*) and mountain pine beetle has killed many of the older whitebark pine, while blister rust has impacted some of the natural regeneration. Some stands sustained near complete loss of the cone bearing age class, shifting composition to other tree species, primarily subalpine fir. Monitoring of mountain pine beetle in the Greater Yellowstone Ecosystem area, has shown a preference for infesting larger sized whitebark pine (Greater Yellowstone Whitebark Pine Monitoring Working Group 2010). A recent study completed in the southern Greater Yellowstone Ecosystem area indicates the preference of mountain pine beetle for diameter sizes varies with stand composition and blister rust severity (Bockino and Tinker 2012). Most stands across the project area with limber pine show similar mortality conditions. Although mountain pine beetle is a native insect and has been documented as active in the past (USDA Forest Service 2011a), current outbreaks have been more intense due to the warm winters increasing bark beetle survival and shortened life cycles (Schwandt 2007). Climatic conditions during the past epidemic in the

1930s were characterized by above average summer temperatures (Perkins and Roberts 2003). Aerial detection surveys documented mortality from 2006 thru 2011 with the highest levels in 2007 and 2008.

White pine blister rust

White pine blister rust can be found within forest areas containing limber and whitebark pine. Field reconnaissance observed the presence of blister rust branch infections using symptoms typical of the disease (presence of spores or cankers - branch flagging rodent chewing, oozing sap, roughened bark, or swelling) within stands where whitebark or limber pine was present. Observed infection levels were generally less than 10% of the pine population and more prevalent in the advanced regeneration size. Monitoring of rust between 2004 and 2007 within the Greater Yellowstone Ecosystem (GYE), which includes the project area calculated an infection rate of 20% of sampled live pine trees. Rust disease was found to be widespread and highly variable in intensity with the GYE. The combined effects of blister rust, drought, higher temperatures, and MPB are linked to extensive mortality of whitebark pine (Sturrock and others 2011). Other factors attributed to decline are competing vegetation and fire (Keane and Parsons 2010, Schwandt 2007).)

Although whitebark pine is highly vulnerable to infection by blister rust, approximately 26% of the pine tree populations located within the greater Yellowstone area have shown genetic resistance to the rust (Greater Yellowstone Coordinating Committee Whitebark Pine Subcommittee. 2011). Seed from these trees have been collected by the Forest for rust resistance testing and potential use for planting. Such seed can be used to increase disease resistance (Burns and others, 2008). Application of carbaryl insecticide to the plus trees for protection from MPB was completed in 2012.

Dwarf Mistletoe

Generally, dwarf mistletoe infection (*Arceuthobium americanum* and *douglasii*) in either the lodgepole pine or Douglas-fir is localized, occurring in pockets, with variable intensity levels. In extreme cases or at high infection intensity, nearly all lodgepole pine in the overstory and understory are infected. Most observed infections were limited to less than five acres in size. A dwarf mistletoe infection rating system was developed to evaluate the level of tree infection (Hawksworth and Dooling 1984). The Hams Fork project area has a very low dwarf mistletoe infection rating on average with some stands or pockets of mistletoe causing localized high infection areas.

Subalpine Fir Mortality Complex

A combination of factors, termed subalpine fir mortality complex, can result in mortality to subalpine fir trees. Factors include root disease, fir engraver beetle, western balsam bark beetle and drought. Observed mortality during field reconnaissance occurred in small pockets, generally affecting several trees. Aerial detection surveys documented mortality in 2006-2007.

Broom Rust

Subalpine fir trees with varying infection levels from fir broom rust have been observed. Infection produces a broom in the tree crown which weakens the tree and can lead to topkill or stem breakage.

Root/Stem Disease

Minor western gall rust cankers (*Endocronartium harknessii*) were observed in lodgepole pine trees. Aspen clones containing mature stems contained a variety of stem cankers.

Existing Condition by Forest Type

The Hams Fork project area is on a mixture of poor to moderately productive soils with lodgepole pine predominating, mixed aspen and lodgepole pine at lower elevations, and mixed conifer at higher elevations. A severe mountain pine beetle epidemic has developed over the last few years in the entire area. Mistletoe is prevalent in most stands of lodgepole pine which is leading to an infection of the understory lodgepole. Aspen stands are in generally poor condition due to a myriad of diseases and an aging stand component. There has been past timber harvest in parts of the project area that totals approximately 3,391 acres of regeneration harvests as well as firewood harvest for personal use. Currently there is one active timber sale in the project area totaling 169 acres. Fire suppression may have led to the current majority of older age classes of conifers and aspen. Aspen is being replaced by conifers in the mixed aspen/conifer stands

Aspen (including mixed aspen with conifer)

Aspen and aspen/conifer stands occupy the lower elevations within the project area and these stands are mostly mature, failing to regenerate, and succumbing to multiple diseases. Together, they represent approximately 18 percent of the analysis area or 13,283 acres. Half of these acres, 7,093 are mixed aspen and conifer in which conifers make up close to half the canopy cover. Aspen stands are generally either stable (those that are able to reproduce under their own canopies) or seral (stands which occupy sites following disturbance, and are gradually replaced by other more shade tolerant species). There may be some stable aspen on the forest, however for this analysis only the more common seral aspen will be discussed.

Seral aspen requires periodic disturbance to perpetuate itself. In the absence of disturbance, aspen will be replaced by conifers (Bartos 2001). Historically, fires most likely began in the sagebrush and burned up into aspen stands where the cooler temperatures and more moisture would stop the fires advance. During those times of drier, warmer, and cured fuel conditions, top kill of aspen was more likely followed by profuse suckering. These fires occurred frequently enough to remove the seed source for conifer species' encroachment.

Structurally the aspen stands have reached maturity to over-maturity in most places and are beginning to fail. The mature component of aspen stands will continue to decline unless large scale disturbance induces change to the area. Composition in the aspen and mixed aspen stands is changing to conifer species more suitable for survival in shade and closed canopies. Stocking levels and the number or aspen stems are steadily shrinking with increased mortality of mature trees and very minimal regeneration.

Lodgepole pine

Most of the mature lodgepole pine in the project area is either dead or dying from the current mountain pine beetle (MPB) epidemic in the area. Structurally the lodgepole pine is mature in nearly all the stands. Lodgepole pine is a pioneer species which regenerates prolifically after stand-replacing fires (or harvest). As stands age, become denser and begin reaching a diameter threshold they become susceptible to mountain pine beetles. In larger, continuous stands, beetle outbreaks can result in high levels of mortality. The susceptibility to this level of mortality increases with stand conditions that include stand average diameter greater than 8" DBH, and stand age greater than 80 years (Samman and Logan 2000). Elevation and latitude are also

important as indicators of climatic conditions favorable to brood development (Samman and Logan 2000).

The mixed lodgepole pine cover type represents 26 percent of the analysis area acreage or about 19,671 acres. However, lodgepole pine is common in nearly all the cover types represented in the project area. Within much of the analysis area, lodgepole pine can be considered long-persistent. While under a long-term successional process (and in the absence of disturbance), these stands usually convert to more shade tolerant spruce and fir species, lodgepole pine remains dominant because of the interplay of fire history, site, and climatic factors that have kept the later seral spruce and fir from dominating these sites. Composition, structure, and fire history studies indicate that these stand types naturally included stand replacing disturbances at intervals of 100 to 200 years followed by rapid regeneration of trees. Evidence of historic fire is common across the lodgepole pine type indicating widespread stand replacing events in the late 1800s.

Most lodgepole pine stands in the analysis area historically would not have reached very old ages because of the susceptibility of the species to mountain pine beetles. By the time lodgepole stands have reached 150 years or more, they generally have developed other characteristics that leave them vulnerable to insects, such as average diameters in excess of 8 “DBH and basal areas in excess of 120 sq. ft. per acre (Samman and Logan 2000). Beetle-killed trees would have increased fuel loadings as they fell, eventually providing the conditions for a stand replacing fire.

Where more recent fires have occurred, or there has been timber harvest, lodgepole pine is generally found as even-aged, single-storied stand, usually without an understory of subalpine fir since the younger stands have not yet developed this later seral condition. Past burns such as the Shingle Mill fire (2008) and the Kelley Fire-Use (2007) fire in the project area have regenerated to fully stocked pure lodgepole pine stands in just five years. These disturbance areas have 400 to 800 trees per acre of lodgepole pine and provide us an opportunity to see future regeneration potential.

Mixed Conifer

Mixed conifer stands are comprised of Engelmann spruce and subalpine fir within the analysis area and represent 13% or 9,952 acres. These stands are dominated by subalpine fir in the understory, with 75% of the smallest age class being fir, the larger size classes are also well represented by fir with approximately 60% of the overstory in fir, 35% in spruce, and 5% in pine or aspen. The stands within the project area represent a transition from the spruce and fir dominated forests at higher elevations to the lower elevation forests dominated by lodgepole pine, aspen and aspen/conifer. As was the case with the lodgepole, the mixed conifer stands are primarily in the mature age class. The ages of the stands vary, depending upon whether the overstory is dominated by spruce or subalpine fir, but the majority of the stands exceed 150 years.

Engelmann spruce is a long lived tree (300 years plus) that prefers moist sites. It is shallow rooted and normally grows in a multi-aged/multi-storied structure. Subalpine fir is similar in nature, will inhabit higher elevations than spruce and prefers drier sites. Fir regenerates in shade better than spruce and needs less bare soil to become established.

The mixed conifer type generally represents stands that are in a late-seral stage, many of the stands contain some seral species (aspen and lodgepole pine) with the majority being climax species (spruce and fir). Uninterrupted by disturbance, these stands would succeed to the more tolerant climax species over time.

Douglas fir

Douglas fir is present in the project area in minor amounts representing less than 1% of the total project area or 513 acres. Douglas fir can be a seral or a climax species, depending on location and soils. Douglas-fir is moderately shade tolerant, reproducing following small scale disturbances in the overstory. Small scale disturbances such as minor Douglas-fir bark beetle outbreaks and low or moderate severity fires create gaps in the canopy that are perfect for regeneration establishment. Douglas fir does not play a major role in any management decisions in the Hams Fork project.

Whitebark Pine

Whitebark pine is a keystone species of high elevation ecosystems and is an important aspect in maintaining diversity of plant and animal life. Whitebark pine represents 10,486 acres or 14% of the project area. Whitebark pine is crucial in stabilizing soil and creating habitats that support a diversity of plants and animals. Whitebark pine will accumulate snow, retard spring runoff, reduce flooding and improve water quality. It is a primary, high nutritional food source for Clark's nutcracker, squirrels, and bears. Old gnarled relics define high elevation vistas and provide much of the character of an alpine experience. (Schwandt 2007) Open whitebark pine stands can act as a fire break due to low fuel amounts. Most of the whitebark pines in the area are experiencing high levels of mortality from mountain pine beetle. Blister rust is also present in the project area to a lesser degree, blister rust is a non-native pathogen that infects and kills five needle pines.

Whitebark pine is unique in its dissemination of seed and is highly dependent on Clark's Nutcracker and red squirrels to disperse its large seed. Both animals gather the seed and cache it for later consumption. These seeds are often not recovered which provides viable seeds dispersed across the landscape. Seeds are often cached in small openings or previously burned areas by Clark's nutcracker which result in new seedlings when left unrecovered. Whitebark pine cone crops are intermittent with good crops occurring every 5-7 years. This long return interval between cone crops, high predation rates, and poor germination and establishment all reduce regeneration potential. With the subsequent decline in mature trees the future for potential regeneration is limited.

Common disturbances in whitebark pine are mountain pine beetle and fire. Mixed severity fires were common in whitebark bark pine communities at a frequency of 50 to 150 years (Williams 2009). Stand replacing fires are not common and occur at 400 year intervals. Fire behavior varies widely in this community type due to slow sparse fuel buildups. Fires seem to behave according to the density of trees. In areas were trees are scattered (ridge tops) fires appeared to burn by spotting tree to tree because ground fuels were sparse. In stands with more closed canopies, fires appear to burn with high intensity creating even aged stands. (Gruell 1980) Due to high elevation, cool moist weather conditions and short growing seasons, whitebark pine community types rarely experience crown fires over large landscapes.

Summary Existing Condition by Forest Type

Table 11. Acres within the project area by vegetation type and percent of the project area and forested area represented by vegetation type.

Vegetation Type	Total acres	Percent of Project Area	Percent of Forested Area
Aspen/conifer	7,093	10	13
Aspen	6,190	8	12
Non-forested	20,371	28	---
Lodgepole Pine Mix	19,671	26	37
Mixed Conifer	9,952	13	18
Whitebark pine	10,486	14	19
Douglas fir	513	1	1
Total:	**74,276**	**100%**	**100%**

Table 12 shows the current size classes all trees in the project area; this information is derived from the 2007 vegetation layer. The table shows the general trends of the project area based on the size or diameter of the trees. Only 9% of the project area contains lodgepole pine stands with an average diameter of less than 5” This demonstrates that the stands are mature in the remaining population.

Table 12. Existing size classes within the Hams Fork project area.

Size Class	Percent Conifer in each Size Class
Sapling/small trees (< 5 inch dbh)	9
Small Sawlogs (5 - 9.9 inch dbh)	81
Large Sawlogs (10 - 19.9 inch dbh)	7
Mature/large tree (20 - 29.9 inch dbh)	3
Total:	**100**

Stand exam data was collected from 2007 through 2011 for a portion of the stands located in the project area. All stands have either received walk through exams to determine species, health and composition or comprehensive stand exams to determine the same information.
Table 13 lists the average stand conditions as determined using the FVS (Forest Vegetation Simulator) model. The number of trees per acre averages 1,284. This is very high for a mature conifer forest. Basal area is an indicator of stem density. The Stand Density Index (SDI) is shown as a percentage and represents relative stand density in terms of the number of trees per acre to quadratic mean diameter (dbh). Crown base height is measured by recording the lowest live branch on a tree. Quadratic mean diameter is the diameter corresponding to their mean basal area.

Table 13. Average stand data summaries.

Criteria	
Number of trees per acre	1,284
Basal Area (Sq. ft. / ac)	111
SDI (% of maximum)	52
CCF per acre	137
Tree Height	67
Crown Base Height	9
Quadratic Mean Diameter	3.33

Table 14 shows the seral stages, the stands position in its maturity, by vegetation type. Stand structure is the horizontal and vertical distribution of vegetation in a stand and is measure by the number of stems, diameter and height of the trees. Early seral would mostly likely represent woody vegetation under 15 feet in height, stems that are smaller than 3”DBH with 500+ trees per acre. Late seral conditions would be represented by trees 65 feet or taller, stems that are larger than 8” DBH and usually have 300 to 450 trees per acre. Mid seral stands are greater than 15 feet tall but less than 65 feet, stems are 5” to 8” DBH with 150 to 200 trees per acre. Succession class is closely related to age/structure. The Hams Fork is heavily represented by late seral or climax stages which is a representation of the stands age and maturity.

Table 14. Seral stage distribution of forested types in the Hams Fork project area.

	Existing Stand Conditions				Desired Stand Conditions		
Vegetation type	Early Seral	Mid Seral	Late Seral		Early Seral	Mid Seral	Late Seral
Aspen	5%	--	95%		20-40%	30-50%	30-40% a
Lodgepole Pine Mix	7%	2%	91%		15%	45%	40%
Whitebark Pine	22%	12%	66%		15%	45%	40%

a conditions based on Bridger-Teton National Forest Five Year Monitoring Report (US Forest Service 2009)

Environmental Consequences

Key Issue #1:

Change in forested communities

The change in the distribution and abundance of forested species and age-classes, as a result of the Proposed Action, could negatively affect wildlife species.

Effects indicators for comparison of alternatives:

- Stand structure: Conversion to single storied/early succession
- Species composition: Conversion to aspens and pines
- Stocking levels: Changes in stand density index, basal area, and trees per acre
- Successional stages: Changes towards early seral species
- Aspen and whitebark pine enhancement: Total acres treated

The threshold for concern is whether or not the alternative will accomplish the goal of restoring plant community diversity.

Spatial and Temporal Context for Effects Analysis

The boundary for the effects analysis for forested vegetation is the Hams Fork project area. Short-term effects refer to effects over the 10-year period from the time the activity was accomplished. Long-term effects refer to effects greater than 10 years from the time the activity was accomplished.

Modeling and Assumptions

Forest Vegetation Simulator (FVS) was used to model or predict the future growth of the inventoried stands in the project area. Over the past five years information has been collected on all the stands in the project area. Detailed stand information including DBH, heights, and basal area estimates has been collected on a portion of the stands and less detailed stand information was collected on the remaining stands. This information was then entered into the FVS modeling system giving us the ability to predict future growth, mortality, and volume estimates.

In assessing indirect and cumulative effects in this analysis, we are assuming: (1) current management direction would continue indefinitely into the future, (2) no large or severe wildfires would burn in the analysis area and impact proposed treatment units, and (3) no other management activities would take place in the project area, with the exception of fuelwood and Christmas tree removal for personal use. This analysis assumes that the indirect effects of no action on stand structures would be (1) the mixed conifer multi-story stands would continue being multi-story and (2) single-story and two-storied stands of lodgepole pine would become multi-storied with reduced overstory dominance. It would be a relatively slow process, and so in the short-term there would be some, but not great change, and in the long-term all stands would become multi-story.

Table 15 shows the average stand data at the start of the simulation year 2011 for 54 stands within the Hams Fork project area. This table includes all the trees inventoried beginning with the 2-inch age class through the largest age class. Infested trees per acre and dead trees per acre were calculated from stand exam data. Basal area is a representation of stem area taken at 4 ½ feet above the ground level. Stand density index is a measure of stands relationship to the average diameter, in general terms it measures the density of the stand or the number of stems. Quadratic mean diameter is the weighted average diameter of all trees in the stands. Canopy closure is an estimate of the percentage of the stand that would be covered by leaf area if taken from an aerial view.

Alternative 1-No Action

Direct and Indirect Effects

<u>Overall</u>

There would be no direct effects to vegetation with this alternative since no treatments or management would be performed. Stand structure changes would occur naturally and the area would see a reduced average tree height and a reduced average tree diameter, as well as a smaller number of mature stems. Species composition would change also to a more shade tolerant component of fir and spruce and would be expected to persist for an extended period of time. Plant community diversity, or the variety of species, would change with the increase in late seral

plant communities and decrease in early seral communities. Stocking levels would remain relatively constant as mature trees die and regeneration restocks the stands.

Stands in general would all continue to move closer to climax. Pine regeneration would remain at a minimum, as harvest based disturbance would not occur. The standing dead trees killed by the mountain pine beetle would eventually fall over creating an increased fuel load. Mistletoe infection in the pines would not be treated and no timber supply to local industry would be generated from this area for the foreseeable future.

The average trees per acre of 1,284 is extremely high for these stands. This number is a reflection of the advanced regeneration, most of which is fir, in the stands. Basal area of 111 is higher than desired for healthy mature timber stands of lodgepole pine. Stand density index averages 312 which is 52 percent of the maximum for lodgepole pine. In order to maximize growth, a stand should be at 35-50 percent of maximum SDI to maximize growth, limit mortality and improve the stand's resistance to insects and diseases. Quadratic mean diameter or the weighted average diameter of 3.3"DBH reiterates the fact that the stand has a full understory of small diameter trees. Canopy closure of 49 percent is low for a mature stand of timber; this number is a reflection of the mortality in the overstory.

Table 15. Average stand characteristics under Alternative 1.

Stand characteristics	Alternative 1
Trees per acre (TPA)	1,284
Infested trees per acre	19
Dead trees per acre	76
Basal area	111
Stand density index	312
Quadratic mean diameter (QMD)	3.3
Canopy closure (%)	49

Aspen (including mixed aspen with conifer)

Aspen stand structure is declining in diameter, tree height and stems per acre, due to mortality in the overstory, in Hams Fork. Nearly all the stands are mature or over mature with heavy mortality. Stands are losing their mature trees causing the decrease in structural integrity. This change in stand structure is due to natural mortality from numerous diseases that infect mature aspen stands. Without a stand level disturbance aspen will continue to decline. The aspen stands are not regenerating.

Stocking levels, or stand densities, are not sustaining themselves in the project area. Regeneration in aspen stands is most often a result of root suckering from parent trees. Although suckers are prevalent in many stands, mortality is high; trees are not growing into saplings/small diameter trees due to heavy browsing from ungulates. The species composition of these aspen stands is converting to conifer timber types. The overstory is dying and regeneration and understory development is not persisting. Stand level disturbance is needed to create large cohorts of new aspen trees which are more resistant to browse pressure and mortality.

The relatively large and distinct aspen clones within conifer stands can be considered seral to conifers (Mueggler 1988). In the project area, climax conifer habitat types supporting aspen include mixed conifer and Douglas-fir. Competition from conifers is expected to continue as conifers grow and additional trees become established within and around the clones. In the long-term, the conifers would continue to become more dominant, increasing in density within the aspen clones. Competition for site resources would increase and the aspen would decline in health, vigor, and extent (Jones et al. 1985, Mueggler 1985, Kaye et al. 2005). Without disturbance, many of the clones would decline and disappear from the landscape, a situation that due to aspen's relatively rapid replacement by conifers can occur within a single aspen regeneration (Mueggler 1985).

The No Action alternative would not allow for any large scale disturbance management. These aspen stands would succumb to succession from conifer encroachment under this alternative and aspen representation on the landscape would become less and less evident. This alternative would not increase regeneration in the area or increase the stands age-class diversity.

Table 16 summarizes the existing (Alternative 1) and desired structural size classes for the aspen and aspen conifer mix. This analysis assumes it is desirable for aspen dominance in the aspen conifer mix since the presence of aspen indicates the historical presence. Aspen is poorly represented in the desired range in size classes <5-inch dbh. and >10-inch dbh. and well represented in size class 5-10-inch dbh. Table 16 compares existing and desired size classes by vegetation type under Alternative 1

Table 16. Comparison of existing and desired size classes by vegetation type under Alternative 1.

Vegetation Type	Percent <5" dbh		Percent 5-10" dbh		Percent >10" dbh	
	Desired	Existing	Desired	Existing	Desired	Existing
Aspen	20-40	2	30-50	98	30-40	0
Lodgepole pine	>10	6	30-40	87	30-50	8
Mixed Conifer	3-10	10	30	77	65-75	13
Whitebark pine	15	24	45	50	40	23

Lodgepole pine

Lodgepole pine stands which represent the majority in the project area have experienced severe change in the past decade due to high levels of mortality. Stand structure has already begun to transform due to the mortality of these trees such that stands have a reduced number of live stems, smaller overall diameter and decreased stand height. The mortality in the lodgepole pine stands are mostly the larger diameter or overstory trees and these trees have a greater influence on stand structure since they occupy a larger percentage of the growing area and have dominance. Without any disturbance from fire or harvesting the defining characteristics of stand structure present in the Hams Fork would slowly decrease.

Stocking levels are being reduced in the overstory with 90 percent mortality in some stands. Small trees, including seedlings and saplings, in the understory are increasing with the majority species being fir trees. Lodgepole pine regeneration is minor in most stands. Without a stand level disturbance to give a competitive advantage to the shade intolerant pine, fir trees would dominate the stand.

Species composition, or the individual trees species in stand, would change under the No Action alternative. Subalpine fir already dominates the understory having established under the lodgepole pine overstory in the past decade. As the overstory has slowly declined, fir has slowly increased. Without an abrupt change that favors shade intolerant species such as lodgepole pine or aspen, the fir would continue to dominate and out-compete the pine as succession continues. Species composition would continue to slowly increase in the fir component and decline in the pine component.

Lodgepole pine stands in the project area are early seral stands meaning they do not persist to climax. Lodgepole pine stands need disturbance to create openings for the shade intolerant seedlings. If current conditions persist, pine stands in the Hams Fork would eventually succeed to subalpine fir forested types. The No Action alternative does not provide a stand level disturbance necessary for pine to regenerate successfully on a broad scale nor does it move the stands towards early seral conditions this alternative does not provide for a manner of removing dead or infested trees which will increase down woody fuel loads without providing wood products for local use. Lastly this alternative does not move the stands towards desired future conditions or provide resiliency toward beetle infestations.

Table 16 summarizes the existing (Alternative 1) and desired structural size classes for lodgepole pine. The table (above) shows that lodgepole pine is under represented in the desired range size class of >10”d.b.h. and slightly under represented in the size class <5”dbh. Additionally, lodgepole pine is very well represented in the size class 5-10”d.b.h.

Mixed conifer

Changes to stand structure in the mixed conifer stands would be very minor under the No Action alternative. Pine is present in the mixed conifer stands, as well as aspen, and both are experiencing mortality. As these species die out of the mixed conifer stands their voids would be quickly replaced by fir and spruce. Mixed conifer stands in the Hams Fork area would continue growing in a multistoried structure. As a mature tree dies there would be numerous co-dominate or intermediate trees available to increase their structural position left by the dead tree. These changes to diameter, height and stems per acre in these stands would be minor due to the quick replacement of adjacent trees.

Species compositions in the mixed conifer habitat types would continue to change as the seral species, lodgepole pine, whitebark pine and aspen, die out of the stands due to insect or competition related mortality. These trees would be replaced by subalpine fir or spruce. Without treatment to thin pine or aspen clones in an effort to induce regeneration, fir and spruce would continue to dominate these stands and increase their foothold in the area. This is the continuing process of succession. This is also a relatively slow process, punctuated by abrupt shifts such as that caused by the recent bark beetle mortality. In the short-term, the change would be slight, in the long-term the change would be profound with most of the project area becoming dominated by subalpine fir and spruce.

Table 16 summarizes the existing (Alternative 1) and desired structural size classes for mixed conifer. The table shows that mixed conifer is poorly represented in the range size class of >10”d.b.h. and very well represented in the size class 5-10”d.b.h.

Whitebark pine

In the project area, whitebark pine is present as a climax species at the highest elevations, but does not compete well in mixed conifer stands. Whitebark pine is present in the project area and

within some of the proposed treatment units. Due to infection levels of white pine blister rust and white pine mortality in western states, including western Wyoming, we are concerned with maintaining mature whitebark pine on the landscape. The reduction in mature whitebark pine reduces cone bearing trees and seed for dispersal by animals and birds.

The No Action alternative does not allow for any treatments for whitebark pine stands through thinning or day lighting. These actions inherently create suitable caching sites for Clark's Nutcracker which would not occur with this alternative. It does not allow for planting rust resistant trees in the project area or increasing suitable sites for natural regeneration. Without treatment of whitebark pine would be expected to continue its decline in the project area and we would not meet the project purpose of reducing competition or creating whitebark pine regeneration.

Cumulative Effects

See cumulative effects under Alternative 2.

Alternative 2-Proposed Action

Direct and Indirect Effects

The proposed vegetation treatments would impact about 8,622 acres, which is about 13 percent of the project area. This includes 5,176 acres of commercial timber harvesting using a variety of silvicultural methods and 730 acres of prescribed fire. This alternative would also treat 2,716 acres of hazard trees associated with roadside buffers. The harvesting of trees would directly affect stand structure and species composition in the project area with the removal of those trees. Stocking levels would be changed with the onset of timber removal as well. A timber harvest in the project area would also reset or alter successional processes at different levels. Aspen and whitebark pine would receive regeneration harvests which would help maintain and restore the plant community diversity on a project level.

The action alternative would move treated stands in the project area closer to the desired future conditions by increasing age class diversity, augmenting regeneration efforts, reducing competition, and promoting trees that are more resilient to insect and disease attacks through superior health and vigor. The proposed action would reduce the level of dead and infested trees in the project area through timber harvest removal. Stand and project level disturbance would help to develop a more diverse species composition while improving the horizontal and vertical structure within the stands. Resiliency to insects and disease is a direct result of a stands health and its availability to water and nutrients. A reduction in trees per acre and a lower basal area under Alternative 2, as compared to Alternative 1, would create healthier stands. The proposed action would move the Hams Fork toward an increased resiliency through timber management.

Alternative 2 would provide approximately 85,599 CCF's of timber to local area mills. Table 17 below displays the acres to be treated and the estimated volume in cubic feet associated with each silvicultural treatment. Most of the treatment types would take place in lodgepole pine stands which have been heavily affected by bark beetles. The row labeled as "300 foot buffer hazard tree" represents the removal of dead or infested trees along the roadways in the project area and would total 29,277 CCF in volume. These trees would be removed to ensure public safety and limit delays along roadways.

Table 17. Timber volume estimates by treatment type under Alternative 2.

Treatment	Total Acres	Units	Volume Dead (CCF)	Volume Green (CCF)	Volume Totals
Aspen Improvement	153	CCF	714	1,731	2,445
Clearcut w/ Reserves	39	CCF	275	409	684
Patch Clearcut w/ Salvage	175	CCF	2,902	4,115	7,017
Salv/San- w/ Aspen Improvement	1,100	CCF	22,173	0	22,173
Salvage	1,775	CCF	18,993	5,629	24,622
Salvage/Sanitation	1,407	CCF	16,475	6,198	22,673
Salvage/Sanitation/Commercial Thin	146	CCF	1,591	0	1,591
Salvage/Sanitation/Commercial Thin w/ Aspen Improvement	174	CCF	2,088	0	2,088
Whitebark Pine Improvement	207	CCF	2,260	46	2,306
		Total	**67,471**	**18,128**	**85,599**
300 feet Buffer Hazard Tree	2,716	CCF	26,019	3,258	29,277

Alternative 2 would also use prescribed fire to reduce fuel loads and promote stand regeneration on 730 acres within the project area

Table 18 shows the averages of the stand data for Alternative 1 (No Action) and residual estimates post-harvest under Alternative 2. The proposed treatments would reduce residual trees per acre from 1,284 to 1,198(change of 86 trees per acre). Since the proposed treatments would concentrate on merchantable trees, there is little change in the overall trees per acre.

In Alternative 2, basal area would be reduced to 85, which is very close to ideal levels for maintaining stands that are increasingly resilient from disturbances.

The increase of Stand density index from 312 to 243 (52% of maximum to 37% of maximum) would promote growth and help increase the stand's resiliency to insects and disease.

Quadratic mean diameter or the weighted average diameter of 3.3" also indicates that the stands are full of small diameter trees. This will also be reduced in Alternative 2, leading to a more productive and healthy stand.

Table 18. Comparison of stand averages for alternatives 1 and 2 (residual estimates post harvest).

	Alternative 1 Existing	Alternative 2 Residual estimates for treated stands
Trees per acre (TPA)	1,284	1,198
Infested trees per acre	19	0
Dead trees per acre	76	3
Basal area	111	85

	Alternative 1 Existing	Alternative 2 Residual estimates for treated stands
Stand density index	312	243
Quadratic mean diameter (QMD)	3.3	2.9
Canopy closure (%)	49	Less than Alt. 1o

Aspen (including mixed aspen with conifer)

Alternative 2 has over 1,400 acres of treatments designed to stimulate aspen regeneration with harvesting. This process involves removing conifers and unhealthy aspen trees in an effort to increase light, moisture and nutrients to site specific areas where aspen regeneration would occur. Aspen has the unique ability to regenerate from root suckering stimulated by the death of the tree. An early seral species, aspen needs full light to become established and grow on a site. This alternative would increase the aspen composition; alter stand structures on a localized level by creating aspen regeneration niches, and increase aspen stocking levels with prolific regeneration in these areas. The plant communities associated with aspen timber types which include numerous forbs and grasses that are also early seral would be restored with aspen improvement.

Aspen in the project area have reached the point of maturity, and in many cases over-maturity. Stand structure is declining in all areas including diameter, height and stems per acre. Natural mortality from numerous diseases is affecting the aspen stands. The action alternative provides an opportunity to create stand level disturbance which would induce regeneration at an acceptable level great enough to withstand browse and natural mortality. Stand structure dynamics with the action alternative would be reset. Aspen stands would be cut to allow root suckering to occur in an area with full sunlight devoid of competition. Stand structure post-harvest under Alternative 2 would consist of aspen seedlings and saplings for the next 20 years.

The project prescriptions are designed to create environments that would increase regeneration opportunities for aspen. Aspen treatments designed for the Hams Fork involve seral aspen stands that persist in conjunction with mixed conifer. The objective of the treatment is to substantially reduce conifer trees within aspen clones, stimulate additional aspen regeneration, and reduce browsing damage to aspen. Conifer trees would be felled, treetops would be lopped and scattered to hamper ungulate dispersion and subsequent browsing of aspen suckers and/or saplings. Treatment may include jackpot pile burning or broadcast burning.

Regeneration is expected to be good following treatments. Stocking levels with the action alternative would consist of thousands of trees per acres in the smallest size class. This increase in sapling quantity per acre, the size and extent of the treatments and the dispersion of ungulates across a larger treated area would reduce browse pressure. Aspen clones within mixed conifer stands would also be cut in an effort to increase regeneration with this alternative. These small clones intermixed with conifers provide island niches which help repel insect pheromones, assist firefighting efforts, and increase overall stand diversity.

Lodgepole pine

Lodgepole pine stands which represent the majority of the timber harvesting in the project area have experienced drastic change in the past decade due to high levels of mortality. Stand structure in these stands has already begun to change and the removal of dead and infested trees would create a young forest of seedling and saplings for the next 20 years. Stand densities would be

reduced with the removal of the trees primarily affecting the larger trees that have experienced the highest levels of mortality. Proposed treatment types with this alternative for pine are mostly sanitation and salvage to remove dead and infested trees and clearcuts to induce regeneration. The treatments are designed to promote pine regeneration, increase age-class diversity, and create future stands less susceptible to insects and diseases.

These mostly pure lodgepole pine stands would receive a change to their structure by removing dead and infested trees from the overstory which would lower overall height, diameter and stems per acre. All harvest units would have a changed structural status post-harvest; however this change would promote pine regeneration and reduce fuels in the stands. Cone serotiny in the project area is mixed; however, stands are expected to regenerate successfully following clearcuts based on past harvesting activity in the vicinity. Stands receiving sanitation/salvage would retain some level of mature cone bearing trees to provide a seed source for regeneration; this in combination with cones retained on site from felled trees would provide an adequate seed source. Regeneration in the lodgepole pine stands would typically range between 400 and 1,000 trees per acre after harvest.

Stand composition, or the type of individual species in each stand, would be expected to remain mostly the same, predominantly lodgepole pine. Lodgepole pine stands would be expected to regenerate with pine due to the nature of lodgepole pine regeneration methods following a clearcut or heavy harvest type. Lodgepole pine is an aggressive fast growing tree that needs full sunlight and mineral soil to become established. The treatment methods proposed would produce ample microsites for pine seedlings. Lodgepole pine would be expected to out-compete other trees species, such as subalpine fir, and would persist in the overstory. These regeneration characteristics and the treatments proposed for the area should ensure pine remains on the landscape in abundance following treatment.

Successional progress or a stand's seral position in its maturity would be reset with a clearcut harvest or a heavy sanitation/salvage removal. Lodgepole pine stands in the project area are seral stands meaning they do not persist to climax. Lodgepole pine in the Hams fork would eventually succeed to subalpine fir timber types in the absence of disturbance. The action alternative would provide the stand level disturbance needed to allow for successional intervention. The lodgepole pine stands in the Hams Fork would mostly be reverted to early successional status following the completion of harvesting activities; improvement cuts proposed with the action alternative would also reset succession eliminating all mature trees in these stands.

Mixed Conifer

Mixed conifer stands (Engelmann spruce and subalpine fir) in the project area are less frequent and there are not any prescriptions directly designed to manage these stands in a traditional sense. Sanitation/salvage and the variations including thinning and aspen improvement are designed to manage or regenerate species other than spruce and fir. Sanitation/salvage harvests in the Hams Fork in mixed conifer stands would treat intermixed lodgepole pine and dead spruce/fir trees. The removal of pine trees, since they do not represent the majority of the trees in these stands, would have a minimal effect on stand structure and stocking levels.

The mortality in these stands is not consistent and often persists in a clumpy pattern killing all trees in a small area with minimal effect in adjacent areas. The removal of these trees with the sanitation/salvage prescription would create holes in the stands changing structure in an uneven and inconsistent pattern throughout.

Species composition in the mixed conifer stands would change with the removal of small groups of trees in a random manner. Lodgepole pine persisting in the overstory in a mixed conifer stand would have a consistent understory of subalpine fir and the fir would advance with the removal of the pine. The same is true where a subalpine fir or spruce overstory has failed, subalpine fir would be expected to advance into the next age class.

Successional status of the mixed conifer stands would remain the same with the proposed prescriptions. The mixed conifer stands in the Hams Fork are at or near climax, meaning they would remain or persist in their current condition forever in the absence of disturbance. Without a fire or a timber harvest at a scale that would remove the overstory and create space for regeneration of pine or aspen the mixed conifer stands would remain. The harvest prescriptions proposed would remove dead and infested trees, and create openings to increase regeneration for aspen when available, however the treatments would not change the overall successional status of the mixed conifer stands since the occurrence and extent of these harvests would be small in the grand scale.

Whitebark pine stands

Whitebark pine stands in the project area have 207 acres planned for treatment. Alternative 2 management actions are designed to move whitebark pine stands towards the forests desired future condition of healthy whitebark pines in all age classes. Whitebark pine improvement cuts would remove adjacent competition in an effort to advance stand health and growth rates. The action alternative would take steps to ensure the survivability of existing trees, increase seed and cone production and create caching sites suitable for Clark's nutcrackers that may result in regeneration.

A planned planting project to increase seedlings in the project area which are rust resistant is also included. The action alternative provides an avenue to plant trees that will withstand attacks from blister rust. This genetic trait once introduced on site would provide a lifelong resistant seed source. Similar to aspen habitat types, whitebark pine communities are also unique in their associated understory plants and grasses. Maintaining whitebark pine would help these plants persist in the high elevation habitat types.

Prescribed fire in the project area proposed under Alternative 2 would serve to remove unwanted understory vegetation in an effort to stimulate regeneration in whitebark pine stands. Fire would alter understory species composition in the burned areas promoting new growth. Prescribed fire would also create a disturbance regime resetting successional advances in many cases and creating openings for Clark's Nutcrackers to cache whitebark pines seeds. Care would be taken not to kill any existing whitebark pine thus maintaining current population levels.

Cumulative Effects for Alternative 1 and 2

Cumulative effects are discussed as changes in the existing condition due to past, present and future activities, including the effects of the alternatives being discussed. The cumulative effects analysis area will be limited to the project area of 74,276 acres and include all known past actions, as well as, all proposed actions in this document. The same indicators of effect are used in the cumulative effects analysis as were used in the direct and indirect effects section.

Past Disturbances --Timber Management

All past completed management activities, wildfires, and insect and disease related damage, as well as, the currently proposed harvesting and prescribed fire activities outlined in this document frame the cumulative activities for the Hams Fork Vegetation project. The current condition has

been shaped by years of fire exclusion, large fires, timber harvest, and insect activity, especially the recent bark beetle activity.

There is a long history of timber harvesting on the Bridger-Teton National Forest from the Hams Fork drainage. Forest Service records have documented all harvesting activities from 1965 to present in the project area include 2,487 acres on Federal lands. These treatments have mostly been regeneration harvests, shown below in Table 19. There has also been harvesting on private lands within the project area totaling 708 acres. In addition to these acres the Hams Fork drainage was logged in the late 1800's and early 1900's for railroad ties, (tie hacking) the exact acres and locations are unknown; however we can expect that most mature stands of timber were logged during this era. The lack of detailed records limits the ability to define the effects from the tie hacking era; however, these historic activities would have altered the forest stand structure and composition in the area and most likely created a majority of the regeneration cohort that still exists in the project area.

Recent harvesting activities since 1965 have affected 4% of the project area. These harvesting methods have mostly been regeneration harvests with the intent of creating new age classes. More recent harvesting has been tied to insect activity and less specifically designed to promoting new regeneration. All past and proposed harvest activities as well as prescribed fire applications in the project area have been designed to either removed dead and infested timber to reduce fuel loads or to create new sites suitable for regeneration. The historical timber harvesting activities from the tie hack era have formed the current stand structure and age classes in the area. The more recent harvesting in the past 40 years has shifted succession and formed younger stands more resilient to bark beetle attacks. The cumulative effects of these projects have moved the area towards forest goals of increased early seral stands, with the no action alternative these acres of conversion would remain as is. The cumulative effects of these past projects in conjunction with the proposed action would provide 4,619 acres of early seral conditions. These combined efforts would make small, but notable contribution in the project area on its path towards increased early seral conditions.

Table 19. Harvesting activities since 1965 in the Hams Fork project area.

Harvest type	Sale Name	Acres
Clearcut	Big Park, Dancing Cow, Dry Hole, Green Knoll, North Kelly, Nugent Park, Rock Creek, West Branch, West Fork	1,447
Clearcut with Reserves	Dancing Cow, Rock Creek, Private	727
Coppice	Tunp Ridge, Tunp Ridge II	219
Patch Clearcut	Big Park, Dancing Cow, Dry Hole, Green Knoll, North Kelly, Rock Creek, West Branch, West Fork, Tunp, Well Pad, Huckleberry, Private	192
Conifer Removal	Tunp Ridge, Dancing Cow, Rock Creek, Nugent Park	203
Group Selection	Big Park, Dancing Cow, Dry Hole, Green Knoll, West Fork, Rock Creek	52

Harvest type	Sale Name	Acres
Salvage/Sanitation w/Commercial Thinning	Kelley Guard Station	55
Patch Clearcut with Reserves	Dancing Cow, Private, Rock Creek	18
Shelter wood	Dancing Cow	11
Seed Tree	Dancing Cow	11
Salvage/Sanitation*	East Fork II	169
Pre-commercial Thin	Big Park	88

*These acres are currently under contract

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Compliance with the 2001 Roadless Rule

Removal of Small Diameter Trees: Alternative 2 complies with the intent of the 2001 Roadless Rule which allows for the removal of generally small diameter trees to meet specific purposes.

Under Alternative 2, a focus is placed on removal of small diameter trees and the thinning of these trees from the Hams Fork project area to improve stand conditions, increase early seral species such as aspen. With nearly 65% of all the trees proposed for harvest under 10 inches in diameter the project illustrates the small diameter thinning of lodgepole pine timber types necessary to gain resiliency to insects and diseases and subsequent fires. These treatments “from below” remove the stagnant and infested trees to allow for growth and expansion of the overstory and dominant trees. The remaining stand will be dominated by larger, more resistant and resilient trees. The Hams Fork project clearly focuses on the small diameter thinning of mature pine stands in an effort to meet the purpose and need of the proposal and to meet the conditions of the 2001 Roadless Rule.

According to stand exam data, mature/large trees are those 20-29.9 inches DBH. Approximately 96 percent of all the trees proposed for harvest in inventoried roadless areas would be below 16 inches in diameter. Approximately 65 percent of all trees harvested in inventoried roadless areas would be in the smallest merchantable size class (8-10 inches) and 31 percent would be in the 12-16 inch size class. Table 20 displays the estimated proportion of trees removed by approximate size class for removal of trees, within Inventoried Roadless Areas. All of the larger trees that would be harvested are dead or infected trees associated with the salvage and sanitation treatments along existing roads.

Table 20. Percent of harvested trees by size class and treatment type under Alternative 2.

Treatment Types	% Harvested Trees in 8-10” size class and trees per acre (TPA)	% Harvested Trees in 12-16” size class	% Harvested Trees in 18”+ size class
Salvage	59% (36 TPA)	35% (21 TPA)	6% (4 TPA)
Salvage/Sanitation	63% (59 TPA)	34% (32 TPA)	3% (3 TPA)
Salvage/Sanitation with Aspen Improvement	73% (101 TPA)	23% (32 TPA)	4% (4 TPA)
Average across all treatment types	65 % (65 TPA)	31% (28 TPA)	4.3 (4 TPA)

data collected from FVS simulations (Bruch 2013)

Old Growth Forest Standards and Healthy Forests Restoration Act Old Growth Compliance

Alternative 2 is in compliance with the Forest Plan and Healthy Forests Restoration Act direction on old growth forests because only 27 acres of 1,059 acres of designated old growth (3%) are proposed for treatment and these 27 acres are actually misclassified as old growth.

The Hams Fork project area contains 1,059 acres designated old growth located in four blocks (Figure 9). Twenty-seven acres of designated old growth, located in two of the four blocks, overlap with proposed hazard tree removal treatment (100 foot buffer) and 1,032 acres are located outside of any proposed treatments. The designated old-growth located in the Big Park area is actually 372 acres of single-story lodgepole pine stand located in DFC 1B with a system road bisecting the unit. Although the stand does not meet the definition of an old growth stand and is erroneously mapped as old growth, under Alternative 2 hazard tree removal would be limited to a 100 foot distance from both sides of the road (design feature S-7) or 16 acres to minimize impacts to the designated old growth stand while addressing human safety. The remaining 1,032 acres of designated old growth would not be treated under Alternative 2.

The Pole Creek block is located in the southeast portion of the project area. This designated old growth stand is 181 acres of which 11 acres are located within a 100 foot buffer from the open forest system road. In 2000, the Fontenelle fire burned through this old growth stand setting it back to an early successional stage. Although this designated old growth stand is no longer old growth and is in need of reclassification, under Alternative 2 the hazard tree removal would be limited to a 100 foot distance from both sides of the road (design feature S-7) to minimize impacts to the designated old growth stand while addressing human safety.

In mixed conifer stands of Douglas fir and Engelmann spruce, proposed treatments consist of salvage and sanitation which would promote growth and longevity of mature healthy trees. Although these stands have not been designated as old growth, salvage and sanitation treatments would promote a continued restoration of old growth characteristics such as dominant stand structures. The long term productivity of these stands would be increased with the proposed treatments as well as providing a continual environment to support old growth stands.

The Forest Plan (USFS Forest Service 1990a, p.11) defines old growth as: Old-growth stands composed of Douglas-fir and Engelmann spruce will consist of Douglas-fir, spruce, and fir multi-storied stands having two or more well-developed canopies of trees. The oldest overstory trees should be 140 to 240 years of age and be greater than 18 inches diameter at breast height. Understory trees will normally be composed of many age and size classes. Small openings may exist in the canopy where older trees have fallen. Snags should be present in the stand and average 24 snags per acre. Large-diameter downed logs will be a component of the forest floor.

The Forest Plan Old-Growth Standard (USFS Forest Service 1990a, p.129) states: Only silvicultural practices which achieve desired old-growth attributes will be used in stands managed as old-growth. Twelve percent or more of existing old-growth Douglas-fir and spruce forest will not be harvested in order to provide for viable populations of old-growth dependent species. Designated old growth stands will be at least 200 acres contiguous patches, generally spaced 1 to 2 miles apart, but attached by stringers of forested riparian areas or mature timber.

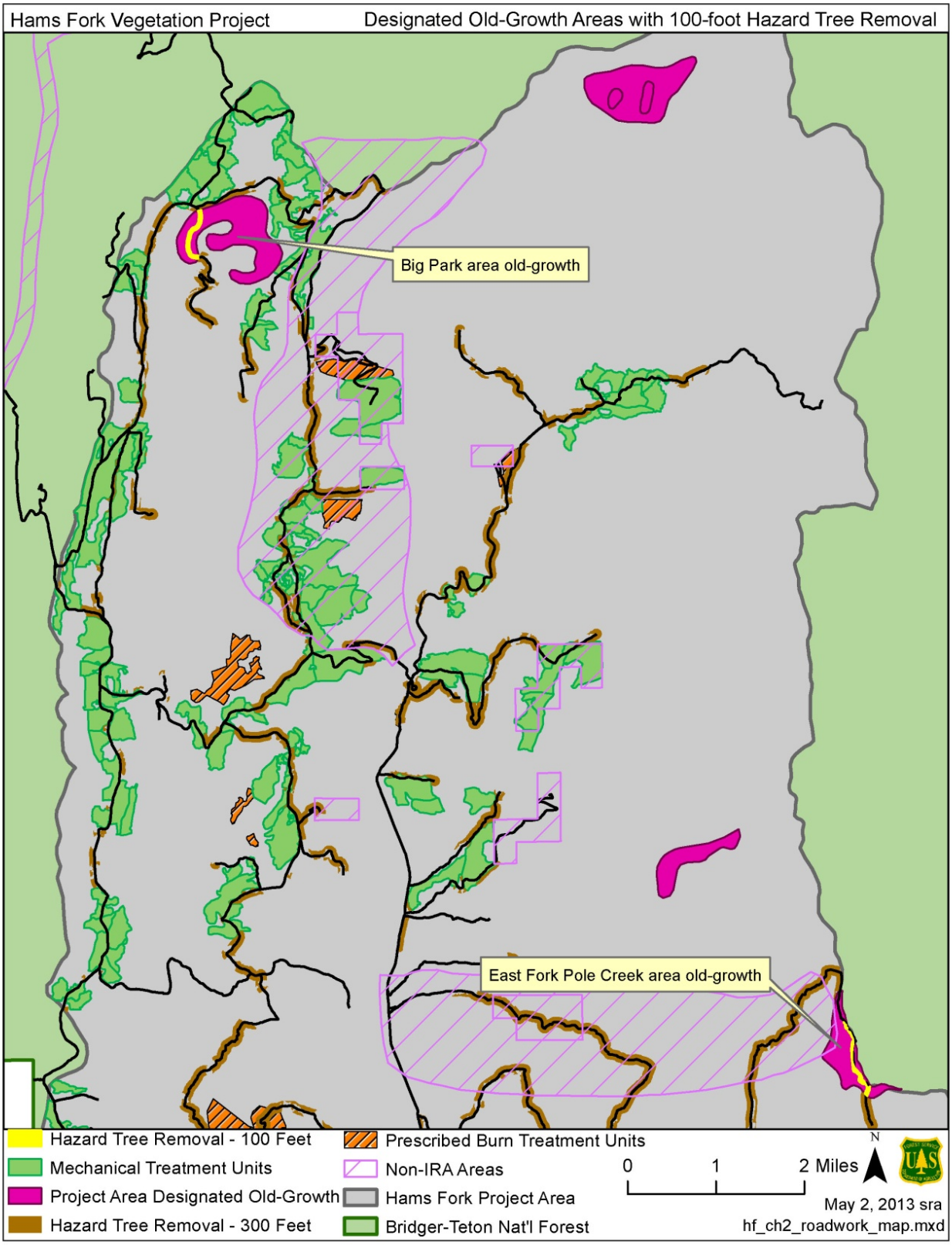


Figure 9. Designated old-growth in the Hams Fork project area.

Fuels and Fire

The following resource information and analysis summarizes the Fuels Report (Banister 2013).

Affected Environment

Existing Condition

The analysis area is 53,878 acres forested with 20,398 acres non-forested, including areas of sagebrush, grasses and forbs, riparian areas of willows and sedges, and rock and barren ground. The forested vegetation is primarily mature mixed conifer dominated mostly by lodgepole pine, with subalpine fir, aspen and Engelmann spruce well represented. This mixed conifer comprises 70% of the total analysis area.

Existing conditions within the proposed Hams Fork units consists of mature over-story combined with regeneration and a mixture of dead and down woody debris. These stands are best described as a Fuel Model (FM) 8 or 10. Fuel loading varies between 8 and 10 tons per acre with ranges from 6 ½ to 15 tons per acres. Within FM 10 there is a live component associated with understory growth, and under drier conditions allows fire to transition more readily from a ground fire to individual tree torching and possibly an active crown fire. In addition to ground fuels significant portions of the area have been impacted by Mountain Pine Beetle. As a result, there will be a greater fuel loading because of increases in the fuel load in the vertical plane. This increases fire behavior, flame length, and potential for even more extreme fire behavior. These factors add up to an increased chance of a stand replacing fire within these units.

The Hams Fork project area at the higher elevations is dominated by lodgepole and whitebark pine. However, the aspen component increases with a more southerly aspect and as elevation decreases. Engelmann spruce and subalpine fir with lodgepole components are encroaching aspen stands, which have declined by over 40%. If left untreated, conifer encroachment into aspen will continue and aspen will continue to deteriorate on the

Lodgepole pine normally occurs as a seral species that may or may not burn before the stand moves towards Engelmann spruce / subalpine fir. The historical fire regime for this fire type is characterized by mixed severity fires every 50 - 80 years with stand replacing fires every 100 to 300 years. The mixed severity fires likely ranged in size from 1/4 to 100 acres or greater and might smolder and creep for much of the summer. Stand replacing fires would occur when a combination of favorable dry and windy fire weather combined with older aged stands that were receptive to a high severity fire.

Small areas of moist and wet subalpine fir occur in seasonally moist or wet conditions, often occurring adjacent to riparian vegetation as moist benches or as stands associated with late-melting snow banks. Fire frequency in this type is possibly as long as 300 to 400 years.

Within the project area aspen is identified as having occupied 42 percent of the area. However, conifer encroachment has reduced existing stands by over 40 percent. The stands that remain are old and decadent, with continued encroachment by conifer. These communities are extremely variable and fire frequency varies with the understory. Aspen communities can either function as a seral or climax species and may coexist with Engelmann spruce, lodgepole pine, subalpine fir or Douglas-fir. Fire frequency was also variable, ranging from 40 to 150 years. At the landscape scale, aspen was probably more widespread and stands had younger stems.

Sagebrush communities had more grasses and forbs in them, which burned frequently, thus keeping sagebrush component at 12 - 20% of total ground cover and reducing encroachment by conifers. Currently the area contains 24% mountain big sage, with dense canopy closure and minimal grass components. Fire frequencies were likely 15 to 35 years, with shorter frequencies in the drier and warmer sites.

The number of aspen stands established during each fire episode also suggests that 1869, 1889, 1910, 1919 were extensive fire episodes. Eighty percent of the aspen stands sampled in 1978 were established between 1867 and 1921. This suggests that most of the aspen stands on the Forest are presently between 80 and 130 years old.

With the 100 plus years of fire suppression within the analysis area, the vegetative structure is outside its normal fire return interval and has lost or is losing the structural component that existed historically within these areas. By adding fire into these areas, we have the ability to control prescribed fire to produce beneficial effects while limiting the consequence of a large wildfire.

Methodology, Assumptions and Definitions

Using Behave Plus, this analysis compares fire behavior between the alternatives. Behave Plus uses changes in vegetative conditions in the form of fuel loading to determine expected fire behavior affects. Fire growth, public and firefighter safety, fire suppression costs, fireline intensity, flame length and BTUs produced are predicted for each fuel model. How fire behavior changes in time with changes in vegetative conditions is also predicted. See the Fuels Report (Banister 2013) for more information.

Fuel Condition –

Fuel models were determined for each vegetation type based on fuel model data collected during stand exams and walk through surveys conducted in 2010– 2011. Fuel models were applied to the forest types determined by the Bridger-Teton National Forest 2007 vegetation. Table 21 presents the number of acres within the Hams Fork project area for each fuel model by vegetation type under existing condition.

Table 21. Acres by fuel model and vegetation type within the Hams Fork project area under existing condition.

Vegetation category	Aspen Fuel Model (acres)	Fuel Model 1 (acres)	Fuel Model 2 (acres)	Fuel Model 5 (acres)	Fuel Model 8 (acres)	Fuel Model 10 (acres)	Fuel Model modified 10/12 (acres)	Total Acres
Lodgepole pine					9832	9832		19664
Spruce/ subalpine fir mix						9950		9950
Aspen	6167							6167
Aspen/conifer mix						7103		7103
Douglas-fir mix						517		517
Whitebark pine			9335					9335
Whitebark pine mix					1142			1142
Total acres	6167	0	9335	0	10974	**27402**	**0**	53878

For analysis purposes, fuel models 10 was assumed to support a high intensity fire based on results of predicted fire behavior characteristics. Under existing conditions, there are 27,402 acres in fuel model 10. In the event that a wildfire would occur within the Hams Fork project area, an estimated 37 percent of the project area or 51 percent of the forested area would likely burn as a high intensity fire under moderate burning conditions. The current pine beetle outbreak in the Hams Fork drainage consists not of whole stand mortality but rather mortality by species and in pockets. The potential for a modified fuel model 10/12 in addition to fuel model 10 in the near future is very real. The fuels within the Hams Fork drainage consist of a mixed conifer component, where some species are killed by the pine beetle others are not. Lodgepole pine has mostly been impacted by the pine beetle. As a result, the shallow rooted lodgepole pine will fall, causing ground fuel loading to increase. The remaining standing live spruce/fir component and subsequent regeneration from opening the canopy from the falling dead trees will create a condition where a modified fuel model 10/12 persists on the landscape. Such a fuel load will contribute to increased fire behavior and increase potential for torching and crown fire behavior. This increase in fire behavior will result in decreased firefighter capabilities.

Historic and Existing Fire Size

Historic fire size typically remained relatively small. The Hams Fork drainage is characterized by an open patchwork of timber, aspen and grass/shrub openings. Under historic conditions, it is likely that the larger fires were no bigger than 250-500 acres in the timber stands. Fires likely burned at different times and not in one large stand replacing event, based on silvicultural data from the upper northwest corner of the Hams Fork drainage (Ainsley 2011). Aspen was over 40 percent more abundant in 1913 than under existing conditions and acted as a buffer to fire spread (Hill 2004).

Under existing conditions, fires may burn larger areas than historic fires. Aspen communities that were once abundant and acted as a buffer to fire spread, have been reduced by over 40 percent within the project area and remaining aspen stands are typically encroached with conifers. In addition, fuel loads are increasing as a result of past fire suppression and the more recent mountain pine beetle epidemic. Under these conditions, the potential for large fire growth has increased. On the Bridger-Teton National Forest from 1951 to 2012 there have been a total of 3,243 recorded fires, with an average fire size of 172 acres. Of these fires, 56 fires were 500 acres or larger in size with an average of 9,654 acres burned. The five largest fires on record occurred recently, three fires in 1988 and two fires in 2012. These five fires account for 63 percent of the total acreage burned over the 61 years and averaged 70,636 acres in size. Excluding the largest five fires, the next largest 51 fires average 3,675 acres in size, considerably greater than the historic large fire size of 250 to 500 acres. The majority of fires on the Forest (3,187 fires less than 500 acres) averaged 5 acres per fire. When conditions including weather, fuels, topography line up, there is significant potential for large fire growth. However, most fires that occur are small and the likelihood of large fires is minimal but increasing.

Under existing conditions the potential size of larger fires, even under moderate weather conditions, is greater than 250-500 acres. This is a result of conifer domination of the landscape with a subsequent decline in aspen stands. Within the Kemmerer Ranger District since 1951, there have been two large fires on the district and both have occurred relatively recently, the Fontenelle fire of 2000 (14,750 acres of which 1,018 acres actually burned within the Kemmerer District), and the Fontenelle fire of 2012 (approximately 65,220 acres of which 8,500 acres burned within the Kemmerer District). In both fires, management actions to suppress the fires were taken immediately but were relatively ineffective to prevent fire spread.

Desired Conditions

Desired conditions for the Hams Fork drainage are to have a patchy mosaic, with a mix of species as well as a mix of age class diversity within those species compositions (Table 1).

Environmental Consequences

Key Issue #2:

Proportion of landscape affected by high intensity wildfire

The proposed action may affect fire behavior and the ability to control and/or utilize fire in the area.

Effects indicators for comparison of alternatives:

- change in fuel models over the project area
- fireline fire intensity
- initiation of ground fire to crown fire
- percent of the forested area predicted to burn as a high intensity fire

Spatial and Temporal Context for Effects Analysis

The direct, indirect, and cumulative effects analysis area is the project area. Temporal effects considered are over 20 years from project implementation for direct and indirect effects as predicted by Forest Vegetation Simulator. Temporal effects for cumulative effects were considered from 2006 (hazard tree removal at administrative sites) through 20 years from project implementation. Effects of earlier activities and projects were included as part of the existing condition.

Alternative 1-No Action

Direct and Indirect Effects

Fuel loading would continue under this alternative, resulting in a change in fuel models from existing fuel models 8 and 10 to fuel models 10 and modified 10/12 over the next 20 years respectively as predicted by Forest Vegetation Simulator. Under Alternative 1, there would be increases in fireline fire intensity, potential initiation of ground fires to crown fires, and increased fuel loads over time as fuel model 8 progressed towards fuel model 10 and fuel model 10 progressed towards fuel model modified 10/12 under Alternative 1 (Table 22). Fuel model modified 10/12 describes the condition under Alternative 1 in which stands maintain the overall characteristics of fuel model 10 with added fuel loading in the understory of fallen beetle-killed trees comparable to that of fuel model 12. Fuel model 12 is based on logging slash from clear-cuts with no forest canopy.

Table 22. Changes in fuel indicators as fuel models move from existing conditions to Alternative 1 (no treatment and 20 years out).

Change in fuel model	FM 8 (existing)	FM 10 (Alt. 1)		FM 10 (existing)	FM modif. 10/12 (Alt. 1)
Flame Length: ft	1.1	4.3		4.3	8 ft
Fireline Intensity: btu/ft/s	7	133		133	518 btu/ft/s
Initiation to Crown Fire:	No	Yes		Yes	Yes
Fuel load: tons/acre	5	12		12	34.5

The inherent danger of fuel model modified 10/12 is the increased fuel loading on the ground supports a high intensity ground fire coupled with dead and dying trees in the overstory that supports a crown fire and increases the risk of snags weakening and falling into a ground fire with heavy fuel loading. This fuel model is extremely dangerous to ground firefighting personnel and would contain the fuel loading in the understory necessary to build the heat required to sustain crown fires over large distances. Fire suppression costs for fuel model modified 10/12 would be the greatest compared to suppression costs for all other fuel models. An estimated 19,782 acres of fuel model modified 10/12 would occur under Alternative 1 compared with 16,194 acres under Alternative 2. Under existing conditions there are zero acres in fuel model modified 10/12.

Table 23 displays the number of acres in each fuel model by vegetation type within the Hams Fork watershed after 20 years under the Alternative 1 (No Action alternative). An increase in fuel models 10 and modified 10/12 would dominate the forested fuel areas compared to existing conditions and Alternative 2. There would be an increase of 19,782 acres in fuel model modified 10/12 under Alternative 1 and increased fire behavior would be a result.

Table 23. Acres by fuel model and vegetation type within the Hams Fork project area under Alternative 1.

Vegetation type	Aspen	Fuel Model 1(acres)	Fuel Model 2 (acres)	Fuel Model 5 (acres)	Fuel Model 8 (acres)	Fuel Model 10 (acres)	Fuel Model Modified 10/12 (acres)	Total Acres
Lodgepole pine						9832	9832	19664
Spruce/ subalpine fir mix							9950	9950
Aspen	6167							6167
Aspen/conifer mix						7103		7103
Douglas-fir mix						517		517
Whitebark pine				9335				9335
Whitebark pine mix						1142		1142
Total acres	6167	0	0	9335	0	18594	19782	53878

For analysis purposes, fuel models 10 and 10/12 modified will support a high intensity fire based on results of predicted fire behavior characteristics should a wildfire occur in the project area. Under Alternative 1, there would be an estimated 38,376 acres in fuel models 10 and 10/12 modified within the project area. In the event that a wildfire occurs, an estimated 52 percent of the project area or 71 percent of the forested area would be available to burn as a high intensity fire under moderate weather conditions.

Under Alternative 1 there would be no reduction in fuel loadings because no treatments to reduce fuel loadings would occur and therefore no reduction in resulting fire intensity would occur in the short-term. However, there would be a changing of fire behavior on the landscape as fuel loadings are redistributed. Over the next 20 years, canopy cover would decrease as beetles continue to kill trees and the potential for crown fire would decrease slightly as a result of decreased fuel continuity within the canopy to sustain fire. Dead trees would fall to the ground and fuel loading

would increase. This would result in hotter more intense fire behavior, resulting in an increase to suppression cost, decrease in firefighter capabilities, and increase in the exposure of fire fighters and the public to a hazardous condition.

Fire suppression costs would increase as flame length, intensity, and duration of the fire increases. Under the No Action Alternative fuel loading would not decrease, and over time the untreated fuels would begin to accumulate on the landscape, increasing the potential that when a fire is established on the landscape it would cost more to suppress. The heavy accumulation of fuels within and around the project units would increase duration and cost of fire suppression activities.

In addition to increased suppression costs, firefighter safety would decrease. As with any hazardous situation, increasing exposure increases risk. With no treatments on the landscape, accumulated fuels would increase the hazards being faced by firefighting personnel during suppression actions. Large diameter fuels hold and contain large amounts of energy compared to lighter fuels, causing a direct impact to the cost of suppression and firefighter safety.

Under this alternative, we would not have the management flexibility to manage natural starts to mimic history fire size.

Cumulative Effects

Under the No Action alternative none of the proposed unit treatments would occur. As a result, fuels would continue to increase on the landscape. The negative effects of this would be alleviated by some past, present, and future actions some of which are specifically designed to reduce fuels and hazard trees. However, no action in the project area would compound the effects from historic fire suppression and beetle epidemics.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Under the No Action Alternative the Forest Plan would not be implemented. The areas would not be managed under Desired Future Condition 1B (enhancement of timber and range values scheduled for current use), 2A (Fire Management emphasizes a natural-appearing landscape), 9A (Fire management emphasizes protection of developed facilities and related site values), 10 (Fire management emphasizes preservation and enhancement of habitat), and 12 (Fire management emphasizes preservation and enhancement of habitat, particularly through prescribed fire). After treatment, canopies would not be reduced along road corridors and in stands throughout the project area, changing the fuel characteristics and reducing the ability of that stand to initiate and sustain a crown fire. Uncontrolled fire starts would not have reduced impacts to the current and future forest base within the project area. By not reducing the canopies and understory, fuel loading would not reduce the ability of the fire to initiate and/or sustain crown fire. If left untreated, uncontrolled fire starts could damage the current and future timber base within this project area.

In addition, fire would not be used as a tool to accomplish resource objectives while protecting identified values within acceptable levels of risk. Within the guidelines identified in the Forest Plan, prescribed fire may be used to accomplish management objectives which include; insect and disease suppression, reducing fuel loading to acceptable levels, achieving other desired vegetation conditions to meet management objectives, and maintaining fire-dependent animal or plant species. Under this alternative prescribed fire would not be used to meet any of these objectives.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Under the Proposed Action alternative there would be a reduction in fuel loadings on 5,176 acres from mechanical treatments, and additional 2,716 acres from hazard tree removal and 730 acres from prescribed fire, resulting in a decrease in fire behavior on the landscape. As dead and down trees are removed, large proportions of the available fuels, which increase fire intensity, flame length, and rates of spread, are removed. This results in fire behavior that is generally reduced compared to existing conditions under Alternative 1. Crown fire potential would decrease as beetle-killed conifers are removed and there is a lack of fuel continuity within the canopy to sustain fire. Once treatments are implemented, treated areas would move from fuel model 8 to fuel model 2 and from fuel model 10 to fuel model 8. Stands that are not treated would remain in fuel models consistent with Alternative 1. Table 24 shows the change in fuel models from existing condition to Alternative 2 and also compares Alternative 2 with Alternative 1 in terms of fuel indicators. Alternative 2 would generally result in a decrease in flame length, fireline intensity, and fuel loading compared to existing conditions and Alternative 1. An exception is fuel model 2 under Alternative 2 which has greater flame length and fireline intensity than existing conditions and Alternative 1 because fuel model 2 has a shrub component. While it may appear as though fuel model 2 is more difficult to control than fuel model 8 and 10, this is untrue because fuel model 2 does not have the potential for individual tree torching or for sustained crown fires (which produce flame lengths in excess of 100 feet and spotting distances of ¼ mile or more). Therefore, fuel model 2 is easier to control than fuel model 8 or 10 which does have the potential for individual tree torching or sustained crown fire.

Table 24. Comparison of fuel indicators for Alternative 2 with existing conditions and comparable fuel model under Alternative 1.

Change in fuel model from existing to Alt. 2	FM 8 → (existing)	FM 2 (Alt. 2)	FM 10 (Alt. 1)		FM 10 → (existing)	FM 8 (Alt. 2)	FM modif. 10/12 (Alt. 1)
Flame Length: ft	1	6	4		4	1	8
Fireline Intensity: btu/ft/s	7	232	133		133	7	518
Initiation to Crown Fire:	No	No	Yes		Yes	No	Yes
Fuel load: tons/acre	5	4	12		12	5	35

With the mechanical and prescribed fire treatments proposed in the Hams Fork project area fuels would be reduced, allowing for a removal of fuels that would otherwise contribute to increased difficulty in fire management, increasing hazards for both firefighting personnel and the public.

By proceeding with the proposed action, fuels would be reduced over large enough of an area as to provide for increased firefighter and public safety while at the same time reducing effect on the landscape of large scale, high intensity fires, by creating blocks of reduced fire behavior that would slow down an advancing fire front. Ingress and egress are important aspects to firefighter safety. Clearing road corridors of standing dead trees allows for fire breaks along these roads that would enhance safety for firefighting crews as they access the Hams Fork area for fire management activities including fire suppression.

Roads make for an excellent pre-established fuel break. The greatest concern then would be to keep the fire on the ground and out of the canopies, and to use roads to aid firefighters in suppression activities. For example, the Fontenelle fire of 2012 was a wind driven event and although overall control actions were initially unsuccessful, there were many successes in modifying fire behavior that were tied specifically to roads. The southwest corner of the fire was secured by back burning off a road that tied the fire into Scaler and Labarge creeks preventing the fire from expanding further west. After the wind events subsided, there were many places where roads, old clearcuts and openings were used to modify fire behavior. The hazard tree removal treatment within 300 feet from roads reduces fuels and further serves to enhance the effectiveness of roads as fire breaks.

Treatment of fuel model 8 and 10 would reduce significant amounts of dead and down woody debris and set most of the treatment units back to a combination of fuel model 2 and 8 for treated stands compared to fuel models 10 and modified 10/12 under Alternative 1. Fuel model 2 has a brush (mountain shrub/sage) component and fuel model 8 an open timber component with light fuel understory. When considering firefighter and public safety, lighter fuels are safer to engage and easier to control than heavier fuels. Data from the fireline handbook (p. A-32) estimates that a three person engine crew fighting fire in a fuel model 2 and 8 has a production rate of 15 chains per hour, while the same crew in fuel model 10 has a production rate 12 chains per hour and in fuel model 12, 10 chains per hour. The larger the fuel model, the longer it takes engine crews to establish a fireline.

Table 25 shows the number of acres in each fuel model by forest vegetation type within the Hams Fork watershed predicted after 20 years under the Alternative 2. Under Alternative 2, fuels would be reduced predominately in stands that have been identified as supporting high fire behavior characteristics (FM 10 and modified 10/12) compared to Alternative 1. The result is a landscape with lighter fuel loadings and a reduction in fire behavior, increasing safety for the public and firefighting personnel when compared to Alternative 1.

Table 25. Acres by fuel model and forest vegetation type within the Hams Fork project area under Alternative 2.

Vegetation category	Aspen Fuel Model	Fuel Model 1 (acres)	Fuel Model 2 (acres)	Fuel Model 5(acres)	Fuel Model 8 (acres)	Fuel Model 10 (acres)	Fuel Model modified 10/12 (acres)	Total Acres
Lodgepole pine	36	217	1		3160	8680	7570	19664
Spruce/ subalpine fir mix	58	47	1	1	93	1126	8624	9950
Aspen	6167							6167
Aspen/conifer mix	529					6574		7103
Douglas-fir mix						517		517
Whitebark pine			181	9154				9335
Whitebark pine mix				27	39	1076		1142
Total forested acres	6790	264	183	9182	3292	17973	16194	53878

Under Alternative 2, there would be an estimated 34,167 acres in fuel models 10 or modified 10/12 within the project area. In the event that a wildfire occurs, an estimated 46 percent of the project area or 63 percent of the forested area would likely burn as a high intensity fire under moderate burning conditions. This estimate is based on the acreage in fuel model 10 or modified 10/12 and that these fuel models support a high intensity fire based on predicted results of predicted fire behavior characteristics.

Treatments proposed in Alternative 2 would result in an estimated reduction of 4,209 acres in fuel models 10 and modified 10/12 when compared with Alternative 1. This change results in a direct effect to 6% of the project area and 8% of the forested area. The strategic location of the proposed treatments along roads results in enhanced firefighting capabilities and the ability to manage fires to mimic more natural fire sizes.

Cumulative Effects

The cumulative effects analysis area consists of the 74,276 acre Hams Fork project area. The following activities were considered for this analysis.

Historical wildfires: Between 1960 and 2008, 69 fire starts were documented in the Hams Fork project area which burned approximately 2,700 acres. The largest three fires were managed fires, the Hams Ridge (2005), Kelly (2007) and Shingle Mill (2008) fires (42 acres, 363 acres and 1,376 acres, respectively) The Fontenelle Fire of 2000 was a suppression fire that burned 975 acres in the Hams Fork watershed. The effects of these past fires have contributed to the reduction in current fuel loads that are described in the existing condition and in the alternatives and do not provide any additional cumulative effects.

East Fork Salvage and Sanitation –Removal of dead and dying trees would occur in 159 acres. This treatment would reduce fuel loads from fuel model 10 to fuel model 8.

Pole Creek prescribed burn. – This 6,500 acre proposed prescribed burn would reduce fuel loads and enhance wildlife habitat. The majority of this project is to regenerate aspen by removing the conifer encroachment. This treatment would reduce fuel loads from fuel model 10 to fuel model 2, 5 and Aspen on approximately 3,760 acres.

Kelly Guard Station Fuels Reduction – 50 acres treated surrounding the Kelly Guard Station by removing dead and dying trees and thinning live trees to reduce fuel load. This project was completed in 2012 and serves to protect this facility. Fuel loads reduced from fuel model 8 and 10 to fuel model 2 and 8 on 50 acres.

Administrative Sites Forest Health Protection Projects: 24 acres of past treatments similar to the Kelly Guard Station Fuels Reduction project in which dead and dying trees were removed and live trees were thinned to reduce fuel loads and protect administrative sites. These projects began in 2006 and are ongoing.

Livestock grazing reduces fine fuels by removing grasses and forbs across the project area. These fine fuels contribute to carrying fires in fuel models aspen, 1, 2, and 5. Livestock grazing would not substantially modify fuel loads in fuel models 8, 10 and modified 10/12 and therefore would not contribute to the cumulative effect in this analysis.

The Kemmerer historical timber treatments: The effects of these past timber treatments have contributed to current fuel loads that are described in the existing condition and in the alternatives and do not provide any additional cumulative effects.

Cumulatively, these activities reduce the acreage of fuel models 10 and modified 10/12 by approximately 5,800 acres in the project area.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Forest Plan

Under Alternative 2 the Forest Plan would be implemented. The areas would be managed under Desired Future Condition 1B (enhancement of timber and range values scheduled for current use), 2A (Fire Management emphasizes a natural-appearing landscape), 9A (Fire management emphasizes protection of developed facilities and related site values), 10 (Fire management emphasizes preservation and enhancement of habitat), and 12 (Fire management emphasizes preservation and enhancement of habitat, particularly through prescribed fire). After treatment, canopies would be reduced along road corridors and in stands throughout the project area, changing the fuel characteristics and reducing the ability of that stand to initiate and sustain a crown fire. Uncontrolled fire starts would have reduced impacts to the current and future forest base within the project area. By reducing the canopies and understory fuel loading would reduce the ability of the fire to initiate and/or sustain crown fire.

Fire would be used as a tool to accomplish resource objectives while protecting identified values within acceptable levels of risk. Within the guidelines identified in the Forest Plan, prescribed fire may be used to accomplish management objectives which include; insect and disease suppression, reducing fuel loading to acceptable levels, achieving other desired vegetation conditions to meet management objectives, and maintaining fire-dependent animal or plant species.

Clean Air Act of 1970, as amended and Wyoming Air Quality Standards and Regulations:

The Hams Fork Vegetation project will meet the standards of the Clean Air Act and the Wyoming Air Quality Standards and Regulations (WAQSR) by registering burns (slash piles, broadcast burns, prescribed fire) in accordance with the requirements in Chapter 10, Section 4 of the WAQSR with the Wyoming Air Quality Division and receiving a burn ID prior to conducting the burns. The Hams Fork project area is approximately four miles to the west of the boundary of the Upper Green River Basin non-attainment area for ozone. Because this project lies outside of the non-attainment area, no conformity analysis is needed. However, in recognition that the project area is located near the non-attainment area, , the project implementation (burning) will be scheduled to avoid the ozone season which typically occur January through March and any ozone advisory days that are forecasted by WY DEQ. Emissions of ozone precursors (NOx and VOCs) outside of the wintertime ozone season on days with good ventilation and mixing of air, will not likely contribute to ozone formation.

Wildlife Habitat

The following resource information and analysis summarizes the Biological Evaluation and Wildlife Report (DeLong 2013a). This section summarizes the conditions under which native wildlife-communities developed or formed in the area (estimated natural conditions or natural range of variability), existing habitat conditions, and potential effects on habitat at a broad level that is applicable to the range of wildlife species covered in the Wildlife Species section.

Mix of Succession Stages and Conifer Expansion - Affected Environment

A relatively high level of fragmentation of forestland by vegetation type exists in the Hams Fork watershed. This can be readily seen in the 2007 Bridger-Teton National Forest vegetation map for the Hams Fork project area which can be viewed on the Bridger-Teton National Forest website under the Hams Fork Vegetation project at http://www.fs.usda.gov/goto/btnf/projects . Approximately 72 percent of the project area is forested and the forested area includes lodgepole pine mix (37%), aspen (25%), whitebark pine (19%), spruce/subalpine fir (19%), and Douglas-fir (1%) vegetation types (Table 26).

The natural mix of succession stages provides a baseline against which to evaluate potential effects of Alternatives 1(No Action) and 2 (Proposed Action). Existing conditions are not meeting natural conditions, and Alternative 1 would continue this into the future (Table 1, Chapter 1, Purpose and Need). Periodic fire is needed to maintain lodgepole pine communities on the landscape and it is not possible, over the long term, to maintain an unnaturally large proportion of forestland in late succession on landscapes in which lodgepole pine is prevalent (Brown 1975, Hessburg and Agee 2003, Hessburg et al. 2005, Lehmkuhl et al. 2007). Attempts to maintain larger-than-natural proportions of forestland in late succession eventually lead to larger and higher severity fires.

Estimated Historic Conditions

There is considerable evidence that more forestland exists today than existed naturally in the past, prior to alteration of fire-return intervals. Currently, as much as 15 percent more forestland exists than did a century ago; meaning the acreage of forestland under existing conditions (Table 26) is unnaturally high and acreage of big sagebrush and grass/forb communities is unnaturally low. This estimate of 15 percent more forestland is based on a large volume of scientific literature and a 1913 vegetation map of the Hams Fork project area (Hill 2004) which shows roughly 44,000 acres of all forest types combined compared to an estimated 53,904 acres in 2007. This difference is an 18 percent increase in forestland; however, taking into account differences in map scale and methods, a more conservative estimate of 15 percent was assumed for this analysis. This comparison contributes to the evidence that expanded fire return-intervals have resulted in expansion of forestland within the project area.

The expansion of conifer forestland into big sagebrush, grassland, and meadow communities is well documented in the scientific literature (e.g., Pieper 1990, Knight 1994:194-198, Riggs et al. 1996, Thompson 2007, Halpern and Swanson 2009). Hill (2004) showed a 40% reduction in rangeland acres between 1913 and 1996, and a 20% reduction in big sagebrush acreage. Site specific evidence is common in the Hams Fork project area throughout the Kemmerer Ranger District and across the Bridger-Teton National Forest. For example, subalpine fir expanding into meadows, several conifer species expanding into mountain big sagebrush and mountain shrubland communities, not to mention the major increase in conifer abundance and canopy cover in aspen stands (Gruell 1980a,b).

An estimated 18,327-26,952 acres of late-seral forestland existed under a natural fire return-interval. The amount of late-seral forestland was substantially lower under a natural fire return-interval for two main reasons. First, a greater frequency of fires did not allow conifer forestland to expand into non-forest types to the same extent that has occurred during the past century. This expansion has increased the footprint of forestlands in general. Second, the greater frequency of fires directly resulted in a larger proportion of forestland in early succession, which indirectly

resulted in a lower amount of forestland in late succession than currently exists after a century of fire suppression. The Biological Evaluation and Wildlife Report (DeLong 2013a) contains a detailed explanation of how the estimated acreage was identified.

Existing Conditions

The total acreage of forest types that exists today (53,904 acres), compared to the acreage that is estimated to have existed prior to Euro-American settlement (45,818 acres), is primarily used in this analysis to estimate the total amount of late-seral forestland that existed under a natural fire regime.

Table 26. Estimated acres by vegetation type in the Hams Fork project area based on the 2007 Bridger-Teton National Forest vegetation layer (existing condition).

Vegetation Type	Acres	Percent of Total	Percent of Forestland	Percent of Total
Lodgepole Pine Mix	19,671	26%	37%	72% (53,904 ac.)
Aspen (minimum acres)	13,282	18%	25%	
Whitebark Pine	10,486	14%	19%	
Spruce/Subalpine Fir	9,952	13%	19%	
Douglas-fir	513	1%	1%	
Big Sagebrush/Mtn. Shrub	13,536	18%		22%
Grassland/Forbland	2,621	4%		
Riparian	3,603	5%		5%
Barren Rock, Alpine, Sparse	611	1%		1%
Total — All Types	74,275	100%		100%

The acreage of non-forested vegetation types (e.g., big sagebrush, mountain shrubland, tall forb, grassland, meadow, willow) and aspen communities is smaller than what had existed prior to Euro-American settlement. Conifer forestland is expanding at a faster rate into these types due to fire suppression and the lack of other disturbance that would normally reduce conifer cover in these other communities (Gruell 1980a,b, USFS 1997, USFS 2001a). During the last 100 years or more, conifer trees have increasingly established on edges between conifer forestland and non-forested vegetation types. As trees that had “invaded” non-forestland become older, new trees establish further into the non-forest communities. In other situations, a scattering of conifer trees have become established throughout non-forested types and in aspen stands. Then, as these trees provided a seed source and shade, additional conifer trees became established and, over time, sites converted to conifer forestland. This means that the acres of forestland derived from the 2007 vegetation layer contains more acres of forestland that occurred prior to the onset of fire suppression. In addition, the sizes of early-seral patches are currently substantially smaller than conditions under which native wildlife-communities evolved. For instance, fires in lodgepole pine landscapes were typically large--several thousand acres to tens of thousands of acres or more.

Table 27 displays the minimum estimates of the existing mix of early and mid-seral acreage using documented timber harvest, mechanical treatment projects, and fire related disturbances that resulted in forestland being converted to early or mid-seral stands.

Table 27. Minimum estimates of the existing mix of succession stages, based on past logging and fires.

Vegetation type	Acres	Documented Regenerated Forestland		Existing Mix of Succession Stages		
		Early Seral	Mid Seral	Early Seral	Mid Seral	Late Seral
Lodgepole Pine	19,671	2,303	561	12%	3%	85%
Aspen	13,282	366	382	3%	4%	93%
Whitebark Pine	10,486	434	0	4%	≤1%	95%
Spruce-Fir	9,952	493	5	5%	≤1%	94%
Total Forestland	53,904	3,596	948	7%	2%	91%[D]

Source: DeLong 2013a

It appears that the 2006-2012 insect epidemic created a small acreage (e.g., ≤5 – 10%) of early-seral communities. Stand exam data shows that on average, 40% of the mature trees were left unaffected. This combination of mid-story green trees combined with a high density of large snags, emulates some of the characteristics of late-seral forestland, which typically does not happen since large snags are typically long since gone by mid succession. The early-seral communities produced by the 2006-2012 insect epidemic are small, substantially smaller than early-seral acreage that would result from a typical fire in lodgepole pine; meaning they are of limited utility for some wildlife species that depend on habitat that is produced by typical fires in lodgepole pine forests.

These factors have reduced the amount and quality of habitat for wildlife species associated with early- and mid-seral conifer forestlands and for wildlife species associated with habitats being encroached upon by conifer (e.g., aspen, big sagebrush), they have benefited wildlife species associated with late-seral conifer forestlands.

The part of the project area that has had logging activity, mechanical treatment, prescribed fire, and fire use currently has a patchwork of relatively small forest openings, scattered across the area, primarily the western two-thirds of the project area. This has created a network of artificially small forest openings. A minimum of 114 individual regeneration treatment units and fires have regenerated approximately 5,130 acres during the past 75 years or more (when records on fires began), which is an average of 45 acres per opening. Under natural conditions, not only would substantially more than 5,130 acres have been burned in the last 75 years, (as evidenced by fires that have been suppressed and the major over-representation of late-seral conditions) but 5,130 acres of burned ground would have involved far fewer individual fires than 114 (not including lightning strikes that do not get beyond approximately 1/8 acre).

The remaining one-third of the project area is dominated by whitebark pine, which also depends on periodic fire (Johnson 2013) that is more frequent than occurs in the spruce-fir zone. Johnson (2013) explained in his report that, in addition to native beetle epidemics and whitepine blister rust, a primary threat to whitebark pine is successional replacement by shade-tolerant conifer species. Too little fire, therefore, has reduced the health of whitebark pine forests. Furthermore, the build-up of shade-tolerant species like subalpine fir increases the chances of large-scale fires, which may make current conditions unsustainable — and highly undesirable — in the whitebark pine type.

Mix of Succession Stages and Conifer Expansion - Environmental Consequences

Key Issue #1:

Change in forested communities

The change in the distribution and abundance of forested species and age-classes, as a result of the Proposed Action, could negatively affect wildlife species.

Effects indicators for comparison of alternatives:

Vegetation indicators used in the Forest Vegetation section:

- Stand structure: Conversion to single storied/early succession
- Species composition: Conversion to aspens and pines
- Stocking levels: Changes in stand density index, basal area, and trees per acre
- Successional stages: Changes towards early seral species
- Aspen and whitebark pine enhancement: Total acres treated

Vegetation indicators used in this section:

- Mix of succession: the percent of the forest types in early, mid and late seral
- Changes towards increases in early seral species and decreases in late-seral stages.

Spatial and Temporal Context for Effects Analysis

Potential effects on the mix of succession stages and stand characteristics, including potential cumulative effects, were evaluated at several geographic scales:

- **Within Treatment Units** — Potential effects within treatment units were analyzed for many wildlife species. Units range in size from about 6 acres to 265 acres.
- **Project Area** — This is the analysis area defined for the project in the scoping letter. The total size of the area is about 74,276 acres, and it consists of the entirety of the Hams Fork watershed on National Forest System lands. This is the geographic scale at which assessments were made about whether the project contributes to or detracts from suitable habitat conditions.
- **Hams Fork/Commissary Ridge/Southern Wyoming Range Area** — This geographic area encompasses 14 6th-order HUCs or parts of these HUCs for a total of 308,108 acres. This is included primarily to analyze changes to the mix of succession stages and availability of dead trees at a landscape level, including taking into account a large portion of the Fontenelle Fire, and effects on wildlife that could potentially be affected by these changes. The HUCs are as follows: Hams Fork, West Hams Fork, Upper Smiths Fork-Bear River, Hobble Creek, Coantage Creek, Fontenelle Creek-Bear Trap Creek, LaBarge Creek-Coyote Park Creek, LaBarge Creek-Turkey Creek, LaBarge Creek-Miller Creek (only the extreme north tip), Greys River-Spring Creek, South Piney Creek-Green River, and the far western ends of Upper Beaver Creek-Green River, Fogarty Creek, and Dry Piney Creek.

Potential effects, including potential cumulative effects, were evaluated at two temporal scales:

- **5-30 years, Post-Project** — This addresses a large portion of the early-seral period following treatment activities in treatment units, the period of dead trees falling (post 2006-2012 insect epidemic) in the project area, as well as a large portion of the early-seral period following some of the treatments/fires addressed in the cumulative effects (e.g., Pole Creek prescribed burn, 2012 Fontenelle Fire).
- **Long Term (>30 years)** — This addresses the period of time after the "5-30 years, Post-Project" described above.

Alternative 1-No Action

Direct and Indirect Effects

In the short term under Alternative 1, there would likely be no changes in the mix of seral stages in the project area. Over time, however, the percent of forestland in late succession would continue to increase in the absence of fire. However, the potential for larger and more severe fires to occur in the vicinity of the treatment units would be larger than under Alternative 2 (Fuels and Fire section). Thus, Alternative 1 could facilitate reductions in late-seral forest communities and increases in the proportions of early-seral and mid-seral communities, in the event of one or more fires that are not successfully suppressed. In addition, the size of early-seral patches could be much larger under Alternative 1. It also has more potential than Alternative 2 in reducing conifer cover on non-forest vegetation types.

Cumulative Effects

Cumulative effects of both Alternative 1 and Alternative 2 are covered together in the Cumulative Effects section under Alternative 2, below.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Compliance related to mix of succession is discussed in the Wildlife Species section.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Under Alternative 2, the amount of forestland in late succession would decline by as much as an estimated 1% to 3% in the project area (from an estimated 91% down to an estimated 88-90%; Table 28). Concurrently, the amount of forestland in early succession would increase by as much as an estimated 1% to 3% in the project area (from an estimated 7% up to and estimated 8-10%).

Table 28. Estimated changes in the mix of succession stages resulting from Alternatives 1 and 2.

Vegetation type	Acres	Add'l Acres in Early Succession[A]	Estimated Acres in Early Succession	Estimated Mix of Succession Stages		
				Early Seral	Mid Seral	Late Seral
Lodgepole Pine						
Exist. & Alt. 1	19,671	0	2,303	12%	3%	85%
Alternative 2	No Change	217	2,520	13%	3%	84%
Estim. Natural	No Change			10-20%	30-40%	30-50%
Aspen						
Exist. & Alt. 1	13,282	0	366	3%	4%	93%

Alternative 2	No Change	635-1,188	1,001-1,554	9-11%	4%	85-87%
Estim. Natural	No Change			20-40%	30-50%	30-40%
Whitebark Pine						
Exist. & Alt. 1	10,486	0	434	4%	≤1%	95%
Alternative 2	No Change	0-200	434-634	4-6%	≤1%	93-95%
Estim. Natural	No Change			≥15%	45%	40%
Spruce-Fir						
Exist. & Alt. 1	9,952	0	493	5%	≤1%	94%
Alternative 2	No Change	91	584	6%	≤1%	93%
Estim. Natural	No Change			5-10%	30%	60-65%
Total						
Exist. & Alt. 1	53,904	0	3,596	7%	2%	91%
Alternative 2	No Change	943-1,696	4,539-5,292	8-10%	2%	88-90%
Estim. Natural	No Change			≥15-20%	30-40%	40-50%

Therefore, with respect to the mix of succession stages, Alternative 2 would only negligibly move forestland in the project area in the direction of more suitable conditions for native wildlife-communities, except possibly in the aspen type where the movement would be somewhat larger than negligible.

- Lodgepole Pine Type — Alternative 2 would have minor benefits with respect to moving the mix of succession stages toward conditions that existed prior to the suppression of fire. Few treatments were designed to regenerate lodgepole pine.
- Aspen Type — Alternative 2 would result in a moderate increase in early-seral aspen communities and a small reduction in the proportion of late-seral aspen communities. Regenerating aspen communities under Alternative 2 depends primarily on prescribed burning and, to a lesser extent, the aspen improvement treatments. The additional amount of forestland that would be regenerated to aspen depends in part on the actual acreage having aspen present within the “salvage/sanitation with aspen improvement” units and the density of mature aspen.
- Whitebark Pine Type — Alternative 2 would have minor benefits with respect to moving the mix of succession stages toward conditions that existed prior to the suppression of fire. Based on the treatment type for whitebark pine, it is possible that substantially less than 200 acres would be converted to a stand initiation stage, meaning that changes in the mix of succession could be negligible in this type.
- Spruce-Fir Type — Clearcutting, prescribed burning, and aspen improvement treatments would regenerate only a small amount of spruce-fir forestland under Alternative 2 and therefore, would have minor benefits in moving the mix of succession stages toward conditions that existed prior to the suppression of fire. Effects at the landscape level would not be measurable. Old-growth forestland would not be affected by treatments because no modeled old-growth exists within treatment units.

The small size of the regeneration treatments and treatments that would result in some regeneration would add to the patchiness of the early-seral and mid-seral communities in the project area, and would help to increase the overall amount of acreage in which succession is set back, thereby moving closer to the desired (natural) conditions. Although there would be slightly (3%) fewer acres of forestland in late succession under Alternative 2 than under existing

conditions, there would continue to be far more acres in late succession under Alternative 2 than existed under natural conditions.

From the standpoint of wildlife species associated with late-seral conifer forestland, the total acreage of Alternative 2's fire and mechanical treatment that converts late-seral forestland to early-seral communities is a slight reduction in the overabundance of late-seral conifer forestland that have accrued over many decades of human-related actions that have reduced the frequency and extent of fire. The gap between existing and estimated natural conditions, which currently represents major benefits to species associated with late-seral conifer forest, is artificial. A small reduction (e.g., 1-3% reduction in late-seral acreage resulting from Alternative 2), given such a large artificial benefit, does not constitute an adverse effect on wildlife populations that have taken advantage of this benefit.

Cumulative Effects for Alternatives 1 and 2

Actions over many decades resulted in extensive logging (late 1800s to early 1900s), reduced frequency and extent of fires (e.g., fire suppression, clearcutting, roads, livestock grazing), and limited logging and prescribed burning in the late 1900s and first decade of the 21st Century. The net effect has been an overrepresentation of late-seral conifer forestland and expansion of conifer forests into other vegetation types in the Hams Fork watershed, as compared to conditions that existed prior to Euro-American settlement.

Several factors currently limit the amount of late-seral conifer forestland that will be converted to early-seral communities by logging, mechanical treatment, and prescribed burning. Most of the project area is within Inventoried Roadless Areas, which greatly restricts options for converting late-seral forestland to early-seral communities. Some of the areas that have the greatest ecological need for a major disturbance like fire are lodgepole pine and aspen stands with dense understories and mid-stories of subalpine fir. However, the Northern Rockies Lynx Management Direction (USFS 2007b), currently prevents treatments in these stands.

These factors will continue to skew habitat conditions toward providing habitat for wildlife associated with late-seral conifer forestland, which already have an overabundance compared to natural conditions, at the expense of species associated with or using aspen, meadows and other forest openings, mountain big sagebrush, and grassland habitat.

On the other hand, climate change will result in increasingly warmer temperatures and drier conditions in this part of the Rocky Mountains, which will contribute to more acres being burned (Schoennagel et al. 2004, Kaufmann et al. 2008, Glick et al. 2011:39-40,46), which will offset the factors addressed above to some degree.

Other vegetation treatment projects have or will affect the mix of succession stages to varying degrees. The Pole Creek prescribed burn (decision signed in 2009) will, when it is completed, result in as much as an additional 3,760 acres of late-seral forestland being converted to early succession, which would, in combination with Alternative 2, reduce the proportion of late-seral forestland to as little as an estimated 81-83%. The East Fork Salvage/Sanitation project would not affect the amount of forestland in late succession because it would not convert any forestland to early succession.

Several prescribed burns and mechanical treatments on BLM land have reduced the amount of late-seral forestland, but the situation on BLM land is similar to that of forestland in the Hams Fork project area; i.e., an overrepresentation of late-seral forestland. These fires and mechanical treatments are helping to move in the direction of a more natural mix of succession stages. An

estimated 9,563 acres (non-forest and forest, combined, but primarily non-forest habitats) burned between 1940 and 2013 and about 400 acres of forestland was mechanically thinned between 1981 and 2013. Natural ignitions may be managed in such a way as to reduce the amount of late-seral vegetation, however, these are not likely to be measurable at a landscape scale.

The net effect of past cumulative effects and Alternative 1 would be a continuation of benefits to late-seral conifer forestland habitat and ongoing detriments to early-seral and mid-seral habitats in the project area. The net effect of past cumulative effects and Alternative 2 would be a slight reduction in long-term, artificially-accrued benefits to late-seral conifer forestland habitat and associated species, and ongoing detriments to early-seral and mid-seral habitats in the project area.

An effect of Alternative 2 is the potential reduction in acres that would burn as a high intensity fire within the area (Fuels section). If a wildfire were to occur in the vicinity of the harvest units, the potential to manage the size of the fire would be greater under Alternative 2 than Alternative 1, and therefore, Alternative 2 may result in a larger amount of late-seral conifer forestland being retained compared to Alternative 1.

Alternative 2, in combination with Pole Creek prescribed burn and LaBarge vegetation project, would further elevate the proportions of early-seral lodgepole pine and spruce-fir, this combination of treatments would only raise proportions by about 1%. This project, in conjunction with the Pole Creek prescribed burn, would triple the proportion of early-seral aspen habitat. While this would still be well below estimated natural conditions, it would be substantive progress toward restoring aspen habitat on the landscape. Alternative 2, in conjunction with the LaBarge vegetation project, would increase the proportion of early-seral whitebark pine, albeit slightly (i.e., by less than 1%). Regardless, however, Alternative 2 and the LaBarge vegetation treatment project move conditions in the whitebark type closer to estimated natural conditions.

Summary of Cumulative Effects

The net effect of past cumulative effects and Alternative 1 would be a continuation of benefits to late-seral conifer forestland habitat and ongoing detriments to early-seral and mid-seral habitats in the analysis area and Hams Fork watershed. Under Alternative 1, the Hams Fork project area would not move towards the desired mix of successional stages.

The net effect of past cumulative effects and Alternative 2 would be a slight reduction in long-term, artificially-accrued benefits to late-seral conifer forestland habitat and associated species, and ongoing detriments to early-seral and mid-seral habitats in the analysis area and Hams Fork watershed. Under Alternative 2, the Hams Fork project area would move a small increment (approximately three percentage points) towards the desired mix of successional stages.

Stand Characteristics - Affected Environment

Existing Conditions

Within-stand characteristics for any given stand in the project area are assumed to be within the natural range of variability relative to site potential and the age of the stand. To the extent that tree species composition, age structure, and other attributes across the landscape are altered, this is most likely driven by the age of the stands, which in turn is driven by the frequency and extent of major disturbances and the mix of succession stages, which was addressed in the previous section.

Of the roughly 50,000 acres of forestland currently in late succession in the project area, within-stand characteristics have been altered through selective logging or some form of mechanical treatment on only about 400 acres, or less than one percent. Stand characteristics on an estimated 70 percent of the forestland in the project area has been altered at least to some degree by the recent insect/disease outbreak. While the increased density of dead trees resulting from this outbreak and the shift in species and age composition resulting from the outbreak are within the range of natural variability, the existing density of dead trees and the shift in species and age composition may be near the outside edge of this range. The existing number and density of dead trees across the project area is considerably higher than typically exists under natural conditions.

Overstory Canopy Cover

Existing overstory canopy cover — as indicated by the canopy cover of trees >5-inch dbh in this analysis — was recently reduced in most stands by the 2006-2012 insect epidemic. An estimated 70% of forestland in the project area was affected by the epidemic. Herbertson (2012) estimated that the mortality from the insect epidemic reduced the live basal area by 17-86 percent, or 33-86 percent in 15 of 16 stands she examined. The average basal area reduction was 51 percent and exclusion of the upper and lower 25-percentiles brings the range to 35-63 percent. Stand exam data gathered by the district showed that average mortality was between approximately 27 and 44 percent. Thus, canopy cover has declined in most stands by a substantive amount.

Canopy cover, as measured in 2007 and 2010 (at the peak and near the end of the insect epidemic), was lowest for stands dominated by lodgepole pine and highest for stands dominated by subalpine fir (Table 29). Existing canopy cover is somewhat lower than what is summarized below and in Table 29 due to additional mortality caused by the insect epidemic, but given variability in locations of beetle kill, it is not possible to more closely estimate existing canopy cover.

Table 29. Information on canopy cover, as measured in 2007 and 2010 stand exams in the Hams Fork project area.

Measure	Lodgepole Pine	Lodgepole Pine – Subalpine Fir	Spruce – Fir (Subalpine fir)
Average: % canopy cover (CC)	46	48	56
Percent of stands w/ ≥40% CC	76%	92%	93%
Percent of stands w/ ≥50% CC	28%	52%	80%

Density of Dead Trees ≥5-inch DBH

The most obvious and most immediate consequence of the major increase in mortality of lodgepole pine in the project area is a large increase in the number and density of dead trees, especially those ≥5 inches dbh. Herbertson found a significant decline in the live canopy cover across an estimated 70% of the project area, based on Aerial Insect and Disease Detection Surveys. The distribution of the effects of this insect epidemic in forestlands, minus early- and mid-seral stands, provides a strong indication of the distribution and acreage of late-seral forests with high densities of dead trees, both in terms of forestland as a whole and for specific forest types.

Table 30. Average number (and ranges) of dead trees per acre by forest type, based on 2007 and 2010 stand exams, and the estimated percent mortality based on 2011 walk-throughs all conducted in the Hams Fork project area.

		Average No. of Dead Trees (Snags) / Acre (by dbh class)					Est. % Dead (2011 walk-throughs)	Estimated No. Dead Trees /Acre ≥5”
		<5”	5-9.9”	10-19.9”	≥20”	Total ≥5”		
LP	25	2	20	39	1	60	33%	86
		0-21	*0-76*	*0-138*	*0-7*	*0-188*	*5-20% to 60+%*	
LP-SF	10	74	19	23	0	42	38%	120
		0-244	*0-59*	*2-68*	—	*4-115*	*5-20% to 40-60%*	
SF	17	16	17	25	4	46	35	71
		0-259	*0-93*	*0-68*	*0-15*	*0-142*	*5-20 to 60+%*	

Amount of Large Woody Material

Existing amounts of large woody material range from low to moderate amounts in stands in which stand exams were completed. Across all 54 stands examined, 64 percent had an estimated 4-6 tons per acre, 32 percent had an estimated 10-15 tons per acre, and the remaining 4 percent had an estimated 3-4 tons/acre. These proportions were fairly consistent across most proposed treatment types, but all 10 proposed salvage/sanitation units that were examined had an estimated 4-6 tons per acre compared to 4 of the 5 proposed salvage/sanitation with commercial thinning units having an estimated 10-15 tons per acre.

Stand Characteristics - Environmental Consequences

Effects indicators for comparison of alternatives:

- Overstory canopy cover
- Density of dead trees ≥5 inches dbh
- Tons per acre of large woody material

Spatial and Temporal Context for Effects Analysis

The spatial and temporal context for the effects analysis is as described under Mix of Succession Stages and Conifer Expansion (p. 81)

Alternative 1-No Action

Direct and Indirect Effects

In the absence of wildfires, Alternative 1 would allow succession to proceed uninterrupted in treatment units and would allow snags to remain and later contribute to large woody material, thereby further benefitting wildlife species associated with late-seral conifer forests. This is a perpetuation of existing conditions (see “Existing Conditions” section) plus ongoing succession. Stand characteristics would remain unchanged in the short term and mid-term, except that in the next 5-30 years, most of the dead trees resulting from the insect epidemic would fall, which would (1) reduce the density of dead trees, and (2) substantially increase the amount of large woody material above the levels identified for Alternative 2 in Table 23. However, because of the

major reduction in live basal area and relatively young age of many stands (80-110 years), dead trees would be added at a lower-than typical rate in the near future (Herbertson 2012). This means that, after about 20 years, the density of snags would be lower than typical for given forest types and, eventually, the amount of large woody material would be lower than is typical for each forest type.

In the event of one or more wildfires, large acreages could be burned (a larger amount than would burn under Alternative 2; Banister 2013). This is addressed further in the "Cumulative Effects" section.

Cumulative Effects

Cumulative effects of both Alternative 1 and Alternative 2 are covered together in the Cumulative Effects section under Alternative 2, below.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Overstory Canopy Cover

Canopy cover would decline by a major amount in clearcut and prescribed burn units, but this only affects 11% of the 8,662 acres of treatments and has already been addressed in the "Mix of Succession Stages and Conifer Expansion" section.

On an estimated 80% of the treated acres, 7,738 acres of treatments, canopy cover would decline by less than 5%, which would have negligible effects on late-seral wildlife species. This is due to limiting the footprint of skid trails to ≤10% in salvage units and ≤15% in salvage/sanitation and hazard-tree-removal units and an emphasis on placing skid trails to avoid having to fell live trees ≥5 inches dbh, especially large trees.

Canopy cover would decline by a moderate to major amount in 9% of the treated acres in the salvage/sanitation with commercial thinning, aspen improvement, and whitebark pine improvement units. A central purpose of these treatments is to remove as much non-whitebark pine conifer cover as possible within 10-30 feet or more of aspen and whitebark pine trees. Whitebark pine improvement units are not included in the analysis as no stand exams were completed in this type, but the change in canopy cover would be comparable to that in aspen improvement units.

Density of Dead Trees ≥5-inch DBH

The density of dead trees would decline by a 85-95 percent or more (Table 31), compared to existing conditions, on up to 7,592 acres of mechanical treatment (i.e., not including aspen improvement and whitebark pine improvement treatments where dead trees would only incidentally be felled). The density of dead trees in aspen and whitebark pine treatment units (up to 359 acres) would fall somewhere between existing levels and those estimated for Alternative 2 in other mechanical treatment units. Due in part to limiting the footprint of skid trails to ≤10% of the acreage of each unit, it may not be possible to reach all parts of some salvage units, which would result in >3 dead trees/acre being retained. Also, it is likely that many parts of hazard-tree-removal units would remain untreated, which would result in no change in the density of dead trees on these untreated acres. There is no way to predict the extent to which this would occur in hazard-tree-removal and salvage units so full build-out is analyzed.

The density of dead trees would increase substantially in mature forest communities burned under prescription (up to 681 acres), which would approximate natural conditions in early-seral communities on these acres. On the other hand, because nearly all trees would be removed from patch clearcut units, the absence of dead trees would reduce habitat suitability for many early-seral wildlife species (Thomas et al. 1979c), but this would only occur on a very small proportion of late-seral forestland (214 acres, or <1% of late-seral forestland) within areas outside of inventoried roadless areas.

Table 31. Average number of dead trees that existed in 2007-2010 and potential changes resulting from mechanical treatments under Alternative 2, but not including effects of secondary fire related effects.

Treatment	5-9.9”		10-19.9”		≥20”		Total ≥5” [a]	
	Exist	Alt2	Exist.	Alt2	Exist.	Alt2	Exist.	Alt2
Salvation	17	0	35	≥2	1	≥1	53-97	≥3
Salvage/Sanitation	24	0	42	≥2	1	≥1	63-67	≥3
Salv./San. w/ Aspen Improv.	10	0	25	≥2	1	≥1	36-65	≥3
Salv./San. w/ Comm. Thin.	16	0	17	≥1	4	≥2-3	37-72	≥3
Aspen Improvement	0	0	15	≥1-20[A]	5	≥2-3	20-45	3-23[b]
Clearcut w/ Salvage/Sanitation	30	0	20	≥1	3	≥2-3	53-149	≥3
Clearcut w/ Reserves	12	0	17	≥1-2	2	≥1-2	31-37	≥3

a: The total column also includes the adjustments made based on 2011 walk-throughs

b: The 23 total dead trees/acre was derived as an estimate by reducing the existing high of 45 by 50%. This was done in recognition that felling of dead trees is not a purpose of aspen improvement treatments, but that some dead trees would be felled incidental to the felling of conifer trees near aspen. The same is true of whitebark pine improvement treatments.

Retaining dead trees as outlined in design feature WL-11 would mitigate the adverse effects of the reduction. To the extent Engelmann spruce and Douglas-fir trees >10 inches are available, they would be retained (based on design feature). Engelmann spruce trees are relatively uncommon, but they are fairly prevalent in some lodgepole pine, spruce-fir, and aspen stands. Douglas-fir trees are rare. To the extent there are not enough dead Engelmann spruce to meet requirements of design feature, subalpine fir would be retained.

Another factor is that broadcast burning and other secondary fire treatments in mechanical treatment units has the potential to kill trees after mechanical treatments are completed, which would supplement the density of dead trees on some sites. This would result in a slightly higher density of dead trees in small areas than is shown for Alternative 2 in Table 31.

To the extent dead trees greater than 20 inches in diameter are available, they would be retained. Table 31 provides some indication of the breakdown of size classes that would be retained if the composition of treated stands is similar to those assessed in stand exams.

Although the reduction in dead tree densities within as much as 7,592 acres would be a major reduction in habitat quality on these acres for species associated with or dependent on snags, impacts would be far lower when viewed in an ecosystem context. Of the existing estimated 34,000 acres of lodgepole pine, aspen-conifer, and spruce-fir with a typical or greater density of snags (i.e. late-seral stands and recently burned stands), snag densities on approximately 26,400

acres would remain unaffected by Alternative 2. This compares to an estimated 21,425-23,392 acres that would have had typical or greater densities of snags on them under natural conditions, meaning there would continue to be more acres with a typical or greater density of snags than existed under natural condition (i.e., when late-seral and snag-dependent wildlife communities formed in this area). Even with a conservative estimate of 65 percent of the lodgepole pine and spruce-fir types being in late succession under a natural fire regime, 24,376 acres would have had typical or greater densities of snags on them under natural conditions.

Similar contextual effects apply to the whitebark pine type, but only 207 acres (2% of the total 9,952 acres of this type) would be affected, meaning that Alternative 2 would only affect a small portion of the acres that now are in late succession but that were either in early or mid-succession or that were part of non-forest type.

Therefore, while reducing the acreage of snag-bearing forestland by as much as an estimated 22% constitutes a moderate impact to existing populations of snag-dependent and snag-associated species within the treatment area, the remaining acres of snag-bearing forestland would remain above the amount that typically existed when snag-dependent wildlife communities developed in this area. In this context, Alternative 2 would only reduce the extent to which long-term accrued benefits to these communities remain. These communities currently have an estimated 10,000-12,000 acres more habitat than they had available to them in the project area prior to Euro-American settlement.

Furthermore, each treatment unit is relatively small and most units adjoin forestland that would not be treated, typically with high densities of dead trees. The pattern of the treatment units on the landscape generally consists of units arranged as north-south relatively narrow strips with large amounts of forestland immediately to the west and east. Most of the other units have substantial amounts of forestland adjoining them. Additionally, much of the acreage in the immediate vicinity of treatment units has high densities of understory subalpine fir and other conifer species, which many times are associated with higher densities of dead mature trees.

During the 20 years following completion of the project, the retained snags would fall, which may result in zero snags in some units. However, during this time, a small number of trees in treatment units that were alive under existing conditions would likely die during this period. Because a large number of trees died during the 2006-2012 insect epidemic, the mortality rate during this period likely would be fairly low (Hebertson 2012).

Also, after about 20 years, differences in snag densities between Alternative 2 and Alternative 1 would disappear as the last of the dead trees produced by the 2006-2012 insect epidemic fall.

Amount of Large Woody Material

By treatment type, the amount of large woody material is highly variable and some of the sample sizes are low. Table 32 presents estimated existing conditions and Alternative 1 in order to compare with the effects of Alternative 2.

Table 32. Estimated existing amount of large woody material (tons/acre) in the treatment units in which stand exams were completed, estimated amount that would be retained, the percent change this represents (upward arrows indicate an increase), and estimated changes in large woody material when most of the trees killed by the 2006-2012 insect epidemic have fallen.

Treatment	Estimated Tons/Acre of Large Woody Material (Immediately Post-Treatment)			Estimated Tons/Acre of Large Woody Material (≥5-30 years)	
	Existing and Alternative 1	Alternative 2	Percent Change	Alternative 1	Alternative 2
Salvation	8.2	12.5	52%↑	≥10-20	<10-15
	3-4 to 11-17	*≥10-15*			
Salvage/Sanitation	5	12.5	150%↑	≥7-15	<10-15
	4-6	*≥10-15*			
Salv./San. w/ Aspen Improv.	6.4	12.5	95%↑	≥7-15	<10-15
	3-4 to 10-15	*≥10-15*			
Salv./San. w/ Comm. Thin.	11	12.5	14%↑	≥7-20	<10-15
	4-6 to 10-15	*≥10-15*			
Aspen Improvement	8.8	12.5	40%↑	≥10-15	<10-15
	4.6, 10-15	*≥10-15*			
Clearcut w/ Salvage/Sanitation	7.5	12.5	52%↑	≥10-30	<10-15
	4-6 to 10-15	*≥10-15*			
Clearcut w/ Reserves	5	12.5	150%↑	≥7-10	<10-15
	4-6	*≥10-15*			

In the short term, the amount of large woody material on 7,952 acres would increase as a consequence of Alternative 2. It would increase because the existing amount in most stands is relatively low, the 2006-2012 insect epidemic killed an average of 27-44 percent of trees, and because Alternative 2 would result in these dead trees being felled. In the mid-term (e.g., within about 20 years), when dead trees from the insect epidemic would have fallen (if they had not been felled and removed under Alternative 2), there would be less large woody material than under Alternative 1 because most of the large material above 10-15 tons per acre would be removed from treatment units, except in aspen and whitebark pine treatment units (about 359 acres) where felled trees would remain on site and large accumulations would persist. After trees have fallen that died in the prescribed burn units (up to 681 acres of forest), accumulations of large woody material would be high. Due in part to limiting the footprint of skid trails to ≤10% of the acreage of each unit, it may not be possible to reach all parts of some salvage units, which would result in the maintenance of existing amounts of large woody material in these places and, over the next 5-30 years, the addition of insect-killed trees to existing levels of large woody material. Also, it is likely that many parts of hazard-tree-removal units would remain untreated, which would result in no change in the amount of large woody material on these untreated acres.

Because some of the mechanical treatment acreage would be burned through broadcast burning or other means, and because this brings with it the potential to reduce the amount of large woody material, treatments need to be implemented in a way that retains the minimum 10-15 tons per acre (design feature WL-12).

The mid- to long-term reduction in large woody material — i.e., after retained large woody material has decayed and is not replaced due to low mortality rates — would occur on as much as 7,952 acres (22% of forestland in the project area). While this is a large proportion of the project

area that would be affected, relative to the existing overrepresentation of late-seral forestland, it would not represent a reduction compared to natural conditions. Of the existing estimated 34,000 acres of lodgepole pine, aspen-conifer, and spruce-fir with a typical or greater amount of large woody material (i.e. late-seral stands after dead trees have fallen and in burned stands after trees have fallen), large woody material on approximately 26,400 acres would remain unaffected by Alternative 2. This compares to an estimated 21,425-23,392 acres that would have had typical amounts of large woody material under natural conditions, meaning there would continue to be more acres with a typical or greater amounts of large woody material than existed under natural condition. Even with a conservative estimate of 65 percent of the lodgepole pine and spruce-fir types being in late succession under a natural fire regime, 24,376 acres would have had typical or greater amounts of large woody material under natural conditions.

Summary of Effects

Compared to existing conditions, Alternative 1 would result in no changes to existing conditions in the short term, except a small reduction in dead tree densities (as dead trees killed by the insect epidemic begin to fall) and a small increase in the amount of large woody material. After 5-30 years, there would be a large reduction in the density of dead trees and a moderate to large increase in the amount of large woody material.

Compared to existing conditions, Alternative 2 would result in a major reduction in the density of dead trees and a small increase in the amount of large woody material on approximately 22% of the project area. In treatment units not regenerated, stand characteristics related to live trees would change no more than a negligible amount except where aspen and whitebark pine improvement actions would be taken. In these units (up to 359 acres), stand characteristics would shift substantially toward a prevalence of aspen and whitebark pine.

Cumulative Effects for Alternatives 1 and 2

Cumulative effects that led to the existing mix of succession stages, and potential future changes to it, apply directly to cumulative effects on stand characteristics (see cumulative effects analysis in the “Mix of Succession Stages and Conifer Expansion” section). The “Aspen (MIS)” sections provides additional information specific to stand characteristics in aspen stands. Historic logging (including early years of tie hacking), fire suppression, and the 2006-2012 insect epidemic greatly influenced existing overstory canopy cover, tree density, age structure, dead-tree density, and amount of large woody material in forests of the project area. Recent mechanical treatments, recent fires, and firewood collection near roads have also affected these attributes in localized areas.

The 2006-2012 insect infestation reduced overstory canopy cover considerably more than would occur under Alternative 2 on the estimated 6,915 acres on which mechanical treatments would be limited to hazard tree removal, salvage, or salvage/sanitation (80% of the total treatment acres). This is because the average mortality of lodgepole pine may have been as high as 44 percent (Hebertson 2012) on the approximately 76 percent of the lodgepole pine type (DeLong 2013a, Table 20). Based on a larger set of stand exams, it was estimated that average mortality (all tree species combined) was between 27 and 44 percent (project records). This level of mortality likely resulted in reductions in overstory canopy cover of at least 25 percent (e.g., if canopy cover was 50%, it would have declined to about 38%). Compared to the minimal effects of < 5% canopy cover reductions resulting from hazard tree removal, salvage, and salvage/sanitation treatments, reductions due to the insect infestation were moderate to large. Reduction in overstory canopy cover on the 6,915 acres of Alternative 2 would be similar to what will occur in the East Fork Salvage/Sanitation, which will affect an additional 169 acres.

In the absence of wildfires, Alternative 1 would allow succession to proceed uninterrupted in treatment units and would allow snags to remain and for them to later contribute to large woody material, as outlined in the direct and indirect effects discussion. In the absence of wildfires, Alternative 2 would have the effects outlined in the direct and indirect effects discussion.

If one or more wildfires were not successfully suppressed and if no additional treatments had occurred (i.e., Alternative 1) and if this resulted in several thousand acres or more being burned, this would increase young age classes of trees and snag densities substantially. It is possible that fewer acres would be burned under Alternative 2. (See the "Mix of Succession Stages and Conifer Expansion" section.)

Along many portions of roads adjoining treatment units, including hazard-tree removal units, the public would continue to cut and remove dead trees and logs for firewood under Alternative 1, but it is likely this would have little effect on the overall number and density of dead trees, except in localized situations. Cutting and removing dead trees for firewood by the public, after completion of Alternative 2, would contribute further to reductions in dead tree numbers and densities, and these effects would be additive in the vicinity of treatment units. This is because treatment units are along roads and the public harvests firewood along roads. Because removal of hazard trees would be most likely along main roads and along improved roads accessing mechanical treatment units, which are the roads along which the public would most likely be looking for dead trees to harvest, it is likely that a portion of dead trees retained for wildlife would be removed. Additionally, a portion of the large woody material that would be retained under Alternative 2 for wildlife would be removed by firewood gatherers. These cumulative effects would contribute further to negative effects of Alternative2, compared to existing conditions, with respect to dead trees and large woody debris. However, there would continue to be more acres of forestland with typical or greater levels of dead trees and large woody material than existed under a natural fire regime.

In summary, compared to existing conditions, Alternative 2 would result in a major reduction in the density of dead trees and a small increase in the amount of large woody material on approximately 22% of the project area. In treatment units not regenerated, stand characteristics related to live trees would change no more than a negligible amount except where aspen and whitebark pine improvement actions would be taken. In these units (up to 359 acres), stand characteristics would shift substantially toward a prevalence of aspen and whitebark pine.

If one or more large wildfires were to occur, this would not affect within-stand characteristics, but instead would affect the mix of succession stages (see the "Mix of Succession Stages and Conifer Expansion" section).

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Compliance related to stand characteristics is discussed in the Wildlife Species section.

Wildlife Species

The following resource information and analysis summarizes the Biological Evaluation and Wildlife Report (DeLong 2013a) and the Biological Assessment for the Hams Fork Vegetation Project (DeLong 2013b). These reports should be referred to for more detailed information. The Wildlife Species section is based on information presented in the Wildlife Habitat section above.

This analysis addresses the effects to wildlife species in four categories:

- Endangered Species Act (ESA) species listed as Threatened, Endangered, experimental, or candidate species by the U.S. Fish and Wildlife Service (USFWS).
- U.S. Forest Service (USFS) Sensitive Species identified by the Regional Forester for the Intermountain Region.
- Bridger-Teton National Forest Management Indicator Species identified in the Forest Plan.
- Migratory birds in accordance with the Migratory Bird Treaty Act and Executive Order 13186.

The discussions of direct and indirect effects were organized and focused to outline the basis for the determinations. Therefore, the basis for determinations is not provided in the determination sections, in most cases, so as not to be redundant. Additional details of the analysis are provided in DeLong (2013a) and DeLong (2013b).

Species Analyzed in Detail

Species in the above categories known to occur on the Bridger-Teton National Forest were screened for relevancy to the proposed activities: only species with known occurrence or habitat in the analysis area and those that could be measurably affected by the proposed activities are analyzed in detail. Species not analyzed in detail are those that have no known occurrence or habitat in the project area; or would have no measurable effect from the proposed activities.

Species analyzed in detail are listed in Table 33. The full screening results with rationales are available in the Biological Evaluation and Wildlife Report (DeLong 2013a) and the Biological Assessment for the Hams Fork Vegetation Project (DeLong 2013b).

Table 33. Wildlife species and aspen* that were analyzed in detail.

Species	Species Listing	Species or Habitat Present or Occasional in Project Area	
		Species	Habitat
Canada Lynx (*Lynx Canadensis*)	ESA Threatened	Yes	Yes
Grizzly Bear (*Ursus arctos*)	ESA Threatened BTNF management indicator	Yes	Yes
Wolverine (*Gulo gulo*)	ESA proposed for listing	Yes	Yes
Elk (*Cervus elaphus*)	BTNF management indicator	Yes	Yes
Mule Deer (*Odocoileus hemionus*)	BTNF management indicator	Yes	Yes
Moose (*Alces alces*)	BTNF management indicator	Yes	Yes
Pine Marten (*Martes americana*)	BTNF management indicator	Yes	Yes
Great Gray Owl (*Strix nebulosa*)	USFS sensitive	Yes	Yes
Boreal Owl (*Aegolius funereus*)	USFS sensitive	Yes	Yes
Three-toed Woodpecker (*Picoides tridactylus*)	USFS sensitive	Yes	Yes
Northern Goshawk (*Accipiter gentilis*)	USFS sensitive	Yes	Yes
Gray Wolf (*Canis lupus*)	USFS sensitive	Yes	Yes
Bald Eagle *(Haliaeetus leucocephalus)*	USFS sensitive	Yes	Yes

Species	Species Listing	Species or Habitat Present or Occasional in Project Area	
Columbia Spotted Frog (*Rana luteiuentris*)	USFS sensitive	Unknown	Yes
Western Boreal toad (*Bufo boreas*)	USFS sensitive BTNF management indicator	Unknown	Yes
Boreal Chorus Frog (Pseudacris triseriata)	BTNF management indicator	Yes	Yes
Brewer's Sparrow (*Spizella brewer*i)	BTNF management indicator	Yes	Yes
*Aspen (*Populus tremuloides*)	BTNF management indicator	Yes	Yes
Migratory Birds	Migratory Birds	Yes	Yes

* Aspen was identified as a Management Indicator Species for aspen-dependent wildlife species.

Table 34 lists wildlife species that are not analyzed in detail in this environmental assessment. They were not analyzed in detail for reasons detailed in the Biological Evaluation and Wildlife Report (DeLong 2013a).

Table 34. Species under the Threatened and Endangered Species Act, Sensitive Species, and Management Indicator Species (MIS) that were not analyzed in detail.

Species considered for detailed analysis	Status
Bighorn Sheep	Sensitive Species and MIS
Pronghorn	MIS
Fisher	Sensitive Species
Townsend's Big-eared Bat	Sensitive Species
Spotted Bat	Sensitive Species
Common Loon	Sensitive Species
Trumpeter Swan	Sensitive Species
Harlequin Duck	Sensitive Species
Peregrine Falcon	Sensitive Species
Greater Sage Grouse	Sensitive Species
Flammulated Owl	Sensitive Species
Yellow-billed Cuckoo	Candidate Species

Spatial and Temporal Context for Effects Analysis

Potential effects for all analyzed wildlife species were evaluated at several geographic scales, depending on the natural history requirements and behavior of individual wildlife species and groups of species:

- **Within Treatment Units** — Potential effects within treatment units were analyzed for many wildlife species. Units range in size from about 6 acres to 265 acres.
- **Project Area** — This is the analysis area defined for the project in the scoping letter. The total size of the area is about 74,276 acres, and it consists of the entirety of the Hams Fork watershed on National Forest System lands. This is the geographic scale at which

assessments were made about whether the project contributes to or detracts from suitable habitat conditions.

- **Road Corridors between Treatment Units and Forest Boundary** — This geographic area consists of the zone occupied by the road system used in Alternative 2. This is included to evaluate effects of potential disturbance effects and direct mortality due to changes in traffic.
- **Hams Fork/Commissary Ridge/Southern Wyoming Range Area** —. This geographic area encompasses 14 sixth-order HUCs or parts of these HUCs for a total of 308,108 acres. This is included primarily to analyze changes to the mix of succession stages and availability of dead trees at a landscape level.
- **Bridger-Teton National Forest** — The entire BTNF is used as the largest geographic area for analyzing effects on populations and habitat. There are very few, if any, projects that would have the potential to independently negatively or positively affect any wildlife population at the BTNF scale. Effects at this scale are cumulative in nature and, therefore, the emphasis at this scale is whether effects of each alternative would contribute to or partially offset population and habitat trends at this geographic scale.

Potential effects, including potential cumulative effects, were evaluated at several temporal scales, depending on the action being evaluated and the natural history requirements of individual wildlife species and groups of species:

- During Project Implementation (5-10 years) — This primarily involves direct effects of treatment activities and hauling logs along haul routes and immediate habitat changes.
- 5-30 years, Post-Project — This addresses a large portion of the early-seral period following treatment activities in treatment units, the period of dead trees falling (post 2006-2012 insect epidemic) in the project area, as well as a large portion of the early-seral period following some of the treatments/fires addressed in the cumulative effects (e.g., Pole Creek prescribed burn, 2012 Fontenelle Fire).
- Long Term (>30 years) — This addresses the period of time after the “5-30 years, Post-Project” described above.

Canada Lynx (Threatened) - Affected Environment

Population Status and Distribution

The Canada lynx population in the contiguous United States was listed as Threatened under the Endangered Species Act on March 24, 2000. Critical habitat was designated for this species in 2009.

The historical range of Canada lynx in the Greater Yellowstone Area includes Idaho, Montana, and Wyoming (USFWS 1998a and b). In Wyoming, Canada lynx has been protected as a non-game species with no open season (for trapping) since 1973. The southernmost natural population of Canada lynx in North America is found in the Wyoming/Salt River Ranges and Commissary/Tunp Ridges. Based on local telemetry data (Laurion and Oakleaf 2000) and studies of Canada lynx and snowshoe hare relationships in other areas, it appears that the heterogeneity of topography and vegetation and relatively low densities of snowshoe hares could be maintaining relatively low lynx densities in the Wyoming and Salt River Ranges, as compared to lynx populations in Canada and Alaska (Ruediger et al. 2000:1-3, 7-4). Snowshoe hares do not appear to exhibit regular, dramatic population cycles as they do in the northern regions. Lynx home ranges in western Wyoming are large (Squires and Laurion 2000).

Lynx occur periodically on the Kemmerer Ranger District and within the Hams Fork project area, based on historical records, past radio telemetry studies, and snow tracking. Twelve have been documented in the Hams Fork project area and vicinity during the last 40 years (see DeLong 2013b) for more detail.

There do not appear to have been any lynx territories in the Hams Fork project area for several years. Based on the above information, the most likely scenarios are that (1) one or two individuals periodically move through the project area on their way from one location to another location, (2) one or two individuals periodically visit or move through the project area as part of a large home range.

Habitat Conditions

The Hams Fork Lynx Analysis Unit (LAU) is about 74,270 acres. The boundary of the Hams Fork LAU is very similar to that of the Hams Fork project area. Of the total acreage, 53,989 acres are designated as "lynx habitat." Even though a large proportion of the Hams Fork LAU is forested (approximately 73%), the forestland matrix is naturally fragmented by big sagebrush and other rangeland types, riparian zones, meadows, and rock bands. Old clearcuts and the fires add to the habitat diversity. There are no large expanses of unbroken forestland. Discontinuous conifer forests may not provide adequate habitat for dispersing hares to survive, and fragmented forestland habitat is generally of lesser suitability to lynx (Ruediger et al. 2000, USFS 2007c).

The acreage of forest types and existing mix of succession stages across the Hams Fork project area and the overstory canopy cover and density of young trees (<5-inch dbh) are important elements of lynx habitat, and they are described in the Habitat section. Just over 90% of the conifer forestland and aspen habitat in the Hams Fork LAU is in a late stage of succession, which is considerably more than what is estimated to have occurred prior to the alteration of fire-return intervals.

Overall across the Hams Fork LAU, approximately 70% of existing forestland has been affected by an insect epidemic (primarily mountain pine beetle) during the period beginning shortly before 2006 and ending in 2012 (see DeLong 2013a for more detail). However, reduced canopy cover due to beetle kill likely has had little if any negative effects on lynx foraging habitat and may benefit lynx habitat in the long term. This is because it is the understory that determines the quality of lynx foraging habitat. Even if overstory canopy cover declined by a major amount where suitable snowshoe hare habitat existed, this habitat would remain suitable. Similarly, if overstory canopy cover declined by a major amount where the understory layer was too sparse for snowshoe hares, a major reduction in overstory canopy cover would not make the habitat any less suitable. In both situations, opening up of the stand may facilitate greater production in the understory, which would improve lynx foraging habitat (see DeLong 2013 for more discussion).

The highly variable terrain (including prevalence of steep slopes, commonly greater than 20-30º) and inherent fragmentation of forested habitat may explain the low abundance of lynx in the Hams Fork LAU and adjoining LAUs. While some lynx authorities do not feel that slope is a determinant of lynx use of areas, there is information that indicates steep slopes in the LAU contribute to low densities of lynx (McKelvey et al. 2000, radio-collared lynx data).

Vegetation characteristics amenable to providing denning habitat do not appear to be limited in the Hams Fork LAU, and the quality of denning habitat will increase as more trees fall (see DeLong 2013b).

Prey Base

Snowshoe hares are the preferred prey of lynx (Ruediger et al. 2000), and habitat in the project area appears to be generally favorable to snowshoe hares (Berg 2010). Snowshoe hares tend to prefer younger lodgepole pine stands, as well as mature conifer stands with dense understories (Hodges 2000, Ruediger et al. 2000, Berg 2010). Mature forests typically have a moderate to high density of young conifer trees, although density of these trees in some areas is fairly low. Berg (2010) demonstrated a strong relationship between dense horizontal cover in forestland and snowshoe hare densities. Winter snowshoe hare habitat is provided primarily in stand-initiation stages and multistoried mature/late-seral forestlands (USFS 2007c, Berg 2010). Hare densities in Berg's (2010) study ranged from about 0.21 to about 4.15 per hectare. "Background" hare densities in his study (0.21 to 1.2 hares/hectare) occurred in late-seral forests where horizontal cover was below about 48% (DeLong et al. 2010). Hare densities increased considerably where horizontal cover exceeded about 48%. However, to be conservative for this project, a lower limit of 35% horizontal cover is used since this is the threshold supported by the U.S. Fish and Wildlife Service.

Many of the old clearcuts in the vicinity of the treatment units are still providing winter snowshoe hare habitat. Additionally, horizontal cover was inventoried on a total of 10,380 acres, and 5,173 acres (50%) of these acres had ≥48% horizontal cover, indicating a relatively high level of suitable snowshoe hare habitat in late-seral forestland. There is a substantially larger amount of multistoried late-seral forestland in the Hams Fork LAU than occurred under natural conditions, due in part to an estimated 91% of forestland being in late succession compared to an estimated 40-50% under natural conditions and an ongoing increase in subalpine fir in the understory of many stands. Conversely, there is an underrepresentation of forestland in the LAU that provides suitable winter habitat for snowshoe hares in old fires and clearcuts.

The Final Environmental Impact Statement for the Northern Rockies Lynx Management Direction (USFS 2007c) highlighted the important role of periodic disturbance events in maintaining lynx habitat and the importance of a mosaic of varying stand ages (USFS 2007c:145-154). "High quality lynx habitat contains an abundance of this early successional habitat in 'unsuitable condition' (up to 30 percent of an LAU) within a mosaic of mid- to late-seral stands… along with [lynx habitat in unsuitable condition] and intervening successional stages, provide the landscape mosaic of habitat conditions needed for snowshoe hare production and lynx foraging (hunting) habitat, and thus for recovery and survival of lynx" (USFWS 2007:41). "Based on the best available information, the [U.S. Fish and Wildlife] Service concludes that combined, this direction would conserve the most important components of lynx habitat: a mosaic of early, mature and late successional staged forests, with high levels of horizontal cover and structure" (USFWS 2007:43).

Critical Lynx Habitat

The project area is within Critical Lynx Habitat Unit 5 (Greater Yellowstone Area). The primary constituent element is boreal forest, which has four components: (1a) dense horizontal cover, (1b) deep fluffy snow, (1c) denning habitat, and (1d) matrix habitat. Critical lynx habitat encompasses all habitats that have been mapped as lynx habitat in the Hams Fork LAU. "Critical lynx habitat" is a specific designation and is different than the general term lynx habitat.

Canada Lynx (Threatened) - Environmental Consequences

Key Issue #:3

Impacts to Canada lynx habitat

There is a concern that the proposed vegetation activities could reduce Canada lynx foraging habitat.

Effects indicators for comparison of alternatives:

- Percent of lynx habitat in the Hams Fork lynx analysis unit (LAU) that exists in a stand initiation stage.
- Percent of lynx habitat, within the Hams Fork LAU, that has been regenerated by timber management activities in the last 10 years.
- Percent horizontal cover within treatment stands.

Alternative 1-No Action

Direct and Indirect Effects

Beneficial effects include a continuation of a large proportion of forestland in late succession with relatively high densities of understory trees (multistoried conditions), and the prevalence of multistoried conditions is increasing as subalpine fir trees continues to increase in density and canopy cover.

A negative effect of Alternative 1, which equates to foregoing an opportunity to increase the amount of early-seral communities under Alternative 2, is that the selection of Alternative 1 would maintain an underrepresentation of early-seral forestland, which would continue to limit the amount and distribution of early-seral snowshoe hare habitat, which is recognized as an important part of lynx foraging habitat (USFS 2007a, USFS 2007b). Furthermore, if one or more large wildfires were to burn thousands of acres in the project area, individual Canada lynx (e.g., those that may move through the project area in the near future) may be negatively affected relative to existing conditions, more so than would occur under Alternative 2 since Alternative 2 would result in fewer acres of forestland burned in wildfires.

However, because the existing amount of late-seral forestland in the project area is artificially high and not ecologically sustainable, forests in the project area cannot be depended upon to provide the existing amount of late-seral, multistoried habitat very far into the future. Alternative 1 would contribute to setting the stage for large stand-replacing fires that could potentially be large enough to negatively affect lynx.

Cumulative Effects

Cumulative effects for Alternatives 1 and 2 are addressed in the Cumulative Effects discussion under Alternative 2.

Determination of Effects

In the absence of wildfires, Alternative 1 would not have any effects on Canada lynx or their habitat, relative to existing conditions. Compared to estimated natural conditions, Alternative 1 would, in the absence of wildfires, continue to have both beneficial and negative effects on Canada lynx.

If wildfires occurred under Alternative 1, lynx may be negatively affected more than would happen under Alternative 2. The basis for this determination is found in the discussion of direct and indirect effects, in combination with the cumulative effects assessment.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Standards in the Northern Rockies Lynx Management Direction Record of Decision (USFS 2007b) restrict vegetation management activities in lynx habitat. Objectives, standards and guidelines would generally be met under Alternative 1 with the exception of vegetation objectives that are currently not being met and would not be affected or changed by this alternative. Further analysis is available in the Biological Assessment for the Hams Fork Vegetation Project (DeLong 2013b).

Alternatives 2-Proposed Action

Direct and Indirect Effects

Approximately 15% of lynx habitat in the Hams Fork LAU is considered to be in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, compared to the allowed 30% (Standard VEG S1). The project would increase the percentage in stand initiation from 15% to 21.2%, which is still below the 30% threshold. Also, the amount of lynx habitat regenerated during the last 10 years would increase from about 8% to 14.1%, which is below the 15% threshold. Therefore, the short-term loss of lynx habitat would have minor effects on lynx, particularly since all of these acres are currently not providing suitable snowshoe hare habitat.

The potential for temporary, short-term displacement or long-term displacement of lynx due to treatment activities is low for several reasons. First, there is a low probability of a lynx passing through or inhabiting the project area when mechanical treatment activities were taking place. During the last 40 years, lynx have been documented in the Hams Fork LAU in about 2 of 5 years; however, two-thirds of the observations were in about the first 20 years (1972-1993) and only one lynx (10% of observations) was observed in the last 10 years. Second, the operation of heavy equipment and vehicles is not thought to displace lynx, except possibly for short distances (USFS 2007a). Also, lynx prey on a wider range of prey species during summer months (Koehler and Aubry 1994) meaning they are less limited during summer months to habitat supporting higher densities of snowshoe hares. This adds to the ability of lynx to adjust to localized incidences of disturbance during the summer. The potential exists, albeit very small, for a lynx to be hit by a logging truck or support vehicle. This represents a negligible potential negative effect on lynx. Also, temporary roads would temporarily remove 12 acres of lynx habitat (maximum of 4 miles of temporary roads), but following completion of timber harvesting, these roads would be re-contoured and re-vegetated.

Up to 944 acres of lynx habitat would be temporarily lost to prescribed burning and patch clearcuts, and a portion of 1,632 acres would be temporarily lost due to aspen improvement, whitebark pine improvement, and salvage/sanitation with aspen improvement treatments, although all applicable standards of the Northern Rockies Lynx Management Direction would be met. Negative effects on lynx would be negligible because (1) succession will return treatment units to lynx habitat within an estimated 20-25 years; (2) horizontal cover in these units averaged less than 35% and, therefore, these treatments would not conflict with Standard VEG S6; (3) each of the clearcuts and patch clearcuts are very small (while “units” may be larger, actual patches would not exceed 13 acres); (4) prescribed burn units are relatively small (≤265 acres); (5) late-seral and mature conifer forestland is greatly over-represented in the LAU; (6) clearcutting and

prescribed burning these units would contribute slightly toward Objectives VEG O1 and O2; and (7) possible displacement effects during treatment activities.

The density of understory trees would be reduced by <5% to 20% on up to 6,915 acres within the Hams Fork LAU. This acreage currently either has very low to low densities of young trees (as indicated by horizontal cover readings of <35%), or has low to moderate densities of young trees (as indicated by horizontal cover readings of 35-47%) and skid trails would be limited to a footprint of 10% or less, thereby mitigating negative effects. Furthermore, much of the forestland in prescribed burning and patch clearcut units that currently does not contribute to winter foraging habitat would, within 20-25 years, provide suitable lynx foraging habitat (i.e., an improvement from existing conditions).

Together with Standard VEG S6 of the Northern Rockies Lynx Management Direction, none of the treatments in Alternative 2 would be undertaken in stands with 48% or greater horizontal cover. An exception, as allowed by Standard VEG S6, is the "…incidental removal [of snowshoe hare habitat] during salvage harvest." Salvage treatments, including hazard tree removal, would take place under Alternative 2 in some stands having 35-47% horizontal cover. Skid trails and landings would be less than 10 percent of the treatment area and no broadcast or jackpot burning would be conducted to minimize impacts to snowshoe hare habitat (design features WL-5).

Cumulative Effects

Cumulative effects applicable to lynx are outlined in the cumulative effects analysis of the "Mix of Succession Stages and Conifer Expansion" and "Stand Characteristics" subsections of Wildlife Habitat section, and are similar to cumulative effects outlined in the "Pine Marten (MIS); Great Gray Owls, Boreal Owls, and Northern Three-toed Woodpeckers – Environmental Consequences" subsection. In summary, cumulative effects of human activities during the last century have caused a large increase in the proportion of late-seral conifer forest habitat, both in terms of major increases in the proportion of late-seral communities and in expansion of forestland. Currently, approximately 91% of forestland in the Hams Fork LAU is in late succession, in contrast to 40-50% of forestland that existed in late succession under natural conditions.

Other projects to be completed in the near future, including the Pole Creek Prescribed Burn, will also affect the amount of lynx foraging habitat in the project area. They are incorporated into the analysis below for Standards VEG S1 and VEG S2, and were addressed in the cumulative effects discussion of the Wildlife Habitat section and in the Biological Assessment (DeLong 2013b).

Over the long term, the reduced overstory of lodgepole pine — a consequence of the 2006-2012 insect epidemic — would foster the growth of subalpine fir and other conifer species in the understory, which on the one hand would benefit Canada lynx by providing substantially more late-seral multistory snowshoe hare habitat. However, on the other hand, this would come at the expense of fewer acres of early-seral snowshoe hare habitat, which is an important component of winter snowshoe hare habitat and, therefore, lynx foraging habitat (USFS 2007a, USFS 2007b).

Determination of Effect

Alternative 2 may affect individual lynx, but it would likely not have any population level effects for three primary reasons:

- low likelihood of Canada lynx being present in the project area when vegetation treatment activities are occurring

- low proportion of late-seral forestland to be regenerated
- no suitable snowshoe hare habitat being regenerated

Alternative 2 may affect critical lynx habitat, but none would be permanently lost and a large portion of the acreage that would be temporarily lost would provide better quality habitat than is now being produced (within about 10-20 years).

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The objectives, standards, and guidelines in the Northern Rockies Lynx Conservation Direction (USFS 2007b) provide management direction for minimizing adverse impacts to lynx on the Bridger-Teton National Forest and other national forests in the northern Rocky Mountains of the United States. These objectives, standards, and guidelines are now part of the Bridger-Teton National Forest Land and Resource Management Plan through a Forest Plan amendment (USFS 2007b). Projects that implement them are generally not expected to have adverse effects on lynx, and implementation of these measures across the range of lynx is expected to lead to conservation of the species.

Standards in the Northern Rockies Lynx Management Direction Record of Decision (NRLMD; USFS 2007c) restrict vegetation management activities in lynx habitat. However, exceptions allow for fuel treatments within the wildland-urban interface. Relevant standards are summarized below. See Biological Assessment (DeLong 2013) for a detailed discussion of NRLMD objectives, standards and guidelines.

In summary, effects on lynx habitat resulting from Alternative 2 would not conflict with vegetation objectives and standards, and this alternative would contribute slightly to Objectives VEG O1 and VEG O2. Therefore, while there would be minor, short-term adverse effects on lynx habitat in the Hams Fork LAU, there would be some beneficial effects on lynx habitat after 10-20 years.

Grizzly Bear (Threatened) - Affected Environment

Population and Habitat Status

Grizzly bears once roamed the Wyoming, Salt River Ranges and Commissary/Tunp Ridges, but were extirpated from much of their historic range by the middle of the twentieth century (USFWS 1993). A small population persisted in Yellowstone National Park during this period. The population since this time expanded from Yellowstone National Park to other areas in the Greater Yellowstone ecosystem and the overall Greater Yellowstone population now appears to be increasing at about 4-6% per year as of 2002 (Moody et al. 2002). Currently an estimated 500-700 grizzly bears inhabit the Greater Yellowstone ecosystem.

This increasing population is expected to cause more grizzly bears to venture outside of their existing range into other areas of suitable habitat, including into the Salt River and Wyoming Ranges. The Bridger-Teton National Forest encompasses approximately 13% of the occupied grizzly bear range in the Yellowstone Grizzly Bear Ecosystem, and the project area comprises approximately 4% of the Bridger-Teton National Forest (actual harvest units comprise about 0.1% of the national forest).

The project area is approximately 95 miles south of the grizzly bear recovery zone, and is approximately 50 miles south of an area delineated by USFWS (2007) as suitable and acceptable for grizzly bears. The project area is more than 30 miles from occupied grizzly bear habitat delineated by the Interagency Grizzly Bear Study Team. There have been no verified grizzly bear

occurrences in the project area, but there was an unverified report of a sow with cubs at the north end of the Kemmerer Ranger District (within 10 miles of the north end of the project area). The other nearest confirmed report is more than 20 miles north of the project area.

Whitebark pine can be an important food for grizzly bears and is addressed in this analysis (DeLong 2013b lists other foods). Whitebark pine forests currently are below satisfactory conditions, mainly because of aging conditions and associated successional replacement of whitebark pine by shade tolerant conifers and mortality from beetles (Johnson 2013). An estimated 95% of the type is in late succession, instead of an estimated 40% (Table 28).

By taking into account traffic volumes that differ between main roads (14 miles), secondary roads (18 miles), and primitive roads (70 miles) and differences in screening effects of forest vegetation along roads, an effective road density for the entire project area is about 0.52 miles of open road per square mile, and for the roaded 70% of the project area is about 0.72 miles of open road per square mile (DeLong 2013).

Grizzly Bear/Human Interactions

The Interagency Conservation Strategy Team (2007:43) stated that "Motorized access is one of the most influential factors affecting grizzly bear use of habitats." According to USFS (2006:85), "A primary factor in providing for the conservation of grizzly bears is the management of grizzly bear/human interactions. Grizzly bear mortality is almost solely attributable to grizzly bear/human conflicts with a common outcome of bear mortality by interagency bear managers or killing by other humans. In addition to mortality concerns, providing secure habitat (areas free of motorized access) is important to enable bears to fully use their food sources, denning sites, and meet other living needs. Human presence can limit bear use of habitat, create tolerance among some bears that allows for interaction at great risk to the bears, or attract bears to unnatural or unsecured food sources increasing the risks of food conditioning to unnatural foods and human conflict."

USFS (2006:89) recognized that motorized access and site development are the main human activities influencing grizzly bear use of habitat, and assessed that "…unregulated human access and development within grizzly bear habitat can contribute to increased bear mortality and affect bear use of existing habitat" and this was based on several studies cited in the EIS. This information led to their conclusion that motorized-use management (e.g., mainly through restrictions on certain types of motorized use on established access routes) has a major influence on grizzly bear/ human interactions. In general, motorized use can affect interactions with humans (i.e., potential grizzly bear mortality), displacement from important habitats, and habituation (which in turn can increase mortality).

Secure habitat for grizzly bears was defined as areas greater than or equal to 10 acres in size and more than 0.31 miles from a road being used by motorized vehicles, regardless of whether open, unauthorized but used, or gated (USFS 2006). There are many ways to restrict travel on roads and even gated roads are not considered effective closures by the Forest Service (USFS 2006).

USFS (2006) assessed that existing road densities preclude some areas from being effectively occupied by grizzly bears, and the Interagency Conservation Strategy Team (2007) identified an open motorized access route density of 1 mile/mile2 and a total motorized access route density of 2 mile/mile2 as biological thresholds for the Primary Conservation Area (PCA) for grizzly bears. Road densities in the Hams Fork project area are under these thresholds. Road densities in the project area are lower than both of these measures. The existing open motorized route density in

the project area is 0.89 miles/mile2, and with the addition of an estimated 90 miles of unauthorized motorized routes, the total motorized access route density is an estimated 1.68 miles/mile2. However, the density of roads in the western two-thirds of the project area (roughly 52,000 acres) exceeds the thresholds, meaning that road density is likely high enough to effectively preclude the area being effectively occupied by grizzly bears. The existing open motorized route density in this part of the project area is 1.26 miles/mile2 and the total motorized access route density is an estimated 2.37 miles/mile2. Existing road densities in the project area are presented in the "Effects of Motorized Use on Elk, Mule Deer, and Moose" section (p. 108).

Grizzly Bear (Threatened) - Environmental Consequences

Alternative 1-No Action

Direct and Indirect Effects

Alternative 1 would not have any more effects on grizzly bears than already would be anticipated to occur under existing conditions. The main effect of Alternative 1 would continue to be the density of open and unauthorized roads and motorized trails, which appears to be below the density thresholds at the project level and above the density thresholds in the western two-thirds of the project area. For grizzly bears that ventured into the project area, roads would contribute to an elevated level of interactions with humans (which has the potential to lead to grizzly bear mortality), displacement from important habitats, and habituation (which in turn can increase mortality), especially in the western two-thirds of the project area. Additionally, the condition of whitebark pine communities would continue to decline with aging forests (Johnson 2013), except possibly in some places with substantial beetle kill and recruitment of young whitebark pine trees.

Cumulative Effects

Because there are no direct or measurable indirect effects of Alternative 1, above and beyond the effects of existing conditions, there are no cumulative effects.

Determination of Effects

Alternative 1 would not have any effects on grizzly bears or their habitat, relative to existing conditions. Compared to estimated natural conditions, motorized route densities in the project area would continue to limit use by grizzly bears and would continue to preclude the effective use of the western two-thirds of the project area. The basis for this determination is found in the discussion of direct and indirect effects.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 would have no effect on the ability to meet requirements of the Endangered Species Act with respect to grizzly bears, as outlined above and in DeLong (2013b). Alternative 1 would also not conflict with the Grizzly Bear-Human Management Standard and Grizzly Bear Habitat Management Standard of the Forest Plan because there is no action associated with Alternative 1.

Alternatives 2-Proposed Action

Direct and Indirect Effects

The Proposed Action would have no effects on habitat that would affect grizzly bears, relative to existing conditions. Grizzly bears typically are not affected by most changes in vegetation, and the project area is outside of the grizzly bear recovery zone (see DeLong (2013b) for existing habitat conditions and potential effects).

Alternative 2 has a slight potential for affecting individual grizzly bears or minor parts of their habitat, but would likely not contribute to any population-level effects due to there being no documented occurrences of grizzly bears in the project area and low expectation of future occurrences, regardless of habitat conditions. Road volume and use and the potential for human disturbance are not expected to change enough throughout the life of the project to affect bears. The potential for grizzly bear/human interactions would be minimized by implementing design feature WL-22.

Additionally, Alternative 2 would benefit whitebark pine to a small degree, but this likely would have negligible benefits to grizzly bears given the small proportion (2%) of the 10,486 acres of whitebark pine to be treated.

Except for a slight increase in the density of roads during project implementation, due to about 4 miles of temporary roads, the density of open motorized routes would be the same after the project is completed as it was prior to project implementation. There is a possibility of unauthorized routes expanding, but the total motorized access route density in the project area would likely remain under the 2 miles/mile2 threshold and it is already above the threshold in the western two-thirds of the project area, meaning that a small increase in unauthorized motorized routes would have few potential impacts on grizzly bears, especially given the low probability of grizzly bears occurring in this part of the BTNF. Additional information is provided in DeLong (2013b).

Cumulative Effects

Past Federal and non-Federal actions that affect grizzly bear use of the Kemmerer Ranger District include:

- the extirpation of grizzly bears from the area and subsequent establishment of sheep and cattle grazing in the Wyoming/Salt River Ranges and Commissary/Tunp Ridges,
- agricultural production and residential development to the west, south, and east of these ranges,
- establishment of roads and motorized trails,
- increase in public use of the area, and
- the adoption of a recovery area that does not include the Wyoming/Salt River Ranges and Commissary/Tunp Ridges.

Habitat associated with the Wyoming/Salt River Ranges and Commissary/Tunp Ridges is not considered biologically suitable for grizzly bears. Several factors may continue to hinder the establishment of a reproducing grizzly bear population in the Hams Fork, including fairly high road densities and human activity levels in the district (from the standpoint of grizzly bear needs), potential takings resulting from domestic sheep depredations and human-bear conflicts locally and north of the district in travel corridors (e.g., during hunting season), and illegal killing of bears.

The LaBarge Vegetation Restoration project would, if approved for implementation, result in an additional 765 acres of whitebark pine habitat being restored. Possible benefits to grizzly bears, however, will be realized decades from now when seedlings, saplings, and pole-size trees are producing cones. While the whitebark pine restoration of 200 acres under Alternative 2 and 765 acres in the LaBarge project are small compared to the total acreage of the whitebark pine in the cumulative effects area, it represents a start. Including the existing acreage of whitebark pine in early succession (an estimated 835-1,089 acres), an estimated 8-9% would be in early succession

or otherwise improved following both the Hams Fork and LaBarge projects. At a larger landscape scale of 233,832 acres (which includes watersheds immediately northeast of the LaBarge Creek watershed, there currently is an estimated 6-9% of the whitebark pine type in early succession, and the Hams Fork and LaBarge projects would increase this acreage to 8-11% (including acres on which whitebark pine is improved but not necessarily regenerated).

Determination of Effect

Alternative 2 may affect individual grizzly bears, but it would likely not have any population level effects due to there being some potential for incidental displacement of dispersing grizzly bears and slight potential for a human-bear interaction.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 would have no effect on the ability to meet requirements of the Endangered Species Act with respect to grizzly bears, as outlined above and in DeLong (2013b). Alternative 2 would not conflict with the Grizzly Bear-Human Management Standard and Grizzly Bear Habitat Management Standard of the Forest Plan.

Elk, Mule Deer and Moose (MIS) - Affected Environment

Elk, mule deer, and moose are analyzed together because they are all big game “harvest indicator species,” they have similar broad-scale habitat requirement, and they all generally respond similarly to major vegetation disturbances like fire. Key differences include: (1) elk are more sensitive to motorized vehicle use than the other two species, (2) mule deer and elk habitat-use patterns can differ due to competitive interactions between these species and differing tolerances of motorized use, and (3) summertime thermal cover is especially important for moose.

Population Status

Elk in the Hams Fork project area are part of the West Green River herd unit (herd unit 428), which occupy a land area of nearly 1.5 million acres occupied by elk in the herd unit area. The project area is within a broad geographic area used by elk for spring/summer/fall range, including calving and migration habitat. The West Green River elk herd currently is approximately 60% above the population objective of 3,100, and there appears to be a slow downward trend toward the population objective since 2005 (Short 2011a). The project area is within a broad geographic area used by elk for spring/summer/fall range, including calving and migration habitat. Seasonal range maps of WGFD reveal that spring/summer/fall range encompasses 72,940 acres (98% of the project area), calving range encompasses 36,446 acres (49% of the project area), and that crucial winter, year-long range encompasses 1,336 (2% of the project area). Elk inhabit the project area from the time snow clears (e.g., May) until snows push them out (e.g., October-November).

Mule deer in the Hams Fork project area are part of the Wyoming Range mule deer herd unit, which covers approximately 3,824 square miles (nearly 2.5 million acres). The project area is within a broad geographic area used by mule deer for spring/summer/fall range, including fawning and migration habitat. The Wyoming Range mule deer herd currently is approximately 42% below the population objective of 50,000 (Fralick 2011). The 10-year average is 31,990 mule deer, and the trend is fairly stable. The population has been below objective for 19 years mainly due to degraded habitat conditions on winter ranges southwest, south, and east of the Kemmerer Ranger District, but there are other contributing factors, likely including habitat conditions on spring, summer, and fall range.

Moose in the Hams Fork project area are part of the Lincoln moose herd unit, which covers approximately 1.4 million acres. The project area is within a broad geographic area used by moose year-round, and it includes calving and migration habitat. The Lincoln moose herd currently is about 64% below the population objective of 1,620 animals, and there has been a steady downward trend since 2007 (Short 2011b). The cause of declining moose numbers is being studied and appears to be due to a combination of habitat, disease, and predation factors.

Habitat Conditions

The project area contains a wide range of habitat for elk, mule deer, and moose, including forest openings and rangelands, early- and mid-seral conifer forestland, mature and old-age conifer forestland, aspen stands, riparian meadows, and riparian willow communities. Habitat in the project area currently is in less-than-satisfactory condition for these species due primarily to the under-representation of early- and mid-seral plant communities, reduced condition of aspen habitat, and reduced habitat effectiveness (especially for elk). Although mule deer are affected by motorized use to some extent, they are not as sensitive to it as elk.

Mix of Succession Stages and Stand Characteristics

The estimated natural mix of succession stages outlined in the Wildlife Habitat section constitutes a suitable mix of succession stages for elk, mule deer, and moose, albeit possibly at the low end of suitability. Because elk, mule deer, and moose are seral species, they benefit from having a mix of early, mid, and late succession within forestland (Boyce 1989, Peek and Krausman 1996, Wisdom and Thomas 1996, Peek 1997, Thompson and Stewart 1997, Franzmann 2000, Kie and Czech 2000, Skovlin et al. 2002). Based on a detailed analysis, Thomas et al. (1979a) identified an “optimum” mix of cover types for elk and mule deer as being 40% hiding and thermal cover and 60% foraging habitat. Under estimated natural conditions — with 15% fewer acres of forest types and 10-20% of forestland acres in early succession (see Wildlife Habitat section) and 75% of the aspen type providing foraging habitat — this would have provided an estimated 52-55% of foraging habitat for elk and mule deer.

The existing proportion of forestland in late succession, as described in the Habitat Section, provides less-than-suitable habitat for these species (USFS 2009). Aspen habitat is generally in depleted condition, as described in the Aspen (MIS) section, which contributes further to less-than-suitable habitat conditions. An estimated 37% of the project area has the potential to provide foraging habitat for elk and mule, with the remaining 63% providing hiding and thermal. This mix of foraging habitat and cover is the opposite recommended by Thomas et al. (1979a).

Herbaceous Vegetation and Shrubs, and Noxious Weeds

Given the late-seral status of a large majority of forestland in the project area, herbaceous and browse diversity and production is about as low as they can be on these acres. This is because late-seral forestland produces far less herbaceous vegetation than younger age classes (Thomas et al. 1979a:116, Pieper 1990, Riggs et al. 1996, Stam 2008) and because the average age of late-seral forestland is older than existed under a natural fire return-interval, which further reduces the amount of herbaceous vegetation. Only an estimated 11% of forestland in the project area has the potential for high diversity and productivity of herbaceous vegetation and browse (e.g., because it is in early stages of succession) due to the lowered or eliminated canopy cover of conifer trees. However, a portion of these acres already has a relatively high canopy cover of young conifer trees, which limits herbaceous and shrub production.

Mature aspen stands can sustain a relatively high diversity and productivity of herbaceous vegetation and shrubs, but well over half of the aspen type in the project area has substantial canopy cover of conifer trees, which likely has greatly reduced this diversity and productivity. Additionally, because conifer trees have been expanding into non-forest types such as big sagebrush and meadows, forage production is correspondingly declining along the edges of these types.

Effects of Motorized Use on Elk, Mule Deer, and Moose Use

A large volume of scientific studies demonstrates that motorized use on roads and trails displaces a portion of elk from habitat along roads and that the proportion of elk displaced is mainly a function of the level of traffic on the roads (e.g., Thomas et al. 1979a, Lyon 1983, Lyon et al. 1985, Rowland et al. 2005, Wisdom et al. 2005a). Displacement effects generally decline with increasing distance from roads, with disturbance effects being detected as far away as 1 mile or more (Rowland et al. 2005, Wisdom et al. 2005a). The existence of forest vegetation along roads and the density of this vegetation affect the degree to which motorized use affects use of roadside habitat by elk (Thomas et al. 1979a, Lyon et al. 1985, Skovlin et al. 2002). The presence and level of motorized use is the overriding influencing factor on habitat effectiveness, and the presence and density of forest vegetation mitigates the effects of motorized use to some degree. While motorized use reduces habitat effectiveness for mule deer and moose (Thomas et al. 1979a), mule deer and moose are affected by motorized use to lesser degrees than elk.

Motorized use on open roads reduces elk use to some extent in the project area, especially in the western two-thirds of the project area. The density of open roads in the project area currently meets the Road Management Standard of the Forest Plan (see the Transportation section). An exception is that road density in the project area's DFC 12 area exceeds the Road Management Standard, but (1) this is an existing condition, (2) neither alternative would result in any changes in the DFC 12 area, and (3) road density in the DFC 12 area exceeded the standard when the Forest Plan was approved. Because disturbance effects on elk are heavily influenced by the level of motorized use on roads, as well as the presence and density of forest vegetation, the Forest Plan provides direction on re-calibrating road mileage and road density based on approximations of traffic volumes expected on different types of roads and adjoining forest vegetation (USFS 1990a:109-110). Based on these re-calibrations, the current open-road density and the level of motorized use on these roads reduces potential elk use to 74% of what it would be in the absence of any roads, which is similar to potential elk use in the DFC 10 area. Proportionally, potential elk use in the western two-thirds of the project area is estimated to be roughly 66%, which is lower than the eastern one-third of the project area where roads do not exist.

Table 35. Existing "open" road mileage, road densities, and estimated reductions in elk use in each DFC area in the Hams Fork project area, based solely on open roads and not including effects of closed, unauthorized, and user-created roads and trails that are being used by standard-size vehicles, ATVs, and motorbikes. Thus, actual reductions in elk use are greater than what is shown. Mileages were obtained from Lusty (2013a).

DFC Area	Square Miles	Miles of Road				Weighted Miles[A]				Weighted Miles/Mile^2	*Maximum* Estimated Potential Elk Use
		Main	Sec.	Prim.	Total	Main	Sec.	Prim.	Total		
10 – entire	89	11.7	16.3	59.1	87.1	12.9	11.4	26.6	50.9	0.57	72%
2A	13	0	0	0	0	0	0	0	0	0	100%
1B	9	1.3	0	11.0	12.3	1.3	0	4.4	5.7	0.63	69%
12[D]	2.7	1	0.4	0	1.4	1.1	0.3	0	1.4	0.52	74%
9A	0.4	0	1.3	0	1.3	0	0.9	0	0.9	n/a	n/a
Entire Proj. Area	114.1	14	18	70.1	102.1	15.3	11.7	31.0	58.9	0.52	74%

[A] Based on Lyons 1983, and as summarized in USFS (1990:109-110). None of the roads have seasonal timing restrictions. For the purposes of estimating the Adjusted Miles/Mile2 for existing conditions, the multipliers are as follows:

DFC 10 — The main road is mostly in open rangeland with a small amount in forestland (1.1); secondary roads are mostly in forestland with a moderate amount with an open understory (0.7); and primitive roads are in a mix of forestland with mixed cover qualities and rangelands, and ATV use can be a regular occurrence on some of these roads (0.45).

DFC 1B — The main road has a mix of cover qualities in forestland (1.0); secondary roads are mostly in forestland with a moderate amount with an open understory (0.7); and primitive roads are mostly in forestland with a mix of cover qualities, and ATV use can be a regular occurrence on some of these roads (0.4).

DFC 12 — The main road is mostly in open rangeland (1.1); and secondary roads are mostly open (0.8).

Security Cover

Of the 53,904 acres of forestland in the project area, an estimated 12,580 acres (23%) currently meet the criteria for elk security cover (≥250 contiguous acres of ≥40% forest canopy cover more than ½ mile from open roads; Hillis et al. 1991). The Hams Fork project area has substantially less security cover than other parts of the Kemmerer Ranger District, with the exception of the LaBarge drainage, due primarily to the relatively high density of roads in the Hams Fork project area and the much lower density of roads in the remaining portion of the district aside from the LaBarge Creek watershed. Given the existing road densities, the Hams Fork project area is of lesser importance to security cover than other parts of the Kemmerer Ranger District.

Elk, Mule Deer and Moose (MIS) - Environmental Consequences –

Indicators are as follows:

- Proportion of forestland in late succession
- Proportion of forestland in early succession
- Acres of aspen habitat rejuvenated
- Canopy cover and production of herbaceous vegetation and noxious weeds
- Density of roads
- Change in amount of secure elk habitat

Alternative 1-No Action

Direct and Indirect Effects

Alternative 1 would not impact elk, mule deer, and moose, or their habitat, relative to existing conditions. Alternative 1 is a continuation of existing conditions into the future (see Habitat Conditions, above).

Alternative 1 would not contribute to the slow downward trend in the West Green River elk herd that has occurred since 2005 because this appears to be driven by hunting and winter range conditions. Alternative 1 would not contribute to any upswing in the Wyoming Range mule deer population since habitat conditions for mule deer would continue to be below potential and this trend would continue in the absence of vegetation treatments and wildfire. Alternative 1 would not help to slow and may contribute to the current steady downward trend in Lincoln moose numbers. Effects at the BTNF scale would be similar.

Cumulative Effects:

Cumulative effects of Alternatives 1 and 2 are discussed together under the Cumulative Effects section of Alternative 2.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1, in and of itself, would not conflict with Forest Plan direction with respect to elk, mule deer, and moose since there is no action. But it does not contribute to meeting Forest Plan Objective 2.1(a) and direction for providing suitable and adequate habitat for big game species.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Changes in Indicators:

- the proportion of early-seral communities would increase from an estimated 7% to 8-10%
- herbaceous vegetation and shrub canopy cover and production would increase by small amounts, on average, across the 8,622 acres of treatments, with substantial increases on 1,104 acres
- aspen habitat would improve on as many as 830 acres
- open road density across the project area would increase to 0.69 mi/mi2
- secure elk habitat would be reduced by 2.4%
- implementation timing would avoid ungulate calving seasons

Elk

The vegetative changes are beneficial to elk. However, most of the increases in understory vegetation would take place within ½ mile of roads, which is where elk use is probably lowest. The reductions in the density of forest vegetation in treated areas, particularly along roadways, and increased road use would further reduce elk use along roads. Security cover may be further reduced to the extent that road improvements, skid trails, and reduced density of trees lead to more user-created motorized trails.

Potential elk use, based on open-road densities and not including motorized use of unauthorized routes, would decline from an estimated 74% in the project area as a whole and 72% in the DFC 10 area down to 68% and 66%, respectively, as a result of Alternative 2. This is based on re-

calibrating road densities based on criteria on pages 109-110 of the Forest Plan. Security cover will be reduced by approximately 2.4%.

Additionally, elk would be temporarily displaced where and when heavy equipment and work crews are operating, but this is not anticipated to contribute to further reductions in elk numbers. To the extent possible, activities would be focused in a small number of treatment units at any given time and, once crews have completed work in one set of units, they would not return to these units (see Management Activity Guideline for DFC 10 areas, USFS 1990a:235). Because no treatment activities would be permitted before July 20 (design feature WL-14, based on migratory bird nesting), elk calving would not be disrupted. The Elk Calving Area Standard of the Forest Plan requires that no human activities occur within elk calving areas prior to June 30 in order to avoid adverse impacts on elk calving, and this requirement would be met.

Although Alternative 2 would help reduce the spread of wildfires that may occur, it would still be possible for wildfires to burn forestland and rangeland, although to a somewhat smaller extent than would occur under Alternative 1. Thus, wildlfires would still contribute toward a more natural mix of succession stages, which would benefit elk, mule deer and moose, but treatments in Alternative 2 would help prevent tens of thousands of acres being burned, which in some cases could negatively affect these species.

Overall, at the herd unit level, this alternative has the potential to contribute slightly to reduced elk use and a small reduction in elk numbers in the West Green River herd, but this would move population numbers in the direction of the Wyoming Game and Fish Department herd objectives (the elk population currently is 60% over the herd objective). The Hams Fork project area comprises only 5% of both the West Green River elk herd unit, therefore slight changes at the project level would be negligible at the herd unit level. At the BTNF level, effects would be small enough that any changes in population levels of elk, mule deer, and moose would not be measurable.

Mule Deer and Moose

While thermal cover provided by relatively dense mature conifer trees is important to summering moose, Alternative 2 would reduce canopy cover by a moderate to large degree on 1,767 acres (4% of late-seral forestland in the project area) and would reduce it by a slight to small degree on another 6,915 acres (14% of late-seral forestland).Also, untreated forestland in the vicinity of treatment units provides denser cover than what currently exists in treatment units.

Mule deer and moose are somewhat less sensitive to motorized use than elk and, therefore, mule deer and moose use of treated units would likely increase where forage production increases. The assessment related to herbaceous vegetation assumes that noxious weeds, which may increase as a consequence of Alternative 2, are properly controlled and that increases in the diversity, total canopy cover, and production of herbaceous vegetation and shrubs is not offset by livestock grazing in treatment units.

Mule deer and moose would be temporarily displaced where and when heavy equipment and work crews are operating, but this is not anticipated to contribute to any population-level effects. To the extent possible, activities would be focused in a small number of treatment units at any given time and, once crews have completed work in one set of units, they would not return to these units. Because no treatment activities would be permitted before July 20 (design feature WL-14), moose calving and deer fawning would not be disrupted.

Alternative 2 would benefit the Wyoming Range mule deer herd and Lincoln moose herd by a small degree. The project area comprises 5% of the Lincoln Moose herd unit and comprises approximately 3% of the Wyoming Range mule deer herd unit, and the percentages for spring, summer, and fall range are not appreciably different. This means that slight to small positive and negative effects in the project area translate to negligible effects at herd unit levels.

Cumulative Effects for Alternative 1 and 2

Two of the biggest factors that affect the West Green River elk and Wyoming Range mule deer populations outside the project area are winter range condition and hunting. Protection of elk from hunting on the Fossil Butte National Monument has contributed to numbers that are far above the herd objective. Compared to elk, mule deer rely much more heavily on rangelands on Bureau of Land Management lands which are in relatively poor condition and some are being lost to oil and gas development (WGFD 2007b). Given depleted winter range conditions, it is becoming increasingly important for mule deer to enter the winter in good physical condition and summer and transition ranges are important if mule deer are to attain good physical condition. Mule deer, as well as elk and moose, in higher fitness have been shown to be more able to survive the winter, even with reduced winter range conditions (Scwartz and Renecker 1997, Cook et al. 2004, Lomas and Bender 2007, WAFWA 2008). This increases the importance of the condition of forage in the project area, which is affected by a wide range of factors including overrepresentation of late-seral forestland, overrepresentation of late-seral shrublands, and expansion of conifer into non-forest types (due mainly to fire suppression), and historic heavy livestock grazing. Roads and motorized vehicles also affect the distribution and abundance of elk and mule deer in the project area. Other factors affecting the elk and mule deer populations are described in DeLong (2013a).

Moose numbers throughout the region have declined, and the situation continues to be studied by the Wyoming Game and Fish Department, Wildlife Conservation Society, and other partners. Possible factors contributing to the decline in moose numbers include declines in habitat conditions, predation, disturbance during winter, and disease.

Due to a variety of constraints, progress toward increasing the proportion of early and mid seral conifer forestland communities will likely be slow, which will limit benefits to elk, mule deer, and moose. On the other hand, climate change will increase the potential for more fires in the future under both alternatives, but Alternative 2 would increase the chances of maintaining more acres of late-seral forestland, which is needed to provide thermal cover for moose, as compared to Alternative 1.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 would not conflict with or would contribute to meeting applicable Forest Plan standards, prescriptions, and guidelines. For negative effects on elk that would occur in the DFC 1B area, the Forest Plan Final EIS (USFS 1990b:283) disclosed these types of negative effects.

Pine Marten (MIS); Great Gray Owl, Boreal Owl, and Three-Toed Woodpecker (Sensitive) - Affected Environment

Pine marten is an ecological indicator species identified in the Forest Plan (USFS 1990a), and great gray owls, boreal owls, and northern three-toed woodpeckers are Sensitive Species that occur within the project area. All of the species and goshawks (next section) are primarily associated with mature conifer forestlands, typically with a component of old trees, snags, and course woody debris on the ground. Goshawks were included in a separate section because the

level of detail in the analysis is greater. The main factors that affect distribution and abundance of species in this group are discussed below.

Population Status

Pine marten are well distributed across the portion of the project area where treatment units are located (i.e., the western 2/3 of the project area), and appear to be fairly common. Great gray owls breed in the project area, but their population status is unknown. Population status of boreal owls is unknown as well. Densities of three-toed woodpeckers on the Kemmerer Ranger District are low. Several were observed or heard during goshawk nest surveys of the project area, but there are no records of this species in the Wyoming Natural Diversity Database. The population status and population trends for all four species at the project level and BTNF level are unknown.

If numbers of pine marten, great gray owls, boreal owls, or northern three-toed woodpeckers in the project area are contributing to reduced numbers on the BTNF, it is not a consequence of (1) not having enough late-seral forestland, or (2) having had too much timber harvest, mechanical treatment, or fire in the last 50 years. Hillis and Lockman (2003) assessed effects of vegetation disturbances on pine marten in Region 1 of the Forest Service. They concluded that "if American marten are at risk in Region 1, it is likely not due to habitat-related factors." They demonstrated that existing amounts of habitat and levels of habitat fragmentation in Region 1 were comparable to pre-Euro-American settlement conditions. The Hams Fork project area and Kemmerer Ranger District have greater amounts of late-seral habitat and lesser habitat fragmentation than occurred prior to Euro-American settlement.

Habitat Conditions

Proportion of Forestland in Late Succession and Early-Seral Openings

The proportion of forestland in late succession is one of the main drivers of habitat suitability for the species in this group as a whole. Pine martin and boreal owls inhabit late-seral conifer forestland. Great gray owls require mature forestland for nesting, rearing fledglings, roosting, and some foraging. Three-toed woodpeckers require the dead trees found in late-seral forestland.

At present, an estimated 49,630 acres of forestland within the project area currently are in late succession, which is substantially more than existed naturally (DeLong 2013a). This same pattern exists for each forest type used by pine marten, great gray owls, boreal owls, and northern three-toed woodpeckers. Additional information on the existing mix of succession stages can be found in the Wildlife Habitat section.

There currently is an estimated 611 acres of prime suitable boreal owl habitat in the 53,904 acres (1%) of forestland in the Hams Fork project area. Across the BTNF, 8 of 39 fifth order HUCs have less than 5% of forestland that meets prime suitable habitat conditions for boreal owls, and five of these HUCs are on the Kemmerer Ranger. This indicates the low capability of forestland to provide boreal owl habitat.

Stand Structure: Canopy Closure, Age Structure, and Density of Mature Trees

The canopy cover, age structure, and density of trees in late-seral forests under natural conditions are generally sufficient to meet the needs of pine marten, great gray owls, boreal owls, and northern three-toed woodpeckers, at a landscape scale, since these species were part of the conifer forestland community prior to Euro-American settlement. Even though the recent insect epidemic reduced canopy cover across 70% of the forestland acres in the project area, canopy cover

remains sufficient on more acres than would have existed in suitable condition under a natural fire regime, especially when considering natural insect epidemics (DeLong 2013a).

Pine marten and boreal owls in particular require forestland with relatively high canopy closure, and great gray owls nest in relatively dense stands of mature to old trees. Great gray owls appear to prefer foraging in meadows and other forest openings, but they also forage in open forest habitats such as naturally open forests and selectively logged forests, so long as they have a relatively well-developed herbaceous understory (Duncan and Hayward 1994). Because they forage in non-forest habitats, there does not appear to be a lower canopy cover threshold for the overstory. The driving factor is the suitability of herbaceous vegetation of their primary prey: microtine voles and pocket gophers. Since northern three-toed woodpeckers inhabit recently burned forestland , canopy cover, tree density, and age structure may not be considered vital to any large extent so long as an adequate density of dead trees of suitable size are available.

Stand Structure: Density of Dead Trees and Amount of Large Woody Material

The density of dead trees and amount of large woody material in early-seral (e.g., abundance of snags post fire) and late-seral forests under natural conditions are generally sufficient to meet the needs of pine marten, great gray owls, boreal owls, and northern three-toed woodpeckers, at a landscape scale. In the project area, the density of dead trees currently exceeds typical densities that existed under a natural fire regime and the acreage of snag-bearing forestland exceeds what had existed under a natural fire regime.

Components of structural diversity in late-seral forestlands important to pine marten and boreal owls are standing and leaning snags and complex physical structure near the ground, most importantly logs, and root wads (Buskirk and Ruggiero 1994, Buskirk and Powell 1994, Hayward 1994). Large-diameter snags and logs at various stages of decay are important to pine marten for resting, denning, and prey habitat, and are important to boreal owls for nesting and prey habitat. Pine marten make low use of late-seral forestland lacking structure near the ground.

The broader need for snags and logs is the habitat they provide for prey of pine martens, boreal owls, and northern three-toed woodpeckers. Snags and logs provide food and nutrients, dwelling sites, shelter, and structure for a large variety of insects, forest-voles, chipmunks, tree squirrels, bark-gleaning birds, woodpeckers, and a wide range of other small mammals, birds, and invertebrates (Thomas et al. 1979c, Bull et al. 1987, Buskirk and Ruggiero 1994, Buskirk and Powell 1994, Hayward 1994). Included in this list is ectomycorrhizal and surface-fruiting fungi that are associated with tree roots, rotting logs, and decaying litter.

Pine Marten (MIS); Great Gray Owl, Boreal Owl, and Three-Toed Woodpecker (Sensitive) - Environmental Consequences

Indicators are as follows:

- Proportion of forestland in late and early succession
- Acres of modeled boreal owl habitat
- Overstory canopy cover
- Composition of overstory
- Density of live trees ≥5-inches dbh
- Density of dead trees ≥5-inches dbh
- Tons/acre of large woody material

- Canopy cover and production of herbaceous vegetation
- Starting dates for operation of heavy equipment in treatment units

Alternative 1-No Action

Direct and Indirect Effects

In the absence of wildfires, Alternative 1 would not affect pine marten, great gray owls, boreal owls, and northern three-toed woodpeckers any more than currently is occurring under existing conditions. Alternative 1 would continue to have beneficial effects on boreal owls and northern three-toed woodpeckers, relative to natural conditions, because the large over-representation of late-seral forestland would be perpetuated under this alternative. Alternative 1would continue to have some degree of negative effects on great gray owls, relative to natural conditions, because the alternative would perpetuate an artificially large amount of late-seral forestland in the project area.

However, because the existing amount of late-seral forestland in the project area is artificially high and not ecologically sustainable, Alternative 1 may contribute to the stage being set for future declines in populations of pine marten, great gray owls, boreal owls, and northern three-toed woodpeckers. Given such large areas of continuous fuels and other factors that would facilitate large fires (Banister 2013), the occurrence of large fires is only a matter of time. While great gray owls would benefit from an increase in early-seral communities, they would not benefit from large areas, such as the 65,220-acre Fontenelle Fire that occurred in 2012. For northern three-toed woodpeckers, population declines would occur after an initial increase due to such fires. If fires are large enough, it is possible for populations to decline below what would exist with a natural mix of succession stages.

Cumulative Effects:

Cumulative effects for Alternatives 1 and 2 are addressed in the Cumulative Effects discussion under Alternative 2.

Determination of Effects

MIS – Pine Marten

Alternative 1 would have no impact on pine marten, relative to existing conditions, and would continue to benefit pine marten, relative to estimated natural conditions, since Alternative 1 would perpetuate an artificially large amount of late-seral forestland in the project area. At the BTNF scale, Alternative 1 would contribute to the long-term increase and over-representation of late-seral habitat for pine marten. Effects of Alternative 1 on the BTNF population trend would mirror effects on habitat trends.

Sensitive Species - Great Gray Owl, Boreal Owl, and Three-Toed Woodpecker

Alternative 1 would have no impact on great gray owls, boreal owls, and northern three-toed woodpeckers or their habitat, relative to existing conditions, and would likely not contribute to a trend toward Federal listing or loss of viability. In the absence of wildfire, Alternative 1 would continue to benefit boreal owls and northern three-toed woodpeckers relative to natural conditions; and would continue to have some degree of negative effects on great gray owls. At the BTNF scale, Alternative 1 would contribute to the long-term increase and over-representation of late-seral habitat for great gray owls, boreal owls, and three-toed woodpeckers; and would contribute to the long-term downward trend in early-seral foraging habitat of great gray owls. Effects on population trends would mirror effects on habitat trends.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 would not hinder the achievement of Objective 3.3(a), Sensitive Species Management Standard, the Fisheries and Wildlife Prescription, or Snag Habitat Guideline with respect to pine marten, great gray owls, boreal owls, and three-toed woodpeckers.

Alternatives 2-Proposed Action

Changes in Indicators:

- elimination of the overstory on 944 acres, moderate reductions in overstory canopy cover on 824 acres, small (<5%) reduction in overstory canopy cover on 6,915 acres
- no regeneration treatments and 44 acres of mechanical treatments within modeled boreal owl habitat
- major reductions in dead tree densities on 7,952 acres
- large woody material would remain the same or would increase on 7,952 acres
- treatment activities would not be allowed until after July 20; within ½ mile of a great gray owl nest no treatment would occur until after August 15

Direct and Indirect Effects

Pine Marten — Alternative 2 would negatively affect individual pine marten relative to existing conditions, due to the changes in the overstory canopy cover. These negative effects outweigh the small benefit gained from an increase in large woody material. However, because the existing amount of late-seral forestland in the project area is artificially high and not ecologically sustainable and because population levels associated with a sustainable amount of late-seral forestland (i.e., reflective of a natural fire regime) are themselves sustainable, population reductions associated with the process of reestablishing a natural mix of succession stages is not considered 'adverse' in an ecosystem context. In the context of the effects of regeneration treatments, changes in populations of pine marten — as a Management Indicator Species — would be one indication of a shift toward a desired mix of succession stages.

Because Alternative 2 would help reduce the spread of wildfires that may occur, it would have fewer negative effects on pine marten relative to existing conditions. Disturbance effects during the breeding season would be minimized by not allowing any treatment activities until after July 20 each year.

Great Gray Owls — Alternative 2 would have minor negative effects on potential nesting habitat and would have beneficial effects on their foraging habitat, likely with a net beneficial effect on great gray owls in the project area. Improvements to foraging habitat would result from the creation of relatively small patches of early-seral communities and other patches where conifer overstory is otherwise greatly reduced and herbaceous vegetation is increased as a result of the changes in canopy cover listed above. In addition, understory-tree densities on 7,061 acres and broadcast burning on some of this acreage would increase herbaceous canopy cover and production by a small amount. The main prey of great gray owls is microtine voles, which require open areas with relatively dense grasses and their secondary prey is pocket gophers which favor relatively dense growths of herbaceous vegetation.

Under Alternative 2, treatments would occur in vicinity of the two recently/currently active great gray owl nests in the project area. No habitat changes would occur within a 40 acre area of nest trees (Design Feature WL-16). Treatments within the 5,400-acre areas of the Hams Fork Ridge Main and Green Knoll nest sites, used by great gray owls within the last 3 years, would have

positive and negative effects on their foraging habitat, and may have a small net benefit, primarily because Alternative 2 would enhance foraging habitat, while leaving dense forests for nesting, and would have negligible disturbance effects. A total of 46 and 26 treatment units are located within the 5,400-acre areas surrounding the Hams Fork Ridge Main and Green Knoll nest sites, which would affect approximately 1,384 acres (34%) and 1,078 acres (26%) of forest habitat, respectively. Regeneration treatments (8-9% and 10% of forestland habitat, respectively) would increase the proportion of early-seral communities in 5,400-acre area from an estimated 2% to an estimated 12-13% in the 5,400-acre area around the Hams Fork Ridge Main nest and from an estimated 5% to an estimated 15% in the 5,400-acre area around the Green Knoll nest, which should enhance foraging habitat for great gray owls (Franklin 1988, Duncan and Hayward 1994, Sulkava and Huhtala 1997, Duncan 1997).

The remaining treatment acreage (23-26% and 16%, respectively) consists of varying degrees of mechanical treatments. As a consequence of treatments on most of these acres, live tree density in treatment units would decline by less than 5% and the acreage of trees <5-inch dbh would decline by an estimated 10-20% (since the footprint of skid trails would be limited to <10% or <15% of each unit). Treatments in a small proportion of the area would result in live tree (≥5-inch dbh) densities declining by 25% and the density of trees <5-inch dbh declining by 40%. These treatments, therefore, may improve foraging habitat by a small degree since it may increase herbaceous canopy cover and production, which would enhance habitat for their main prey item, microtine voles, and possibly for pocket gophers (Duncan and Hayward 1994).

Because treatment activities would not occur each year until after August 15 within ½ mile of great gray owl nests (Design Feature WL-16), operation of heavy equipment and other activities would not disturb nesting great gray owls and would provide a buffer for foraging near nest sites. Beyond the ½ mile buffer, operation of heavy equipment and other activities would not begin until after July 20, meaning that great gray owl pairs would be able to forage without any potential for being disturbed by project related activities through most of the nesting season.

Although unlikely, it is possible that changes in habitat conditions in the foraging area of the Hams Fork Ridge Main and Green Knoll nests could result in nest-area abandonment.

Boreal Owls — Alternative 2 may have a net negative effect on boreal owls relative to existing conditions. This potential negative effect would only affect a few individual boreal owls. The negative effects, if they occurred would be due to reductions in late-seral forestland and dead-tree densities in a small amount of potentially suitable boreal owl habitat. Of the existing 611 acres of modeled prime suitable boreal owl habitat, none would receive regeneration treatment, and mechanical treatment would only take place on a total of about 44 acres (about 7%). On most of the 44 acres, tree canopy would decline by >5%, although snag density would decline markedly. The project area is at a low elevation and the treatment units and vicinity contain relatively little potential boreal owl habitat, so the likelihood is low that boreal owls would be affected. There would not be any population-level effects on boreal owls.

Northern Three-toed Woodpeckers — Alternative 2 would have a net negative effect on this species in the project area, relative to existing conditions, due to the major reduction in dead-tree densities on 15% of late-seral forestland in the project area (including 29% of late-seral lodgepole pine and spruce-fir). However, the existing amount of late-seral forestland in the project area is artificially high and not ecologically sustainable and, therefore, reductions in the amount of snag-bearing forestland would not translate to negative effects on the population. Because of the over-representation of late-seral forest conditions across the BTNF, this same pattern exists at this larger scale. Design feature WL-11 would reduce some of the impacts

associated with salvage and salvage/sanitation treatments (including hazard tree removal) by retaining an average of 3snags/acre. This would allow woodpeckers to continue using treated units, albeit at a much reduced rate.

All Species — While a small number of individual great gray owls, boreal owls, and northern three-toed woodpeckers may be displaced by heavy equipment during treatment activities, the effects would be short-lived and animals would soon redistribute themselves after operations have ceased in each treatment unit. Furthermore, some species such as boreal owls do not appear to be very sensitive to disturbance by motorized vehicles. The potential for eggs or nestlings being killed, due to the felling or burning of trees containing active nests, would be low because mechanical treatment and prescribed burning activities would not occur prior to July 20 each year (based on USFS 2012j), after most or all nesting has been completed. Furthermore, no treatment activity would occur within 0.5 miles of known active great gray owl nests prior to August 15, and no treatments would occur within a 40-acre block around known active nests.

If one or more wildfires occurred in the foreseeable future, this would further contribute to restoring a more natural (and sustainable) mix of succession stages. Because treatments in Alternative 2 would help limit the spread of wildfires, depending on location, negative effects compared to Alternative 1 (with wildfires included) would be less, thereby having fewer negative effects on individual great gray owls and boreal owls.

Cumulative Effects (Alternatives 1 and 2)

Cumulative effects of human activities during the last century have caused a large increase in the proportion of late-seral conifer forest habitat, both in terms of major increases in the proportion of late-seral communities and in expansion of forestland. Currently, approximately 91% of forestland in the Hams Fork project area is in late succession, in contrast to 40-50% of forestland that existed in late succession under natural conditions (as well as roughly 15% less forestland overall). The gap between existing and natural conditions, which represents a major benefit to species associated with late-seral conifer forest, is artificial. It is possible that the acreage of forestland (including early-, mid-, and late-seral stages) has increased by 15%. This is discussed further in the Wildlife Habitat section.

The net effect of past cumulative effects, ongoing projects (e.g., East Fork salvage/sanitation and Pole Creek prescribed burn projects), and Alternative 1on pine marten, great gray owls, boreal owls, and northern three-toed woodpeckers would be a slight reduction in the long-term large accrual of benefits to these species, except possibly great gray owls since they also depend on early-seral communities, absent one or more future wildfires. There would also be potential benefits to great gray owls due to a small amount of early-seral communities and open forest habitat being produced as a result of Pole Creek Vegetation Project.

The net effect of past cumulative effects, ongoing projects, and Alternative 2 on pine marten, great gray owls, boreal owls, and northern three-toed woodpeckers would be (1) a small reduction in the long-term large accrual of benefits to these species, except possibly great gray owls since they also depend on early-seral communities, absent one or more future wildfires; and (2) potential benefits to great gray owls due to a small amount of early-seral communities and open forest habitat being produced as a result of Alternative 2 and the Pole Creek Vegetation Project and East Fork Salvage/Sanitation Project. The benefits to northern three-toed woodpeckers of the Pole Creek prescribed burn project is likely not enough to offset the negative effects of a major reduction in dead trees on 7,952 acres under Alternative 2.

A number of factors have combined to facilitate increases in forestland with high components of subalpine fir, and (1) Alternative 1 would do nothing to offset the trend and (2) Alternative 2 would do little to offset the trend, especially given the large acreage of treatment. This trend benefits species like pine marten and boreal owls and would benefit northern three-toed woodpeckers in the long term (given their preference for spruce-fir forests); but would negatively affect great gray owls since they need relatively open forest floors for foraging.

If there were one or more wildfires in the project area and specifically in the vicinity of the harvest units: (1) Alternative 2 would contribute to a lower acreage of wildfires (Bannister 2013), which would offset some or all of the negative effects of Alternative 2 on pine marten, boreal owls, and northern three-toed woodpeckers, relative to existing conditions, and depending on how large the fire would have gotten in the absence of Alternative 2 treatments; and (2) Alternative 1 would result in higher acreage of wildfires (Bannister 2013), which would result in larger negative effects on late-seral wildlife species than would occur under Alternative 2 with and without wildfires, relative to existing conditions. However, unless wildfires burned more than about 20,000 acres, wildfires in addition to both Alternative 1 and Alternative 2 would not eliminate the long-term accrual of benefits to late-seral wildlife species. Climate change will increase the potential for more fires in the future under both alternatives, but Alternative 2 would increase the chances of maintaining more acres of late-seral forestland as compared to Alternative 1 (see cumulative effects discussion in the “Mix of Succession Stages and Conifer Expansion” section).

Livestock grazing has the potential to offset some of the beneficial effects that Alternative 2 would have on great gray owl foraging habitat, particularly in light of the acreage of meadowland and other forest openings lost to conifer expansion that has occurred during the last century (i.e., there is a shortage of this type of habitat). Neither Alternative 1 nor Alternative 2 would contribute to any reductions in the amount of meadowland encroached upon by conifers. On the other hand, Alternative 2 would result in greater openness of some forests and an increase in the amount of early-seral forest openings, and a higher canopy cover and production of herbaceous vegetation on a portion of these acres. Microtine voles are the main prey of great gray owls, and they need moderately-tall to tall, dense herbaceous vegetation to reach the relatively high population levels that appear to be needed for successful great gray owl nesting. Reductions in the height and/or density of herbaceous vegetation in meadows and forest openings, for example due to livestock and elk grazing, reduces the potential for providing conditions needed to produce and sustain high densities of microtine voles, which in turn reduces foraging habitat suitability for great gray owls (DeLong 2012). Therefore, the benefits of Alternative 2 to great gray owl foraging habitat has the potential to be offset by grazing where it occurs in great gray owl foraging habitat. While not as pronounced, livestock grazing can also result in lower densities of pocket gophers, a secondary prey species of great gray owls, but livestock grazing does not affect populations to the same extent as they can affect vole numbers (DeLong 2012).

Determination of Effects

MIS – Pine Marten

Alternative 2 may impact individual pine marten or a small part of their habitat, but would not negatively affect the population. At the BTNF scale, Alternative 2 would partially offset (but only by a negligible amount) the long-term increase and over-representation of late-seral habitat for pine marten. Therefore, while there may be negative effects on individuals, Alternative 2 would not contribute to negative population effects at the BTNF scale. Effects on population trends likely would be similar to the effects on habitat trends.

Sensitive Species - Great Gray Owl, Boreal Owl, and Three-Toed Woodpecker

Alternative 2 may impact individual great gray owls, boreal owls, and northern three-toed woodpeckers, or minor parts of their habitat, but would likely not contribute to a trend toward Federal listing or loss of viability. At the BTNF scale, Alternative 2 would partially offset (but only to a negligible degree) the long-term increase and over-representation of late-seral habitat. Therefore, while there may be negative effects on individuals, Alternative 2 would not contribute to negative effects at the BTNF scale. Effects on population trends would be similar to the effects on habitat trends. Even if the Hams Fork Ridge Main and Green Knoll nests were to be abandoned due to project activities and changes in habitat, this would not contribute to a downward trend at the BTNF level and would not contribute to a trend toward Federal listing.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 would not hinder the achievement of Objective 3.3(a), Sensitive Species Management Standard, the Fisheries and Wildlife Prescription, or Snag Habitat Guideline with respect to pine marten, great gray owls, boreal owls, and three-toed woodpeckers for the same reasons as outlined above. The major habitat components discussed above will be retained at the BTNF scale. For these reasons, Alternative 2 would not conflict with Objective 3.3(a) of the Forest Plan. See the Specialist Report for additional information on compliance with Sensitive Species objectives.

Alternative 2 would not conflict with the Snag Habitat Guideline for two reasons. There are about 116 sections of land within the project area. A minimum of an estimated 28,167 acres of forestland having elevated snag densities would remain after completion of the project. Thus, an average of approximately 243 acres of snag-patch habitat per section would remain, which is far above the Snag Habitat Guideline's target of 60 acres per section. After treatment, nearly all treatment units would adjoin snag rich, late-seral forestland that is larger than 5 acres.

Alternative 2 would not conflict with the Old Growth Standard because the harvest units do not contain any designated old growth.

The theme and management emphasis of DFC 10 areas includes allowing "…for some resource development and roads" (specifically including timber harvest), as long as there are "no adverse and some beneficial effects on wildlife" (USFS 1990a). While it is recognized that Alternative 2 would negatively affect wildlife species dependent on late-seral forestland relative to existing conditions, especially those that depend on dead trees, this needs to be assessed in an ecosystem context. Because the existing amount of late-seral forestland in the project area is artificially high and not ecologically sustainable and because population levels associated with an artificially high and unsustainable amount of late-seral forestland are not sustainable, population reductions associated with the process of reestablishing a natural mix of succession stages cannot be considered 'negative' in an ecosystem context.

In the part of the project conducted in a DFC 1B area, any conflicts between meeting Forest Plan objectives for timber harvest and those for pine marten, great gray owls, boreal owls, and northern three-toed woodpeckers are resolved in favor of timber harvest objectives, so long as the project would not contribute to a loss in viability in these species (USFS 1990a:93, 145, 149). Far fewer acres of timber are being harvested on the BTNF, especially in DFC 1B areas, than anticipated in the Forest Plan EIS (USFS 1990b).

Northern Goshawks (Sensitive) – Affected Environment

Northern goshawks are listed as Sensitive Species in Region 4 and occur within the Hams Fork project area. Habitat conditions preferred by goshawks are estimated conditions under which goshawk inhabited the area prior to Euro-American settlement (natural conditions).

Population Status

Goshawks breed in the project area, but their population status is unknown. From the standpoint of the amount of late-seral habitat for goshawks, there are no concerns that populations are low or trending downward. If numbers of goshawk in the project area are contributing to reduced numbers on the BTNF, it is not a consequence of (1) not having enough late-seral forestland, or (2) too much timber harvest, mechanical treatment, or fire during the last 50 years. The Hams Fork project area and Kemmerer Ranger District have greater amounts of late-seral habitat and lesser habitat fragmentation than occurred prior to Euro-American settlement. See the Wildlife Habitat section for more detail.

Habitat Conditions

Nest Area

Goshawks prefer to nest in mixed conifer, Douglas-fir, lodgepole pine, and aspen forests, particularly in dense old-growth conifers (Wyoming Partners in Flight 2003, Anderson et al. 2004, Brewer et al. 2009). As a conservative estimate, the nest area consists of 40 acres around nest trees. Canopy cover in the nest area is typically “relatively closed” (i.e., 50-90% canopy cover) and the understory layer is relatively open (Reynolds et al. 1992, Brewer et al. 2009). Typical goshawk breeding areas contain several alternate nest sites that are used over several years. Based on available information, a goshawk nesting model was developed for the Bridger-Teton National Forest with the following parameters (elevation <8,500 feet, slope ≤50%, forest types = lodgepole pine, aspen, aspen-conifer, spruce-fir, Douglas-fir, canopy closure ≥50%, size class ≥5 inches dbh, and patch size ≥40 acres).

There is an estimated 9,447 acres of forestland meeting the criteria for goshawk nesting habitat within the Hams Fork project area. This represents approximately 22% of the total acreage of non-whitebark-pine forestland in the project area. Over 100 patches of potentially suitable goshawk nesting habitat, ranging in size from about 40 acres to more than 500 acres, are relatively evenly distributed across approximately 35,000 acres in the western two-thirds of the project area. The eastern one-third of the project area is higher than 8,500 feet in elevation and therefore contains less nesting habitat.

There is an estimated 52-102% more modeled goshawk nesting habitat under existing conditions than is roughly estimated to have existed under a natural fire regime, based on differences in the proportions of late-seral communities under existing conditions and estimated natural conditions. Modeled goshawk habitat does not take into account the effects of the 2006-2012 insect epidemic on forest canopy cover. Accounting for the reduced canopy cover would reduce the percentages somewhat.

Eight goshawk nest sites have been identified within the project area since 2006, and these are identified in DeLong (2013b). Systematic broadcast surveys were conducted in proposed units in 2010 and 2011 (project files). One nest site (the Hams Fork Ridge Alternate nest site) is the only known, currently-active nest site.

All of the known goshawk nest areas in the project area are in lodgepole pine stands, some with developing understories of subalpine fir, except the Poison Hollow nest, which is in a Douglas-fir stand with an Engelmann spruce understory. Canopy cover at all nests was estimated to be 40-60%, except for one nest at which canopy cover was estimated to be over 60%. Where notes were recorded of the characteristics of the understory, all nest areas were noted as having an open understory, although in some cases, subalpine fir "encroachment" was also noted. It is possible that some nests were abandoned due to reductions in overstory canopy cover resulting from the recent insect epidemic, but there is no verification of this possibility.

Post-Fledgling Habitat

The post-fledgling area is the area used by family groups after young fledge and before young are no longer dependent on the adults for food. It may serve as an area where young birds develop flying and hunting skills where cover is sufficient to protect them from predators.

Post-fledgling areas range in size from 198 to 494 acres (Brewer et al. 2009). Reynolds et al. (1992) identified 420 acres around nest trees as a general representation of the nest area. A ½-mile radius (502 acres) was used around nest trees to delineate the nest area for goshawk nests in the project area and other parts of the Kemmerer Ranger District.

Reynolds et al. (1992:27) recommended providing a mix of size classes or succession stages in post-fledgling areas, including providing approximately 20% of the area within post-fledgling in a stand-initiation through seedling-sapling stage, 20% in a young forest stage, 20% in mid age forest, 20% in mature forest, and 20% in old-age forest. Reynolds et al. (1992) also recommended ≥2 large snags/acre that are ≥30 feet tall and ≥5 large logs (≥12-inch diameter at the mid-point) logs ≥8 feet long per acre to contribute to the habitat needs of prey.

Modeled goshawk nesting habitat provides an indication of the amount and locations of post-fledgling habitat that is currently available because many of the parameters are the same. Exceptions are that post-fledgling habitat (1) may include steeper ground; (2) includes forestland with overstory canopy cover less than 50%; and (3) can include non-forest habitat. This means that more post-fledgling habitat exists than is shown by the output of the goshawk nesting model.

As with nesting habitat, the existing proportion of the project area that meets criteria of post-fledgling habitat exceeds the proportion that existed under a natural fire regime due to the large overrepresentation of late-seral conifer forestland and the large proportion of forestland dominated by ≥5-inch dbh trees (91%).

In known goshawk nests on the Kemmerer Ranger District, post-fledgling areas typically include both lodgepole pine and spruce-fir forest types, but one nest area includes a Douglas-fir community where the nest tree is situated.

- The average proportion of the post-fledgling area comprised of forestland on the Kemmerer Ranger District was within the range found in other studies, although it is at the lower end of the range.
- An average of 75% of the post-fledgling area on the Kemmerer Ranger District is dominated by trees 5-9.9 inches in diameter, which is comparable to what Clough (2000) found in Montana. The similarity is likely due to nest areas in both locations being dominated by lodgepole pine.
- The average proportion of the post-fledgling area that is non-forestland on the Kemmerer Ranger District is twice as high as what was found in other areas. For a small number of

nest areas on the district, the proportion of non-forest habitat is 3-5 times higher than the averages from other studies.

Foraging Habitat

Studies have found goshawk home ranges (i.e., foraging areas) to vary in size from approximately 1,400 to 8,650 acres (Brewer et al. 2009), and Reynolds (1992) identified 5,400 acres as a representative foraging area. A foraging area of 5,400 acres was used for the purposes of this document.

Reynolds et al. (1992) and Brewer et al. (2009) emphasized the importance of having suitable habitat conditions for a range of prey species, especially important prey species, within foraging areas. Important prey species vary, but in many places they include snowshoe hares, ground squirrels, red squirrels, and a suite of small to medium-size bird species including forest grouse, woodpeckers, corvids, and thrushes (Reynolds et al. 1992, Kennedy 2003, Anderson et al. 2004). For this reason, Reynolds et al. (1992) and Brewer et al. (2009) emphasized the importance of a range of habitats, including the presence of non-forest as well as different forest successional stages within foraging areas. This range is apparent in the goshawk foraging areas on the Kemmerer Ranger District.

Reynolds et al. (1992:27) recommended providing a mix of size classes or succession stages in post-fledgling areas, including providing approximately 20% of the area within post-fledgling zones in a stand-initiation through seedling-sapling stage, 20% in a young forest stage, 20% in mid age forest, 20% in mature forest, and 20% in old-age forest. However, in an appendix, they revised these figures somewhat to better reflect mixed conifer forestland managed moderately intensively: 18%, 15%, 22%, 18%, 20%, and 18%, respectively; and spruce-fir forestland: 8%, 14%, 23%, 17%, 19%, 19% (Reynolds et al. 1992:82-83). Reynolds et al. (1992) also recommended ≥2 large snags/acre that are ≥30 feet tall and ≥5 large logs (≥12-inch diameter at the mid-point),and logs ≥8 feet long per acre to contribute to the habitat needs of prey.

In contrast to nesting and post-fledgling habitat, the project area may contain fewer areas of roughly 5,400 acres that meet foraging needs of goshawks, compared to pre-Euro-American settlement, due to reduced amounts of forestland in early and mid-succession. Prior to the 2006-2012 mountain pine beetle infestation, the proportion of late-seral forestlands having suitable foraging conditions likely was not all that different from the conditions that typically existed within stands prior to Euro-American settlement. Over-story canopy cover and live-tree density likely are currently at the low end of what existed within late-seral stands prior to Euro-American settlement.

Some general characteristics of foraging areas of known goshawk nest sites in the project area and in other parts of the Kemmerer Ranger District are as follows (see DeLong 2013b for more details):

- An average of about 60% of the foraging area on the Kemmerer Ranger District is dominated by trees 5-9.9 inches in diameter, which is somewhat lower than what exists within the post-fledgling area.
- All of the foraging areas contain several hundred acres of modeled nesting habitat, except for the Hams Fork Ridge nests, but even this foraging area contains more than six potential nest areas of 40 acres or more. This means that all known foraging areas meet the recommendation of Reynolds et al. (1992) to provide at least six nest areas of 30 acres for every 5,400 acres of foraging habitat.

- The proportion of the foraging area comprised of rangeland varies from about 10% to about 35% in the project area (up to nearly 50% when riparian habitat is included), but it is about 50% in two of the three foraging areas in other parts of the district, indicating that goshawk foraging areas can include a relatively large proportion of non-forest habitat.
- About 3-5% of forestland in each of the foraging areas has been regenerated in the past 25 years. None of the known foraging areas in the project area have escaped logging or vegetation treatment of some kind within the past 25 years.
- All foraging areas around all of the known nests were likely heavily logged or burned during the late 1800s and early 1900s. Most stands likely are between 80 and 120 years old.

Northern Goshawks (Sensitive) - Environmental Consequences

Indicators are as follows:

- Proportion of forestland in late and early succession, and in different size classes
- Acres of modeled goshawk nesting habitat
- Overstory canopy cover
- Density of dead trees ≥5 inches dbh
- Tons/acre of large woody material
- Canopy cover and production of herbaceous vegetation
- Starting dates for operation of heavy equipment in treatment units

Alternative 1-No Action

Direct and Indirect Effects

Of the two alternatives, Alternative 1 would be most beneficial to goshawks, at least in the short term, because overstory canopy would not be reduced. Snags resulting from the 2006-2012 insect epidemic would remain, and the remaining snags would eventually fall and become large woody material. Even though the reduced overstory canopy cover caused by the insect epidemic may have negatively affected goshawk nesting habitat to some extent, the resulting higher density of snags and eventual higher amounts of large woody material would offset these effects (see DeLong 2013a).

Solely from the standpoint of the mix of succession stages, Alternative 1 would be less beneficial than Alternative 2. This is because there currently is a shortage of early- and mid-seral forest communities relative to the foraging habitat needs of goshawks.

A possible indirect negative effect of Alternative 1 is that existing conditions set the stage for large wildfires and no actions would take place to reduce the potential for fire spread. If one or more wildfires were to occur in the near future, they would have the potential to burn substantial amounts of late-seral forestland, which would substantially reduce the amount of goshawk nesting, post-fledgling, and foraging habitat in the project area.

The active nest sites and associated post-fledgling and foraging areas would remain unaffected by management activities.

Cumulative Effects:

See Cumulative Effects under Alternative 2.

Determination of Effects

Alternative 1 would have no impact on northern goshawks or their habitat, relative to existing conditions, and would likely not contribute to a trend toward Federal listing or loss of viability. In the absence of wildfire, Alternative 1 would continue to benefit this species relative to natural conditions. This alternative would not affect any of the active goshawk nests in the project area since there are no actions associated with the alternative. At the BTNF scale, Alternative 1 would contribute to the long-term increase and over-representation of late-seral nesting habitat for goshawks and late-seral foraging habitat, and would contribute to the long-term trend in a decline in early- and mid-seral foraging habitat. The effect of Alternative 1 on BTNF population trends is likely to mirror effects on habitat trends. The basis for this determination is found in the discussion of direct and indirect effects, in combination with the cumulative effects assessment.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 would not hinder the achievement of Objective 3.3(a), Sensitive Species Management Standard, the Fisheries and Wildlife Prescription, or Snag Habitat Guideline with respect to goshawks. Alternative 1 likely would not conflict with any of the quantifiable objectives being developed for goshawks because there are no actions associated with this alternative.

Even if a wildfire were to burn thousands of acres, this would not hinder the achievement of this direction because such a fire would contribute to bringing back a more sustainable mix of succession stages, albeit at a larger geographic scale than the Hams Fork project area. Such a fire would have negative effects on goshawks at the project level relative to existing conditions.

Alternatives 2-Proposed Action

Changes in indicators:

- Proportion of forestland in late and early succession, and in different size classes
- Acres of modeled goshawk nesting habitat
- Elimination of the overstory on 944 acres, moderate reductions in overstory canopy cover on 824 acres, small (<5%) reduction in overstory canopy cover on 6,915 acres
- Density of dead trees ≥5 inches dbh would be reduced on 7,952 acres
- Tons/acre of large woody material would increase on 7,952 acres
- Canopy cover and production of herbaceous vegetation would increase slightly
- Starting dates for operation of heavy equipment in treatment units would be after July 20; within ½ mile of a great gray owl nest no treatment would occur until after August 15; within ½ mile of a goshawk nest no treatment would occur until after August 20

Direct and Indirect Effects

Alternative 2 would benefit goshawks to some degree by setting succession back to early succession and by major reductions in conifer cover on 1,767 acres of forestland. On the other hand, major reductions in the density of dead trees (reductions of 85-95% or more) and small reductions in overstory canopy cover (reductions of <5%) on 4,548 acres (salvage and hazard tree removal) and major reductions in the density of dead, dying, and infected trees and small reductions in overstory canopy cover on 2,367 acres (salvage/sanitation) has the potential to negatively affect individual goshawks, relative to existing conditions.

While small reduction in canopy cover can sometimes improve foraging habitat for goshawks, the small reduction that would result from Alternative 2 likely would not be beneficial to goshawks because the 2006-2012 insect epidemic already reduced canopy cover substantially. In forests that may have been too dense to serve as foraging habitat for goshawks, the insect epidemic likely reduced tree densities in a portion of these forests to suitable levels (and possibly lower), and in forests that provided suitable foraging habitat, the insect epidemic likely reduced tree density in some of these forests to levels that are below suitability. In most situations, the small reductions in canopy cover due to mechanical treatments would not result in canopy cover dropping below 40%.

Alternative 2 would result in an estimated 1-2% of modeled goshawk nesting habitat being set back to early succession, but it would result in at least some alteration to stand structure in another 15% of modeled goshawk habitat. This primarily would involve salvage/sanitation (9% of modeled nesting habitat affected) and salvage (5% of modeled nesting habitat), for which there would be limited reductions in canopy cover (<5% reduction in live-tree canopy).

Much of the late-seral forestland would remain unaffected by the total acreage of treatments. Specifically, an estimated 28,000 acres of late-seral, snag-bearing lodgepole pine, aspen, aspen-conifer, and spruce-fir forestland would remain unaffected by Alternative 2, and a large portion of treated acres would continue to provide potential foraging habitat.

While mechanical treatment activities and prescribed burning may displace individual goshawks that may be present within units or immediately adjacent to them (depending on distances), any such effects would be temporary and would not have effects at the population level. For known goshawk nests, no activities would take place within ½ mile of the nests prior to August 20. Restricting treatment activities until after July 20 would limit potential disturbance effects on any goshawk nests that may not have been detected during formal surveys and during follow-up work in the units. Changes in traffic volumes resulting from road improvements would likely not affect goshawks.

Hams Fork Ridge Alternate Nest

A detailed analysis of the potential effects of Alternative 2 on the Hams Fork Ridge Alternate nest is provided in DeLong (2013a).

Nest Area — The only known goshawk nest that has been recently active is the Hams Fork Ridge Alternate nest. All other nests either no longer exist or have been inactive for at least five years. With the design feature (WL-16) to not allow any mechanical treatment within a 40-acre area around active nest trees, Alternative 2 would not impact the nest area of the Hams Fork Ridge Alternate nest (see DeLong 2013a for more details on this nest). Because intensive nest surveys were conducted in and adjacent to all treatment units at least twice, the chances are low that unknown active goshawk nests exist in treatment units. Furthermore, another design feature requires that, if a goshawk nest is located during cruising or mechanical treatment activities, applicable design features would be applied to the nest site. Because mechanical harvest activities in units 2, 23, and 55 — outside the nest area — would not begin before August 15 (design feature WL-16), this would minimize the potential for mechanical activity and human activity disturbing adults or nestlings if either of the nests (including the main nest, which has been inactive for more than 5 years) are active the year that mechanical treatment is being conducted. Despite this precaution, it is possible that activity outside the 40-acre core could result in nest abandonment, although this is unlikely.

Post-Fledgling Area — Salvage treatments units 2, 23, and 55 and hazard tree removal within the post-fledgling area of the Hams Fork Ridge Alternate nest site has the potential to adversely affect foraging habitat because it would reduce the density of snags (compared to both existing conditions and typical snag densities under natural conditions), which in turn would reduce the diversity of prey species and specifically the abundance of species that depend on or favor snags and large woody material. The treatments within the post-fledgling area likely would affect hiding cover and roosting habitat of fledgling goshawks a small amount because a small percent of live trees may be removed in order to get skid trails into some areas. The insect epidemic reduced the canopy cover of the stand-exam sites in units 23 and 50 from 45% and 50% down to an estimated 32-41% and 28-38%, respectively. Therefore, the percent of the post-fledgling area with ≥50% canopy cover is now below the estimated 40%. Brewer et al. (2009) recommended that at least some portion of post-fledgling areas maintain ≥50% canopy cover. The amount of forestland having ≥50% canopy cover in the post-fledgling area is unknown, but Alternative 2 would only have minor effects on this. On the other hand, while Alternative 2 would only reduce canopy cover by 0-5% (since the footprint of skid trails would be 10% of each unit), it is possible this may take it below the threshold of suitability, which in turn has the potential to contribute to the site being abandoned. A goshawk pair used the nest in 2012, at the tail-end of the insect epidemic, indicating the canopy cover was at least minimally suitable for the pair.

Because mechanical harvest activities in units 2, 23, and 55 would not begin before August 15 (design feature WL-16), implementation of Alternative 2 would not result in added human disturbance (e.g., in the form of heavy equipment operation and other human activity) to goshawks in the post-fledgling area during the most critical part of the nesting season. Despite the timing restriction and limiting treatments in the post-fledgling area to salvage operations, it is possible that activity and changes in habitat could result in nest abandonment, although this is unlikely.

Foraging Area — Alternative 2 treatments within the 5,400-acre foraging area of the Hams Fork Ridge Alternate nest site would have positive and negative effects on foraging habitat, and may have a net negative effect, primarily because it would add to the already large changes in tree density and canopy cover caused by the 2006-2012 insect epidemic (if it was not for this change, overall effects of Alternative 2 would be positive). A total of 46 treatment units are located within the 5,400-acre foraging area Hams Fork Ridge Alternate nest site, which would affect approximately 1,384 acres (34%) of forest habitat.

Of the total treatment acres, 334-389 acres (8-9% of forestland habitat) would consist of regeneration treatments (e.g., clearcuts, prescribed burning, aspen improvement, and possibly a small portion of salvage/sanitation with aspen improvement). Regeneration treatments would increase the proportion of the <5-inch dbh size-class in the foraging area from an estimated 2% to an estimated 12-13%, which is within the range of what is acceptable and suitable for goshawks (Reynolds et al. 1992, Brewer et al. 2009). While three of the prescribed burn units are larger than what goshawks would fully use, many natural fires are substantially larger and they would reinvigorate aspen habitat. Four of the five clearcuts are 11 acres or smaller and the other is 25 acres. Although unlikely, it is possible that changes in habitat conditions in the foraging area of the Hams Fork Ridge Alternate nest could result in nest-area abandonment.

Cumulative Effects:

Cumulative effects pertinent to northern goshawks are outlined in the cumulative effects analysis of the “Pine Marten (MIS); Great Gray Owl, Boreal Owl, and Northern Three-Toed Woodpecker” section, especially for pine marten and great gray owls.

In addition, Brewer et al. (2009:18) assessed that "lack of disturbance, such as fire, can result in increased densities of trees above some threshold that may render habitats unsuitable for nesting and foraging goshawks as well as some prey species," and cited three references in support of this. If it were not for the 2006-2012 insect epidemic, this may have been the case in the Hams Fork project area. However, the insect epidemic reduced densities of mature trees by an estimated 27-44% on a large portion of the project area (Hebertson 2012), including the area generally occupied by goshawks during the breeding season.

Determination of Effects

Alternative 2 may impact individual northern goshawks or minor parts of their habitat, but would likely not contribute to a trend toward Federal listing or loss of viability. While there may be a net negative effect on goshawk habitat in the post-fledgling and foraging areas of the Hams Fork Ridge Alternate nest and although it is possible the nest could be abandoned, it is unlikely that the nest area would be abandoned since some elements of foraging habitat would improve (a closer approximation of recommended mix of forest size classes), treatment units are small, a large majority of forestland would remain unaffected, and a design feature would limit entry until after the critical nesting period. The effect of Alternative 2 on BTNF population trend is likely similar to habitat trends. Even if the Hams Fork Ridge Alternate nest were to be abandoned due to project activities and changes in habitat, this would not contribute to a downward trend at the BTNF level and would not contribute to a trend toward Federal listing.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 would not hinder the achievement of Objective 3.3(a), Sensitive Species Management Standard, the Fisheries and Wildlife Prescription, or Snag Habitat Guideline with respect to goshawks for the same reasons as outlined above in the "Biological Evaluation Determination" subsection and in the Pine Martin, Boreal and Great Gray Owl Section. Additional information on compliance with the Forest Plan objectives is in the Wildlife Specialist Report.

Columbia Spotted Frog, Boreal Toad and Boreal Chorus Frog (Sensitive & MIS) – Affected Environment

Spotted frogs and boreal toads are on the Region 4 Sensitive Species list, and boreal toads and boreal chorus frogs are ecological indicator species (MIS).

Population Status

Columbia spotted frogs are on the Wyoming Game and Fish Department's list of Species of Special Conservation Concern such that declining populations and/or habitat losses are not suspected (WGFD 2010). Columbia spotted frogs are also on the Sensitive Species list of the Wyoming Natural Heritage Program, and the statewide population is ranked as vulnerable (NatureServe 2002). Vulnerable is defined as "At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. Such species are often rare or found locally in a restricted range." (NatureServe 2002).

Boreal toads are thought to have two distinctive population segments in Wyoming, a northern Rocky Mountain population and a southern Rocky Mountain population (WGFD 2005). The Southern Rocky Mountain population segment, which includes Uinta, Sweetwater, and Lincoln counties, is being considered by the U.S. Fish and Wildlife Service for listing under the Endangered Species Act due to geographic isolation and disease concerns (USFWS 2011).

Boreal toads are classified by Region 4 as a Sensitive Species due to viability concerns and because it is only found within habitats that encompass a small portion of the landscape, especially capable breeding habitat which comprises a very small proportion of the landscape. Boreal toads are on the Wyoming Game and Fish Department's list of Species of Special Conservation Concern (WGFD 2010) with a declining population trend and/or habitat in need of conservation management actions. Boreal toads are also on the Sensitive Species list of the Wyoming Natural Heritage Program, and the statewide population is ranked as critically imperiled (NatureServe 2002). Critically imperiled is defined as "Critically imperiled in the jurisdiction because of extreme rarity or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the jurisdiction."

Boreal chorus frogs are widespread across the north-central United States and much of Canada, from western Utah and Colorado north through the eastern three-quarters of Montana and northeast through Nebraska South Dakota and Minnesota to all of the central provinces of Canada. Within this large range, they occur in a large variety of ecological zones and elevations, from the plains to alpine habitats.

All three of these amphibian species are known to occur on the Kemmerer Ranger District, and chorus frogs and boreal toads are known to exist in the Hams Fork project area. Only three amphibian breeding sites have been documented thus far within the Hams Fork project area.

Trend data are not available for spotted frogs, boreal toads, and chorus frogs on the Bridger-Teton National Forest because they have just recently begun to be monitored. At this point, there is no evidence showing that reduced populations of spotted frogs and boreal toads (statewide assessments) and declining populations of boreal toads (statewide assessment) are not characteristic of Bridger-Teton National Forest populations, particularly since many of the factors that may have contributed to statewide reductions exist on the Bridger-Teton National Forest (DeLong 2013a). Thirteen years ago, Patla (2000:5), assessed that "Within the zone of the main population (central and north Idaho, western Montana, and northwestern Wyoming) spotted frogs are generally believed to be widespread and/or common, with only localized declines." The population status of spotted frogs in Wyoming was downgraded between 2005 and 2010. It is suspected that the boreal toad population in the Greater Yellowstone Ecosystem is declining, which is consistent with documented declines in other parts of the western U.S., including southeastern Idaho (Patla 2000). According to Wyoming Game and Fish Department (2005a:438), "Boreal toad populations appear to be in a state of severe decline. Numerous factors may be contributing to these declines…" Boreal chorus frogs are the most common and widespread amphibian species on the Bridger-Teton National Forest. Although they appear to be common, sufficient information does not exist to assess regional trends (WGFD 2005a).

Habitat Conditions

After breeding, adult spotted frogs and chorus frogs inhabit marshes, streams and riparian areas, moist/seasonally-wet meadows, and adult boreal toads inhabit a large variety of habitats, including somewhat drier sites than the frog species (e.g., including some forest habitats and forest edges), but they tend to remain near moist/wet habitats supporting sedges and/or willows. Distances between breeding habitat, summer foraging habitat, and winter habitat can be as far as 1/3 to 1.25 mile or more for spotted frogs, 1/4-mile to 2.5 miles for boreal toads, and up to 1/3-mile for chorus frogs (Hammerson 1982, Pilliod et al. 2002, Patla and Keinath 2005, Pierce 2006), meaning that frogs and toads may travel through forests and proposed harvest units. Toads may inhabit forested areas for longer periods so long as adequate microsites are available. Particularly when they inhabit drier habitats, boreal toads spend a disproportionate amount of

time in relatively moist microsites such as under shrubs, large woody material, and in underground burrows, and they tend to remain near moister habitats (Keinath and McGee 2005). Moist microsites in drier habitats provide protection from evaporative water loss and are used to thermoregulate.

After metamorphosing, young toads move away from aquatic habitat and use moist terrestrial habitats where part of their time is spent under the shelter of moist woody debris and underground cavities, and they spend part of their time basking in the sunlight to thermoregulate (Keinath and McGee 2005). Adults are primarily terrestrial and inhabit a great variety of habitats, from non-forested to forested and from dry to wet.

Suitable habitat conditions generally align with estimated natural conditions, especially with respect to the extent of riparian zones and functioning of stream systems, wetlands, mix of succession stages, overstory canopy cover, large woody material, distribution and abundance of beaver pond complexes. Optimum habitat conditions for spotted frogs and boreal toads include the absence of roads.

Of the range of factors that affect spotted frogs and boreal toads, the existing mix of succession stages, overstory canopy cover, large woody material, and road locations and densities have the potential to be affected by Alternative 2. The existing large over-representation of late-seral forestland has a large number of negative effects, relative to estimated natural conditions, including (1) excessive shading and insufficient micro-sites for basking in the sun, (2) shading of breeding pools, (3) reduced water flow due to excessive evapotranspiration, and (4) reduced prevalence of aspen in areas that once supported beaver pond complexes but that may not support them due to lack of aspen (discussed further in DeLong 2013a). Existing conditions of these factors are also described in the Wildlife Habitat section.

The existing road system and associated facilities (e.g., bridges, culverts) likely have contributed negatively to the distribution and abundance of spotted frogs, boreal toads, and chorus frogs in the Hams Fork project area. “The adverse ecological effects of roads (on soils, water, and the biotic community) extend outward from the road edge for 100 meters or more, based on quantitative studies investigating the ‘road-effect zone’ (Jochimsen et al. 2004 and sources therein)” (Patla and Keinath 2005:49).

Columbia Spotted Frog, Boreal Toad and Boreal Chorus Frog (Sensitive & MIS) – Environmental Consequences

Indicators are as follows:

- Proportion of forestland in late succession
- Amount of forestland treated within 100 feet of riparian areas
- Acres of aspen habitat rejuvenated (e.g., as a proxy for expansion of beaver pond distribution)
- Overstory canopy cover
- Tons/acre of large woody material
- Shrub canopy cover and browse production
- Amount of habitat lost to new roads and widened roads
- New roads within 200 yards and 1/3 mile of amphibian breeding sites
- Starting dates for operation of heavy equipment in treatment units

- Footprint of skid trails and landings
- Water quality and sedimentation rate

Alternative 1-No Action

Direct and Indirect Effects

In the absence of wildfires, Alternative 1 would have no impact on spotted frogs, boreal toads, or chorus frogs relative to existing conditions, as there would be no actions or changes resulting from the alternative. Compared to estimated natural conditions, Alternative 1 would continue to have some degree of negative effects on these species by perpetuating an artificially large amount of late-seral forestland in the project area which, over time, would shift increasingly toward spruce-fir forestland. An overrepresentation of late-seral forestland would continue to have a net negative effect on these species due to shading of breeding sites, reduced water flows into streams and wetlands, reduced distribution and abundance of beaver pond complexes. Where the insect did not reduce overstory canopy cover, the interior forest may become too shaded and cool for boreal toads and spotted frogs. If a large wildfire were to burn thousands of acres in the project area, boreal toads, spotted frogs, and chorus frogs would likely respond favorably, except for increased sedimentation.

Cumulative Effects

See Cumulative Effects under Alternative 2.

Determination of Effects

MIS – Boreal Toads and Chorus Frogs

Alternative 1 would have no impact on boreal toads and chorus frogs, relative to existing conditions, and would continue to negatively affect these species, relative to estimated natural conditions, since Alternative 1 would perpetuate an artificially large amount of late-seral forestland in the project area. The road across the West Hams Fork riparian area would continue to hinder north-south movements. Effects of Alternative 1 on the BTNF population trend likely mirror effects on habitat trends.

Sensitive Species – Boreal Toads and Spotted Frogs

Alternative 1 would have no impact on boreal toads and spotted frogs or their habitat, relative to existing conditions, and would likely not contribute to a trend toward Federal listing or loss of viability. Effects of Alternative 1 on the BTNF population trend likely mirror effects on habitat trends.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 would not conflict with Forest Plan direction with respect to spotted frogs and boreal toads (e.g., Objective 3.3(a), Sensitive Species Management Standard), nor would it contribute to their achievement.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Different components of Alternative 2 would have positive and negative effects on boreal toads, spotted frogs, and chorus frogs, but the net effect would likely be positive. Positive contributions of Alternative 2 include the following:

- conifer canopy cover would be reduced by a major degree on 1,767 acres and a small amount on 6,915 acres, while leaving a large majority of understory trees and dense patches of mature trees
- aspen would be regenerated or rejuvenated on 830 acres
- large woody material would increase by a small degree or would remain the same, on average, across 7,952 acres (92% of treatment acres);
- bridge crossing West Hams Fork would be reconstructed in a way that would more readily facilitate boreal toad movements up and down the West Hams Fork riparian corridor

These changes in vegetation would contribute to an increase in open forestland that has sun penetration to ground level, while also maintaining substantial shading and moist microclimates. The changes would also contribute, to a small extent, to increased water flows, and an increase in the distribution and abundance of beaver pond complexes, to the extent aspen regenerates near suitable habitat.

Components of Alternative 2 that have potential to negatively affect boreal toads, spotted frogs, and chorus frogs, include:

- road maintenance (which can include widening and additional surfacing)
- construction of temporary roads
- creation of skid trails and operation of heavy equipment on these skid trails
- activities associated with prescribed burning
- additional user-created trails indirectly resulting from the project have the potential to increase sedimentation rates into streams and wetlands.

However, by adhering to project design features, Forest Plan direction and Wyoming State best management practices, sedimentation would be kept below acceptable levels (Burgoyne 2013, Robertson 2013). By not allowing heavy equipment and treatment activities within treatment units until after July 20 and by not allowing any mechanical treatments within 100 feet of riparian areas, the operation of heavy equipment would likely increase mortality a negligible amount.

There is only a minimal amount of treatment acreage within 1/3 mile of known existing breeding sites, which further reduces the potential for mortality. By maintaining skid trail footprints to less than 10-15 percent of unit acreage, soil compaction and caving-in of burrows would be minimized. No temporary roads would be constructed within 1/3 mile of known existing breeding sites and would not be constructed in the vicinity of potential breeding habitat. The potential increase in traffic volumes on secondary and primitive roads has the potential to result in higher levels of mortality (due to crushing), but any increase would be negligible and may be offset by reduction in the potential for puddling (which attracts toads and frogs to remain in roads, setting them up to be crushed by vehicles).

Cumulative Effects

A large number of factors may be affecting amphibian distribution and abundance throughout the Kemmerer Ranger District and at larger scales (Patla 2000, Patla and Keinath 2005, Keinath and McGee 2005). Factors that affect or have potential to affect amphibian habitat and populations in the Kemmerer Ranger District include the historic beaver trapping, a recovering beaver population, presence of roads and motorized trails in riparian zones and near riparian areas, crushing mortality by motorized vehicles, spread of disease, altered vegetation in wetlands and

riparian areas due to historic livestock grazing, lowered retention levels of herbaceous vegetation around wetlands and in riparian areas due to livestock grazing, crushing mortality by livestock, possible reductions in water quality and, and fish stocking in ponds and lakes that did not naturally support trout, historic over-trapping of beavers, and present-day relocation of beavers (Patla 2000, Keinath and McGee 2005, Patla and Keinath 2005; see DeLong 2013 for additional citations). Many of these factors likely affect frog and toad populations in the Hams Fork project area, Kemmerer Ranger District, and larger geographic scales. Although cumulatively Alternative 2 in combination with past, present and reasonably foreseeable future activities have the potential to negatively affect boreal toads, spotted frogs, and boreal chorus frogs to a minor degree, the level of impacts are expected to be below a level of concern and would not cause a trend toward Federal listing.

At a larger scale, the Fontenelle Fire may have benefitted these species by reducing the amount of forest cover, setting the stage for improved aspen recruitment which will later facilitate recovery of beaver distribution and abundance, and possibly addition of nutrients to breeding pools. There also is the potential for increased sedimentation which can impact water quality and shorten the lifespan of breeding pools.

Foreseeable future actions that have the potential to cumulatively affect these amphibian species include Pole Creek prescribed burn (including contributions to potential future recovery of beavers) and livestock grazing. Livestock grazing has the potential to offset some of the positive effects of Alternative 2 on boreal toads, spotted frogs, and chorus frogs, for example if suitable levels of herbaceous vegetation are not retained in the vicinity of breeding pools and throughout their summer range, if use is high enough in the vicinity of breeding pools to reduce water quality or to elevate mortality due to trampling, among other potential effects.

Determination of Effects

MIS – Boreal Toad and Chorus Frog

Alternative 2 may affect individual boreal toads and chorus frogs, or small parts of their habitat, and would likely result in a net benefit to these species. At the BTNF scale, Alternative 2 would slightly offset the long-term increase and over-representation of late-seral forestland, which would have slight benefits to these. Effects on population trends are likely similar to effects on habitat trends.

Sensitive Species – Boreal Toad and Spotted Frog

Alternative 2 may impact individual boreal toads and spotted frogs, or minor parts of their habitat, but would likely not contribute to a trend toward Federal listing or loss of viability. At the BTNF scale, Alternative 2 would slightly offset the long-term increase and over-representation of late-seral forestland, which would have slight benefits to these. Effects on population trends are likely similar to effects on habitat trends.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 would either be neutral with respect to Objective 3.3(a), Sensitive Species Management Standard, and Fisheries and Wildlife Management Prescriptions with respect to spotted frogs, boreal toads, and chorus frogs, or would contribute slightly to their achievement with respect to these species. Habitat conditions would move in the direction of suitable conditions for these species, and potential adverse effects would be minimized through design features. The Biological Evaluation and Wildlife Report (DeLong 2013a) has additional detail on how this objective is affected.

Aspen (MIS) – Affected Environment

Aspen was identified as an ecological indicator species in a Forest Plan update. The acreage and condition of aspen habitat directly indicate the overall health of biological communities, including a large number of wildlife species associated with aspen stands.

Meeting the Aspen Management Guideline is central to achieving Forest Plan objectives for native ungulates and complying with higher-level direction (e.g., FSM 2202.1, FSM 2630.3, Executive Order 13186). Aspen habitat, especially when accompanied with productive forb understories, provides important to crucial habitat for native ungulates, many other herbivores and their predators, and a wide range of migratory birds, small mammals, and invertebrates (DeByle 1985a, DeByle and Winokur 1985, Mueggler 1985, Bartos and Campbell 1998, Dobkin et al. 2002). Aspen is one of the most important browse species on elk winter range, and areas of intermixed aspen, big sagebrush and conifer forestland provide ideal calving areas for elk (Gruell 1975, Boyce 1989, Beck et al. 1996). Of all types of habitat in the Hams Fork project area, bird species richness is highest in aspen habitat, as well as in riparian willow/cottonwood habitat. At least 55 migratory bird species use aspen habitat in the project area. Salt (1957), Anderson (2002), Dobkin et al. (2002), and Wyoming Partners in Flight (2003) found that ecologically intact and healthy aspen habitat (and willow and cottonwood habitat) in the southern Greater Yellowstone Ecosystem have 76-88 species of birds. Salt (1957) found the aspen type to have more than three times the biomass of birds than the other six vegetation types he inventoried near Jackson. Herbaceous vegetation and shrubs in the understory provide forage, cover, and habitat for insects, which are important to a large number of wildlife species using aspen stands.

Existing Conditions

Aspen communities are well distributed on the Bridger-Teton National Forest, with an estimated 145,746 acres of aspen cover type (i.e., cover type having >30% canopy cover of aspen) existing on the entire forest (USFS 2007c). There is an estimated 13,282 acres of aspen cover type in the Hams Fork project area, which is 18 percent of the project area and 25 percent of forestland in the project area. However, the estimate of aspen acreage is an underestimate because it does not include areas in which aspen have become too small of a component in the overstory (<10% of the forested canopy cover) to have been classified as aspen or aspen-conifer mix in the 2007 vegetation mapping effort. Some of the acreage of the aspen type is seral aspen communities and some is climax aspen communities.

Mix of succession stages, especially the proportion of early-seral communities

Stand conditions indicate a long-term downward trend in acreage of aspen, the desired mix of succession stages in the aspen type, and ecological conditions within aspen stands:

- An estimated 93% of aspen stands are in late succession, with a majority of the acres being dominated by conifers. Just over half of mapped aspen (7,093 acres) was classified as “aspen-conifer,” in which conifer typically comprises a majority of the canopy cover. Conifer also comprises a substantial portion of the canopy in some of the acreage classified as “aspen.” Furthermore, substantial acreage of aspen was not mapped in the 2007 effort because aspen-conifer stands with <10% canopy cover of aspen was classified as conifer, meaning that the estimated percent of the aspen type in late succession (93%) is underestimated. As an illustration of this, an in-depth examination of aspen habitat on the Greys River Ranger District, just to the north of the Kemmerer Ranger District, revealed that only about half of the aspen acreage was mapped on the district (Loosen et al. 2009).

- The current status of aspen in the project area — specifically a large proportion of aspen cover type being dominated by conifer trees — indicates a downward trend in ecological conditions. This process will continue without major disturbance that sets succession back (Loope and Gruell 1973, Youngblood and Mueggler 1981). Loope and Gruell (1973) assessed that most of today's mature to old aspen stands on the BTNF burned between 1840 and 1890. Gruell (1980a,b) indicates that most aspen stands on the BTNF were young and densely stocked in the late 1800s and early 1900s, which was a consequence of frequent fire on the landscape prior to Euro-American settlement. Schoen (2012) noted that extensive logging occurred in the Hams Fork watershed in the late 1800s and early 1900s. Since the late 1800s to early 1900s, there has been a continual increase in the abundance and canopy cover of conifer trees in areas supporting aspen and an increase in the age of aspen (e.g., now >80-120 years, except in localized situations where fire or logging eliminated conifers. The 80-120 year time frame roughly correlates with the maximum age of aspen trees.
- Hill (2004) estimated that aspen acreage in the Hams Fork watershed had declined 43% between 1913 and 1996.
- Forest-wide and state-wide assessments have concluded that aspen condition is trending downward as conifer expansion increases (Gruell 1980a,b; USFS 1997; USFS 2001a, Bartos and Campbell1998, Stam et al. 2008). Bartos and Campbell (1998) and Stam et al. (2008) reported on an estimate that aspen acreage in Wyoming has declined by 53%. USFS (1997:10-11) stated "There is a high risk that significant acreage of this type will continue on the path of succession to other vegetation types… Through this continued plant succession, aspen communities would result in a 50% reduction of total acres in an estimated 20-30 years."

The 2006-2012 insect epidemic likely has helped in some places to stem the downward trend in aspen conditions by reducing the overstory of conifer trees that are shading out aspen and contributing to the decline in conditions. However, benefits to aspen habitat from the 2006-2012 insect epidemic are likely limited. According to data in the Wildlife Habitat section, it is likely that overstory conifer mortality was sufficiently high to only increase the amount of early-seral aspen by 5 – 10% or to increase the amount of aspen habitat with minimal conifer overstory. Therefore, although the percent of the aspen type in late succession likely has declined by a small degree due to the 2006-2012 insect epidemic, there continues to be a large overrepresentation of late-seral conditions in aspen stands.

Stand structure characteristics

The process of increased abundance and canopy cover of conifer trees in aspen stands eventually results in aspen being shaded out (Jones and DeByle 1985b), which in turn can lead to permanent disappearance of aspen on sites dominated by conifer trees (Bartos 2000). Where conifer cover is high and only a relatively small number of mature aspen remain, there is a reasonable chance these aspen stands will be permanently lost. Aspen trees only live about 80-120 years, and a large proportion of forestland in the western 2/3 to 3/4 of the project area is between 80 and 130 years old. This means that the ecosystem is at a point where it is reasonable to assume that aspen clones will increasingly be dying out permanently. Once an aspen clone is dead, aspen on the site is permanently lost.

Structural conditions within late-seral aspen stands are variable in the project area, ranging from open stands of mature aspen trees to with few trees in the mid-story and understory, to mature stands with low to moderate densities of young to medium-age aspen and low to moderate densities of conifer trees, to mature stands with dense understories of mostly conifer trees, to

mature or old-age aspen with mid-stories and over-stories co-dominated by conifer trees, to conifer stands with remnant aspen. Because the abundance and canopy cover of conifer trees are considerably higher than would occur under a natural fire regime, they currently contribute substantially more to the structure within aspen stands than existed when wildlife communities developed in this area.

Similarly, the diversity, total canopy cover, and production of herbaceous vegetation and shrubs in the project area's aspen stands currently (1) vary substantially, from lush understories of forbs and shrubs to little or no herbaceous and shrub understories, and (2) are on average substantially lower than the natural potential of the landscape. Because the abundance and canopy cover of conifer trees are considerably higher across the aspen type than would occur under a natural fire regime, the diversity, total canopy cover, and production of herbaceous vegetation and shrubs are considerably lower than what they would be under a natural fire regime. Mueggler (1985) characterized herbaceous vegetation as typically being diverse and productive (e.g., 1,000-2,000 pounds/acre, up to more than 4,000 pounds/acre) in healthy stands of aspen. Youngblood and Mueggler (1981) found 270 herbaceous or shrub species in the understory in their classification of 26 aspen community types across the BTNF. However, given the fire history in the project area and the corresponding age of stands and the high prevalence of conifer trees, relatively few herbaceous and shrub understories are at their potential.

Diversity, total canopy cover, and production of herbaceous vegetation and shrubs in the understory

The diversity, total canopy cover, and production of herbaceous vegetation and shrubs is low, on average, across the aspen type in the project area mainly because conifers have increased in abundance and canopy cover within aspen stands (other contributing factors are discussed in the cumulative effects section). The relationship between herbaceous diversity/production and conifer cover in aspen stands is well established. While mature aspen stands comprised solely of aspen trees can maintain high herbaceous productivity, increasing conifer canopy cover correspondingly reduces herbaceous production (Mueggler 1985, Pieper 1990, Riggs et al. 1996, Stam et al. 2008). Stam et al. (2008) found that herbaceous production began to decline when before conifer canopy cover reaching only 10%. At 10% conifer canopy cover, herbaceous production was substantially reduced and it declined rapidly thereafter. By the time conifer canopy cover reached 30%, herbaceous production had declined by two-thirds or more in their study. This means that herbaceous production could currently be substantially lower than what it would be under a natural fire regime.

Aspen (MIS) – Environmental Consequences

Key indicators are as follows:

- Mix of succession stages, especially the proportion of early-seral communities.
- Stand structure
- Herbaceous vegetation and shrubs in the understory

Alternative 1-No Action

Direct and Indirect Effects

Selection of Alternative 1 would not directly adversely impact aspen because there is no action involved with this alternative. However, inaction, when combined with past fire suppression and other activities that have greatly reduced the proportion of the aspen type in early and mid-

succession and future fire suppression activities, would contribute to further declines in the acreage and condition of aspen. An exception would be if one or more wildfires occurred in the near future and if substantial acreage was burned. Because Alternative 2 would reduce the potential for large acreages to be burned in the project area in the event of a wildfire, Alternative 1 would be more beneficial to aspen under this scenario.

Cumulative Effects

In the absence of future wildfires, Alternative 1 in combination with past, present and reasonably future activities would negatively affect aspen by allowing continued increases in conifer canopy cover in aspen stands.

Determination of Effects

Alternative 1 would have no impact on the aspen type, relative to existing conditions, and would continue to negatively affect wildlife species associated with or dependent on aspen habitat. At the BTNF scale, Alternative 1 would contribute to the long-term decline in the condition and acreage of aspen communities, both in terms of aspen habitat and the aspen "population."

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 would not directly contribute to meeting Forest Plan direction for aspen (e.g., Aspen Management Guideline for the BTNF as a whole, and for DFC areas 1B, 10, and 12; Objective 2.1(a)).

Alternatives 2-Proposed Action

Direct and Indirect Effects

A total of 2,115 acres of mapped aspen and aspen-conifer (24%) falls within the 8,622 acres of mechanical treatments and prescribed burns of Alternative 2. The acreage figure and percentage are underestimates because additional acreage in treatment units contain aspen, but not enough in the overstory to have been classified as aspen or aspen-conifer in the 2007 vegetation layer.

Aspen would be regenerated on a total of 830 acres. About 585 acres would be regenerated from patch clearcutting and prescribed burning. An additional 245 acres of aspen improvement, salvage/sanitation with aspen improvement treatments, and salvage/sanitation/commercial thinning with aspen improvement are planned. Mechanical treatment and follow-up broadcast burning or piling-and-burning may result in aspen regeneration on much of the 245 acres. Leaving felled conifer trees on site in aspen improvement treatments would contribute to aspen regeneration because it would protect suckers from browsing elk, moose, mule deer, and livestock. Because aspen exists as a component of other parts of stands not mapped as aspen or aspen-conifer, additional acres would likely be regenerated as part of the treatments.

With Alternative 2, the proportion of the aspen type in late succession would decline from an estimated 93% down to 85-87%. The proportion of the aspen type in early succession would increase from an estimated 3% to 9-11%, which constitutes substantial progress toward the desired level of 20-40%.

Table 36. Acres of aspen type, conifer types (combined), and non-forest types within each treatment type proposed under Alternative 2.

By Treatment Grouping	Aspen Type		Conifer Types	Non-Forest	Totals
	Acres	Percent			
Salvage	205	12%	1,525	43	1,773
Salvage/Sanitation	19	1%	1,367	21	1,407
Salvage/Sanit w/ Aspen Treatment (one unit with commercial thin, 174 acres)	174	16%	888	38	1,100
Salvage/Sanit./Commercial Thin	12	8%	120	14	146
Patch Clearcut w/ Salvage/Sanit.	38	22%	137	0	175
Patch Clearcut w/ Reserves	18	46%	20	1	39
Whitebark Pine Mech. Treatment	1	<1%	206	3	207
Aspen Mechanical Treatment	71	46%	81	1	153
Mechanical Treatment (total of above)	559	11%	4,485	133	5,177
Hazard Tree Removal	1,027	37%	1,740	8	2,716
Facility Protection	1	<1%			
Prescribed Burning	529	72%	152	49	730
All Treatments	**2,115**	**24%**	**6,377**	**190**	**8,622**

Dark shading indicates treatments and prescribed burning that would result in or could result in regeneration of aspen communities (i.e., setting succession back to early succession) in all areas treated or a portion thereof that currently are mapped as aspen. For salvage/sanitation with aspen treatment, 0-174 acres could be set back to early succession, depending on the density and size of aspen trees that currently exist.

On the remaining estimated 1,264 acres of aspen habitat that would be treated under Alternative 2 (Table 36), most aspen would not benefit from the treatments because only dead trees would be removed on 97% of this acreage and the footprint of skid trails would be minimal. However, it is possible for pockets of aspen habitat to improved where conifer canopy cover is substantially reduced (e.g., salvage/sanitation/commercial thinning, and possibly localized sites where live-tree removal and soil disturbance by heavy equipment produces aspen suckering), but the acreage would be negligible.

Within the ≥830 acres of aspen habitat that would be rejuvenated under Alternative 2, the diversity, total canopy cover, and production of herbaceous vegetation would increase. Mueggler (1985) reported on a study that found that partial cutting (removal of 50% of the larger trees in a stand) increased herbaceous production by 37% after 3 years while clearcutting increased it by 87%. They reported on other studies showing substantial increases in herbaceous production following clearcutting aspen stands. Studies on the effects of increased conifer canopy cover (e.g., Pieper 1990, Stam et al. 2008) provide additional support for this. In particular, results of Stam et al. (2008) indicate that reducing conifer canopy cover to less than 10% would facilitate substantial increases in understory production.

A potential indirect negative effect of Alternative 2, from the standpoint of aspen, is that it would reduce the potential for the spread of wildfires and lightning-ignited fires managed for resource benefit. See the “Cumulative Effects” subsection, below, for more discussion.

Cumulative Effects for Alternatives 1 and 2

Cumulative effects that led to the existing mix of succession stages and stand characteristics, and potential future changes in these, apply directly to cumulative effects on aspen communities (see cumulative effects analysis in the "Mix of Succession Stages and Conifer Expansion" and "Stand Characteristics" sections). Also, effects that led to existing conditions in aspen stands and that would continue to limit major reductions in conifer cover in aspen stands were outlined in the "Existing Conditions" subsection, above. Fire suppression is probably the factor that most limits the restoration of a natural mix of succession stages in the aspen type and that continues to diminish ecological conditions in aspen stands, since conifer cover will continue to increase in the absence of fire or other major disturbance like clearcutting (Loope and Gruell 1973, Youngblood and Mueggler 1981, USFS 1997).

In the absence of wildfires, Alternative 1 would negatively affect aspen by allowing continued increases in conifer canopy cover in aspen stands. In the absence of one or more moderate to large wildfires, Alternative 2 would benefit aspen as a result of regeneration treatments. However, if one or more wildfires burned several thousand acres or more, Alternative 1 in combination with these fires would benefit aspen more than Alternative 2 in combination with these fires.

Future prescribed burns, wildland fire use, wildfires, and mechanical treatment would contribute to restoring the distribution and condition of aspen habitat. The Northern Rockies Lynx Management Direction (USFS 2007c), particularly Standard VEG S6, currently prevents treatments in the aspen stands that are in most need of treatment. Approximately 67% of acres surveyed are unavailable for any treatments that could restore aspen. Many of the excluded treatment units and units downgraded to salvage treatment encompassed aspen communities heavily dominated by conifers, and the most likely treatment in these units was prescribed burning. It is possible that foregoing treatment in some of these units will result in the permanent loss of some aspen stands.

Climate change, in combination with other factors, can have positive and negative effects on aspen communities. Potential positive effects include more frequent fires and possibly enhanced growth due to elevated carbon dioxide levels, and potential negative effects include less water available to aspen and root damage caused by a warmer and drier climate (Morelli and Carr 2011). If the project area is high enough in elevation and if precipitation is sufficient to maintain aspen stands in the long term, the more frequent wildfires would have a net benefit to aspen, especially in the face of constraints restricting prescribed burning and mechanical treatments.

Historic and current livestock and wildlife herbivory, motorized recreation, dispersed camping, and noxious weeds also impact aspen stands (USFS 1997, USFS 2004a). Browsing by native ungulates and livestock has the potential to hinder recruitment of aspen following major disturbances like fire and clear-cutting. The first year or two following a major disturbance in aspen stands is a critical time period (DeByle 1985b), especially if the aspen stand was heavily encroached upon by conifer trees and the remnant aspen clone is of low vigor. Elk are well known for hindering aspen recruitment, especially where elk numbers are high or where the size of treatment is small (Gruell and Loope 1974, DeByle 1985b, Kilpatrick et al. 2003). Thus, it is possible for elk to limit recruitment of aspen in the treatment units of Alternative 2, which would result in lesser benefits than identified in the "Direct and Indirect Effects" section.

It is well documented that livestock can have adverse effects on aspen stands due to browsing of suckers and that browsing of aspen suckers can limit recruitment and eventual stand density (Smith et al. 1972, DeByle 1985b, Jones et al. 2011). In fact, livestock have been effectively used

in some places to control aspen suckering and to eliminate aspen (Fitzgeral and Bailey 1984, Lacey 1987, Brock 1988). Fitzgerald and Bailey (1984:156) found that "A single heavy late grazing practically eliminated regeneration…" It is possible, therefore, for livestock to limit recruitment of aspen in some of the treatment units of Alternative 2, which would result in lesser benefits than identified in the "Direct and Indirect Effects" section.

Determination of Effects

Alternative 2 would affect individual aspen trees and parts of their habitat, and would result in a net benefit to these species. At the BTNF scale, Alternative 2 would slightly offset the long-term decline in the condition and acreage of aspen habitat.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 would directly contribute to meeting Forest Plan direction by setting back succession or otherwise rejuvenating aspen on 842 acres (or more).

Migratory Birds - Affected Environment

When developing a list of species to be considered in NEPA analyses, USFS and USFWS (2008) require the Forest Service to consider bird species on the U.S. Fish and Wildlife Service's birds of conservation concern, state lists, and comprehensive planning efforts (e.g., Wyoming Partners in Flight, Intermountain West Joint Venture). These are identified and addressed in DeLong (2013).

Habitat Conditions

Suitable habitat conditions for migratory birds are natural conditions or an approximation of natural conditions, as outlined in the Wildlife Habitat section. Existing conditions for migratory birds are also outlined in the Wildlife Habitat section. Some major themes include: Some major themes include:

- A major overrepresentation of late-seral conifer forestland.
- An underrepresentation of aspen habitat.
- An overrepresentation of whitebark pine habitat, but major die-backs in some places due to the 2006-2012 insect epidemic.
- An underrepresentation of early-seral forestland and associated herbaceous and shrub resources, including seeds, nectar, berries, and invertebrates.
- An underrepresentation of beaver-pond habitat due to the overrepresentation of late-seral forestland and concurrent underrepresentation of aspen habitat, including in drainages formerly occupied by beavers.
- An underrepresentation of rangeland habitat (i.e., reduced footprint of rangeland types due to conifer expansion), but an overrepresentation of late-seral range habitat due to fire suppression.

Migratory Birds - Environmental Consequences

Alternative 1-No Action

Direct and Indirect Effects

Migratory-bird-communities would remain below the natural potential of the land. Alternative 1 would continue to (1) benefit bird communities associated with late-seral conifer forestland and snags, (2) inhibit recovery of bird communities associated with aspen habitat, (3) allow whitebark

pine and associated bird communities to decline, (4) inhibit bird communities associated with early-seral communities or with understory herbaceous vegetation and shrubs, (5) inhibit further recovery of bird communities associated with beaver pond complexes, and (6) result in losses in rangeland habitat due to ongoing conifer expansion. If one or more wildfires occur, habitat for late-seral bird species would decline. However, given the major overrepresentation of late-seral communities in the project area and at larger geographic scales, the amount of habitat available to late-seral bird communities would continue to remain above what occurred under a natural fire regime. Additionally, bird communities associated with aspen, whitebark pine, early-seral communities, and beaver pond complexes would benefit from wildfires under Alternative 1.

Cumulative Effects

See Cumulative Effects under Alternative 2.

Determination of Effects

Alternative 1 would have no impact on migratory birds, relative to existing conditions. At the BTNF scale, Alternative 1 would contribute to the long-term decline in migratory bird habitat conditions due to decline in early- and mid-seral forest habitat and aspen habitat, long-term loss of meadow, big sagebrush, and grassland habitat.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 would not conflict with direction in Executive Order 13186 or USFS and USFWS (2008) from the standpoint there are no activities being proposed that would conflict with this direction. However, the Executive Order requires, among other things, the Forest Service to "…(1) support the conservation intent of migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities… (2) restore and enhance the habitat of migratory birds, as practicable… (4) design migratory bird habitat and population conservation principles, measures, and practices into agency plans and planning processes… as practicable…" Alternative 1 is inconsistent with these provisions because, despite the opportunity to restore and enhance migratory bird habitat and to design migratory bird principles into management, Alternative 1 would not take any action.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Alternative 2 would have a net negative effect on migratory birds in the project area because early-seral forestland communities would only increase by about 1-3% compared to snag density being reduced by 85-95% on about 14% of the project area's forestland (Table 30). This alternative would result in adverse effects on individual birds associated or dependent on snags due to the major reduction in the density of dead trees in treatment units. In the aspen type, the positive effects are larger and the negative effects are lower than what would occur in forestland as a whole. Approximately 5-9% of the aspen type would be converted to early succession, compared to a major reduction in snag density on only 4% of the type.

An indirect benefit of Alternative 2 is that bird species associated with beaver pond complexes may have additional habitat in the long term. In the lodgepole type, only 1% would be converted to early succession compared to a major reduction in snag density on about 18% of the type. In the whitebark pine type, the project would improve ecological conditions on about 2% of the type, which would have slight benefits in the long term to species associated with this type.

Under Alternative 2, native migratory-bird-communities would remain below the natural potential of the land (similar to Alternative 1), but would be slightly closer to what existed prior to Euro-American settlement. Alternative 2 would have negligible negative effects on individual birds associated with late-seral conifer forestland. Also, despite the large acreage upon which snag density would decline by a major amount, the acreage of snag-bearing forestland would remain well above what existed under a natural fire regime, meaning there would not be an adverse effect on these species in an ecological context (see discussion for the northern three-toed woodpecker in the "Pine Marten (MIS); Great Gray Owls, Boreal Owls, and Northern Three-Toed Woodpeckers (Sensitive)" section).

Alternative 2 would have negligible effects on migratory birds inhabiting rangelands, riparian, and wetland habitat. Negligible amounts of big sagebrush habitat would be burned as part of prescribed burning in several of the prescribed burn units (up to 26 acres) and possibly as secondary treatment in some of the mechanical treatment units (less than 86 acres, and likely far less than this, which is less than 1% of the big sagebrush habitat in the project area). negligible reductions would occur in riparian habitat (<1 acre lost to road work and bridge work, spread across several riparian areas) because new road construction and road widening would not occur in riparian zones except where absolutely necessary. No wetland habitat would be lost to new roads or road widening.

Disturbance effects of heavy equipment and potential for nests, eggs, or nestlings being killed due to felling or burning nest trees would be negligible because no treatment activity would occur prior to July 20 each year (based on USFW 2012b), which would avoid the bulk of the migratory bird nesting season. Then, only a relatively small number of units would be treated in the remaining weeks of July and the first week or two of August, which would complete the breeding season. Design features WL-6, 11, 12, 13, 14, 15, 16, and 20 would further reduce negative effects to migratory birds.

Cumulative Effects

Cumulative effects pertinent to migratory bird species are outlined in the Wildlife Habitat section. More specifically for migratory birds associated with late-succession conifer forestlands, cumulative effects would be similar to the cumulative effects described in the "Pine Marten (MIS); Great Gray Owl, Boreal Owl, and Northern Three-Toed Woodpecker" section, especially for pine marten and great gray owls (page 118).

Determination of Effects

Alternative 2 may affect individual migratory birds and parts of their habitat, would likely result in a net negative effect relative to existing conditions, but would likely not negatively impact migratory bird populations, relative to estimated natural conditions. At the BTNF scale, Alternative 2 would slightly offset the long-term increase and over-representation of late-seral conifer habitat for migratory birds; the long-term decline in early-seral, mid-seral, and aspen habitats; and the short-term increase and over-representation of habitat with high densities of large snags.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 would not conflict with direction in Executive Order 13186 or USFS and USFWS (2008). Alternative 2 would contribute to meeting this direction on migratory birds through the regeneration of 944-1,622 acres of forestland, including rejuvenation of aspen habitat, and conflict to some degree with direction on snag retention. However, Alternative 2 would not

conflict with the Snag Management Guideline of the Forest Plan (discussed earlier) and would not conflict with direction on snag retention in USFS and USFWS (2008), which calls for the availability of snags at larger geographic scales to be considered. Under Alternative 2, there would continue to be a much larger supply of dead trees than existed under a natural fire regime. Thus, migratory birds would not be adversely affected at the population and ecosystem level.

Special Areas (Inventoried Roadless Areas)

The following resource information and analysis summarizes the Special Area Report: Inventoried Roadless Area (Brown 2013a).

Affected Environment

Approximately 87% of the project area or 64,159 acres is designated as Inventoried Roadless Area (IRA). There are two IRAs located within the project area: 03001 – Lake Alice-Commissary Ridge and 03001A – Nugent Park-Hams Fork. Within the project area the existing condition of the wilderness attributes and Roadless characteristics have been affected by past and current actions including existing open Forest System Roads (FSRs), developed facilities, grazing allotments, past timber sales, past prescribed burns, and other vegetation treatment projects.

The purpose of this section is to analyze what effects, if any, the activities proposed by the Hams Fork Vegetation Project would have on the project area portions of the IRAs and their existing wilderness attributes and roadless characteristics.

Management Direction and Desired Conditions

Forest Plan and Related Direction

The two IRAs located within the project area were not included in the 1984 Wyoming Wilderness Act and were not recommended for wilderness designation in the Forest Plan. Forest Plan direction for IRAs that were not approved for wilderness designation is that they be managed for a variety of Desired Future Conditions (DFCs). DFCs first divide the Forest into management emphasis areas and provide respective themes, management emphases, prescriptions and standards and guidelines. An additional management tool utilized in the Forest Plan for recreation management is the Recreation Opportunity Spectrum (ROS). The Recreation Opportunity Spectrum (ROS) is a recreation management tool developed by the US Forest Service in the early 1980s to manage and administer natural settings for specific visitor experiences. The ROS focuses on the identification and management of space, facilities, social and ecological conditions within Forest boundaries (Clark 1979).

Areas with Wilderness Potential

In 2008, in preparation for a planned revision to the Bridger-Teton Forest Plan, a planning exercise was undertaken to evaluate IRAs that were not designated as Wilderness, and identify areas within the IRA that might be potential additions to the national wilderness preservation system in the future (Bridger-Teton National Forest 2009). The areas identified in the evaluation were called Areas of Potential Wilderness (AWP) instead of “roadless” areas to avoid confusion between those areas legally bound by the 2001 Roadless Area Conservation Rule.

As the Bridger-Teton Forest Plan revision was not completed, AWP’s are not official management areas and carry no special designation or management direction outside that provided for by designated IRA’s. For this reason the existing condition and effects to AWPs will not be analyzed separately.

Desired Future Condition

The Hams Fork project area is covered by Management Area 13 (MA-13), as identified in the Forest Plan. IRA 03001 – Lake Alice-Commissary Ridge is managed for five DFCs, and 03001A – Nugent Park-Hams Fork, for only four. The DFCs that these IRAs are managed for are: 1B, 2A, 9A, 10 and 12 (IRA 3001A does not have any DFC 2A areas). Figure 10 illustrates and provides the acres in each DFC by IRA. Complete descriptions for all the DFCs for the Bridger-Teton National Forest may be found in the Forest Plan (US Forest Service 1990, pp. 145-248).

Recreation Opportunity Spectrum

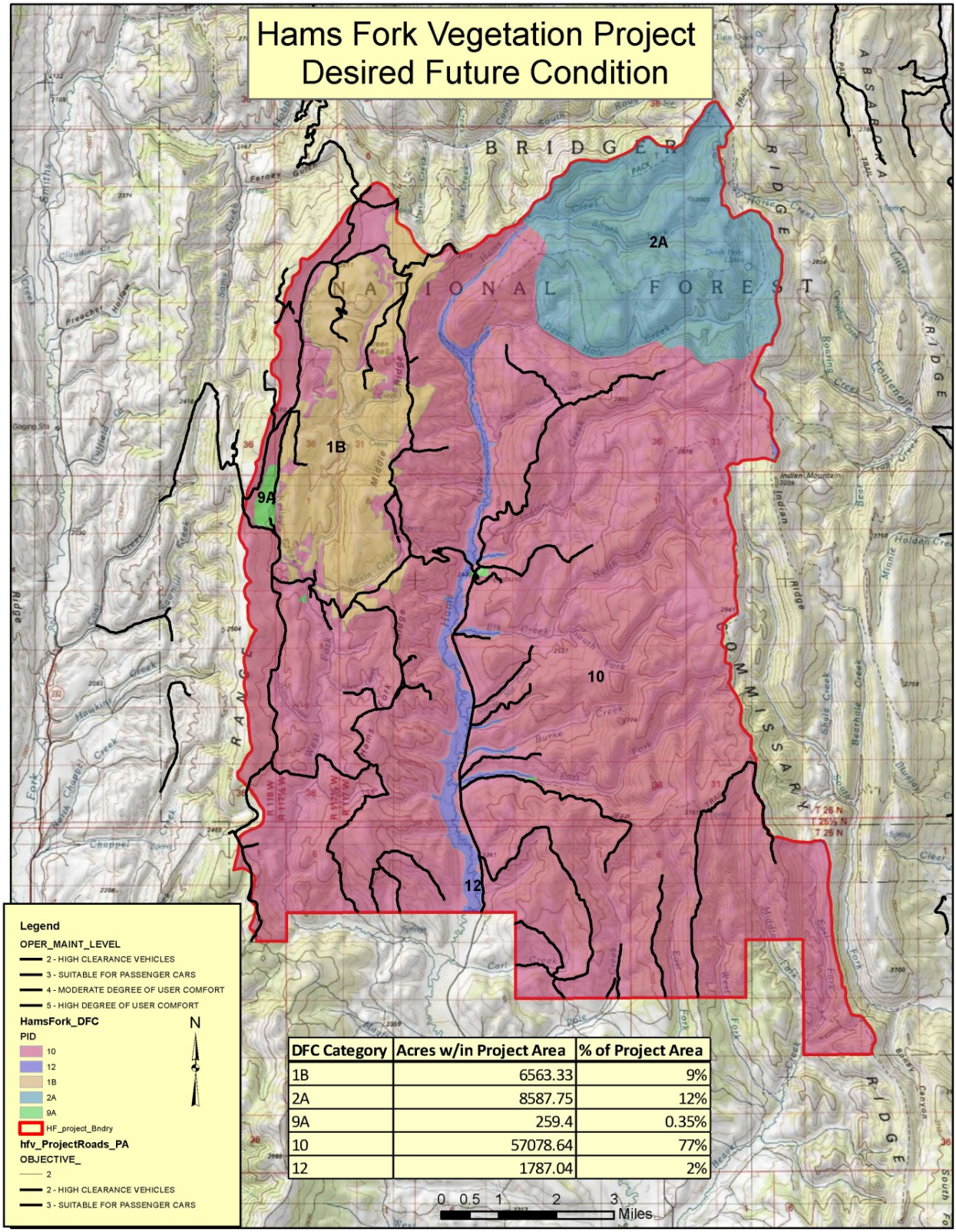
The Recreation Opportunity Spectrum (ROS) is a recreation management tool used by the U.S. Forest Service to manage and administer natural settings for specific visitor experiences. There are seven setting indicators that are used to classify management standards and guidelines of ROS classifications: visual quality, access, remoteness, visitor management, on-site recreation development, visitor management, on-site-recreation development, social encounters, and visitor impacts (Tongas National Forest, 2012). The project area is managed for four ROS settings: Roaded Natural (RN), Semi-Primitive Motorized (SPM), and Semi-Primitive Non-Motorized (SPNM), and Primitive (P).

Primitive ROS Class

The Primitive (P) ROS Class applies to the north-eastern corner of the project area of IRA 03001. Primitive ROS areas are natural appearing environments of large size. Non-motorized cross-country travel and travel on non-motorized trails are typical. There are no or infrequent sights and sounds of human activity present, and the setting is located more than 3 miles from any human developments. There is also limited signing and directional information, and no on-site interpretive facilities. In general users should meet less than 3 parties per day during a trip. Visitor-caused impacts to resources are slight and usually not noticeable.

Semi-Primitive Non-Motorized ROS Class

Semi-Primitive Non-Motorized (SPNM) ROS classification applies to most of the eastern and northern portion of the project area. SPNM areas consist of a natural or natural appearing environment of moderate size. The concentration of users in this area is low, but there is often evidence of other users. Nearby sights or sounds of human activity are rare, but distant sights or sounds may occur. Settings for this ROS class are located approximately ½ mile from roads and trails open to motorized recreation and clear-cut harvest areas. Visitor information facilities may be used to interpret cultural and natural resource features, but are not elaborated and harmonize with the setting. Facilities and structures may exist but are not highly developed. Users meet less than 10 parties per day. Visitor-caused impacts to resources are rare and usually not long-lasting.



DFC Category	Acres w/in Project Area	% of Project Area
1B	6563.33	9%
2A	8587.75	12%
9A	259.4	0.35%
10	57078.64	77%
12	1787.04	2%

Figure 10. Desired Future Conditions (DFC) designations within inventoried roadless areas. (IRAs)

Semi-Primitive Motorized ROS Class

Semi-Primitive Motorized (SPM) ROS areas are typically located around lower class motorized roads and trails. SPM areas are natural or natural-appearing environment of moderate size. Travel on motorized and non-motorized trials and low level, high clearance roads, provide access to the area. Nearby sights or sounds of human activity are rare, but distant sights or sounds may occur. Settings for this ROS class is within ½ mile of roads opened and maintained for passage by high clearance and four wheel drive vehicles (Maintenance Level 2) and provide access to recreation opportunities and facilities. Forest developed roads that are used for resource management, as well as recreation, are present in the area. Interaction among users in this setting is low, with users meeting less than 10 parties a day, but there is often evidence of other users. Visitor-caused impacts may be noticeable, but not degrading to basic resource elements.

Roaded Natural ROS Class

The Roaded Natural (RN) ROS can be summed up as a natural or natural–appearing environment of moderate size with moderate evidence of the sights and sounds of humans; these areas are located in corridors around higher management level roads. All forms of access and travel modes may occur in RN areas, although access is typically by passenger vehicle. Remoteness is of little importance, but low to moderate concentrations of human sights and sounds are preferred. Roaded Natural setting is located within ½ mile of moderate to heavily-traveled roads that are maintained to Levels 3, 4, or 5 and open for use by the public. On-site regiment and controls are obvious, and control facilities, such as parking areas, barriers, and signs, harmonize with the natural environment. Facilities and structures are maintained to accommodate the types and levels of use anticipated for the site and include Forest Service cabins, campgrounds, and picnic areas. Users meet less than 20 other parties per day, and visitor caused impacts may be noticeable.

Forest Service Handbook Direction

Direction for the evaluation of unroaded lands for potential wilderness designation can be found in Forest Service Handbook 1909.12 (72). This handbook direction specifically identifies and defines wilderness attributes for potential wilderness and how they should be evaluated. Additionally, the 2001 Roadless Area Conservation Rule (RACR) identified specific characteristics for inventoried Roadless Areas (USDA, Forest Service 2001).

Methods for Analysis

There will be two methods for analysis that will be used in this report. The first method will be analyzing the impacts of the proposed actions and what their effects will be to the environment and changes to the existing wilderness attributes and roadless characteristics. The second will focus on the quantitative impacts of the Proposed Action on the IRA portions of the project area, i.e. acres of proposed treatments within the IRAs.

Wilderness Attributes

This analysis will use a blended set of attributes combining the four qualities of wilderness related to wilderness character as defined from Section 2(c) of the 1964 Wilderness Act in addition to the wilderness evaluation process found in Forest Service Handbook (FSH) 1909.12.

The seven wilderness attributes that will be used to evaluate the effects of the project to wilderness attributes are:

- Untrammeled

- Natural
- Undeveloped
- Outstanding opportunities for solitude
- Outstanding opportunities for primitive recreation
- Special features (Ecological, Geologic, Scientific, Education, Scenic, or historical)
- Manageability (as a Wilderness)

Inventoried Roadless Areas

The 2001 Roadless Rule identified specific characteristics for inventoried Roadless Areas. There are nine roadless area characteristics that will be used to evaluate potential adverse effects to the project areas roadless character. They are:

- Soil, water and air resources
- Sources of public drinking water
- Diversity of plant and animal communities
- Habitat for TES and species depended on large undisturbed areas of land
- Primitive and semi-primitive classes of recreation
- Reference landscapes for research study or interpretation
- Landscape character and integrity
- Traditional cultural properties and sacred sites
- Other locally unique characteristics

Existing Condition

In 1979 when these IRAs were identified in the Hams Fork project area, they contained a developed road system as well as a timber management program. Approximately 98 miles of open roads are maintained in the project area portion of the IRAs. Table 37 shows the breakdown of the total acres of each IRA, the acres of the IRA within the project area, the percentage of the project area each IRA occupies, and the acres of the IRA that will be directly affected by the project.

Table 37. Summary of Inventoried Roadless Areas in the Hams Fork Project Area

IRA ID #	IRA Name	IRA - Total Acres (RARE II)	IRA Acres w/in Project Area	% of IRA in Project Area	% of Project Area w/in IRA
3001	Lake Alice - Commissary Ridge	179,920	50,152	28%	68%
3001	Nugent Park-Hams Fork	21,590	14,495	67%	20%

Existing Wilderness Characteristics Condition

***Untrammeled*:** The “Untrammeled” quality monitors modern human activities that directly control or manipulate the components or processes of ecological systems. This characteristic is a measure of the actions that have occurred or are proposed to occur that will hinder, manipulate or control the long-term natural ecological processes of the area. In summary, to what extent the area is unhindered and free from modern human control or manipulation.

03001 – Lake Alice-Commissary Ridge: A total of 1,429 acres of timber have been harvested in the project area portion of IRA 03001 between 1965 and 2001 (Bruch 2013). As timber harvests increased from the early 1900's, roads were developed to access timbered areas. Approximately 62 miles of roads currently exist within the project area portion of IRA 03001, 57 of which are open to the public. In addition to the existing road system there are two bridges in the project area portion of IRA 03001, the Elk Creek Bridge and Hams Fork Bridge.

At the time of the RARE II evaluation process in 1983, there were 54,995 sheep/months and 2,069 cattle/months estimated to be permitted in the whole of both IRA 03001 and 03001A (Bridger-Teton National Forest 1983). In project area portion of IRA 03001 there are portions of nine current allotments, that cover approximately 45,777 acres; approximately 6,805 ewe/lamb pairs and 352 cow/calf pairs authorized to graze within those nine allotments (Cameron 2013).

In the more recent past, 2,103 acres of the project area portion of the IRA have been affected by wildfire, some of which resulted in suppression activities. Additionally, there have been 168 acres of IRA 03001 that have been included in prescribed burning activities in the Pole Creek Prescribed burn (Banister 2013). Lastly there have been two forest health projects that have occurred in the project area portion of the IRA for a total of 24 acres of treatment around the Kelley Guard Station and Hams Fork Campground. These treatments included mechanical sanitation, slashing and piling of material, and Carbaryl and Verbenone applications to living trees.

In summary there have been management actions that have occurred in the past and continue to occur in the project area portion of the IRA 03001 that directly control or manipulate the components or processes of ecological systems. The overall quality of the untrammeled attribute is moderate. Due to the degree and amount of human manipulation that has occurred in the project area portion of the IRA since the 1900s, the untrammeled characteristic ranges from high to low quality. Roads, bridges, logging operations, and continued grazing all manipulate the ecological process in the project area portion of the IRA. However the majority of the low quality untrammeled areas are focused around the 35 % of the project area portion of the IRA that is within 3 miles of the existing road system. The further from the existing roadways the more the untrammeled quality increases.

03001A – Nugent Park-Hams Fork Ridge: The project area portion of IRA 03001A has been similarly impacted by human manipulations of the natural environment as those described above for IRA 03001.

The project area portion of IRA 03001A is significantly smaller than the project area portion of IRA 03001, and thus the amount of manipulations is also smaller. 594 acres of the project area portion of IRA 03001A have been logged between 1965 and 2011. A total of 13,245 acres of the project area portion of the IRA is made up of three active grazing allotments, with a total of 3,900 ewe/lamb pairs authorized to graze the three allotments (Cameron 2013). Three fires were reported in the area in the 1940s records, and a total of 56 acres within the project area portion of the IRA have been impacted by wildfire to date. There have been no prescribed burns or forest health projects in the project area portion of IRA 03001A. Additionally, there are approximately 30 miles of Forest System Roads in the project area portion of IRA 03001A, 28 miles of which are open to the public. Also included in the IRA are the West Fork Hams Fork bridge and the Big Spring gravel pit which is approximately 2 acres and is used to provide surface and fill material for road projects in the area.

The level of development, management activities, and modifications to the natural ecosystem in the project area portion of IRA 03001A as described above has resulted in a low quality of the untrammeled characteristic in the area. Although roads, bridges, and gravel pits are the most noticeable impacts to the untrammeled characteristic, widespread grazing, past logging and fire suppression activities have all modified the existing untrammeled characteristic in the project area portion of the IRA. Approximately 99.85% of the project area portion of IRA 03001A is located within ½ mile of an existing Forest system road. This immediate vicinity to human manipulations results in the low quality of the untrammeled characteristic.

***Natural*:** The Natural quality monitors both intended and unintended effects of modern people on ecological systems. This is a measure of past and proposed activities on the natural conditions of the area. The natural quality describes the extent to which human influences have or will altered the natural process and conditions away from what one would otherwise expect. This is the measure of the degree of environmental modification that has occurred, or will occur, as a result of actions that were described above in the untrammeled section.

The project area portion of both IRAs lies in the south-central portion of the Kemmerer Ranger District in Lincoln County, Wyoming (Figure 10) and encompasses the headwaters of the Hams Fork watershed. The project area is approximately 73 % forested, with lodgepole pine as the predominant forest type, followed by aspen, spruce/subalpine fir, whitebark/limber pine, and Douglas-fir (Bruch 2013). The majority of stands contain a mix of tree species with the pine component significantly affected by the mountain pine beetle. Non-forested areas are willow dominated riparian areas and tall forb/sagebrush/grass communities. The landscape is a natural mosaic with forested and non-forested patches. A variety of fish and wildlife species are found in the area including elk, moose, mule deer, pine marten, northern goshawk, boreal toad, and Colorado River cutthroat trout.

As described above in the untrammeled quality section, there are a variety of existing and past activities that influence, or have influenced, and affected the naturalness and ecological systems in the IRA portion of the project area.

03001 – Lake Alice-Commissary Ridge: The Hams Fork project area portion of IRA 03001 is a mixture of poor to moderately productive soils with lodgepole pine predominating, mixed aspen and lodgepole pine at lower elevations, and mixed conifer at higher elevations. A severe mountain pine beetle epidemic has developed over the last few years in the entire area. Additionally, mistletoe is prevalent in most stands of lodgepole pine which is leading to an infection of the understory lodgepole. Aspen stands are in generally poor condition due to a myriad of diseases and an aging stand component.

Fire suppression may have led to the current majority of older age classes of conifers and aspen. Additionally, aspen is being replaced by conifers in the mixed aspen/conifer stands (Bruch, 2013). Past timber sale activities decreased the amount of dead fuel loading within the project area, increased aspen regeneration, and may have resulted in increased amount of sedimentation in streams, even if only in the short term, along temporary roads and skid trails. Insect and disease activity within the project area have been altering forest conditions also.

Vegetation utilization by livestock manipulates the existing ecological environment, but is mitigated by range readiness inspections and the adherence to annual operating instructions for each allotment. Studies indicate the majority of rangeland plant communities are meeting and/or moving towards desired conditions as described in the Forest Plan in the project area portion of the IRA regardless of current rangeland grazing (USDA, 2012a; USDA, 1990). Grazing allows

for the reduction in fine fuel loading within the project area. Impacts from trampling due to wildlife and livestock grazing effect streambank stability and channel sedimentation.

The overall existing condition of the Natural characteristic is moderate, ranging from high to low, depending on which part of the project area portion of the IRA evaluated. Primarily the low quality areas are in the 35% of the project area IRA that is within a ½ to 3 mile buffer of existing Forest System Roads. The moderate to low natural quality areas exist in approximately half of the project area portion of IRA 03001due to the highly modified and altered characteristic of the area. Although ecological systems are still functioning at a natural and functional level, the scenic modifications and impacts that have occurred as a result of road development, facility development, timber management, and grazing. The further one retreats from this buffer the higher the natural characteristic quality increases.

03001A – Nugent Park-Hams Fork Ridge: The existing condition of the natural quality in IRA 03001A, and the effects of past treatments, are the same as those described above for IRA 03001 in areas that past timber treatments, wildland fires, and grazing has occurred. The above described past activities and 30.2 miles of existing FSR's within the project area similarly creates an existing condition of habitat condition, effectiveness, and connectivity as that described in IRA 03001.

The existing condition of the Natural characteristic is of low quality in the project area portion of IRA 03001A. Roads crisscross the project area portion of the IRA and along with the facilities, gravel pit and bridge, in addition to past and current management activities including grazing, timber harvest and fire suppression have all modified the natural setting to its current existing condition. There is only a small sliver of the project area portion of the IRA that is located ½ mile from any road, and no portions located further than 3 miles from any Forest system road, resulting in the low quality of the natural characteristics.

Undeveloped: The Undeveloped quality monitors the presence of structures, construction, habitations, and other evidence of modern human presence or occupation. In short, this quality is a measure of the present day physical indicators such as the presence and development levels of trails, campsites, structures and facilities as well as the use of motorized equipment and mechanical transport used in the area.

The most noticeable development in both IRA portions of the project area is the presence of open, developed Forest System Roads. Maps from the 1930's show a road system composed of approximately 55 miles of roads throughout the project area including the Kelley, Hams Fork, Little Park Creek, Hobble Creek, Indian Creek, Shingle Mill, South Sawmill, Sawmill, East Fork Ridge, and Hams Fork Ridge roads. These roads were primarily used for logging and livestock activities. Maps form the late 1960's show a much more extensive road system at approximately 110 miles within the project area. In 1977, when the Forest Service began a process to identify areas that would be suitable for the National Wilderness Preservation system both IRA 03001 and 03001A were identified as potential areas even with existing roads present. According to historic maps and imagery analysis there have been approximatly14 miles of roads built in the project area portion of the IRAS's after 1977. These existing developments are now considered part of the existing condition of the IRAs.

03001 – Lake Alice-Commissary Ridge: The project area portion of IRA 03001 is highly developed with open Forest System Roads, bridges, campgrounds, rental cabins, trailheads and trails. Levels of development can be illustrated by the Recreation Opportunity Spectrum classification of the project area. The Recreation Opportunity Spectrum (ROS) is a recreation

management tool by the US Forest to manage and administer natural settings for specific visitor experiences. The project portion of IRA 03001 includes the Primitive, Semi-Primitive Non-Motorized, Semi-Primitive Motorized, and Roaded Natural ROS Classifications.

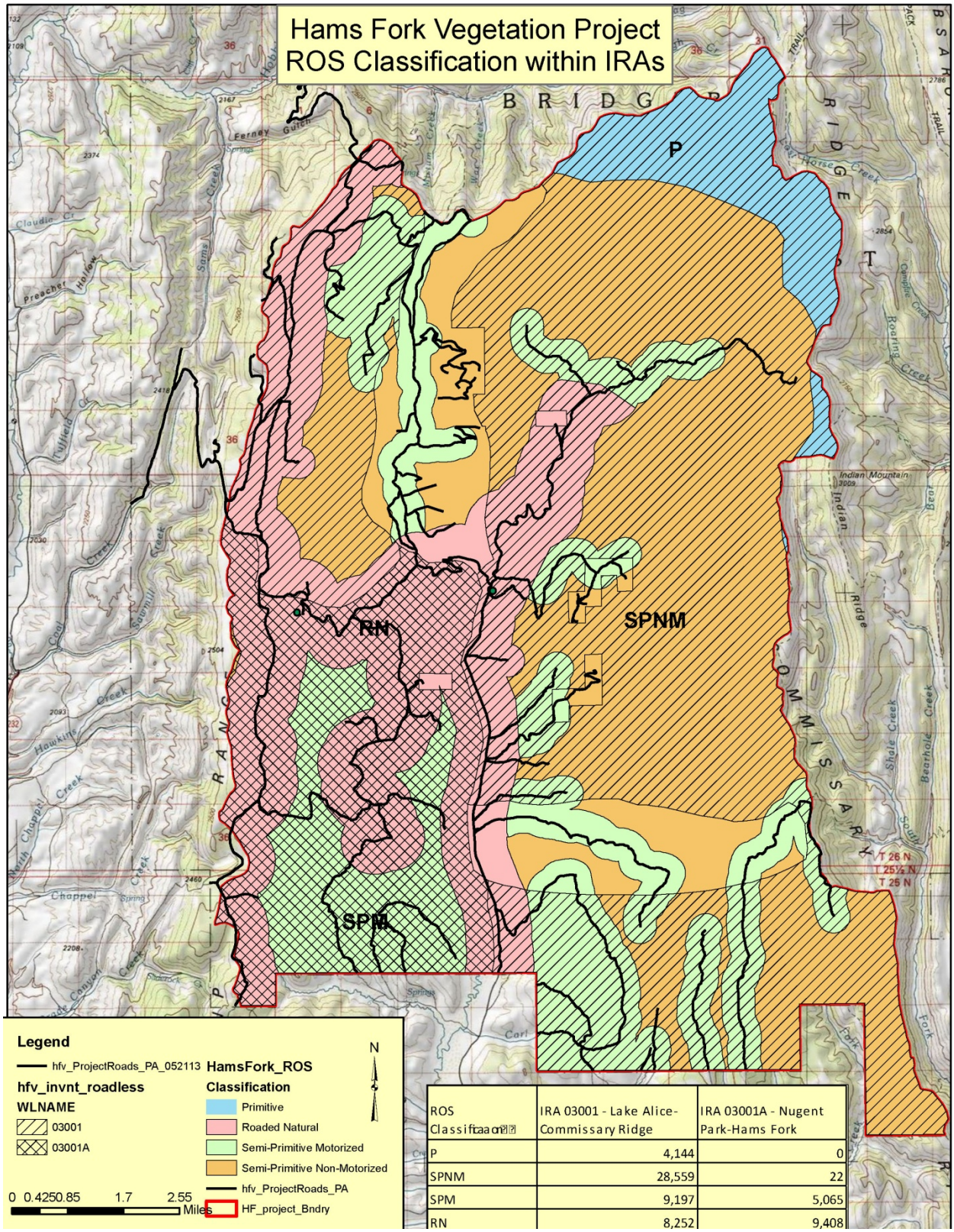
Approximately 56% of the project area portion of IRA 03001 is classified as SPNM, with the remaining 44% made up of the other 4 classifications. Figure 2 illustrates the ROS classifications of the project area and IRA's and includes a table that shows the acres of each ROS within each IRA. ROS settings are described above in the Management Direction of this report. For a full description of the ROS and management direction see the Recreation Report included in the project record.

Thirty-five percent of the project area portion of IRA 03001 is located within ½ mile of a Forest System road or development. There are 10 Forest System Roads (FSRs) within the project area portion of IRA 03001, for a total of 62.08 miles of road. Portions of two of these roads are closed to the public for a total of 57.14 miles of roads open to public use. These roads are included in the Kemmerer Ranger District Motor Vehicle Use Map, and were analyzed for Travel Management for the Kemmerer Ranger District in 2009. 7 of the open FSRs are Maintenance Level (ML) 2 roads, which are less developed, infrequently maintained, and intended for high clearance vehicles only. Three roads are Maintenance Level 3 (ML3) roads which are more developed frequently maintained, and suitable for low clearance vehicles. Additionally, there are two bridges on FSR 10062 in the project area portion of IRA 03001.In addition to the FSRs within the project area, portion of the IRA, there are multiple illegal, user created, ATV and two-track roads.

In addition to roads, there are two developed facilities within the project area portion of IRA 03001: Kelley Guard Station and Hams Fork Campground. The Kelley Guard Station is a historic Forest Service guard station built by the Civilian Conservation Corps in 1933. Located about 45 miles north of Kemmerer, Wyoming, along the Big Springs Scenic Backway, Kelley is on the Forest Service reservation system, and available to rental by the public through the Recreation.gov website. Kelley Guard Station provides the public with an alternative to dispersed camping, or camping in campgrounds in the Hams Fork project area.

The Hams Fork Campground is located in the center of the project area off of the main Hams Fork access road, FSR 10062. The campground is located in a mixed conifer stand to the east of Hams Fork Creek, with camps sites provided on either side of the road. There are a total of 13 public sites, and one host site in the Hams Fork Campground. Potable water, trash services, and vault toilet facilities are also provided. Hams Fork Campground is open, on average from July 4 – September 30, or as weather and temperature permit. General maintenance occurs on develop sites, maintaining facility site condition, and ensuring that sites are safe for public use.

There are four trailheads within the Hams Fork Vegetation Project area. Although all trailheads have some signing, the Hams Fork Trailhead located near the Hams Fork Campground is the most developed with a set of corrals constructed with metal drill stem material as well as wood rails. The Hams Fork Trailhead provides access to the Hams Fork-Red Park Trail that enters into the largely unroaded area west of Commissary Ridge. The Hams Fork corral and trailhead is heavily used in the summer and fall by stock users packing into the backcountry for hunting but also by



ROS Classification	IRA 03001 - Lake Alice-Commissary Ridge	IRA 03001A - Nugent Park-Hams Fork
P	4,144	0
SPNM	28,559	22
SPM	9,197	5,065
RN	8,252	9,408

Figure 11. Recreation opportunity spectrum (ROS) classifications by inventory roadless area (IRA).

individuals camped at Hams Fork Campground to hold stock for day trips while they stay in the area. The project area portion of IRA 03001 includes portions of 13 Forest System trails, for a total of 32.15 miles. Although the majority of use on these trails is pack and saddle stock, there is some foot traffic, mostly during the fall hunting season.

In summary the overall undeveloped characteristic for the project area portion of IRA 03001 could be classified as moderate, although it ranges from high to low in different portions of the project area. Although over half of the area is classified as Primitive or Semi-Primitive Non-Motorized, there are facilities that are inconsistent with a undeveloped characteristic and setting including roads, bridges, camp facilities and other developments in 35% of the project area portion of the IRA, that classify that portion of the IRA with a low quality undeveloped characteristic.

03001A – Nugent Park-Hams Fork Ridge: The project area portion of IRA 03001A is smaller than the project area portion of IRA 03001, but is considerably more developed with open Forest System Roads, one bridge, the Big Spring gravel pit, and one developed picnic site. The project portion of IRA 03001A includes Semi-Primitive Non-Motorized, Semi-Primitive Motorized, and Roaded Natural ROS Classifications. Approximately 65% of the project area portion of IRA 03001A is classified as Roaded Natural (RN), 35% is classified as Semi-Primitive Motorized and only 0.15% of the project area portion of the IRA classified as Semi-Primitive Non-Motorized. Figure 2 illustrates the ROS classifications of the project area and IRA's and includes a table that shows the acres of each ROS within each IRA.

There are a total of 11 Forest System Roads (FSRs) within the project area portion of IRA 03001A, for a total of 30.2 miles of road. One of these roads is closed to the public, for a total of 27.9 miles of roads open to the public. These roads are included in the Kemmerer Ranger District Motor Vehicle Use Map, and were analyzed for Travel Management for the Kemmerer Ranger District. 7 of the open FSRs are Maintenance Level (ML) 2 roads, which are less developed, infrequently maintained, and intended for high clearance vehicles only. 3 roads are Maintenance Level 3 (ML3) roads which are more developed frequently maintained, and suitable for low clearance vehicles. There is one bridge, the West Fork of Hams Fork, in the project area portion of the IRA. Additionally, the Big Spring gravel pit, which is approximately 2 acres in size, is also within the project area portion of IRA 03001A. In addition to the FSRs within the project area, portion of the IRA, there are multiple illegal, user created, ATV and two-track roads,

There are two developed sites within the project area portion of IRA 03001A, the Big Spring Picnic Area and the historic Elk Creek Guard Station. The Big Spring Picnic Site is located at the scenic Big Spring. From the parking lot visitors follow the boardwalk through the willows up the rock trail to the falls, where you can see the spring gushing from the mountain side. If you follow the trail back into the trees there are two picnic sites with fire pits and grills. Big Spring flows year round and is a popular stop for snowmobilers when traveling the groomed trail system in the winter. The site is free to use. The Elk Creek Guard station is an administrative site that is an uninhabitable historic guard station that is lightly maintained for its historic and interpretive value. There is a buck-rail fence around Elk Creek Guard Station to prevent livestock from damaging the building, however a gate does allow public access to view the guard station and read the interpretive information that is available.

There are no Forest System Trails or Trailheads within the project area portion of the IRA.

The undeveloped quality for the project area portion of IRA 03001A is low. Although much of the area is classified as semi-primitive, none of the areas is Primitive, and there are facilities

inconsistent with an undeveloped setting including roads, picnic areas, and the gravel pit. The area shows many signs of human activity and development.

Opportunities for Solitude: This quality monitors conditions that affect the opportunity for people to experience solitude, or the isolation from the sights and sounds of management activities and the presence of others. Solitude is measured by considering the presence of screening, distance from impacts by management activities and developed facilities.

Analyzing the ROS classifications of the project area portion of the IRAs provides the best evaluation of the degree of solitude currently available throughout the IRA, as ROS classifications determine remoteness and solitude as specific mileages from roads, developed facilities, and developed trailheads. Table 38 shows the standards and guidelines for the Remoteness Indicator for ROS Classification (Tongas National Forest, 2012).

Table 38. Remoteness Indicator Standards and guidelines.

ROS Class	Remoteness Indicator Standard and Guideline
Primitive	No or infrequent sights and sounds of human activity are present. Setting is located more than 1.5 hours walking distance or 3 miles, from any human developments.
Semi-Primitive Non-Motorized	Nearby sights or sounds of human activity are rare, but distant sights or sounds may occur. Setting is located more than ½ hour walking distance, or approximately ½ mile from roads and trails open to motorized recreation and clearcut harvest areas.
Semi-Primitive Motorized	Nearby sights or sounds of human activities are rare, but distant sights or sounds may occur. Setting is located within ½ hour walk or within ½ mile of infrequently traveled roads which are open and maintained for passage by high clearance and four-wheel drive vehicles (Maintenance level 2) and provide access to recreation opportunities and facilities.
Roaded Natural	Remoteness is of little importance, but low to moderate concentrations of human sights and sounds are preferred. Setting is located within ½ mile of moderated to heavily-traveled roads which are maintained to levels 3, 4, and 5 and open for use by the public.

03001 – Lake Alice-Commissary Ridge: The project area portion of IRA 03001 has a ranging opportunity for solitude from low to high depending on the time of the season, and the portion of the IRA occupied. Approximately 65% of the project area portion of IRA 03001 is within the Primitive or Semi-Primitive Non-Motorized ROS classifications (57% SPNM, 8% P); with the remaining 35% within the Semi-Primitive Motorized and Roaded Natural Settings.

The 65% of the project area portion of the IRA that are classified for P and SPNM s are located away from developed motorized routes, and have little illegal OHV use in them. However, sights and sounds of roads can still be observed from some portions of this area. Users in this area can expect to be isolated from the sights and sounds of management activities and the presence of others. In the summer time use levels in the P and SPNM areas is considerably lower where parties in the area may encounter up to 2 parties a day, but more than likely will see no one. In

the fall use levels do increase as hunting season sees more members of the public utilizing the unroaded areas on foot and horseback for big game hunting. During the fall it is more common to 3-6 parties within a day.

In the 35% of the IRA that is located within SPM and RN ROS classifications however, the current opportunities for solitude are low. These areas are located immediately around open motorized routes and developed sites, especially for the areas around FSR 10062, which is the primary travel route and a designated Scenic Backway by the state of Wyoming. These portions of the IRA receive a considerably higher amount of use, primarily by motorized vehicles, all year round. Use in the summer in these areas is lower, however it is common on weekends to see anywhere from 6 – 15 parties in a day dispersed camping, utilizing developed sites, or using OHV's on open routes. In the fall, however use increases considerably and visitors can easily encounter over 20 parties in a day utilizing the area. In the hunting season, illegal OHV use increases in the immediate vicinity of open and exiting travel routes as hunters retrieve game carcasses.

In summary there is a moderate opportunity for solitude in the project area portion of the IRA. Less than half of the area can be classified as Primitive and there are portions of the area, however the area is accessed by roads and has disturbances within the area. The portion of the IRA that is located within ½ - 3 miles of open roads and developments provides a low opportunity for solitude as there are heavily used roads, easily accessible, and little opportunity for visitors to feel alone and away from signs of civilization.

03001A – Nugent Park-Hams Fork Ridge: The project area portion of IRA 03001A has considerably less opportunities for solitude than IRA 03001. Only 0.15% of the project area portion of the IRA is located in SPNM class, resulting in 99.85% of this area being located within ½ mile of an open FSR in SPM or RN classified areas. With the majority of the project area portion of the IRA being located immediately around open motorized routes, developed sites, and for the portion around FRS 10062, which is the primary travel route and a designated Scenic Backway by the state of Wyoming, sights and sounds of human presence and activities are heavily present. These portions of the IRA receive a high amount of use, primarily by motorized vehicles, all year round. Use in the summer in these areas is lower, however it is common on weekends to see anywhere from 6 – 15 parties in a day dispersed camping, utilizing developed sites, or using OHV's on open routes. In the fall, however use picks up considerably and visitors can easily encounter over 20 parties in a day utilizing the area. In the hunting season, illegal OHV use increases in the immediate vicinity of open and exiting travel routes as hunters retrieve their carcasses.

In summary there is a low quality of opportunities for solitude in the project area portion of IRA 03001A. There are no portions of the project area portion of the IRA that are classified as Primitive, and the IRA is crossed with multiple roads that see medium to high levels of use. Additionally there are few to no areas within the project area portion of the IRA that can be accessible away from roads where others would not be seen or heard.

Opportunities for Primitive Recreation: This quality is a measure of the experiences available without human developments and to feel a part of nature, with a high degree of challenge and reliance on outdoor skills rather than facilities.

03001 – Lake Alice-Commissary Ridge: There are multiple factors that impact opportunities for primitive recreation within an area including developed facilities, developed trailheads, developed roads, and even developed trail systems. As described above the undeveloped section,

there are two developed facilities within the project area portion of IRA 03001, 4 trailheads, 57.14 miles of open FSRs, and 32.15 miles of Forest System Trails. The 35% of the project area portion of the IRA that is classified as SPM and RN encompasses the majority of these developments, except for the trails, and thus provide little to no opportunity for primitive recreation in the area.

In the 65% of the project area designated as P and SPNM however, there are much higher opportunities for primitive recreation. The P and SPNM areas of the project area portion of IRA 03001 consist of 32,703 acres, and the 32.15 miles of trials are spread throughout this area. Even with the trails present there is a large amount of this area that does not have any developments and offers a high opportunity for primitive recreation. The rugged terrain in the majority of the project area portion of the IRA provides challenging terrain to users to test their skills and abilities in primitive and remote settings.

Similar to the opportunity for solitude, the project area portion of IRA 03001 offers a moderate opportunity for primitive recreation. Less than half the area is classified as Primitive, however the combined area of P and SPNM areas away from roads and developments offers the ability for visitors to feel alone. The area removed from roads, trailheads, and developments does require some degree of physical ability, and knowledge. However, the challenging terrain features do add to the overall appeal of the area, they do not contribute to the visitor's primary reason for visiting the area. The 35% of the project area portion of IRA 03001 classified is heavily developed with highly maintained and traveled roads, physical developments, and other disturbances.

03001A – Nugent Park-Hams Fork Ridge: The project area portion of IRA 03001A has very little opportunity for primitive recreation. There are a total of 30.2 miles of FSR, two developed facilities, and the Big Spring gravel pit in the project area portion of the IRA. Only 0.15% of the project area portion of the IRA is located in SPNM class, resulting in 99.85% of this area being located within ½ mile of an open FSR. With the majority of the project area portion of the IRA being located immediately around open motorized routes and developed sites there is little to no opportunity for users to escape from the influences of modern development and rely upon their own outdoor skills rather than facilities. Additionally, there are many user created routes that further provide motorized access to even the more remote and primitive portions of the IRA portion of the project area.

Similar to the opportunity for solitude section above, the opportunities for primitive recreation are low in the project area portion of IRA 03001A. There are no areas classified as primitive in the project area portion of the IRA, areas are easily accessible with a high degree of development that requires only average physical ability and limited knowledge and skill for safe travel.

Special Features: This is an attribute that recognizes that the area may contain other values of ecological, geologic, scientific, education, scenic or historical or cultural significance. Unique fish and wildlife species, unique plants or plant communities, potential or existing resource natural areas, outstanding landscape features, and significant cultural resource sites should all be considered as types of value that might exist.

03001 – Lake Alice-Commissary Ridge: There is a relatively low value of special features identified for the project area portion of IRA 03001. In the 1983 Roadless Area Reevaluation Study, it was indicated that there were no special ecological features in the IRA as a whole, so therefore none identified in the project area portion of the IRA (Forest, 1983). Special features that have been identified in the project area portion of IRA 03001 are mainly ecologically based in the form of habitat for Threatened and Endangered Species (TES).The project area portion of

IRA 03001 has been identified as having potential habitat for two Federally Listed species including Canada lynx and grizzly bear. Additionally, a self-sustaining (wild) population of Colorado River Cutthroat trout is present in the Hams Fork watershed (Fogle, 2013).

There are approximately 37,348 acres of the Hams Fork Lynx Analysis Unit (LAU) within the project area portion of IRA 03001. Fragmented forestland habitat, as existing in the project area portion of the IRA is generally of lesser suitability to lynx (DeLong, Biological Assessment for the Hams Fork Vegetation Project, 2013). Historically, there have been lynx occurrences on the Kemmerer Ranger District. The last documented tracks within the project area were in 2000, and it was anticipated that the individuals were simply just moving through the project area. The most recent occurrence of documented lynx activity was from August 2009 – March 2010 where a collared lynx visited areas north of the project area (DeLong, Biological Assessment for the Hams Fork Vegetation Project, 2013).

The IRA portion of the project area also has potential for Grizzly Bear habitat, though the area is outside the Grizzly Bear Primary Conservation Area and no Grizzly Bear Management Units are mapped within the project area (Moody, Hammer, Bruscino, Bjornlie, Gogan, & Debolt, 2002) Furthermore, the project area portion of the IRA is not indicated as suitable or acceptable habitat for grizzly bears by the United States Fish and Wildlife Service (2007). Additionally there have been no verified grizzly bear occurrences in the project area portion of IRA 03001.

There are no outstanding landscape features identified in the project area portion of the IRA, nor are there any potential or existing research natural areas (Forest, 1983). Any special features or historical features that have been identified in the IRA exist outside the project area boundary.

In summary the special features characteristic is of low quality in the project area portion of IRA 03001. There are no real scientific, educational or historical values identified in the area, and although there are some identified values in the form of wildlife habitat, these values are common throughout the Bridger-Teton National Forest and the region. Additionally there are no features of particular outstanding character identified, nor does the project area portion of the IRA contain an established, candidate or eligible special areas, e.g. wild and scenic river and research natural area.

03001A- Nugent Park-Hams Fork Ridge: As stated above in the description for IRA 03001, there is also a very low value of special features identified in the project area portion of IRA 03001A. The special features listed in the above, also apply to the project area portion of IRA 03001A.

The quality for special features in the project area portion of IRA 03001A is low as there are no scientific, education or historical values identified, and any values identified are common throughout the Bridger-Teton. Additionally there are no established, candidate, or eligible special areas.

***Manageability*:** This is a measure of the ability to manage an area to meet the size criteria (5,000 + acres), the resulting configuration of the potential wilderness, and the interaction of other elements.

03001 – Lake Alice-Commissary Ridge: Overall, current size, shape, and existing uses of the project area portion of IRA 03001 is not ideal for manageability as a wilderness. There are 62.08 miles of existing, designated FSRs within the project area portion of the IRA, as well as multiple developed facilities. As the existing roads have been present long prior to the IRA designation, have been developed and maintained after the RARE II Evaluation, and are major access points to

the district, it is not feasible for the 35% of the IRA classified as Roaded Natural or Semi-Primitive Motorized, to be considered to be managed for wilderness

The overall manageability of the project area portion of IRA 03001 is moderate. The 35% of the project area portion of the IRA that is roaded and developed could not be included in a wilderness designation. However, the more remote, 65% of the project area portion of the IRA that is located in P or SPNM ROS class could be suitable for manageability. If IRA 03001 as a whole was considered for inclusion into the wilderness system, roaded and developed areas would need to be removed but should not affect the overall suitability of the IRA as a whole.

03001A – Nugent Park-Hams Fork Ridge: The project area portion of IRA 03001A is not suitable for management as a wilderness area. With over 99% of the project area portion of the IRA classified as having motorized use, and the long history of the existence and use of the roads, it would not be feasible to manage this area as a wilderness. Furthermore, with low lying, open and gentle terrain it could be difficult to prevent incompatible uses in the area even if existing roads were closed to motorized uses.

The manageability of the project area portion of IRA 03001A is low. The area is crisscrossed with roads and developments, and any areas that are not developed or roaded are too small to make a suitable wilderness. Additionally the topography and vegetation and the activity in the area is not a deterrent to prohibited uses. Lastly, activity in the surrounds area will affect the manageability of the area including traffic and noise. Even if the project area portion of the IRA was removed it is most likely that the IRA as a whole would be suitable for wilderness designation, as it is similar developed, would be a small portion of land, and the terrain does not naturally deter prohibited uses.

Summary of Existing Wilderness Attributes:

The project area portions of both IRA 03001 and 03001A have a varying degree of wilderness qualities and attributes. In the majority of the project area portion of the IRAs substantial past activities and current developments have had widespread impacts to the untrammeled, natural, and undeveloped characteristics of the IRAs.

IRA 03001: **– Lake Alice-Commissary Ridge**: The untrammeled characteristic in the project area portion of IRA 03001 is of moderate quality. Past and present management activities have modified the untrammeled state of the project area portion of the IRA, primarily in portion around the existing roads and developments. The natural characteristic in IRA 03001 is also of moderate quality, but can range from high to low depending on which portion of the IRA is evaluated. Although ecological systems are still functioning in a more or less natural level, road and facility development, timber management, grazing and fire suppression have all resulted in modifications to the ecological system in the area. The further one retreats from this buffer the higher the natural characteristic quality increases

The undeveloped characteristic in the project area portion of the IRA is moderate to low. Although 65% of the project area is classified as P or SPNM areas within the ROS class, there is heavy development in the remaining 35% of the project area portion of the IRA including 62.08 miles of roads, multiple trailheads and a developed campground. Opportunities for both solitude and primitive recreation are both at moderate quality within the project area portion of IRA 03001 as less than half of the area can be classified as Primitive. Opportunities of solitude and primitive recreation fluctuate between high or low depending on the portion of the IRA occupied. In the

35% located around the roads and developed areas opportunities are low. However, in the more primitive and remote areas these opportunities increase.

The quality of special features in the project area portion of IRA 03001 is low. There are no features of outstanding character and the area does not contain any established, candidate or eligible special areas. Additionally, the manageability of the area is of moderate to low quality. The 35% of the project area located within ½ - 3 miles of roads would not be suitable for manageability as a wilderness. However, if the roaded portion was removed from consideration, the IRA as a whole could still be considered for eligibility.

IRA 03001A– Nugent Park-Hams Fork Ridge: The untrammeled characteristic in the project area portion of IRA 03001A is of low quality. Past and present management activities have modified and untrammeled state of the project area portion of the IRA, primarily in portion around the existing roads and developments. The natural characteristic in IRA 03001A is also of low quality, Although ecological systems are still functioning in a more or less natural level, road and facility development, timber management, grazing and fire suppression have all resulted in widespread modifications to the ecological system across the project area portion of the IRA.

The undeveloped characteristic in the project area portion of the IRA is low. 99.85% of the project area portion of the IRA is located within ½ mile of a developed Forest System road. There are a total of 30.2 miles of roads, a developed picnic site, a gravel pit, and a historic guard station. Opportunities for both solitude and primitive recreation are low within the project area portion of IRA 03001A as there is no part of the IRA classified as Primitive. Only one small 22 acre area is present where visitors can get further than ½ mile from a developed road.

The quality of special features in the project area portion of IRA 03001A is low. There are no features of outstanding character and the area does not contain any established, candidate or eligible special areas. Additionally, the manageability of the area is of low quality. The area is crisscrossed with roads and has no remote areas within it. Additionally the topography and vegetation are not a deterrent to prohibited uses. It is difficult to say if the removal of the project area portion of the IRA from the IRA as a whole would still allow for wilderness designation as the remaining portion is also roaded, with open accessible topography.

Existing Current Roadless Characteristics

Soil, water, and air resources: This characteristic is used to identify any unique or critical watershed or air shed resources and the habitats that depend on them.

The project area portions of the IRAs are located within the Hams Fork and Beaver Creek drainages. The vegetation in the project area of the IRA is variable depending on elevation and aspect. The dominant forest type is lodgepole pine but aspen, spruce/subalpine fir, whitebark/limber pine and Douglas fir forests also exist. Open areas also exist with willow and riparian dominated wet meadows. Understory vegetation can be very dense in areas without logging history. Areas with intense logging history tend to have less ground cover and more open areas with bare soil exposed.

03001 – Lake Alice-Commissary Ridge: Past harvesting activities within the project area portion of IRA 03001 include conifer removal, clearcuts with reserves and salvage/sanitation thinning, and prescribed burning have occurred. Additionally, there are 62.08 miles of roads built and maintained within the project area of the IRA. These past disturbances have resulted to an increased soil compaction and overall general soil disturbance associated with old primary skid trails and landings. Grazing disturbance including compaction and erosion was found also in the

project area portion of the IRA. Compaction from cattle grazing is generally concentrated near water sources. The area was also identified as having several large active or potentially active land slump areas, and large tracts with natural surface slope instability. The overall water quality in the project area portion of the IRA is in good condition.

No unique or critical soil, watershed or air quality resources have been identified within the project area portion of IRA 03001.

03001A – Nugent Park-Hams Fork Ridge: The existing condition of soil, water and air resources for the project area portion of IRA 03001A is the same as that listed above for IRA 03001.

No unique or critical soil, watershed or air quality resources have been identified within the project area portion of IRA 03001A.

Sources of public drinking water: This characteristic identifies any public drinking water systems or sources within the project area.

03001 – Lake Alice-Commissary Ridge: There are two developed sources of public drinking water in the project area portion of IRA 03001: Hams Fork Campground and Kelley Guard Station. Both of these sites are fee sites that are open to the public, with water systems maintained by the Forest Service, and when open to the public (typically May – September) are tested monthly for coliform levels. These water systems are well based systems.

03001A – Nugent Park-Hams Fork Ridge: There are no sources of public drinking water located within the project area portion of the IRA.

Diversity of plant and animal communities: This characteristic discusses the diversity of plan and animal communities in the IRAs and identifies any unique plant and animal communities within the area.

03001 – Lake Alice-Commissary Ridge: The project area is approximately 73% forested, with lodgepole pine as the predominant forest type, followed by aspen, spruce/subalpine fir, whitebark/limber pine, and Douglas-fir. The majority of stands contain a mix of tree species with the pine component significantly affected by the mountain pine beetle. Non-forested areas are willow dominated riparian areas and tall forb/sagebrush/grass communities. The landscape is naturally mosaic with forested and non-forested patches.

Insect and disease activity within the project area has been altering forest conditions. Recent noticeable changes are mortality to lodgepole from mountain pine beetle at outbreak levels and the occurrence of white pine blister rust. The loss of mature pines has resulted in a modification of sand and age-class structure and species composition. Due to stand replacing fire and a history of fire suppression, conifer encroachment has increased reducing the size and frequency of aspen and sage communities.

The entire project area, including the IRA, provides habitat and supports big game and trophy wildlife, including black bear, elk, moose, mountain lion, pronghorn, and mule deer. Additionally the IRA portion of the project area provides potential habitat for grizzly bear, Canada Lynx, gray wolf, and Colorado River cutthroat trout. There are also various amphibians and reptile species found in the IRA portion of the project area.

The IRA portion of the project area provides a habitat to migratory birds using sagebrush habitats and sagebrush obligate species such as Brewers sparrow, sage thrasher, and sage sparrow. Additionally the project area of the IRA provides the potential habitat for a variety of bird species, including nine Level I and II priority bird species associated with the riparian areas within the project area including Bald Eagle and Harlequin Duck.

There is a wide diversity of plant and animal communities within the project area portion of IRA 03001 even though there is not an absence of disturbance in the area. There are 62 of Forest System Roads, as well as developed campgrounds, trailheads, and bridges in 35 % of the project area portion of the IRA that has affected habitat connectivity. The developments in the area have long existed, as early as the 1900's logging and grazing activities have occurred in the area. Additionally, the long history of roads used for logging operations in the area has altered connectivity but diverse plant and animal populations have adapted and continue to thrive.

03001A – Nugent Park-Hams Fork Ridge: The existing diversity of plant and animal communities for the project area portion of IRA 03001A is similar to that listed above for IRA 03001. The project area portion of the IRA is not an undeveloped area of land. Over 99% of the area is located within ½ mile of a FSR, with roads crisscrossing the entirety of the project area, as well as developed picnic sites, gravel pits, and a historic guard station. There are a total of 30.2 miles of FSR within the project area portion of the IRA. The long history of roads, logging operations, and grazing activities has led to species adapting to the existing development in the area.

Habitat for Threatened and Endangered Species (TES) and species dependent on large undisturbed areas of land: This characteristic identifies any TES or Sensitive Species within the Roadless area.

The project area portion of IRA 03001 has been identified as having potential habitat for two Federally Listed species: Canada lynx and grizzly bear. Additionally, there are 31 Sensitive Species or habitat for Sensitive Species identified in the Bridger-Teton National Forest Land and Resource Management Plan. Sensitive Species identified in the project area are big horn sheep, fisher, gray wolf, great grey owl, boreal owl, northern goshawk, bald eagle, northern three-toed woodpecker, Columbia spotted frog, boreal toad, whitebark pine, Payson's milkvetch, and creeping twinpod (DeLong 2013; Johnson 2013).

03001 – Lake Alice-Commissary Ridge: The project area portion of IRA 03001 is not an unroaded, undisturbed area of land. There are a total of 62.08 miles of Forest Service Roads (FSRs) in the project area portion of the IRA, including highly traveled and maintained roads, as well as developed facilities.

There are approximately 37,348 acres of the Hams Fork Lynx Analysis Unit (LAU) within the project area portion of IRA 03001. Even though a large proportion of the LAU in the project area is forested, the forest land matrix is naturally fragmented by big sagebrush and other rangeland types, riparian zones, and rock bands. A large number of old clearcuts and historical fires add to the inherent habitat diversity. There are no large expanses of unbroken forestland in the project area portion of the IRA. Fragmented forestland habitat, as existing in the project area portion of the IRA is generally of lesser suitability to lynx (DeLong, Biological Assessment for the Hams Fork Vegetation Project, 2013).

The historical range of Canada Lynx includes Wyoming, with the southernmost natural population of lynx found in the Wyoming Range, Commissary Ridge and Tunp Range.

Historically, there have been lynx occurrences on the Kemmerer Ranger District. The last documented tracks within the project area were in 2000, and it was anticipated that the individuals were simply just moving through the project area. The most recent occurrence of documented lynx activity was from August 2009 – March 2010 where a collared lynx visited areas north of the project area (DeLong, Biological Assessment for the Hams Fork Vegetation Project, 2013).

The IRA portion of the project area also has potential for Grizzly Bear habitat, though the area is outside the Grizzly Bear Primary Conservation Area and no Grizzly Bear Management Units are mapped within the project area (Moody, Hammer, Bruscino, Bjornlie, Gogan, & Debolt, 2002) Grizzly bears once roamed the Wyoming Range but were extirpated from much of their historic range by the middle of the twentieth century (U.S. Fish and Wildlife Service, 1993). Furthermore, the project area portion of the IRA is not indicated as suitable or acceptable habitat for grizzly bears by the United States Fish and Wildlife Service (2007). Additionally there have been no verified grizzly bear occurrences in the project area portion of IRA 03001.

In summary, there is potential habitat for both lynx and grizzly bear in the project area portion of IRA 03001; however there have been no instances of occurrences within the project area in the last 10 years. The Fish and Wildlife Service has not determined that there is suitable or acceptable habitat for grizzly bears within the project area of the IRA. There are a variety of "Sensitive Species" as identified in the Bridger-Teton Forest Plan that also have the potential to be present in the project area including boreal toads, goshawk, and grey wolf and 12 plant species. As described above, although over half of the project area portion of the IRA is a large undisturbed area, 35% of the area is roaded and developed which limits habitat connectivity.

03001A – Nugent Park-Hams Fork Ridge: Habitat for TES and Sensitive Species for the project area portion of IRA 03001A is similar to that listed above for IRA 03001. There are a total of 8,521 acres of the Hams Fork LAU within the project are apportion of IRA 03001A. As indicated above, there have been no verified grizzly bear occurrences in the project area portion of the IRA. A total of 30.2 miles of FRS's exist in the project area portion of the IRA, including very highly used routes, which further bisect the potentially suitable habitat.

In summary the project area portion of the IRA does have potentially suitable habitat for TES and Sensitive Species. However, there have not been any occurrences of either TES species in the area in the past 10 years. There is a high concentration of roads within the IRA that bisect suitable habitat and reduce habitat connectivity.

Primitive and semi-primitive classes of recreation: This characteristic describes opportunities for primitive and semi-primitive classes of recreation within the Roadless area.

03001 – Lake Alice-Commissary Ridge: The project area portion of IRA 03001 has a ranging opportunity for primitive and semi-primitive classes of recreation depending on the portion of the IRA occupied. Approximately 65% of the project area portion of IRA 03001 is within the Primitive (P) or Semi-Primitive Non-Motorized (SPNM) ROS classifications; with the remaining 35% within the Semi-Primitive Motorized (SPM) and Roaded Natural (RN) Settings, Figure 2.

The 35% of the project area portion of the IRA that is classified as SPM and RN encompass the majority of roads and developed facilities, and thus provide little to no opportunity for primitive classes of recreation in the area. There are three developed facilities within the project area portion of IRA 03001, 4 trailheads, 57.14 miles of open FSRs, and 32.15 miles of Forest System Trails within the project area portion of IRA 03001. These portions of the IRA receive a

considerably higher amount of use, primarily by motorized vehicles, and provide very limited opportunities for primitive and semi-primitive recreation.

In the 65% of the project area designated as P and SPNM there are much higher opportunities for primitive and semi-primitive classes of recreation. The P and SPNM areas of the project area portion of IRA 03001 consist of 32,703 acres, and the majority of the 32.15 miles of trials are spread throughout this area. Even with the trails present there is a large amount of this area that does not have any developments. The rugged terrain in the P and SPNM classified areas of the project area portion of the IRA provides challenging terrain to users to test their skills and abilities in primitive and remote settings.

In summary opportunities for primitive and semi-primitive classes of recreation are moderate in the project area portion of the IRA. Although the more highly developed portion of the IRA does not provide many opportunities for primitive and semi-primitive recreation, the 65% of the IRA that are further than ½ - 3 miles away from developed roads and sites offers a higher degree of primitive and semi-primitive forms of recreation.

03001A – Nugent Park-Hams Fork Ridge: The project area portion of IRA 03001A has considerably fewer opportunities for solitude than IRA 03001. Only 0.15% of the project area portion of the IRA is located in SPNM class, resulting in 99.85% of this area being located within ½ mile of an open FSR. With the majority of the project area portion of the IRA being located immediately around open motorized routes, developed sites, and for the portion around FRS 10062, which is the primary travel route and a designated Scenic Backway by the state of Wyoming, sights and sounds of human presence and activities are heavily present. There are a total of 11 Forest System Roads (FSRs) within the project area portion of IRA 03001A, for a total of 30.2 miles of road. One of these roads is closed to the public, for a total of 27.9 miles of roads open to the public. Additionally, there are two developed sites within the project area portion of IRA 03001A, the Big Spring Picnic Area and the historic Elk Creek Guard Station.

The project area portion of IRA 03001A has very little opportunity for primitive and semi-primitive classes of recreation. With the majority of the project area portion of the IRA being located immediately around open motorized routes and developed sites there is little to no opportunity for users to escape from the influences of modern development and rely upon their own outdoor skills rather than facilities.

Reference Landscapes for research study or interpretation: This Roadless Characteristic describes any unique reference landscapes that exist within the Roadless area.

03001 – Lake Alice-Commissary Ridge: The major physiographic features of the project area portion of IRA 03001 are the Hams Fork Basin and Commissary Ridge. These two features are characterized by a diverse landscape and scenic experiences for travelers and residents of the area. The terrain of the Hams Fork watershed ranges from gentle to rugged, with elevations generally below 9,000 feet. Indian Mountain along Commissary Ridge is the highest point at 9,871 feet. The project area portion of IRA 03001 is remote from population centers and major highways, but it is a local and regional attraction, offering dispersed roadside camping and backcountry recreation.

Existing visual modifications to the natural setting within, and visible from, the IRA portion of the project area consists of three developed facilities, 4 trailheads, 57.14 miles of open FSRs, and 32.15 miles of Forest System Trails.

There are no portions of the project area portion of IRA 03001 that have been identified as a reference landscape for research, study, or interpretation.

03001A – Nugent Park-Hams Fork Ridge: The major physiographic features of the project area portion of IRA 03001A are the Hams Fork Basin, Tunp Range to the west and the view of Commissary Ridge to the east. These features are characterized by a diverse landscape and scenic experiences for travelers and residents of the area. The terrain of the Hams Fork watershed ranges from gentle to rugged, with elevations reaching roughly 8,500 feet at the tallest points along the Tunp Range. The project area portion of IRA 03001A is remote from population centers and major highways, but it is a local and regional attraction, offering dispersed roadside camping and backcountry recreation.

Existing visual modifications to the natural setting within, and visible from, the IRA portion of the project area consists two developed facilities and 27.9 miles of open FSRs.

There are no portions of the project area portion of IRA 03001A that have been identified as a reference landscape for research, study, or interpretation.

Landscape character and integrity: This characteristic describes the scenic quality and character of the Roadless area. For a full report on visual quality objectives and existing landscape character, please see the Hams Fork Visual Quality Report.

03001 – Lake Alice-Commissary Ridge: The existing scenic landscape characteristic for the IRA 03001 is distinctive in appearance which references the special landform features of Lake Alice and Commissary Ridge. Lake Alice is a large natural lake impounded behind a landslide. Its deep water and scenic vistas, as well as its location a mile and a half from the Hobble Creek campground and trailhead, make it a popular destination for fisherman, campers, and hikers in the summer and early fall. The Commissary Ridge portion of the area is fairly isolated and rugged. The landscape contains many extensive stands of lodgepole and coniferous trees, aspen, open sage brush meadows with large amount of visually attractive flowering forbs during the summer season. The only special scenic feature identified in IRA 03001 in the 1983 Roadless Area Reevaluation Study was Lake Alice, which is outside the project area (Forest, 1983).

As described in above sections the project area portion of IRA 03001 includes recreational developments, high use of dispersed camping areas, the Big Springs scenic backway, two guard stations, livestock grazing and miles of forest system roads and trails. Overall the scenic integrity on the Bridger-Teton National Forest is in decline, particularly in the Hams Fork watershed where dead trees in large numbers can be seen on much of the forest and public concern for aesthetics is rising (Barthelenghi, 2013). The distinctive naturalness is basically intact with the exception of unpaved Forest Service roadways and a few rural developments, which all met visual quality objectives of retention.

03001A – Nugent Park-Hams Fork Ridge: The existing scenic quality and landscape characteristic for the IRA 03001A, is quite common in appearance consisting of routine dense stands of dead and dying lodge pole pine, open hill sides and some open sagebrush meadows none of which is usual or unique. Although developments and miles of roads and trails differ the overall landscape character and integrity is the same. Big Spring Picnic area does offer a very scenic view shed, even though it is directly off a developed road system. The gravel pit located in IRA 03001A is not visually evident, because it blends well with the natural rocky slope of the landscape. In its current condition it appears natural. In summary the project area portion of IRA 03001A is much more highly developed per acre than that of IRA 03001.

Traditional cultural properties and sacred sites: This indicator identifies any significant cultural resources within the Roadless area.

Cultural resources include prehistoric sites, historic sites, buildings, structures, and traditional cultural properties. These resources are the remains of past patterned human activity. Prehistoric and historic sites can be significant or eligible for the National Register of Historic places if they meet certain characteristics. Previous archeological investigations in the analysis area have resulted in the identification of a number of prehistoric and historic sites (Schoen, 2013). The majority of the prehistoric sites is classified as lithic scatters and is identified by scatterings of stone tools and chipping debris and is indicative of temporary campsites (Schoen, 2013). These sites are associated with Native American groups in the area which were nomadic hunters and gatherers. The historic period in the analysis area begins in the 1820s with the arrival of the mountain man and fur trapping era. There is no archeological evidence of the fur trapping area found within the analysis area (Schoen, 2013). A further description of the cultural resources can be found in the Hams Fork Vegetation Project: Cultural Resource Report.

03001 – Lake Alice-Commissary Ridge: During the analysis of the existing condition of cultural resources there were 27 sites (prehistoric and historic, eligible and ineligible) identified in the project area portion of IRA 03001. The Kelley Guard Station is included in these inventoried historic sites. The Kelley Guard Station was built in 1908 to better manage activities in the newly created Wyoming National Forest. The original guard station was torn down and replaced by the Civilian Conservation Corp (CCC) in 1933, and is still used today. The Kelley Guard Station is equipped with a potable water system and propane appliances and is available to the public for rent. The Kelley Guard Station is not currently on the National Register, but has been deemed eligible.

There are no sacred sites identified in the project area portion of IRA 03001.

03001A – Nugent Park-Hams Fork Ridge: During the analysis of the existing condition of cultural resources there were 2 sites (prehistoric and historic, eligible and ineligible) identified in the project area portion of IRA 03001A. The Elk Creek Guard Station is included in these inventoried historic sites. The Elk Creek Guard Station (Elk Creek Patrol Cabin) was built in 1914 on the banks of the Hams Fork River to monitor timber activity in the area. The cabin is still standing and is the oldest administrative site on the Bridger-Teton National Forest. The Elk Creek Guard Station has been deemed eligible for the National Register.

There are no sacred sites identified in the project area portion of IRA 03001A.

Other locally unique characteristic: This characteristic identifies and measures any other locally unique characteristics.

03001 – Lake Alice-Commissary Ridge: Although there are special features identified in the whole of IRA 03001 – Lake Alice-Commissary Ridge, they are outside the project area, and thus outside the analysis area for this report.

There are no other locally unique characteristics in the project area portion of IRA 03001.

03001A – Nugent Park-Hams Fork Ridge: There are no other locally unique characteristics in the project area portion of IRA 03001A.

Summary of Existing Roadless Characteristics:

IRA 03001 – Lake Alice-Commissary Ridge: There are no unique or critical soil, water or air shed resources identified in the project area portion of IRA 03001. There have been past and currently existing impacts to soil, water, and air resources in the form of existing roads, past timber harvests and prescribed burns, and facility development. There are only 2 sources of public drinking water within the project area portion of the IRA at developed facilities.

The overall diversity of plant and animal communities in the project area portion of the IRA is moderately high, and there is habitat for a variety of big game species and a large number of smaller species. The project area portion of IRA 03001 includes potential habitat for two Threatened species including Canada Lynx and Grizzly Bear, The habitat suitability is relativity low for the Threatened species and there are no current known habitations of either of these species within the project area portions of the IRA. Additionally there is potential habitat within the IRA for a variety of Sensitive Species that have been identified in the Bridger-Teton National Forest Plan.

Opportunities for primitive and semi-primitive classes of recreation are moderate in the project area portion of IRA 03001. 35% of the project area portion of the IRA is highly developed with roads, campgrounds, guard stations, and trailhead developments and does not provide an opportunity for primitive classes of recreation. The remaining 65% of the project area portion of the IRA has a moderate to high opportunity for these types of recreation as the majority of this area is over 3 miles away from developed roads or facilities.

There have been no portions of the project area portion of the IRA that are identified as a reference landscape. Visual modifications have occurred in a variety of ways in the forms of past timber activities, past fire activities, developed roads, bridges and developed facilities. Overall, the scenic integrity of the area is on the decline as a result of timber mortality, although the distinctive naturalness of the area is still basically intact with the exception of Forest System roads and some rural developments; however the area still meets the visual quality objectives of retention. There are a total of 27 identified historical sites, and no sacred sites within the project area portion of the IRAs. There are no other locally unique characteristics identified in the project area portions of the IRAs.

IRA 03001A – Nugent Park-Hams Fork Ridge: There are no unique or critical soil, water or air shed resources identified in the project area portion of IRA 03001A. There have been past and currently existing impacts to soil, water, and air resources in the form of existing roads, past timber harvests and prescribed burns, and facility development. There are no sources of public drinking water within the project area portion of the IRA.

The overall diversity of plant and animal communities in the project area portion of the IRA is moderately high, and there is habitat for a variety of big game species and a large number of smaller species. The project area portion of IRA 03001A includes potential habitat for two Threatened species including Canada Lynx and Grizzly Bear, The habitat suitability is relativity low for the Threatened species and there are no current known habitations of either of these species within the project area portions of the IRA. Additionally there is potential habitat within the IRA for a variety of Sensitive Species that have been identified in the Bridger-Teton National Forest Plan. The highly developed nature of the area does have impacts to the overall habitat connectivity of the area.

Opportunities for primitive and semi-primitive classes of recreation is low in the project area portion of IRA 03001A. Over 99% of the area is located within ½ mile of a developed road or

facility. Due to this highly developed nature of the area there are no opportunities for primitive recreation in the project area portion of the IRA.

There have been no portions of the project area portion of the IRA that are identified as a reference landscape. Visual modifications have occurred in a variety of ways in the forms of past timber activities, past fire activities, developed roads, bridges and developed facilities. Overall, the scenic integrity of the area is on the decline as a result of timber mortality. There are a total of 2 identified historical sites, and no sacred sites within the project area portion of the IRAs. There are no other locally unique characteristics identified in the project area portions of the IRAs.

Environmental Consequences

Key Issue #4:

Impacts to Inventoried Roadless Area:

> The Proposed Action may affect the wilderness attributes and roadless characteristics of the inventoried roadless areas (IRA).

Indicators to assess impacts to water resources include the following:

- Effects on the wilderness attributes and roadless area characteristics by inventoried roadless area
- Acres of treatment and treatment type within the IRA
- Miles of road construction/reconstruction in inventoried roadless areas

Spatial and Temporal Context for Effects Analysis

The boundary for the direct and indirect effects analysis for Inventoried Roadless Areas will be the 64,159 acres of IRA within the project area. Any effects to the IRAs as a result of this project will originate within the project area boundary and effects can be captured by the analysis of this area.

As required by 36 CFR 220.4(f) the analysis considers the present effect of past activities. These effects are reflected in the existing condition and generally include the effects of past road building and timber harvest within the IRAs. This analysis considers short-term effects on Roadless opportunities or the overall quality of the IRAs over a period of 1 to 5 years during and immediately following project activities. Long term effects will be considered to be those effects that will last after the project has been completed, approximately 10 years. This context, both spatial and temporal, will allow for an effective and concise evaluation of the impacts to the wilderness attribute and the roadless characteristics and the impacts that the Proposed Action shall have.

The cumulative effects boundary will expand past the project area to expand to the full extent of the Hams Fork drainage and include the entirety of both IRAs. This area is being used to include all projects that may occur and have effects on the IRAs as a whole and thus further affect the project area and the effects that will directly and indirectly occur from the Proposed Action

Alternative 1-No Action

Direct and Indirect Effects

The No Action Alternative would not conduct any active restoration treatments (mechanical treatments or prescribed burning) in the project area portions of the IRAs. Current management plans would continue to guide management of the project area portions of the IRAs, including road, facility and trail maintenance. Forest Plan standards and guidelines and other laws, regulations, and policies required for national forest management would continue to be implemented for ongoing activities in the project area.

Effects to Wilderness Attributes and Characteristics

Untrammeled:

03001 – Lake Alice-Commissary Ridge: The No Action Alternative would not conduct any active restoration treatments (neither mechanical treatments nor prescribed burning) in the project area. Current management plans would continue to guide management of the project area. There would be no new implementation of activities that would directly control or manipulate the components of or processes of ecological systems within the project area portion of the IRA.

As there would be no active restoration treatments occurring as a result of Alternative 1 the existing untrammeled attribute would remain stable in the project area portion of IRA 03001. No current management actions would cease as a result of Alternative 1. There would be no effect to the untrammeled wilderness characteristic of IRA 03001 under Alternative 1.

03001A – Nugent Park-Hams Fork Ridge: The No Action Alternative would not conduct any active restoration treatments (neither mechanical treatments nor prescribed burning) in the project area. Current management plans would continue to guide management of the project area. There would be no new implementation of activities that would directly control or manipulate the components of or processes of ecological systems within the project area portion of the IRA.

As there would be no active restoration treatments occurring as a result of Alternative 1 the existing untrammeled characteristic would remain stable in the project area portion of IRA 03001A. No current management actions would cease as a result of Alternative 1.There would be no effect to the untrammeled wilderness characteristic of IRA 03001A under Alternative 1.

Natural:

03001 – Lake Alice-Commissary Ridge: Drought conditions and mild winters have stressed trees making them vulnerable to the impacts of insect and disease. Noticeable tree mortality would continue to have a dynamic effect on the natural appearance within the project area portion of IRA 03001 in accordance to natural ecological processes. Insects and diseases would continue to kill trees in the area leaving the vegetation on these landscapes prime for large-scale high-intensity wildfire events. The overabundance of late succession forestland would continue to exist and late succession forestland would increase as early succession, mature aspen and whitebark stands succumb to conifer encroachment

03001A – Nugent Park-Hams Fork Ridge: The effects to the natural quality in IRA 03001A are the same as those described above for 03001. No new treatments or management actions are proposed under Alternative 1. As there would be no active vegetation treatments including mechanical treatments or prescribed burns under this alternative, there would be no new human attempts at manipulating or controlling the long term natural ecological process of the area. As a result the natural characteristic in its existing condition will be stable in the project area portion of

IRA 03001A as no new manmade environmental modifications will occur. There would be no direct effects to the natural wilderness characteristic of IRA 03001A under this alternative.

Undeveloped:

03001 – Lake Alice-Commissary Ridge: Alternative 1, the no action alternative, does not propose any new developments of roads or facilities in the project area portion of IRA 03001. Continued management and maintenance of existing developments and roads within the project area portion of the IRA would continue as current management directs.

The existing undeveloped characteristic in the project area portion of the IRA would remain stable as no new developments, either road or facilities, are proposed under Alternative 1.There would be no effect to the undeveloped wilderness characteristic of IRA 03001 under Alternative 1.

03001A – Nugent Park-Hams Fork Ridge: Alternative 1, the no action alternative, does not propose any new developments of roads or facilities in the project area portion of IRA 03001A. Continued management and maintenance of existing developments in the project area portion of the IRA would continue as current management directs.

The existing undeveloped characteristic in the project area portion of the IRA would remain stable as no new developments, either road or facilities, are proposed under Alternative 1.There would be no effect to the undeveloped wilderness characteristic of IRA 03001under Alternative 1.

Opportunities for Solitude:

03001 – Lake Alice-Commissary Ridge: Alternative 1 does not propose any new, roads, developments, or vegetation treatments. Current management of the project area portion of IRA 03001 would continue as directed by Forest Plan direction and other regulatory guidelines.

Existing opportunities for solitude in the project area portion of IRA 03001 would remain stable as Alternative 1 does not propose any actions or activities that would modify or affect current opportunities. Alternative 1 would have no effect on the opportunities for solitude in the project area portion of the IRA.

03001A – Nugent Park-Hams Fork Ridge: Alternative 1 does not propose any new, roads, developments, or vegetation treatments. Current management of the project area portion of IRA 03001A would continue as directed by Forest Plan direction and other regulatory guidelines.

Existing opportunities for solitude in the project area portion of IRA 03001A would remain stable as Alternative 1 does not propose any actions or activities that would modify or affect current opportunities. Alternative 1 would have no effect on the opportunities for solitude in the project area portion of the IRA.

Opportunities for Primitive Recreation:

03001 – Lake Alice-Commissary Ridge: No new developments of roads, facilities or vegetation treatments are proposed under Alternative 1 within the project area portion of IRA 03001.

Existing opportunities for primitive forms of recreation would remain stable under Alternative 1 in the project area portion of IRA 03001. Alternative 1 would have no effect on existing opportunities for primitive recreation.

03001A – Nugent Park-Hams Fork Ridge: No new developments of roads, facilities, or vegetation treatments are proposed under Alternative 1 within the project area portion of IRA 03001A.

Existing opportunities for primitive forms of recreation would remain stable under Alternative 1 in the project area portion of IRA 03001A. Alternative 1 would have no effect on existing opportunities for primitive recreation.

Special Features:

03001 – Lake Alice-Commissary Ridge: As there are no roads or treatments proposed under Alternative 1, would have no direct effect to special features in the project area portion of IRA 03001.

Indirect effects could occur to TES habitat under Alternative 1. The long term reduction in stand-initiation habitat in the forestlands within the IRA would result in a reduction of winter snowshoe habitat since stand-initiation habitat is an important part of their foraging habitat. This downward trend will continue without vegetation management or fire. (DeLong, Biological Assessment for the Hams Fork Vegetation Project, 2013).

Although there is the potential for indirect effects to special features under Alternative 1 in the form of effects to lynx habitat, it is not anticipated that these effects will degrade the overall special feature attribute in the project area portion of IRA 03001.

03001A- Nugent Park-Hams Fork Ridge: As there are no roads or treatments proposed under Alternative 1, there will be no direct effect to special features in the project area portion of IRA03001A.

Indirect effects could occur to TES habitat under Alternative 1. The long term loss of the distribution of age class in forest stands could result in a reduction of winter snowshoe habitat. The long term reduction in stand-initiation habitat in the forestlands within the IRA would result in a reduction of winter snowshoe habitat since stand-initiation habitat is an important part of their foraging habitat. This downward trend will continue without vegetation management or fire. (DeLong, Biological Assessment for the Hams Fork Vegetation Project, 2013).

Although there is the potential for indirect effects to special features under Alternative 1 in the form of effects to lynx habitat, it is not anticipated that these effects will degrade the overall special feature attribute in the project area portion of IRA 03001A.

Manageability:

03001 – Lake Alice-Commissary Ridge: There are no new roads or vegetation treatments proposed under Alternative 1 in the project area portion of IRA 03001. Current management would continue to maintain and manage existing roads and facilities. Alternative 1 does not propose any action in the IRA that would change the existing size or shape of the IRA, modify activities nearby that are currently occurring, or modify topography of the project area portion of IRA 03001.

As described in the existing condition there are portions of project area portion of the IRA that are currently not suitable for wilderness designation or management as a wilderness. Alternative 1 will not change or modify the current existing manageability of the project area portion of IRA 03001, and existing manageability will remain stable.

03001A – Nugent Park-Hams Fork Ridge: There are no new roads or vegetation treatments proposed under Alternative 1 in the project area portion of IRA 03001A. Current management would continue to maintain and manage existing roads and facilities. Alternative 1, does not propose any action in the IRA that would change the existing size or shape of the IRA, modify activities nearby that are currently occurring, or modify topography of the project area portion of IRA 03001A.

As described in the existing condition the project area portion of the IRA is currently not suitable for wilderness designation or to be managed as a wilderness. Alternative 1 will not change or modify the current existing manageability of the project area portion of IRA 03001A.

Summary of Effects on Wilderness Quality and Attributes:

The No Action Alternative would not conduct any active restoration treatments (neither mechanical treatments nor prescribed burning), nor would Alternative 1 propose development of new roads in the project area portions of the IRA's. Current management plans would continue to guide management of the project area. Forest Plan standards and guidelines and other laws, regulations, and policies required for national forest management would continue to be implemented for ongoing activities in the project area.

IRA 03001– Lake Alice-Commissary Ridge: Under Alternative 1 there will be few effects to wilderness qualities and attributes in the project area portion of IRA 03001. Although no new management activities are proposed, no existing activities are proposed to be halted under Alternative 1. With no new proposed manipulations on the ecological process both the untrammeled and natural qualities will remain stable in their existing condition; no improvements and no degradations will occur.

Alternative 1 does not propose the development of any new roads or facilities in the project area, nor does it propose improvements to existing roads or facilities. Existing Forest System Roads and Forest facilities, including campgrounds, guard stations, and trailheads will not be modified under Alternative 1. The current undeveloped quality of the area will remain stable and not improve nor degrade as a result of Alternative 1. Current opportunities for solitude and primitive recreation will also remain stable in the project area portion of the IRA. The highly developed area of the project area portion of IRA 03001 will not change, and the existing opportunities for solitude and primitive recreation in the undeveloped area of the IRA will remain stable.

Under Alternative 1 there is the potential for indirect effects to occur on TES habitat as a result of the current ecological process continuing in a manner that has promoted a disproportional expansion of late-seral forests as a result of fire suppression in the past. However, it is not anticipated that these affects will have a degrading effect on the overall special features quality in the project area portion of IRA 03001. Lastly, the manageability of the project area portion of IRA 03001 will not be affected by Alternative 1. Alternative 1 does not propose any actions that would change the size, shape, or boundaries of the IRA. Current manageability of the IRA will not be altered, including no changes to the areas that are currently not suitable for wilderness designation, nor any changes to those areas currently suitable for wilderness designation. Overall manageability will remain stable under Alternative 1.

Through the evaluation of Alternative 1 and its anticipated effects to the project area portion of IRA 03001, it is determined that the wilderness quality of the area will remain stable.

IRA 03001A – Nugent Park-Hams Fork Ridge: Under Alternative 1 there will be few effects to wilderness qualities and attributes in the project area portion of IRA 03001A. Although no new

management activities are proposed, no existing activities are proposed to be halted under Alternative 1. With no new proposed manipulations on the ecological process both the untrammeled and natural qualities will remain stable in their existing condition; no improvements and no degradations will occur.

Alternative 1 does not propose the development of any new roads or facilities in the project area, nor does it propose improvements to existing roads or facilities. Existing Forest System Roads and Forest facilities, including campgrounds, guard stations, and trailheads, will not be modified under Alternative 1. The current undeveloped quality of the area will remain stable and not improve nor degrade as a result of Alternative 1. Current opportunities for solitude and primitive recreation will also remain stable in the project area portion of the IRA. With no new proposed roads or developments the areas that are currently remote and undeveloped will remain so, whereas the areas that are currently developed will not see a modification in the current development status.

Under Alternative 1 there is the potential for indirect effects to occur on TES habitat as a result of the current ecological process continuing in a manner that has promoted a disproportional expansion of late-seral forests as a result of fire suppression in the past. However, it is not anticipated that these affects will have a degrading effect on the overall special features quality in the project area portion of IRA 03001A. Lastly, the manageability of the project area portion of IRA 03001A will not be affected by Alternative 1. Alternative 1 does not propose any actions that would change the size, shape, or boundaries of the IRA. Current manageability of the IRA will not be altered, including any changes to the areas that are currently not suitable for wilderness designation. Overall manageability will remain stable under Alternative 1.

Through the evaluation of Alternative 1 and its anticipated effects to the project area portion of IRA 03001A, it is determined that the wilderness quality of the area will remain stable.

Effects on Roadless Characteristics

Soil, water, and Air resources:

03001 – Lake Alice-Commissary Ridge: Alternative 1 will have no effect on the soil, water, and air resources because there are no unique or critical soil, watershed or air quality resources identified within the project area portion of IRA 03001.

03001A – Nugent Park-Hams Fork Ridge: Alternative 1 will have no effect on the soil, water, and air resources because there are no unique or critical soil, watershed or air quality resources identified within the project area portion of IRA 03001A

Sources of public drinking water:

03001 – Lake Alice-Commissary Ridge: As Alternative 1 does not proposed any new management activity, vegetation treatments, or road development; there will be no effect to the two developed sources of public drinking water in the project area portion of IRA 03001.

03001A – Nugent Park-Hams Fork Ridge: There will be no effect to public drinking water because there are no sources of public drinking water located within the project area portion of the IRA.

Diversity of plant and animal communities:

03001 – Lake Alice-Commissary Ridge: Alternative 1 proposes no vegetative treatments, road or facility development in the project area. Current management would continue in the area as directed by the Forest Plan and Forest Service directives. There would be no direct effects to vegetation and the diversity of plan and animal communities in the project area portion of IRA 03001 as a consequence of management actions.

Shifts in stand structure would occur naturally and species composition would change towards a more shade tolerant component of fir and spruce, unless natural wildfires occurred. Indirect effects of no action on stand structures would be that current multi-story stands would continue to be multi-story and single story and two storied stands would become multi-storied. Over time, the percent of forestland in late succession would continue to increase in the absence of fire. However, the potential for larger and more severe fires to occur in the vicinity of the treatment units would increase in the project area portion of the IRA under Alternative 1. These shifts could lead to a degradation of the diversity of plan communities as late succession forestland will continue to expand and encroach upon aspen and sageland communities modifying and altering the diversity of plant and animal communities in the project area portion of IRA 03001.

Past actions in the project area portion of IRA 03001 have resulted in an overrepresentation of late-seral conifer forestland and the expansion of conifer forests into other vegetation types. These conditions would continue to exist along with the continued expansion of conifer forest into big sagebrush, meadow, and aspen vegetation types. As these conditions would continue under Alternative 1 with no management, they would continue to skew habitat conditions toward providing habitat for wildlife associated with late-seral conifer forestland, which already have an overabundance compared to what occurred under a natural fire regime at the expense of species associated with or using early to mid-seral conifer forestland, aspen, meadows, and other forest openings, big sagebrush, and grassland habitats.

Alternative 1 could result in continued reduction of plant and animal community diversity as conifer encroachment continues unchecked, as the natural ecological continues to progress within the parameters of existing conditions. This continued reduction of plant and animal diversity may lead to a potential degradation to the diversity roadless characteristic.

03001A – Nugent Park-Hams Fork Ridge: Effects to the diversity of plant and animal communities for the project area portion of IRA 03001A under Alternative 1 would be similar as those listed above for IRA 03001.

Habitat for TES dependent on large undisturbed areas of land:

03001 – Lake Alice-Commissary Ridge: The project area portion of IRA 03001 has been identified as providing potential habitat for two Federally listed species: Canada lynx and grizzly bears, as well as for wolverine which is proposed for Federal listing. Alternative 1 would have no direct effect to the habitat for Threatened and Endangered species habitat or species dependent on large undisturbed areas of land as there are no new roads or vegetation treatments proposed.

Currently, the management objective for lynx habitat regarding a “mosaic of habitat conditions” and “stands at initiation structural state and mature, multi-story conifer vegetation” are not being achieved in the Lynx Analysis Unit (LAU) within the project area portion of IRA 03001. Alternative 1 would not move the Hams Fork LAU towards this objective as there are no vegetation management activities proposed that would increase the currently low mosaic or that

would create stand-initiation communities. Therefore, Alternative 1 would contribute to the maintenance of the habitat conditions not meeting these objectives would contribute to further decline in habitat conditions for lynx. There likely would be no direct or indirect effects on grizzly bears or their habitat in the area, except for a small improvement in whitebark pine conditions. However, road densities are currently above a threshold that likely precludes the area from being effectively occupied by grizzly bears (DeLong, Biological Assessment for the Hams Fork Vegetation Project, 2013).

Indirect effects to habitat of Sensitive Species under Alternative 1 would be the perpetuation of artificially large amounts of late-seral forestland in the project area portion of the IRA as a result of the regime of fire suppression in the area. The current amount of late-seral forestland in the project area is abnormally high and not ecologically sustainable (DeLong, Hams Fork Vegetation Project: Biological Evaluation and Wildlife Report, 2013). Additionally, the existing conditions of late-seal forest communities sets the stage for large wildfires that could have negative consequences for some wildlife habitat, including goshawks, pine martens, Great Gray Owls, just to name a few (DeLong, Hams Fork Vegetation Project: Biological Evaluation and Wildlife Report, 2013).

In summary, there is the potential that under Alternative 1 there could be minor degradation to TES animal habitat as that habitat moves towards a wide spread late-seral forest setting the stage for large scale, high-intensity wildfires that could eliminate potential lynx habitat in the project area portion of IRA 03001.

Conversely, Alternative 1 maintains or accelerates the decline in two sensitive plant species. No action moves the habitat away from that which is optimal for whitebark pine and Payson's milkvetch (both are disturbance adapted species). The effect to whitebark pine from current management is well documented and has been identified contributing to the major agents of mortality in whitebark pine.

03001A – Nugent Park-Hams Fork Ridge: Effects to habitat for TES and Sensitive Species for the project area portion of IRA 03001A is similar to that listed above for IRA 03001.

There is the potential that under Alternative 1 there could be minor degradation to TES animal habitat as habitat moves towards a wide spread late-seral forest setting the stage for large scale, high-intensity wildfires that could eliminate potential lynx habitat in the project area portion of IRA 03001A.

Conversely, Alternative 1 maintains or accelerates the decline in two sensitive plant species. No action moves the habitat away from that which is optimal for whitebark pine and Payson's milkvetch (both are disturbance adapted species). The effect to whitebark pine from current management is well documented and has been identified contributing to the major agents of mortality in whitebark pine.

Primitive and semi-primitive classes of recreation:

03001 – Lake Alice-Commissary Ridge: Alternative 1 does not propose any new roads, developments, or vegetation treatments, nor does it propose improvements to existing roads or facilities. Current management of the project area portion of IRA 03001 would continue as directed by Forest Plan direction and other regulatory guidelines. Existing Forest System Roads and Forest facilities, including campgrounds, guard stations, and trailheads will not be modified under Alternative 1.

The current undeveloped quality of the area will remain stable and not improve nor degrade as a result of Alternative 1. Current opportunities for solitude and primitive recreation will remain stable in the project area portion of the IRA. The highly developed portion of the project area portion of IRA 03001 will not change, and the existing opportunities for solitude and primitive recreation will remain stable in the area that is remote and undeveloped. Alternative 1 would have no effects on existing opportunities for primitive and semi-primitive classes of recreation, and the existing condition would remain stable.

03001A – Nugent Park-Hams Fork Ridge: Effects to primitive and semi-primitive classes of recreation in the project area portion of IRA 03001A would be the same as those described above for IRA 03001.

Reference Landscapes for Research Study or Interpretation:

03001 – Lake Alice-Commissary Ridge: There would be no effects to the landscape characteristic in the project area portion of IRA 03001 because there are no Reference Landscapes for Research Study or Interpretation located within the project area portion of the IRA.

03001A – Nugent Park-Hams Fork Ridge: Effects to the project area portion of IRA 03001A would be the same as those described above under IRA 03001.

Landscape character and integrity:

03001 – Lake Alice-Commissary Ridge: No activities would be implemented within the project area portion of IRA 03001 under Alternative 1. The No Action Alternative would have no vegetation treatments, no fuels reduction, and no prescribed forest would be implemented. Under Alternative 1 conifers would continue to encroach upon aspen clones with the possibility of the loss of aspen stands in the future. Additionally, portions of conifer stands may continue to die due to pest and disease as is currently occurring. All of these indirect effects would occur as part of the natural ecological process but may cause a reduction in the visual variety class and textures of the project area as tree mortality increases and late-seral forestland continues to increase and dominate the landscape, a retention area may be decreased to partial retention area; therefore the effect is not significant (Barthelenghi, 2013).

03001A – Nugent Park-Hams Fork Ridge: Effects to the landscape character and integrity in the project area portion of IRA 03001A under Alternative 1 would be the same as those described above in the effects for IRA 03001. The area will continue to be managed with roaded areas and a high human presence in the form of traffic, dispersed roadside camps, and a developed campground. All indirect effects would occur as a part of the natural ecological process and are not anticipated to be significant.

Traditional cultural properties and sacred sites:

03001 – Lake Alice-Commissary Ridge: As there are no management activities proposed under Alternative 1, there would be no effect to traditional cultural properties or sacred sites within the project area portion of IRA 03001. The existing condition of traditional cultural properties and sacred sites in the IRA will remain stable under Alternative 1**.**

03001A – Nugent Park-Hams Fork Ridge: As there are no management activities proposed under Alternative 1, there would be no effect to traditional cultural properties or sacred sites within the project area portion of IRA 03001A. . The existing condition of traditional cultural properties and sacred sites in the IRA will remain stable under Alternative 1.

Other locally unique characteristic:

03001 – Lake Alice-Commissary Ridge: As there are no other locally unique characteristics in the project area portion of IRA 03001, there would be no effect to this Roadless Attribute under Alternative 1.

03001A – Nugent Park-Hams Fork Ridge: As there are no other locally unique characteristics in the project area portion of IRA 03001, there would be no effect to this Roadless Attribute under Alternative 1.

Summary of Effects to Roadless Characteristics:

The No Action Alternative would not conduct any active restoration treatments (neither mechanical treatments nor prescribed burning), nor does Alternative 1 propose development of new roads in the project area portions of the IRA's. Current management plans would continue to guide management and maintenance of existing roads, trails and facilities within the project area portion of the IRA's. Forest Plan standards and guidelines and other laws, regulations, and policies required for national forest management would continue to be implemented for ongoing activities in the project area.

IRA 03001 – Lake Alice-Commissary Ridge: There are anticipated to be very few effects to roadless characteristics in the project area portion of IRA 03001 under Alternative 1. There were no locally unique soil, water or air resources identified in the project area, thus there will be no effects to this roadless characteristic. There are two sources of public drinking water within the project area portion of IRA 03001. There will be no effects to these sources of public drinking water under Alternative 1, and the quality of these sources will remain stable.

Under Alternative 1, although there will be no direct effects to the diversity of plan and animal communities as no mechanical or prescribed burns will occur, allowing the current overly dominated by late succession forests to continue these late-seral forests will continue to dominate and encroach upon aspen, sage, and grassland habitats, thus reducing habitat diversity. Although there will be effects it is anticipated that these effects will be slow and gradual degradation the diversity of plant and animal communities as it will continue over a long time, and could be altered by natural fire regimes. Effects to the TES and sensitive animal species habitat will be similar to that of the effects to habitat diversity. There is the potential for lynx habitat to be Threatened by late seral-encroachment and the potential for high-intensity wildfire due to the abnormal fuels buildup from a culture of wildfire suppression. These potential changes to habitat as an indirect effect of Alternative 1, may lead to minor degradations of TES habitat in the project area portion of IRA 03001. The conditions which will arise from Alternative 1 for sensitive plants are however, negative and contribute to the decline of whitebark pine.

Primitive and semi-primitive classes of recreation will not be affected by Alternative 1 in the project area portion of the IRA. The roadless characteristic for these classes of recreation will continue to be stable as areas in the IRA that are already highly developed and do not provide these types of opportunities and will not be altered or improved. Additionally, those areas that are removed from development and have a high quality of primitive and semi-primitive recreation will not be modified and will continue to keep their roadless characteristics stable. There are no reference landscapes that are identified in the project area portion of the IRA; therefore there will be no effects to reference landscapes in the IRA under Alternative 1. The landscape character and integrity characteristic may be indirectly affected by Alternative 1 in the long term as tree mortality continues to increase and degrade visitor's perception of the landscape. However, this potential degradation to the roadless characteristic would continue to occur through the natural ecological process and would occur regardless of Alternative 1's implementation in the project area portion of IRA 03001.

There are 27 traditional cultural properties are present in the project area portion of the IRA. Alternative 1 does not propose any mechanical treatments nor prescribed burns and will therefore have no effect on these existing sites. The traditional cultural properties roadless characteristic would be stable under Alternative 1. There were no other locally unique characteristics identified in the project area of the IRA.

There is the potential for minor indirect effects to roadless attributes in the project area portion of IRA 03001 to occur as a result of Alternative 1. However, these effects could occur regardless of the implementation of Alternative1. Although there could be minor degradation, overall the roadless characteristics in the project area portion of IRA 03001 would primarily remain stable.

03001A – Nugent Park-Hams Fork Ridge: There are anticipated to be very few effects to roadless characteristics in the project area portion of IRA 03001A under Alternative 1. There were no locally unique soil, water or air resources identified in the project area, thus there will be no effects to this roadless characteristic. There are no sources of public drinking water within the project area portion of IRA 03001.

Under Alternative 1, although there will be no direct effects to the diversity of plan and animal communities as no mechanical or prescribed burns will occur, in the project area portion of the IRA. The indirect effects of Alternative 1 would be similar to those that were described above for IRA 03001. Effects to the TES and Sensitive Species habitat will be similar to that of the effects to habitat diversity and those described above in the summary for IRA 03001. These potential changes to habitat as an indirect effect of Alternative 1, may lead to minor degradations of TES habitat in the project area portion of IRA 03001A. The conditions which will arise from Alternative 1 for sensitive plants are however, negative and contribute to the decline of whitebark pine.

Primitive and semi-primitive classes of recreation will not be affected by Alternative 1 in the project area portion of the IRA. The roadless characteristic for these classes of recreation will continue to exist in their existing state and will be stable as these areas that are already highly developed do not provide these types of opportunities, and they will not be altered or improved. There are no areas in the project area portion of IRA 03001A that provide high quality of primitive and semi-primitive recreation. There are no reference landscapes that are identified in the project area portion of the IRA; therefore there will be no effects to reference landscapes in the IRA under Alternative 1. The landscape character and integrity characteristic may be indirectly affected by Alternative 1 in the long term as tree mortality continues to increase and degrade visitor's perception of the landscape. However, this potential degradation to the roadless

characteristic would continue to occur through the natural ecological process and would occur regardless of Alternative 1's implementation in the project area portion of IRA 03001.

There are 2 traditional cultural properties are present in the project area portion of the IRA. Alternative 1 does not propose any mechanical treatments nor prescribed burns and will therefore have no effect on these existing sites. The traditional cultural properties roadless characteristic would be stable under Alternative 1. There were no other locally unique characteristics identified in the project area of the IRA.

There is the potential for minor indirect effects to the roadless characteristic to occur as a result of Alternative 1in the project area portion of IRA 03001A. However, these effects could occur regardless of the implementation of Alternative on. Although there could be minor degradation, overall the roadless characteristics in the project area portion of IRA 03001A would remain primarily stable.

Cumulative Effects

There are no present or reasonably foreseeable future project activities proposed in the project area portion of either IRA other than current management and maintenance of existing roads and facilities. All past action and current management, including existing roads and facilities and the maintenance thereof, have been integrated into the existing condition description for the project area portion of both IRA 03001 and 03001A.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Current management plans would continue to guide management and maintenance of existing roads, trails and facilities within the project area portion of the IRAs. Forest Plan standards and guidelines and other laws, regulations, and policies required for national forest management would continue to be implemented for ongoing activities in the project area. Alternative 1 is in compliance with other relevant laws, regulation, policies, and plans in regards to the recreation resource.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Under Alternative 2, there are a variety of activities proposed including hazard tree treatments along roads and campgrounds, prescribed burning, mechanical timber salvage treatments of small diameter timber for a total of 6,454 acres, road maintenance on 83 miles combined within the project area portion of both IRAs, 2 bridges replaced and the expansion of the Big Spring gravel pit. Additionally, all temporary roads and new road additions to the FSR proposed in Alternative 2 are outside the project area portions of both IRAs. Table 39 shows the breakdown of the type of proposed action and the miles, or acres, of that action within each IRA.

Table 39. Proposed Actions within IRA.

Resource	Miles/Acres of Treatment/Roads per Project Area Portion of IRA 03001	Miles/Acres of Treatment/Roads per Project Area Portion of IRA 03001A
New Road Construction	0 Miles	0 Miles
FS Roads to Be Reconstructed	0 Miles	0 Miles
FS Roads Maintained	37 Miles	17 Miles
FS Roads with No Change	20 Miles	9 Miles
Bridge Replacement	1	1
Gravel Source Development	0	1
Hazard Tree Treatment	1,483 Acres	540 Acres
Sanitation/Salvage	2,285 Acres	1,584 Acres
Prescribed Fire	185 Acres	337 Acres

Effects to Wilderness Attributes and Characteristics

Untrammeled:

03001 – Lake Alice-Commissary Ridge: Alternative 2 proposes a variety of vegetation treatments and road work the will affect the untrammeled quality of the project portion of IRA 03001. As shown above in Table 39, there are hazard tree treatments, sanitation and salvage treatments, and prescribed fires are proposed in the project area portion of the IRA. The proposed vegetation treatments would impact 3,953 acres of the project area portion of the IRA. This is approximately 8% of the project area portion of the IRA and only 2% of the overall IRA. In support of these treatments there will be road maintenance on 37 miles of roads and 1 bridge replaced within the IRA.

The activities proposed in Alternative 2 are modern human activities that will influence the natural ecological processes. Sanitation and salvage treatments as well as hazard tree removal directly remove timber from the ecosystem, modifying forest stand structure as well as litter cover on the ground. Bridge replacement can alter in-stream flow, sedimentation, and access for aquatic species. The untrammeled attribute in the project area portion of IRA 03001 has already been impacted in the past as a result of management activities similar to those proposed in Alternative. 2. The primary concentration of proposed treatments under Alternative 2 occur in the

more highly developed portion of the IRA that has already experience effects to the untrammeled quality similar to that are being proposed.

The proposed actions in Alternative 2 may have slight degrading effects to the untrammeled attributes of the project area portion of the IRA, where the treatments are proposed. These effects area similar to those that have already occurred, that is considered part of the existing condition. The degrading effect will occur in the portion of the IRA that is already heavily impacted and will not affect the higher quality untrammeled areas. Project activities will only occur in 8% of the project area portion of IRA 03001 and 2% of the overall IRA, and although minor degradation may occur, it will not be severe enough to exclude the area from wilderness designation in the future and the overall condition of the untrammeled characteristic will remain stable.

03001A – Nugent Park-Hams Fork Ridge: Alternative 2 proposes a variety of vegetation treatments and road work the will affect the untrammeled quality of the project portion of IRA 03001A similar to those described above in IRA 03001. . In support of these treatments there will be road maintenance on 17 miles of roads, the replacement of the West Fork of Hams Fork Bridge, and the expansion of the Big Spring gravel pit. The proposed vegetation treatments would impact 2,501 acres of the project area portion of the IRA. This is approximately 17% of the project area portion of the IRA and 12% of the overall IRA.

The activities proposed in Alternative 2 are modern human activities that will influence the natural ecological processes. Sanitation and salvage treatments as well as hazard tree removal directly remove timber from the ecosystem, modifying forest stand structure as well as litter cover on the ground. Bridge replacement can alter in-stream flow, sedimentation, and access for aquatic species. The untrammeled attribute in the project area portion of IRA 03001A has already been highly impacted in the past as a result of management activities similar to those proposed in Alternative. 2. Proposed treatments under Alternative 2 occur in the already highly developed portion of the IRA that has already experience effects to the untrammeled quality similar to that are being proposed.

Under the proposed actions in Alternative 2, the untrammeled quality of the project area portion of IRA 03001A will be stable, as the area has already been heavily impacted by human manipulations in the past. As the percentage of the area of the project area portion of the IRA and the IRA as a whole, the proposed actions should not exclude the entire IRA from wilderness designation, due to effects on the untrammeled attributes.

Natural:

03001 – Lake Alice-Commissary Ridge: Past and ongoing activities or events have had an effect on the natural characteristic of the project area portion of IRA 03001. These past and ongoing activities make up the existing condition of the natural characteristic and are described in the existing condition portion of this report.

Under Alternative 2 effects of the proposed actions on the ecological system in the project area portion of the IRA include timber harvest, prescribed fire, road improvement and maintenance, and the replacement of one bridge. Bridge replacement will provide improved fish, amphibian, and terrestrial wildlife passage, hydraulic function, and reduced sedimentation in the long term. Although this is a human manipulation of ecological processes, the result will be an improvement in hydraulic function and wildlife passage.

Vegetation treatments, including commercial timber harvesting and prescribed fire will directly affect stand structure and species composition in the project area portion of the IRA. Timber harvest also would reset or alter the successional processes of timber. Additionally Aspen and whitebark pine would receive regeneration and stand improvement harvest to help maintain and restore the plant community diversity on a project level. The anticipated effect to the natural ecological systems is to better improve timber stand health and diversity, by reverting stands that have not felt the natural ecological effect of stand replacing fires, and help fight and combat disease.

The proposed treatments activities that will have a benefit on the long term health and functionality of the ecological systems in the project area portion of the IRA may have some direct, but mostly short term, effects to wildlife habitat. The majority of direct effects will result in the short term displacement of animals within the treatment areas due to mechanical equipment, human presence, and prescribed fire. However, it is anticipated that after the completion of the project habitat use would revert back to pre-project levels in most cases. Another effect to wildlife will be the change in forest conditions as a result of the vegetation treatments (mix of succession stages and stand characteristics).

The overall effect of activities proposed in Alternative 2 to the natural quality of the project area portion of the IRA will be a trend toward improving the natural ecological processes.

03001A – Nugent Park-Hams Fork Ridge: Effects to the natural ecological attributes of the project area portion of IRA 3001A will be similar as those described above in under 03001. There will a larger percentage of the project are portion of IRA 03001A affected, as described in the natural section above.

There will be effects to the natural ecological condition in the project area portion of IRA 03001A under Alternative 2. Most effects to the ecological processes under Alternative 2 will improving the natural ecological systems in the project area portion of the IRA by improving the health and stability of the ecological system and promoting a return to the desired ecological condition, which has been affected in the past by fire suppression. Although there is the potential for some of these effects to negatively affect wildlife habitat, and shift habitat use patterns, the overall size of the treatments will not have a large scale, long lasting negative affect to wildlife habitat. The overall effect of activities proposed in Alternative 2 to the natural quality of the project area portion of the IRA will be a trend toward improving the natural ecological processes.

Undeveloped:

03001 – Lake Alice-Commissary Ridge: There are no new developments proposed in the project area portion of IRA 03001 under Alternative 2, however Alternative 2 does propose the replacement of an existing bridge. All existing developments will continue to be maintained and operated in accordance to current management plans and national direction.

Although there are no new roads proposed in Alternative 2, maintenance will occur on a total of 37 miles of existing roads within the project area portion of the IRA. The road maintenance proposed will not change the classification or maintenance level of the roads but will improve them to their current desired condition Bridge construction would involve dewatering the site, excavation new, wider, abutment locations, erecting the abutments, backfilling the abutments, placing streambed material and rip rap, construction the deck and placing an asphalt wearing surface. The Elk Creek Bridge is being re-constructed to safely support logging trucks, which typically weigh around 36 tons. The replacement bridge will be of a higher development level

than the existing bridge, it will be significantly safer for public and administrative use, and provide improved fish, amphibian, and terrestrial wildlife passage, hydraulic function, and reduced sedimentation in the long term.

Overall effects to the undeveloped quality of the project area portion of the IRA under Alternative 2 will be minor. The undeveloped quality of the area is anticipated to remain stable as the maintenance of existing roads and replacement of the bridge will occur in the portion of the IRA that is already developed, will not have any significant effect to the existing undeveloped attributes of the project area portion of the IRA.

03001A – Nugent Park-Hams Fork Ridge: There are no new developments proposed in the project area portion of IRA 03001A under Alternative 2. All existing developments will continue to be maintained and operated in accordance to current management plans and national direction.

Although there are no new roads proposed in Alternative 2, maintenance will occur on a total of 17 miles of existing roads within the project area portion of the IRA. In addition to road improvement and maintenance, the West Fork Hams Fork bridge will be re-constructed in the project area portion of IRA 03001A under Alternative 2. Effects to the undeveloped characteristics in regards to the bridge replacement will be similar to those described above for IRA 03001.

Lastly, under Alternative 2 the Big Spring gravel pit will be further developed to provide gravel and rock material for road improvement materials. The current gravel pit disturbance is 2 acres, and under Alternative 2 would be expanded to 5 acres. The gravel pit is located along an existing high level road, FSR 10062. Although there will be road maintenance, bridge replacement, and the expansion of the Big Spring gravel pit, all of these projects are proposed in an already highly developed portion of the project area portion of IRA 03001A. Effects to the undeveloped quality of the project area portion of IRA 03001A, will be minor and the overall undeveloped character of the area will remain stable.

Opportunities for Solitude:

03001 – Lake Alice-Commissary Ridge: Solitude is a personal, subjective value defined as isolation from the sights, sounds, physical presence of others, and human development. It can also be defined as a perceived condition of being secluded, inaccessible, and out of view. Opportunities for solitude within the project area portion of IRA 3001 will be affected by the proposed vegetation treatments proposed in Alternative 2 that increase human presence in the project portion of IRA, including road improvement, sanitation and salvage treatments, prescribed fire, and hazard tree removal.

The project area portion of IRA 03001 has a ranging opportunity for solitude from low to high depending on the time of the season and the portion of the IRA occupied. Analyzing the ROS classifications of the project area portion of the IRA's provides the best evaluation of the degree of solitude available, as well as the degree of solitude that may be affected by Alternative 2. Approximately 65% of the project area portion of IRA 03001 is within the Primitive or Semi-Primitive Non-Motorized ROS classifications; with the remaining 35% within the Semi-Primitive Motorized and Roaded Natural Settings. Table 40 indicates the total acres of treatment per ROS classification within the project area portion of the IRA:

Table 40. Acres of Treatment per ROS in IRA 03001.

ROS Class	Acres of Proposed Treatment	% of Project Area Portion of IRA 03001
Primitive	0	0
Semi-Primitive Non-Motorized	223	0.4%
Semi-Primitive Motorized	1,631	3.3%
Roaded Natural	2,102	4.2%%
Total Treatment Acres	3,956	7.9%

Approximately 94% of treatments proposed in Alternative 2 would occur in the Semi-Primitive Motorized and Roaded Natural Classification which offer the lowest opportunities for solitude and seclusion in the project area portion of IRA 03001 due to the highly developed and roaded nature of the area. The remaining 6% of treatments would occur in Semi-Primitive Non-Motorized classification, with no treatments being proposed for the most remote and secluded portion of the area, the 4,144 acres of Primitive classification. Figure 3 illustrates the proposed treatments within the project area portion of IRA 03001 and the ROS class they are located within.

Opportunities for solitude including isolation from the sights and sounds of man would be affected by the increase of human presence and activity during the time of treatment operation. Sights and sounds of human activity will increase as treatments are implemented with an increased human presence, heavy machinery, and prescribed fire. This increased activity will be short term however, and at the conclusion of treatments the sights and sounds of human activity will revert back to pre-project levels.

Although some effects will occur to the opportunities for solitude in the project area portion of the IRA, these effects will be short term only and not significant enough to result in a long term degradation of opportunities for solitude in the project area portion of the IRA nor to the IRA as a whole. Opportunities for solitude in the project area portion of IRA 03001 will remain stable under Alternative 2.

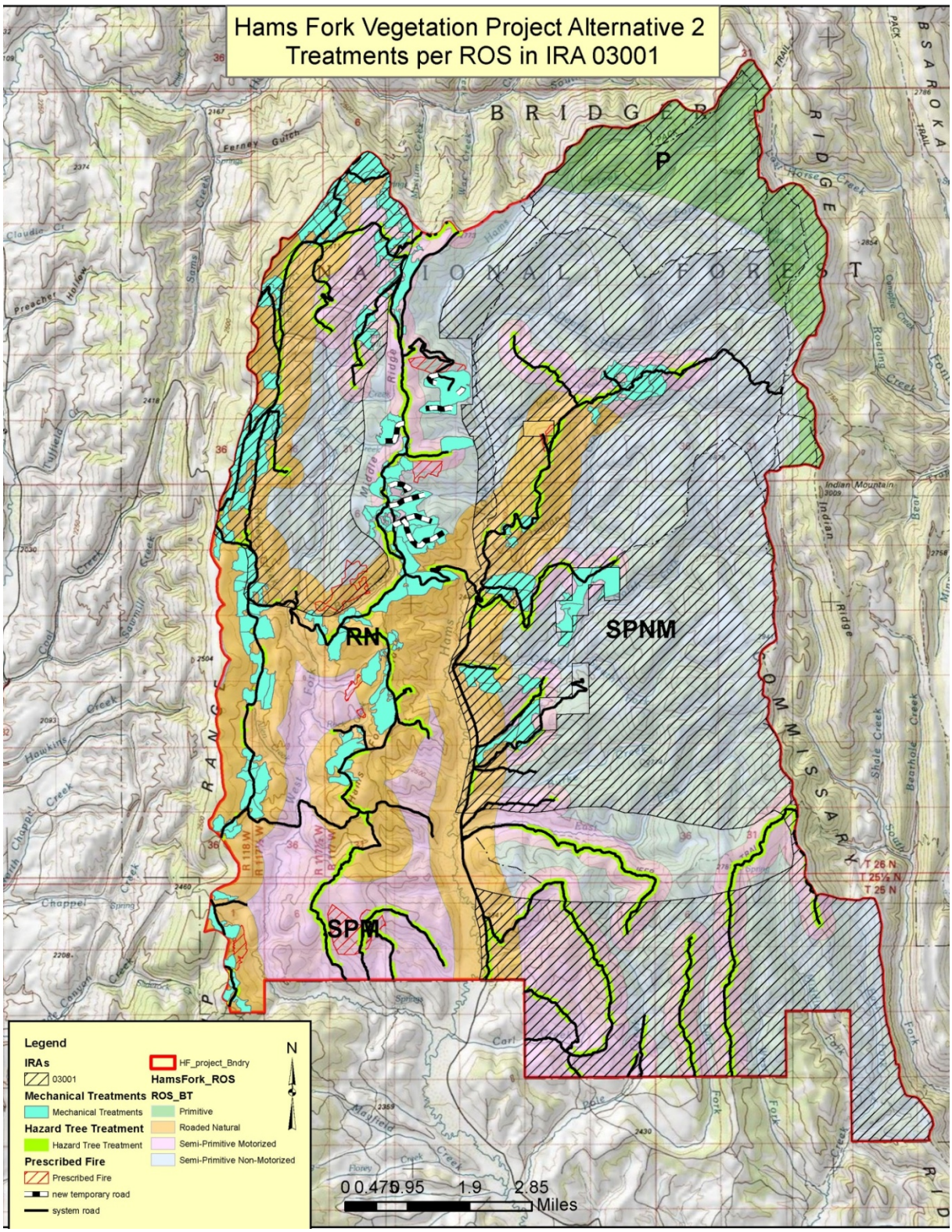


Figure 12. Alternative 2 Proposed Treatments per ROS Class in IRA 03001.

03001A – Nugent Park-Hams Fork Ridge: Opportunities for solitude within the project area portion of IRA 3001A will be affected by vegetation treatments proposed in Alternative 2 in a similar manner to the effects described above for IRA 03001.

The project area portion of IRA 03001A has limited range for opportunities for solitude. Approximately 99% of the project area portion of IRA 03001A is within the Semi-Primitive Motorized or Roaded Natural setting. Areas with this level of ROS classification are primarily highly developed, have a high number of roads, and offer little in way of opportunities for solitude. Treatments proposed in Alternative 2 will only occur in SPM or RN classified areas of the project area portion of IRA 03001A and will have no effect on the more remote SPNM areas. Table 41 indicates the total acres of treatment per ROS classification within the project area portion of the IRA.

Table 41. Alternative 2 proposed treatments per ROS Class in IRA 03001A.

ROS Class	Acres of Proposed Treatment	% of Project Area Portion of IRA 03001
Primitive	0	0%
Semi-Primitive Non-Motorized	0	0%
Semi-Primitive Motorized	505	3.5%
Roaded Natural	1,997	13.8%
Total Treatment Acres	2,502	17.3%

Although there will be a short term effects under Alternative 2, the overall effect to opportunities for solitude in the project area portion of IRA 3001A will not be lasting and will not be significant enough to have a permanent effect to opportunities for solitude in the project area portion of IRA 03001A. Opportunities for solitude in the project area portion of IRA 03001A will remain stable under Alternative 2.

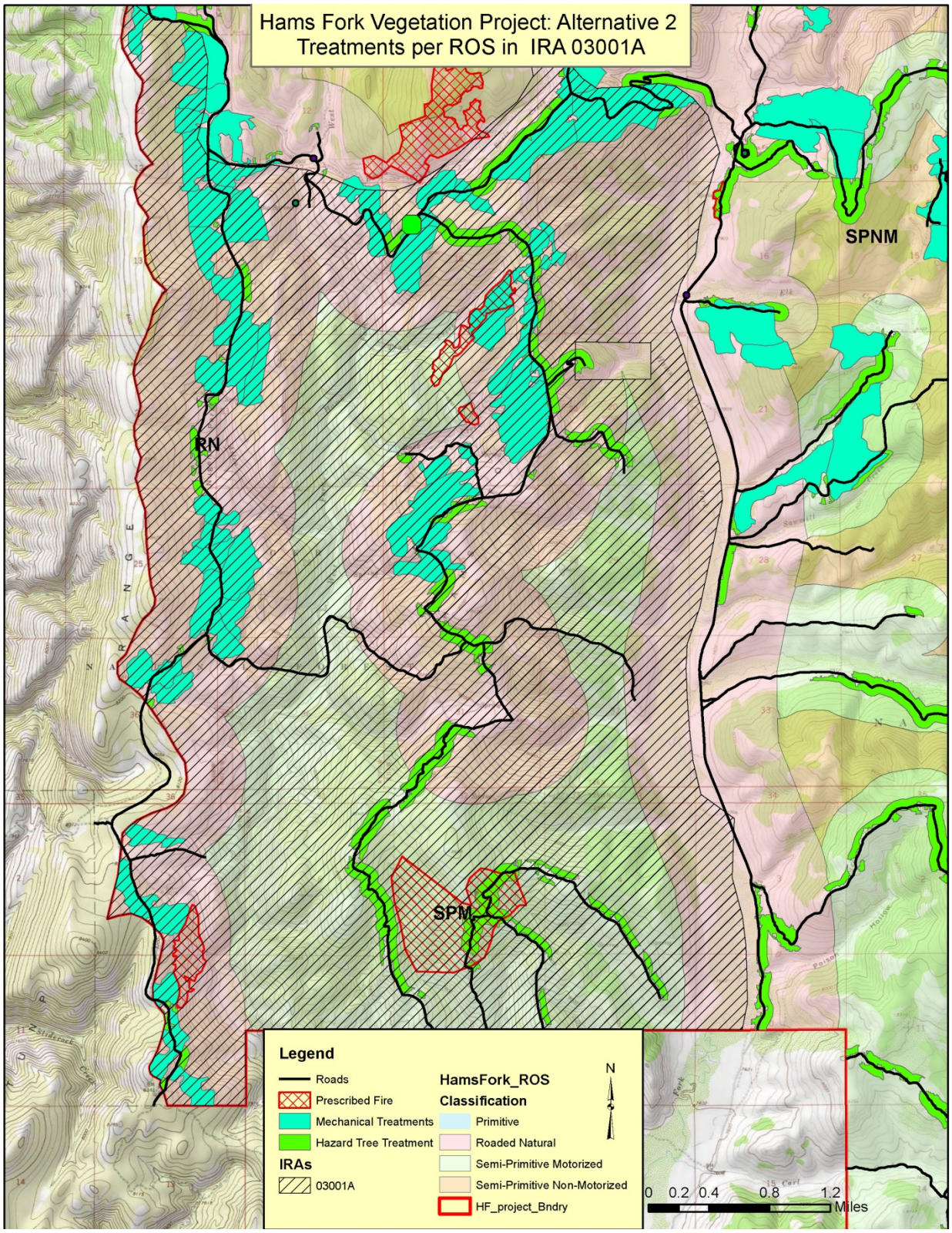


Figure 13. Alternative 2 Treatments per ROS Class within IRA 03001A.

Opportunities for Primitive Recreation:

03001 – Lake Alice-Commissary Ridge: A primitive recreation experience includes opportunities for isolation from evidence of man, a vastness of scale, feeling a part of the natural environment, having a high degree of challenge and risk, and using outdoor skills characterized by meeting nature on its own terms without comfort or facility convenience. There are no proposed facilities or new road developments proposed under Alternative 2 in the project area portion of IRA 03001. Table 40 shows the acres of treatments proposed in each ROS class within the project area portion of the IRA 03001. No road improvements or treatments are proposed in the 4,144 acres of Primitive ROS class.

Road maintenance, improvement, and bridge replacements are proposed in under Alternative 2. This maintenance and development will occur on existing roads, and will only be implemented to bring road conditions up to what the operating maintenance level should be and increase the safety and functionality of the existing bridge. Improved road quality in the project area portion of IRA 3001 may lead to an increase in overall recreational use in the area as access will be improved.

No road maintenance or bridge replacements are proposed to encroach on SPNM or P ROS classified areas within the project area portion of IRA 03001, and additionally no treatments are proposed in primitive ROS classifications. Under Alternative 2 there will be no effect to existing primitive recreation opportunities in the project area portion of IRA 03001. Opportunities for primitive recreation will remain stable under Alternative 2 in the project area portion of the IRA.

03001A – Nugent Park-Hams Fork Ridge: There are few areas in the project area portion of IRA 03001A that are classified for, or offer, primitive recreation opportunities. Less that 1% of the project area portion of the IRA is classified with a ROS class of SPNM, and there are no P areas within the project area portion of the IRA.

Similar to what is described for effects to opportunities for primitive recreation for IRA 03001, there are no new roads or new facilities proposed under Alternative 2 in the project area portion of IRA 03001A. There is road maintenance proposed in the area, one bridge replacement and expanded development of the existing Big Spring gravel pit. However, all these proposed activities will occur in RN or SPM areas that currently do not offer opportunities for primitive recreation. The proposed activities improve or modify existing developments.

There will be no effect to opportunities for primitive recreation in the project area portion of IRA 03001A under Alternative 2. Opportunities for primitive recreation will remain stable under Alternative 2 in the project area portion of the IRA.

Special Features:

03001 – Lake Alice-Commissary Ridge: There is a relatively low value of special features identified for the project area portion of IRA 03001. The special features that have been identified in the IRA portion of the project area are mainly ecological values in the form of habitat for Federally Listed species and Sensitive Species including Canada lynx, grizzly bear, and Colorado River cutthroat trout.

Direct effects to these ecological values will be those that are caused by mechanical treatment and prescribed burn activities, including displacement due to increased human presence and mechanical equipment. Most of these direct effects on displacement will be temporary, short-

term displacement from parts of the project area while mechanical treatments, and burning, activities are occurring (DeLong, Biological Assessment for the Hams Fork Vegetation Project, 2013).

There is not anticipated to be any direct effect to grizzly bears, as there is a very low likelihood of grizzly bears actually inhabiting or traveling through the project area portion of the IRA 03001. Although there is a small potential of an indirect effect of increased human activities in the project area resulting in the human-bear conflicts that could potentially result in the taking of a grizzly bear, this would only be a temporary effect that would last only through the duration of project activities.

Lastly, it is anticipated that the bridge replacement proposed in Alternative 2 would positively benefit Colorado River fish by improving fish passage, reducing sedimentation and improving hydrologic function in the long term.

There is the potential for effects to occur to the ecological values identified as special features in the project area portion of IRA 03001 under Alternative 2. However, it was determined that these effects would not negatively impact or affect the overall habitat and even may result in positive improvements to TES and Sensitive Species habitat in the project area portion of the IRA. The overall special feature attribute in the project area portion of IRA 03001 will remain stable, with the potential to improve, under Alternative 2. Indeed one of the stated goals of this project is to improve the state of whitebark pine in the project area. Whitebark pine is a Sensitive Species and candidate for listing as Threatened.

03001A – Nugent Park-Hams Fork Ridge: The special features identified for the project area portion of IRA 03001A are the same as those identified for IRA 03001. Effects to special features, mainly ecological values in the form of TES and Sensitive Species habitat would be the same as those affects described above for IRA 03001. The one bridge replacement proposed in the project area portion of IRA 03001A in Alternative 2 will improve habitat for sensitive aquatic species and fish.

There is the potential for effects to occur to the ecological values identified as special features in the project area portion of IRA 03001A under Alternative 2. However, it was determined that these effects would not negatively impact or affect the overall habitat and even may result in positive improvements to TES and Sensitive Species habitat in the project area portion of the IRA. The overall special feature attribute in the project area portion of IRA 03001A will remain stable, with the potential to improve, under Alternative 2. . Indeed one of the stated goals of this project is to improve the state of whitebark pine in the project area. Whitebark pine is a Sensitive Species and candidate for listing as Threatened.

***Manageability*:**

03001 – Lake Alice-Commissary Ridge: Alternative 2 does not propose to modify or alter the boundary of IRA 03001. The majority of the project area portion of the IRA has already been identified as not ideal for manageability as a wilderness due to the large extent of existing roads and developed facilities.

Alternative 2 does not propose to increase the number or miles of roads within the project area portion of the IRA, nor are there any new facilities proposed under Alterative 2 within the project area portion of IRA 03001. Existing road, facilities, and other developments that are already present in the project area portion of the IRA would preclude areas classified as SPM and RN

ROS classes from being included in a potential wilderness designation in the area. The overall existing manageability of IRA 03001 will remain stable under Alternative 2.

03001A – Nugent Park-Hams Fork Ridge: Alternative 2 does not propose to modify or alter the boundary of IRA 03001A. The project area portion of the IRA has already been identified as not ideal for manageability of a wilderness due to the large extent of existing roads and developed facilities, as well as topography and vegetation that does not deter prohibited uses.

Alternative 2 does not propose to increase the number or miles of roads within the project area portion of the IRA, nor are there any new facilities proposed under Alterative 2 within the project area portion of IRA 03001A. Existing road and facilities developments would result in all areas classified as SPM and RN ROS classes (over 99%) in the project area portion of the Nugent Park-Hams Fork Ridge IRA not being suitable to be included in if the area was ever proposed to be converted to wilderness.

Summary of effects on Wilderness Qualities and Attributes: Alternative 2 proposes a variety of vegetation treatments within the project area portions of IRA 03001 and 03001A. These treatments include mechanical salvage and sanitation projects, prescribed burning, hazard tree removal, as well as road maintenance and improvement, existing bridge replacement, and the expansion of the Big Spring gravel pit.

03001 – Lake Alice-Commissary Ridge: The proposed treatments under Alternative 2 have the potential to affect the untrammeled and natural attributes as active restoration treatments would occur and would directly control or manipulate the components or process of ecological systems. The proposed actions in Alternative 2 may have slight degrading effects to the untrammeled attributes of the project area portion of the IRA, where the treatments are proposed. These effects area similar to those that have already occurred, that are considered part of the existing condition, and will occur in areas of the IRA that are already heavily impacted and will not affect the higher quality untrammeled areas. Although minor degradation may occur, it will not be severe enough to exclude the area from wilderness designation in the future. Modifications to the natural quality of the IRA would occur through the proposed vegetation treatments proposed in Alterative 2. Although effects would be result human activities influencing the ecological system, the effects to the overall ecological processes would be to bring those more in line with how ecological process should have been occurring without prior influence of man in the form of fire suppression and other management activities. The overall effect of activities proposed in Alternative 2 to the natural quality of the project area portion of the IRA will be a trend toward improving the natural ecological processes.

There would be minor effects to the undeveloped attribute in the project area of the IRA. Effects to the undeveloped attribute would occur only to existing developments and the only increased development level would occur on the improved developmental level of the replacement bridge, and would be insignificant to the overall undeveloped quality. Overall, the undeveloped attribute will remain stable. Alternative 2 will have minor, short term, insignificant opportunities for solitude, and primitive recreation. There are no new roads or facilities proposed, under alternative on, and the impacts of sights and sounds of management activities will not have a long term effect on these attributes. Overall, the opportunities for solitude and primitive recreation will remain stable in the project area portion of the IRA under Alternative 2.

Under Alternative 2 there are expected to be very minor and mostly short term negative effects to special features in the IRA's in the form of effects to TES and sensitive animal species habitat. There may be short term displacement and even long term loss of small portions of habitat due to

the implementation of vegetation treatments. Overall it is expected that the special feature quality in the project area portion of IRA 03001 will be stable with the potential to trend to improving TES habitat in the long term. Lastly there would be no effect to the potential manageability of the portions of the IRA as from the existing condition. Alternative 2 does not propose the modification of the size or shape of the IRA, nor would Alterative 2 alter the IRA boundary. The manageability of the project area portion of the IRA would remain stable.

The effects to sensitive plant species from Alternative 2 will be beneficial. One of the goals of the project is to restore and enhance whitebark pine, which is a sensitive plant species. The actions carried out under Alternative 2 will remove two of the major agents of mortality for whitebark pine (successional replacement and native beetle epidemics). (Johnson 2013)

Overall, effects from Alternative 2 would not significantly or negatively affect the project area portion of IRA 03001, or the IRA as a whole, and would not alter the areas suitability for wilderness designation. Although there is some potential for minor, insignificant degradation, simply because management actions are being taken, as a whole wilderness attributes for the project area portion of the IRA would remain stable with minor potential to improve. .

03001A – Nugent Park-Hams Fork Ridge: The proposed treatments under Alternative 2 would have the potential to affect the untrammeled and natural attributes as active restoration treatments would occur and would directly control or manipulate the components or process of ecological systems. It is not anticipated that the proposed actions in Alternative 2 will have effects to the untrammeled attributes of the project area portion of the IRA. Actions proposed in Alternative 2 are similar to those that have already occurred, that are considered part of the existing condition, and will occur in areas of the IRA that are already heavily impacted and will not affect the already degraded untrammeled nature. Modifications to the natural quality of the IRA would occur through the proposed vegetation treatments proposed in Alternative 2. Although these would be effects would be a result human activities influencing the ecological system, the effects to the overall ecological processes would be to bring those processes more in line with how ecological process should have been occurring without prior influence of man in the form of fire suppression and other management activities. The overall effect of activities proposed in Alternative 2 to the natural quality of the project area portion of the IRA will be a trend toward improving the natural ecological processes.

There would be minor to no effects to the undeveloped attribute in the project area of the IRA. Effects to the undeveloped attribute would occur only to existing developments and the only increased development level would occur on the improved developmental level of the replacement bridge, and would be insignificant to the overall undeveloped quality. Overall, the undeveloped attribute will remain stable. Alternative 2 will have minor, short term, insignificant effects on opportunities for solitude, and primitive recreation. There are no new roads or facilities proposed, under alternative on, and the impacts of sights and sounds of management activities will not have a long term effect on these attributes. Overall, the opportunities for solitude and primitive recreation will remain stable, in their existing degraded state, in the project area portion of the IRA under Alternative 2.

Under Alternative 2 there are expected to be only very minor and mostly short term negative effects to special features in the IRA in the form of effects to TES and sensitive animal species habitat. There may be short term displacement and even long term loss of small portions of habitat due to the implementation of vegetation treatments. Overall, it is expected that the special feature quality in the project area portion of IRA 03001A will be stable with the potential to trend to most effects will be beneficial for improving TES habitat in the long term. Alternative 2 would

improve sensitive plant habitat in both the short and long terms. Lastly there would be no effect to the potential manageability of the portions of the IRA as from the existing condition. Alternative 2 does not propose the modification of the size or shape of the IRA, nor would Alternative 2 alter the IRA boundary. The manageability of the project area portion of the IRA would remain stable in its existing condition.

Overall, effects from Alternative 2 would not significantly or negatively affect the project area portion of IRA 03001A, or the IRA as a whole,, and would not alter the areas suitability, or lack thereof, for wilderness designation. Although there is some potential for minor, insignificant degradation, simply because management actions are being taken, as a whole wilderness attributes for the project area portion of the IRA would remain stable with minor potential to improve.

Effects to Roadless Area Characteristics

Soil, Water, and Air Resources:

03001 – Lake Alice-Commissary Ridge: The actions proposed in Alternative 2 include mechanical vegetation treatments, prescribed fire, hazard tree removal, bridge replacement, and road maintenance. Although there are no unique or critical watershed resources identified in the project area portion of IRA 03001, it is anticipated that the proposed actions will have impacts on the soil, water, and air resources in the IRA portion of the project area.

Proposed activities would have both long and short term effects on soils; however design features SOILS-1 – SOILS-12 will help avoid major effects to the soils resources. Effects from ground based harvesting may reduce soil productivity as a result of compaction, rutting and displacement, degradation of the litter layer and organic material, lack of coarse woody debris and possible weed incursion. Additionally, compaction can indirectly lead to decreased water infiltration rate, leading to increased overland flow and associated erosion. Lastly, as a result to prescribed fire, soil erosion can increase and may reduce nutrients in the soil.

There will be short term effects to soil, water, and air quality resources in the project area portion of IRA 03001. It is anticipated these effects will be insignificant and will not have long term, detrimental effect to the soil, water, and air quality resources. Soil, water and air resource characteristic will remain stable in the project area portion of the IRA, and in the IRA as a whole

03001A – Nugent Park-Hams Fork Ridge: Effects to the soil, water, and air quality Roadless attributes of the project area portion of IRA 03001A will be the same as those describe above.

There will be short term effects to soil, water, and air quality resources in the project area portion of IRA 03001A. It is anticipated that these effects will be insignificant and will not have long term, detrimental effect to the soil, water, and air quality resources. Soil, water, and air resource characteristic will remain stable in the project area portion of the IRA, and in the IRA as a whole.

Sources of Public Drinking Water

03001 – Lake Alice-Commissary Ridge: There are two developed sources of public drinking water in the project area portion of IRA 03001: Hams Fork Campground and Kelley Guard Station. These water systems are well based systems and will not be affected by the hazard tree treatments occurring around the facilities.

There will be no effect to public drinking water in the project area portion of IRA 3001 as a result of the proposed actions in Alternative 2. Sources of public drinking water will remain stable in the project area portion of the IRA.

03001A – Nugent Park-Hams Fork Ridge: There will be no effect to public drinking water because there are no sources of public drinking water present in the project area portion of IRA 03001A.

***Diversity of Plant and Animal Communities*:**

03001 – Lake Alice-Commissary Ridge: Under Alternative 2 there are a total of 3,956 acres of treatments proposed in the project area portion of IRA 03001 Additionally, there will be 37 miles of roads maintained and one bridge replaced in the project area portion of the IRA under Alternative 2.

The amount of forestland in late succession could decline by as much as 1 – 3% in the project area portion of IRA 03001 as a result of Alterative 2 depending in part on the extent to which prescribed burns meet objectives and the extent to which aspen and whitebark pine improvement treatments produce stand-initiation conditions. Diversity, overall canopy cover, and production of herbaceous vegetation and shrubs have the potential to be affected on all 3,956 acres of proposed treatments, however it is anticipated that these effects will be relatively short duration (an estimated 5-10 years).

Alternative 2 would move timber stands in the project area portion of the IRA closer to the desired future condition (e.g., a natural mix of succession stages) by increasing age class diversity, enhancing regeneration efforts, reducing competition, and promoting trees that are more resilient to insect and disease attacks through superior health and vigor. Prescribed burns will assist with halting the encroachment of conifer into aspen and sagebrush communities as would have naturally occurred if a trend of fire suppression had not dominated the area in the last 50 years.

The proposed treatment activities that will benefit the long term health and functionality of the ecological systems in the project area portion of the IRA may have some direct, but mostly short term, effects to wildlife habitat. The majority of direct effects will result in the short term displacement of animals within the treatment areas due to mechanical equipment, human presence, and prescribed fire. Additionally, increased traffic on roadways within the project area portion of the IRA could result in increased mortality rates, or shifts in transportation/migration routes. However, it is anticipated that after the completion of the project habitat use would revert back to pre-project levels in most cases.

Although there will be some short term negative effects to the diversity of plant and animal communities in the project area portion of IRA 03001 under Alternative 2, it is anticipated that most long term effects will be positive in helping restore natural habitat levels in the area, and overall species richness may not be affected, long term, by Alternative 2 in the project area portion of IRA 03001. In summary it is anticipated that the overall diversity of plant and animal community's characteristic of the project area portion of the IRA will be stable and trending towards improvement under Alternative 2.

03001A – Nugent Park-Hams Fork Ridge: Under Alternative 2 there are a total of 2,502 acres of treatments proposed in the project area portion of IRA 03001A. Additionally, there will be 17

miles of roads maintained or reconstructed, one bridge replaced, and the expansion of the Big Spring gravel pit by 3 acres, in the project area portion of the IRA under Alternative 2.

Effects to the diversity of plant and animal communities within the project area portion of IRA 03001A will be the same as those described above for the project area portion of IRA 03001. The diversity of plant and animal communities characteristic within the project area portion of the IRA will be stable and trending towards improving under Alternative 2.

Habitat for TES and Species Dependent on Large, Undisturbed Areas of Land:

03001 – Lake Alice-Commissary Ridge: Implementation of Alternative 2 may disturb, displace, and affect potentially suitable habitats for the Canada lynx and grizzly bear. A description of the selection and analysis for Federally listed wildlife species is provided in the Biological Assessment (BA) that is available in the Project File.

It is anticipated that direct effects to lynx (e.g. use of mechanical equipment, human presence, prescribed fire) could result in the temporary displacement of lynx, although displacement would be highly unlikely since lynx occurrences are so rare in the area. Also, any displacement would be of short duration and would only occur when project treatments where being implemented. It is not anticipated that lynx habitat connectivity within the Hams Fork LAUs will be negatively affected as most treatments that could affect connectivity are small, have the potential to not drastically reduce forestland with overstory tree cover, and treatments are prosed in very small sections of suitable lynx habitat. Lastly, as the current condition is not meeting lynx objective VEG-O2, it is anticipated that proposed treatments may improve lynx habitat by helping create a mosaic of habitat conditions (DeLong, Biological Assessment for the Hams Fork Vegetation Project, 2013). Additionally, as there is little evidence of lynx occupying the project area portion of IRA 03001, it is not anticipated that the project activities will displace any specific individuals.

Implementation of Alternative 2 is not expected to result in direct mortalities of grizzly bears or cause displacement or disturbance of grizzly bears in the project area of IRA 03001 mainly due to the very low likelihood of grizzly bears inhabiting or traveling through the vicinity of treatment units. There are no known occurrences of grizzly bears in the Hams Fork project area and it is unlikely that a grizzly would pass through the project area. Additionally the treatment units in the project area portion of the IRA do not have any particular features or characteristics that would attract grizzly bears. Additionally, mechanical treatment and prescribed burning activities in any given unit would be of short duration.

It is anticipated that Alternative 2 may impact individuals of these species, or minor parts of their habitat, but overall, Alternative 2 would not negatively affect populations of these species and may have beneficial impacts on habitat for great gray owls. Although there may be a negative impact on individual three-toed woodpecker and boreal owl habitat, due to the reduction in the density of dead trees and small reductions in the amount of late-seral spruce-fir, there will not be a trend towards loss of viability or trend towards Federal listing for either boreal owls or northern three-toed woodpeckers.

Under Alternative 2 there may be some effects to Threatened and sensitive animal species habitat, they are not anticipated to be significant, and should not have an adverse effect on TES or Sensitive Species habitat in the project area portion of IRA 03001. It is anticipated that the roadless characteristic focusing on TES and Sensitive Species habitat will remain stable, and may have the potential for limited improvement.

The effects to sensitive plant species from Alternative 2 will be beneficial. One of the goals of the project is to restore and enhance whitebark pine, which is a sensitive plant species. The actions carried out under Alternative 2 will remove two of the major agents of mortality for whitebark pine (successional replacement and native beetle epidemics). (Johnson 2013)

03001A – Nugent Park-Hams Fork Ridge: Effects to TES and Sensitive Species in the project area portion of IRA 03001A will be similar as those described above for IRA 03001.

Under Alternative 2 there may be some effects to TES and sensitive animal species habitat they are not anticipated to be significant, and should not have an adverse effect on TES or Sensitive Species habitat in the project area portion of IRA 03001A. It is anticipated that the roadless characteristic focusing on TES and Sensitive Species habitat will remain stable, and may have the potential for limited improvement.

The effects to sensitive plant species from Alternative 2 will be beneficial. One of the goals of the project is to restore and enhance whitebark pine, which is a sensitive plant species. The actions carried out under Alternative 2 will remove two of the major agents of mortality for whitebark pine (successional replacement and native beetle epidemics). (Johnson 2013)

Primitive and Semi-Primitive Classes of Recreation:

03001 – Lake Alice-Commissary Ridge: The project area portion of IRA 03001 has a ranging opportunity for primitive and semi-primitive classes of recreation in the portion of the IRA occupied.

Effects to semi-primitive classes of recreation, including isolation from the sights and sounds of man, would be affected by the increase of human presence and activity during the time of proposed treatment operation. Alternative 2 does not propose any new roads or developed facilities any portion of the project area portion of the IRA; however, some existing roads will be maintained. Roads that are maintained will only be improved to their objective maintenance level, and will not be upgraded. Sights and sounds of human activity will increase as mechanical timber harvest treatments and prescribed burns are implemented. This increase of activity will be short term however, and at the conclusion of treatments the sights and sounds of human activity will revert back to pre-project levels. The short term effects to semi-primitive classes of recreation will be increased human presence, sights and sounds of timber harvest machinery, and road improvements.

Effects to primitive and semi-primitive recreation class will be short term and temporary in duration. Effects are anticipated to be insignificant and not long term. There will be no long lasting detrimental effects to semi-primitive recreation under Alternative 2. Under Alternative 2 primitive and semi-primitive classes of recreation attribute will remain stable.

03001A – Nugent Park-Hams Fork Ridge: The project area portion of IRA 03001A has very limited areas classified for primitive and semi-primitive classes of recreation.

Primitive and semi-primitive classes of recreation will remain stable under Alternative 2 in the project area portion of the IRA. There will be no long lasting detrimental effects to semi-primitive recreation under Alternative 2 in the project area portion of IRA 03001A, or permanent effects that would result in the permanent reclassification of recreation classes in the project area portion.

Reference Landscapes for Research Study or Interpretation:

03001 – Lake Alice-Commissary Ridge: The major physiographic features of the project area portion of IRA 03001 are the Hams Fork Basin and Commissary Ridge. These two features are characterized by a diverse landscape and scenic experiences for travelers and residents of the area.

Proposed timber harvest treatments will result in an effect of short term (5-10 years) visual modifications to the natural setting within, and visible from, the IRA portion of the project area as a result of timber harvest, mechanical treatments and prescribed fire. No new roads, structures, or developed facilities are proposed in the project area portion of IRA 03001. Most of these short term, direct effects would be in the form of unnatural openings created by timber harvest, visual impacts of construction and maintenance activities, and blacked and burned terrain and vegetation. These affects will be most visual during implementation and immediately after completion of proposed project activities. In the next 1 – 10 years, the land will regain its more natural, and an anticipated healthier, more desired future condition.

There are no portions of the project area portion of IRA 03001 that have been identified as a reference landscape for research, study, or interpretation, therefore Alternative 2 will not have an effect on reference landscapes in the project area portion of IRA 03001.

03001A – Nugent Park-Hams Fork Ridge: The major physiographic features of the project area portion of IRA 03001A are the Hams Fork Basin, Tunp Range to the west and the view of Commissary Ridge to the east. These features are characterized by a diverse landscape and scenic experiences for travelers and residents of the area.

Proposed timber harvest treatments will result in an effect of short term (5-10 years) visual modifications to the natural setting within, and visible from, the IRA portion of the project area as a result of timber harvest, mechanical treatments and prescribed fire. . No new roads, structures, or developed facilities are proposed in the project area portion of IRA 03001A. Effects to reference landscapes for research study or interpretation would be the same as those described above for IRA 03001.

There are no portions of the project area portion of IRA 03001A that have been identified as a reference landscape for research, study, or interpretation. Alternative 2 will not have an effect on reference landscapes in the project area portion of IRA 03001A.

Landscape Character and Integrity:

03001 – Lake Alice-Commissary Ridge: Alterative 2 would have both short-term (less than 5 years) and long-term (greater than 5 years) visual effects to the visual quality and the landscape character and integrity.

It is anticipated that effects to the landscape character and integrity would be short-term associated with mechanical treatments; however these effects would not be significant and would dissipate as project activities were completed. Additionally there is the potential that visual quality of the project area could improve as regeneration of forest lands is encouraged. Alternative 2 would have minimal visual impacts in the form of vegetation textures from the hazard tree removal and thinning of trees on the overall integrity of the project area portion of the IRA. (Barthelenghi, 2013) Effects would be short-term associated with mechanical treatments. Most impacts would show recovery within a few seasons, and in the long-term, these impacts

would be hard to distinguish. Alternative 2 does not propose road construction in the project area portion of IRA 03001. There would be no long-term visual effects to roadless area characteristics or wilderness attributes in the inventoried roadless area within the project area.

The proposed action in Alternative 2 would have minimal visual impacts, and the overall landscape character and scenic integrity of the project area portion of IRA 03001 would remain stable with the potential to improve.

03001A – Nugent Park-Hams Fork Ridge: Alterative 2 would have both short-term (less than 5 years) and long-term (greater than 5 years) visual effects to the visual quality and the landscape character and integrity in the project area portion of IRA 03001A. In addition to the activities described under 03001, Alternative 2 proposes the expansion of the Big Spring gravel pit from 2 acres to 5 acres in IRA 03001A.

Visual impacts and effects to the landscape character and integrity would be very similar to those described above for IRA 03001. Expansion of the Big Spring Gravel pit will occur at the current location of the existing gravel pit will not be moved to another location, the amount of development will simply be expanded to meet road maintenance needs with its material. The gravel pit is located in a Roaded Natural area that has a VQO of Partial Retention, and is not visually evident, because it blends well with the natural rocky slope of the landscape. The visual effects of this work would recover once vegetation is established (Barthelenghi, 2013). Once the rock supply is exhausted, the site would be restored to natural appearing conditions, at which time it would met a VQO of Retention or Partial Retention (Barthelenghi, 2013).

It is anticipated that most effects to the landscape character and integrity of the project area portion of the IRA would be short-term associated with mechanical treatments; however these effects would dissipate as project activities were completed. Alternative 2 does not involve road construction within the IRA, and the only long-term visual effect to the Roadless area would be the expansion of the gravel pit. However, considering the existing modified character of the landscape, and that gravel pit expansion still meets forest plan management direction for the area, it is not anticipated that the expansion of the gravel pit will be significant enough to alter the existing landscape character of the area. The overall landscape character and scenic integrity of the project area portion of the IRA will remain stable under the proposed actions in Alternative.

Traditional Cultural Properties and Sacred Sites:

03001 – Lake Alice-Commissary Ridge: There is always the potential that vegetation management activities could have direct effects to undetected cultural resources. These effects could include the damage or destruction to prehistoric sites. Mechanical equipment used to harvest and remove timer, or to maintain roads, landings or fires lines could also damage archeological sites and features.

Mechanical treatment and prescribed fire units have had their units adjusted to ensure that they will not include cultural sites that have already been identified in the project area portion of IRA 03001. There will be no direct effects to recorded eligible sites; however there is the potential for direct and indirect effects to undetected sites. Indirect effects could result in vegetation is removed from an archeological sites leaving that site exposed to surface erosion or increased artifact collection by the public.

The cultural resource surveys conducted to-date within the project area portion of IRA 03001 indicates that there are no significant historic or prehistoric sites within the proposed mechanical

treatment units. Therefore, there will be no direct or indirect effects to cultural resources if proposed action is implemented in the project area portion of IRA 03001. The existing condition of traditional and cultural properties and sacred sites will remain stable under Alternative 2.

03001A – Nugent Park-Hams Fork Ridge: As described above it is always the potential that vegetation management activities could have direct effects to previously undetected cultural resources.

Effects to cultural resources in the project area portion of IRA 03001A will be the same as those described above for IRA 03001. There will be no direct or indirect effect to know, existing traditional cultural or sacred sites, under Alternative 2. The existing condition of traditional cultural characteristics will remain stable.

Other Locally Unique Characteristics:

03001 – Lake Alice-Commissary Ridge: Although there are special features identified in the whole of IRA 03001 – Lake Alice-Commissary Ridge, they are outside the project area, and thus outside the analysis area for this report. There are no other locally unique characteristics in the project area portion of IRA 03001.

There will be no effect to other locally unique characteristics in the project area portion of IRA 03001 under Alternative 2.

03001A – Nugent Park-Hams Fork Ridge: There are no other locally unique characteristics identified in the project area portion of IRA 03001A.

There will be no effect to other locally unique characteristics in the project area portion of IRA 03001 under Alternative 2.

Summary of Effects to Roadless Characteristics:

Under Alternative 2 there could be effects to Roadless area characteristics with the implementation of mechanical harvest, prescribed burns, road maintenance, bridge replacement, and increased development of the Big Spring gravel pit.

03001 – Lake Alice-Commissary Ridge: There are no identified critical soil, water or air resources in the project area portion of the IRA. Although there will be short term effects to these resources during implementation of the proposed actions, it is not anticipated that there will be any significant, long term detrimental effects to these resources. Soil, air, and water resources in the project area portion of the IRA will remain stable under Alternative 2. Although there are 2 sources of public drinking water it is anticipated that Alternative 2 will have no effect on the 2 sources of public drinking water and sources of public drinking water will remain stable under Alternative 2.

It is anticipated that there will be effects to the diversity of plan and animal communities under the proposed action in the project area portion of IRA 03001. Loss of vegetation as a result of mechanical treatments and prescribed burning may result in long term effect of modifying the natural habitat. However, it is anticipated that the proposed action will trend the ecological community of the project area portion of the IRA to a more natural and diverse plant and animal community by creating more early-seral forestland and improving aspen and whitebark pine habitat. It is anticipated that the diversity of plant and animal community roadless characteristic would be trending towards improvement under Alternative 2 in the project area portion of the

IRA. It is not anticipated that Alternative 2 will have any significant adverse effect to TES or sensitive animal species habitat in the project area portions of the IRA and will be beneficial for sensitive plant species habitat. It is anticipated that the roadless characteristic focusing on TES and Sensitive Species habitat will remain stable, and may have the potential for limited improvement.

There is no new road construction or new development of facilities proposed under Alterative 2 within the project area portions of the IRA. Although there will be some short term effects of increased human presence in the project area, there will be no significant long term, permanent effects to primitive and semi-primitive classes of recreation. Under Alternative 2 primitive and semi-primitive classes of recreation attribute will remain stable. There are no reference landscapes for research studies or interpretation in the project area portion of the IRA; therefore there would be no effect to this characteristic under Alternative 2. There will be some short term (up to 5 years) negative effects to the landscape character and integrity and the overall scenic quality of the project area portions of the IRA as a result of timber harvests and prescribed burns. These effects will be short term as natural regrowth occurs. Additionally, the landscape and scenic quality could improve as aspen stands begin to regenerate and lodgepole stands are rejuvenated with the removal of dead and dying timber. Overall, the landscape character and integrity characteristic will remain stable with the potential to improve as a result of Alternative 2. There will be no effect to existing traditional cultural properties, as units boundaries are planned around known traditional sites. No other unique characteristics are identified in the project area portion of the IRAs have been identified.

The actions proposed under Alternative 2 may result in a variety of effects on roadless characteristics in the project area portion of IRA 03001. In summary however, the result of these effects will leave the Roadless area characteristics in a stable condition with the potential to improve the characteristics of plant and animal diversity and landscape integrity.

03001A – Nugent Park-Hams Fork Ridge: There are no critical air, soil, or water resources identified in the project area portion of IRA 03001A; there will be no effect to this roadless characteristic. There are no identified sources of public drinking water identified in the project area portion of the IRA; there will be no effect to this roadless characteristic. As described above in the summary for 03001, there is the potential for effects to the diversity of plant and animal communities in the project area of the IRA.

However there are no significant negative effects to this characteristic anticipated, and it was determined this characteristic will remain stable with the potential to improve under Alternative 2. Similar to the summary for the project area portion of IRA 03001, no significant effects to TES or sensitive animal species habitat are anticipated to the project area portion of IRA 03001A under Alternative 2 and the effects to sensitive plant species habitat will be beneficial. Additionally, there is the chance that there could be minor trends towards improving habitat in the project area portion of the IRA under Alternative 2.

There will be no significant long-term effects to primitive and semi-primitive forms of recreation. The project area portion of the IRA 03001A is already highly developed, with limited opportunities for primitive and semi-primitive forms of recreation. No actions proposed in Alternative 2 will alter the primitive and semi-primitive opportunities in the area, and they will remain stable in their current condition. As in IRA 03001 there are no reference landscapes identified in the project area portion IRA 03001A. Effects to landscape integrity will remain stable with the potential to improve as aspen stands expand and lodgepole stands are rejuvenated by the removal of dead and dying timber. Effects of the expansion of the gravel pit are anticipated

to not be significant as the area helps blend gravel development and the site will be restored to a natural appearing condition after the gravel supply is exhausted. Expansion of the gravel site would still meet the retention or partial retention VQO for the area. It is anticipated that there will be no effect to existing traditional cultural properties as project area boundaries were planed around known sites. There are no other locally unique characteristics present in the project area portion of IRA 03001A.

The actions proposed under Alternative 2 may result in a variety of effects on roadless characteristics in the project area portion of IRA 03001A. In summary however, the result of these effects will leave the Roadless area characteristics in a stable condition with the potential to improve the characteristics of plant and animal diversity and landscape integrity.

Cumulative Effects

There are no present or reasonably foreseeable future project activities proposed in the project area portion of either IRA other than current management and maintenance of existing roads and facilities. All past actions, including existing roads and facilities and the maintenance thereof, have been integrated into the existing condition description for the project area portion of both IRA 03001 and 03001A.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

2001 Roadless Rule

Eighty-seven percent (64,647 acres) of the Hams Fork project area is located within the Lake Alice-Commissary Ridge Roadless Area (3001) and the Nugent Park-Hams Fork Roadless Area (3001A). The inventoried roadless areas (IRA) were identified and mapped during the 1979 Roadless Area Review and Evaluation (RARE II, U.S. Forest Service 1979). In 1979 when these areas were identified in the Hams Fork project area as inventoried roadless areas, they contained a developed road system as well as a timber management program. Today, approximately 85 miles of roads are open to the public in the inventoried roadless areas. In general, road densities are highest in the western portion of the Hams Fork watershed with approximately 1.4 miles of open road per square mile occurring in the western portion compared with 0.6 miles of open road per square mile in the eastern portion. The eastern portion of the watershed has large, contiguous area with few miles of road.

Management direction for inventoried roadless areas were established in the Roadless Area Conservation Final Rule (36 CFR Part 294), commonly known as the 2001 Roadless Rule. This rule generally prohibits road construction, reconstruction, and timber harvest in inventoried roadless areas; however, forest health treatments for the purposes of maintaining or restoring the characteristics of ecosystem composition and structure, such as reducing the risk of uncharacteristic wildfire effects are allowed where access can be gained through existing roads (with certain exceptions) or by equipment not requiring roads. Under the 2001 Roadless Rule timber cutting, sale, and removal may occur in inventoried roadless areas under certain conditions.

The Hams Fork Vegetation Project meets the following exemption to the prohibition on timber cutting, sale, or removal in inventoried roadless areas as allowed for in the 2001 Roadless Rule:

> *(§294.13(b) (1)) Cutting, sale, or removal of generally small diameter timber is needed for one of the following purposes and will maintain or improve one or more of the roadless area characteristics as defined in §294.11.*

(ii) to maintain or restore the characteristics of ecosystem composition and structure, such as to reduce the risk of uncharacteristic wildfire effects, within the range of variability that would be expected to occur under natural disturbance regimes of the current climatic period;

The Rule requires that the cutting, sale or removal of generally small diameter timber for certain purposes also "maintain or improve one or more of the roadless area characteristics." As shown in the above analysis, most roadless characteristics in the project area portion of the IRAs will remain stable under the proposed action. In addition, the proposed action has the potential to benefit and improve the diversity of plant and animal communities in both IRAs, and may have some potential to improve TES habitat in the area. Additionally, it is anticipated that long term effects of the proposed action may improve the landscape character and integrity of the area.

Forest Plan and other regulation and policies

Alternative 2 is in compliance with other relevant laws, regulation, policies, and plans in regards to the recreation resource.

Conclusions

Effects on Special Areas —

Table 42 shows the summary of actions proposed in both alternatives.

Table 42. Summary of Effects

Resource	Alternative 1		Alternative 2	
	Miles/Acres of Treatment/Roads per Project Area Portion of IRA 03001	Miles/Acres of Treatment/Roads per Project Area Portion of IRA 03001A	Miles/Acres of Treatment/Roads per Project Area Portion of IRA 03001	Miles/Acres of Treatment/Roads per Project Area Portion of IRA 03001A
New Road Construction	0 miles	0 miles	0 Miles	0 Miles
FS Roads to Be Reconstructed	0 miles	0 miles	0 Miles	0 Miles
FS Roads Maintained	20 miles	14 miles	37 Miles	17 Miles
FS Roads with No Change	N/A	N/A	5 Miles	5 Miles
FS Roads to be closed	0 miles	0 miles	0 Miles	0 Miles
FS Roads hazard Tree Maintenance	N/A	N/A	20 Miles	9 Miles
Bridge Replacement	0	0	1	1
Gravel Source Development	0	0	0	1
Hazard Tree Treatment	0 Acres	0 Acres	1,483 Acres	540 Acres
Sanitation/Salvage	0 Acres	0 Acres	2,285 Acres	1,584 Acres
Prescribed Fire	0 Acres	0 Acres	185 Acres	337 Acres

Under Alternative 1 regular maintenance of existing roads and developed facilities would continue as outlined in Forest Plan direction and agency directives. The road maintenance proposed would not be project related but regular scheduled road maintenance on existing roads; there are no additional project actions proposed in Alternative 1. Effects to the wilderness characteristics and roadless attributes under Alternative 1 would not be a direct effect of any proposed actions, but indirect as a result of natural processes, continued tree mortality and long term effects to ecological process as a result of a regime of fire suppression in the area. For the most part wilderness attributes and roadless characteristics will remain primarily stable, with the potential for degradation in habitat diversity and landscape integrity, as the natural ecological process continues unhindered.

Alternative 2, the proposed action alternative, has the potential to affect a variety of wilderness characteristics and roadless attributes for the most part in short term effects during the implementation of the proposed project activities. Proposed treatments would have an effect be resulting in an attempt to directly control or manipulate the components or process of ecological systems. Although these would be human activities influencing the ecological system, the effects to the overall ecological processes, under Alternative 2 in the project area portion of the IRAs would be to restore the ecological structure to a more natural composition as they would result in more heterogeneous timber stands, stand age diversity class, and restore suffering aspen and whitebark pine communities.

In summary, effects from Alternative 2 should not affect the either IRAs suitability for wilderness designation. Under Alternative 2 ecosystem composition will be improved, no new roads or developed facilities will be constructed, and there will be no permanent changes to primitive recreation classes or opportunities for solitude.

Hydrology

The following resource information and analysis summarizes the Hydrology Report (Robertson 2013).

Affected Environment

The lands of the Bridger-Teton National Forest have been divided into hydrologic units (HUCs) for analyses. These HUCs are typically watersheds, although there are rare exceptions when HUC boundaries do not follow watershed divides. For most purposes, the Forest looks at cumulative watershed impacts on a 6th-field HUC basis. These HUCs are usually 5,000 to 50,000 acres in size. The following four HUCs are included in the project area and are displayed in Figure 14:

HUC Number	HUC Name	Size of HUC (acres)
140401070604	Beaver Creek	15,046
140401070601	Hams Fork – East Fork Hams Fork	47,457
140401070603	Hams Fork – West Beaver Creek	27,122
140401070602	West Fork Hams Fork	20,786

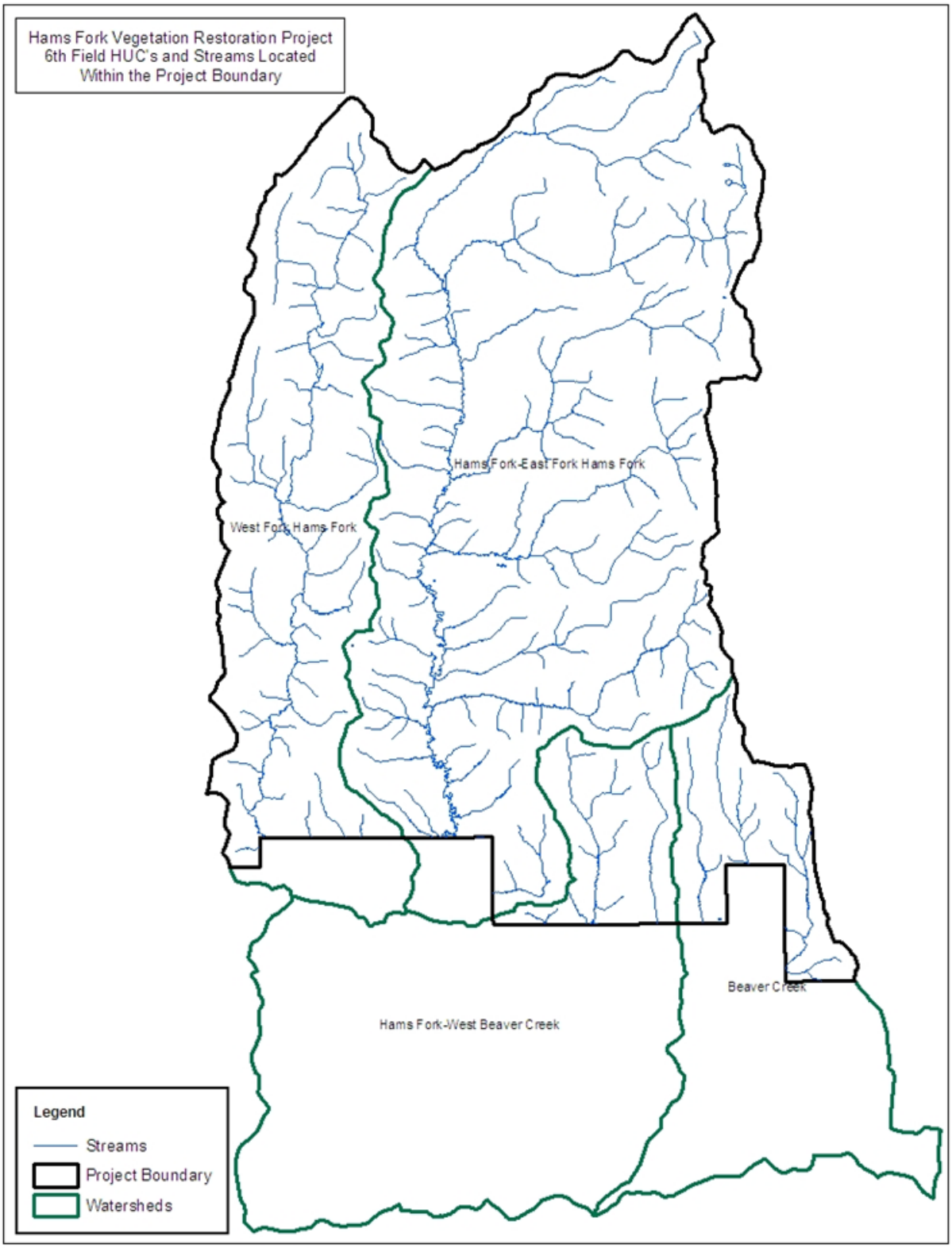


Figure 14. Hydrological Units (HUCs), Hams Fork Vegetation project area boundary and major streams in the project area.

Water Quality

The objective of the Wyoming water pollution control program is to "provide, wherever attainable, the highest possible water quality commensurate with [designated beneficial uses]". (Wyoming DEQ, 2007, Section 3) Examples of beneficial uses include agriculture, fisheries, drinking water, and recreation.

The Hams Fork watershed meets the Forest Service definition of a municipal supply watershed for the town of Kemmerer, even though the town's water intake is downstream from the Forest. As defined in the Forest Service Manual (FSM 2542.05), "A municipal supply watershed is one that serves a public water system as defined in Public Law 93-523 (Safe Drinking Water Act); or as defined in State safe drinking water regulations. The definition does not include communities served by well or confined ground water unaffected by Forest Service activities." Forest Service policy (that applies to this project) for such watersheds are to "Identify watersheds providing the principal source of community water during land management planning. Develop prescriptions on a case-by-case basis to ensure desired multiple-use outputs while recognizing domestic water supply needs…" (FSM 2542.03)

According to Chapter 1 of the Wyoming Water Quality Rules and Regulations:

> Class 2AB waters are those known to support game fish populations or spawning and nursery areas at least seasonally and all their perennial tributaries and adjacent wetlands and where a game fishery and drinking water use is otherwise attainable. Unless it is shown otherwise, these waters are presumed to have sufficient water quality and quantity to support drinking water supplies and are protected for that use. Class 2AB waters are also protected for nongame fisheries, fish consumption, aquatic life other than fish, recreation, wildlife, industry, agriculture and scenic value uses.

Class 2AB waters that are located within the Hams Fork Vegetation Project analysis area are: East Fork Hams Fork, West Fork Hams Fork, Hams Fork River, Little Indian Creek, Indian Creek, North and South Fork Elk Creek, Elk Creek, Sawmill Creek, Pole Creek, West Fork and East Fork Beaver Creek, Beaver Creek, Basin Creek, Devils Hole Creek, Kelley Creek, and Burke Creek.

Wyoming Department of Environmental Quality collected one water quality sample on the Hams Fork downstream from the East Fork Confluence in September 1998, and another sample at the Hams Fork Campground in October 1995. Temperatures at both sites were below 10ºC and all nutrient values (nitrite + nitrate and phosphorus) were below the level of detection, so State water quality standards were met. Turbidity was low at both sites: 1.67 NTU at the former site and 2.4 NTU at the latter site.

Wetlands

Executive Order 11990 provides for avoidance of adverse impacts associated with destruction or modification of wetlands. Wetlands are defined by this order as, ". . . areas inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds."

Wetlands are generally located along streams in the analysis area and these streams include Hams Fork, West Fork Hams Fork, Indian Creek, Little Indian Creek, Devils Hole Creek, Trail Creek, Allen Creek, Basin Creek, Kelley Creek, Shingle Mill Creek, and Sawmill Creek, along with small isolated wetlands. At this time, all wetlands have robust vegetation reflective of healthy conditions, except in the areas described in the specialist report (Robertson 2013) which included small portions of the West Fork Hams Fork, East Fork Hams Fork, and Indian Creek due to sheep grazing.

Water Quantity and Stream flow

There are three SNOTEL long term weather stations located within the project area. The Hams Fork SNOTEL is located in the southeast corner of the project area near the forest boundary. The Indian Creek SNOTEL station is located at the northern end of the project area near the end of FS road 10161. The Kelley Station SNOTEL is located at the Kelley Ranger Station. Table 43 provides a summary of the precipitation data from all 3 SNOTEL sites. All three sites show a late fall/winter monthly precipitation peak (November through February) due to snow accumulation. July and August are the months of lowest precipitation. As indicated by Table 43, Indian Creek experiences the highest levels of precipitation accumulation due to its elevation and the opposite is true for the Hams Fork station. These three sites show the wide range of precipitation seen within the Hams Fork project area.

Table 43. SNOTEL Data for the three long term weather stations located within the project area.

SNOTEL Station	# Record Years	2011 Precipitation Totals (in.)	Average Precipitation (in.)	Elevation (ft)
Hams Fork	27	14	19.2	7840
Indian Creek	32	24.9	33	9425
Kelley Ranger Station	32	21.6	27.4	8180

There is one USGS stream gage operating near the project area. The Hams Fork stream gage is located about 6 miles downstream from the forest boundary and has been in operation since 1953. The peak stream flow for the gage was recorded on June 5, 1986 with a flow of 2,230 cubic feet per second (cfs). Low flows tend to occur from late January to mid-March and are less than 20 cfs.

Stream Channel Conditions

Stream channel condition and trend was assessed in the summer of 2010 and 2011. Proposed treatment areas were visited, aerial photos were reviewed, and streams were walked to obtain an overview of general channel characteristics and conditions (Robertson 2013). Overall, riparian vegetation and stream channel conditions within the project area are good. These riparian areas will allow for the entrapment of sediment during overbank flows from roads and other upland sediment sources. Certain roads were identified as having sediment concerns; specifically the roads adjacent to the Hams Fork Campground, Basin Creek and Kelley Creek. These roads allow for sediment to reach streams and cause a decrease in water quality.

Environmental Consequences

This analysis evaluates the potential effects to riparian areas, vegetation, and overall stream function and health with respect to the alternatives being considered.

Indicators to assess impacts to water resources include the following:

- Potential sediment delivery to stream channels
- Potential impacts to water yield and timing
- Potential impacts to riparian vegetation and stream channel condition

Spatial and Temporal Context for Effects Analysis

Direct, indirect and cumulative effects were analyzed for the four watersheds (Beaver Creek, Hams Fork-East Fork Hams Fork, Hams Fork-West Beaver Creek, and West Fork Hams Fork HUCs) found within the Hams Fork project area. Both Beaver Creek and East Beaver Creek Watersheds extend south beyond the project boundary and the entire four HUCs were used for the cumulative effects boundary. The time frame for this analysis is the duration of project implementation.

Alternative 1-No Action

Direct and Indirect Effects

Under the No Action alternative none of the proposed unit treatments would occur. Fire line would not be constructed for prescribed burning, and no hazard tree removal would occur unless it was incorporated into another analysis in the future. The Elk Creek and West Fork Hams Fork bridges would not be replaced in the near future but ongoing Forest road maintenance would continue to occur. Any project design features proposed would not be implemented for this alternative.

Potential sediment delivery:

Current conditions and trends, described in the existing conditions section, would continue. Forest Service roads 10021, 10601A, 10062, and 10199 would still continue to input sediment into Basin Creek, Kelley Creek, Elk Creek, and the spring fed stream adjacent to the Hams Fork Campground. There would not be any disturbance on the watersheds due to timber harvest activities but disturbance from illegal ATV activities on currently closed roads would continue. A large unplanned fire could have negative impacts on water quality and to the municipal watershed supply due to an increased amount of sediment, ash, and nutrients. An increased probability for erosion and landslide or debris flows could damage roads, degrade water quality, and impair the local municipal water supply.

Water yield and timing:

There are not any treatments proposed for the no-action alternative which means that zero percent of the HUCs would be treated and no change in water yield and timing would be expected. Treatment of more than 30% of the area of a 6th field HUC may lead to a change in water yield and runoff timing, particularly in forested areas (Megahan et al. 1995; Cheng 1989). This could be expected if a large scale fire occurred within the project area.

Riparian vegetation and stream channel condition:

No treatments are proposed under this alternative and therefore no effect on riparian vegetation and stream channel condition would occur due to proposed treatments. Riparian areas that were observed to be impacted due to roads and grazing would continue to occur.

Cumulative Effects

See cumulative effects under Alternative 2.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The No Action Alternative is consistent with most relevant Forest Plan goals, direction, standards and guidelines with the exception of standards relating to the location of roads within riparian areas (identified above), conditions of certain roads and the prevalence of those roads to input sediment into streams.

Alternatives 2-Proposed Action

The proposed action was developed in conjunction with the design features to ensure the protection of water and soil resources, minimize sediment transport and decrease the impact of construction and silvicultural activities in riparian areas.

Direct and Indirect Effects

Water Quality and Sediment Delivery:

The greatest potential water quality concern with the Proposed Action is increased sediment delivery to stream channels from roads. Sedimentation from forest roads contribute an estimated 85 to 90% of sediment reaching stream in disturbed forested roads (Burroughs 1990). Riparian areas that are in good condition act as filters for the delivery of sediment and nutrients to water bodies. They also provide cover to maintain water temperatures, supply good habitat for aquatic organisms, and provide bank stability to ensure that stream channels have a form that allows them to transport the sediment being supplied to them from streambank erosion and from their watersheds. This is generally the case for in the Hams Fork project area. Under Alternative 2, proper maintenance of roads identified as having a sediment concern under existing condition (roads adjacent to the Hams Fork Campground, Basin Creek and Kelley Creek) would decrease the impact of sediment currently entering into streams and reduce the impact from log hauling activity associated with timber harvest by adding road base and installing proper ditches along the roads. In addition, vegetation alongside these streams will help capture some of the sediment from these roads.

Water quality will be impacted during the construction and obliteration of the temporary roads. These impacts would be short term inputs of sediment during the actual construction and obliteration of temporary roads and would not be a long term adverse impact to water quality at the site or downstream. Long term, the overall water quality to the watershed may be enhanced due to the closure and rehabilitation of all temporary (both existing and newly constructed) roads.

The expansion of the currently existing gravel pit would not have an effect on water quality due to it not being located near any streams or wetlands.

Replacing both the Elk Creek and West Fork Hams Fork bridges would have a short-term impact (2 – 3 years) on water quality during the removal of the existing bridges and construction of the new bridges and would be reduced as riparian vegetation re-establishes. Implementation of project design features would minimize impacts to the riparian area during the construction of the bridges. These impacts will be short-term and the Army Corp of Engineers and Wyoming DEQ will be consulted for the obtaining of the proper permits for the construction of both the bridges and the temporary road construction needed for timber harvest activities. Over the long term, replacing these two bridges allows for a 100-year flood flow and would be both less constricting on stream movement and allow for better sediment transport of the streams due to the appropriate sizing of the bridges.

Water quality may also be impacted in the short-term immediately after a burn and at least the first year following a burn until the grass/sedge vegetation regrows. Impacts are increased as sediment and ash inputs into the stream channels, but a properly managed prescribed fire that implements design features H-1, H-4 and FM-2 will have minimal impacts to the riparian area and water quality. Riparian vegetation along stream channels provides effective buffers against sediment inputs (Belt et al. 1992) and would help mitigate this short term impact. With the prescribed fire, having a more mosaic pattern of vegetation would allow for a more enhanced and desirable riparian and upland vegetation mixture.

Various investigators have described the effects of prescribed fire on erosion and sediment delivery to streams. Sediment production on hill slopes depends on burn severity (and resulting vegetation or duff cover, versus bare ground), surface soil textures, and magnitude of precipitation events following burning (e.g., Elliot and Robichaud, 2001; Wondzell and Clifton 2001; Robichaud and Waldrop 1994; MacDonald and Stednick 2003). See the Soils Specialist Report (Burgoyne 2013) for information on erosion potential following prescribed burning and mechanized treatment.

The Water Erosion Prediction Project model interface for Disturbed Forest and Range Runoff, Erosion and Sediment Delivery ("Disturbed WEPP") was run for transects within the proposed units directly adjacent to Trail Creek and Shingle Mill Creek to assess potential sediment delivery to stream channels and riparian areas. Documentation for the model is available at http://forest.moscowfsl.wsu.edu/fswepp/docs/distweppdoc.html. For a full description of the parameters used for the WEPP analysis along with a descriptor of the model itself please refer to the Hydrology Specialist Report (Robertson 2013).

Two transects were run for this assessment; "Trail Creek" and "Shingle Mill", which are units 9 and 73 and these are sanitation and salvage units. The Trail Creek transect drains into Trail Creek which then drains into the West Fork Hams Fork. The Shingle Mill transect drains into Shingle Mill which then drains into Hams Fork River. These areas were chosen because of the presence of perennial streams in and near the project areas, and because steep slopes and erosive soils may lead to high sediment delivery to streams. Table 44 compares the average annual rates of modeled sediment delivery over 50 years into Trail Creek and Shingle Mill under Alternative 1 (No Action) and the Alternative 2 (the Proposed Action).

Table 44. Modeled sediment delivery to channels, average annual rates over 50 years

Transect location	Existing modeled sediment delivery Alternative 1 (tons/acre/year)	Proposed action modeled sediment delivery Alternative 2 (tons/acre/year)
Trail Creek	0	0.013
Shingle Mill	0	0.022

As stated above, the relative increase in sediment delivery over current conditions is the key factor to note. The increase in sediment delivery to channels under the proposed action, within all proposed treatment units, would not be measurable and would not have measurable adverse impacts to stream channels. Therefore, no measurable effects from timber harvest activities should occur if all of the design features are implemented. This is consistent with the field findings of Wondzell and Clifton (2001).

Beaver activity—both past and ongoing activity-- is a natural influence on almost all the channels visited. Channel stability assessments and reported levels of fine materials in channels are described, taking the effect of beavers into account.

Water yield and timing:

Treatment of more than 30% of the area of a 6th field HUC may lead to a change in water yield and runoff timing, particularly in forested areas (Megahan et al. 1995; Cheng 1989). Of the four watersheds located within the project area, none of the watersheds exceeded treating more than 30% of the watershed. Therefore Alternative 2 would not be expected to change water yield or runoff timing in any of the four watersheds.

Table 45 is a summary of the maximum number of acres and percent of HUC that would be treated (including both harvest and prescribed burning) in the 6th field HUCs under Alternative 2.

Table 45. Maximum area and percent of HUC treated under the Alternative 2 (Proposed Action)

HUC	Maximum area treated (acres)	Maximum percent of HUC treated
East Fork Hams Fork	3568	8
Hams Fork – West Fork Hams Fork	4499	24
Beaver Creek	253	2
Hams Fork – West Beaver Creek	359	1

Riparian vegetation and stream channel condition

Design features include no active lighting of fuels within 100 feet of streamside boundaries and this would protect riparian vegetation and maintain stream channel condition. Allowing fire to "back" into riparian areas has not been shown to adversely affect resources (Wondzell and Clifton, 2001). BMP's including hardened water crossings, vegetation treatment buffers, and no pile-burning and decking logs near or within riparian areas would allow for the protection of streambank vegetation and would decrease the amount of disturbance to the stream channels within the project area.

Effects Summary

Effects from roads due to temporary road building, obliteration, and the construction of bridges would be short-term and due to the obliteration of many of the roads, should in the long term decrease the overall amount of sediment being inputted into adjacent stream channels. Effects from prescribed fire, namely potential ash and sediment inputs into the stream, would be short term, especially right after the fire and the first year, until the sedge/grass herbaceous vegetation grows back and re-establishes cover. No measurable effects from timber harvest activities should occur when all of the design features described above are implemented. Riparian vegetation along stream channels provides effective buffers against sediment inputs (Belt et al. 1992) and would help mitigate all of these short term impacts. No measurable long term impacts, during the proposed seven year span of the project and afterwards, or adverse impacts to water resources would occur under the proposed action.

Cumulative Effects for Alternatives 1 and 2

Because there will be no effect to water quality from Alternative 1 there is nothing to add to the past, present, and reasonably foreseeable future effects on water quality. As such there will be no adverse impact from Alternative 1.

A number of fires have burned in the project area over the past fifty years. The most recent fire was the Shinglemill fire, which burned 1,381 acres in 2008 and it was located in the Shinglemill Creek drainage near the southern end of the project boundary. Fires that have burned within the analysis area are the Kelley Fire (2007), Hams Ridge (2005), and the Fontenelle Fire (2000). These fires burned a total of 2774 acres. Hydrologic changes would be expected to last approximately five years after the burn with vegetative recovery, but changes in sediment loading and transport could persist for a longer period of time. These hydrologic changes would also apply to any fuels treatments that were applied in the project area or are proposed for the future. The Pole Creek Prescribed burn is planned to burn approximately 3,275 acres over a 4 year period. This burn is located on the southeast boundary of the project area and 168 acres has been burned. Also with these treatments, new roads and increased use of current roads during fuels treatments contribute to the production of sediment off these roads.

Historically, multiple timber sales that have taken place within the project area but currently there is only one active timber sale in the project area. The East Fork Sanitation Salvage Timber Sale is a mixture of sanitation and salvage treatment with a total of 169 acres for potential harvest. Timber sale activities from the last ten years include the Kelly Guard Station Fuels Reduction (2011), Tunp Ridge 2 (2006), Hams Fork Hazard Fuels (2004), and Tunp Ridge (2000-2004). These timber sales were a combination of sanitation and salvage, commercial thinning, and coppice treatments. The total area impacted by these sales is 421 acres and the main objectives were aspen regeneration and hazard fuels reduction. Along with the logging operations, firewood cutting is permitted within the project area. The past timber sales decreased the amount of dead fuel loading within the project area, increased aspen regeneration, and decreased the hazard of dead and dying trees falling on the public. Temporary roads built for these timber sales and decreased amount of vegetation cover could lead to an increased amount of sedimentation in streams but if BMPs are followed, only short term inputs of sediment would have been seen. Rehabilitated roads and cut timber units would see re-growth with a grass/shrub mixture along with new stands of young conifer and aspen.

Treatment of more than 30% of the area of a 6th field HUC may lead to a change in water yield and runoff timing, particularly in forested areas (Megahan et al. 1995; Cheng 1989). With both the historical timber sales and fuels projects including these past cumulative effects with the Proposed Action, these combined historical and proposed current activities would not exceed the 30% threshold. No effect would be seen on water yield and timing.

Sediment production from roads and delivery to stream channels and riparian areas would continue at existing rates, channels and floodplains would continue to be confined and altered by these facilities, and water routing would be altered by roads and their drainage structures. As identified in the existing conditions, Forest roads 10021A adjacent to Kelley Creek, road 10160A adjacent to Basin Creek, and road 10199 directly south of the Hams Fork campground were identified as having poor bearing strength with a lot of rutting evident in wet places along with being in close proximity to the stream and within the channels floodplain. Elk Creek, due to high amounts of beaver activity and the main Hams Fork road crossing the creek and its floodplain would continue to overtop and flood the road in the springtime. The associated springtime

flooding causes road bed material to be deposited within the main Elk Creek channel and floodplain.

Sheep and cattle grazing occur within the project area. Grazing allows for the reduction in fine fuel loading within the project area. Impacts from trampling due to wildlife and livestock grazing would continue. It is hard to determine the amount of impact on channels due to wild animals because of the difficulty in determining the differences in hoof prints when monitoring streambank trampling. Impacts (trailing, trampling) appeared to be mostly from cattle along the main Hams Fork along with impacts from sheep on the West Fork Hams Fork, Grindstone Creek, and Indian Creek. The impacts from sheep most clearly identifiable were trailing alongside streams and along hillsides with stream within steeper v-notched canyons (Indian Creek).

Impacts from unauthorized ATV trails include increased sediment production and delivery to stream channels would continue at existing rates and water routing would be altered by these unauthorized trails that are located near or across stream channels. Dispersed recreational sites tend to be located near stream channels and the most common impacts seen are soil compaction and stream alteration due to the concentrated activity at those sites. This leads to a greater possibility of sediment entering the stream channel and the loss of soil productivity. These sites also are vectors for invasive plants due to the high amount of disturbance they receive and these types of plants are not desirable for streambank stability and riparian health. Dispersed camping activities are most prevalent along the main Hams Fork, with several locations along the main channel that are very popular throughout the entire summer for camping activities. These sites have spur access roads from the main Hams Fork road and have large areas of compaction. Within these sites, vegetation is trampled and patches of Canada thistle were observed.

Beaver activity—both past and ongoing activity-- is a natural influence on almost all the channels visited. Channel stability assessments and reported levels of fine materials in channels are described, taking the effect of beavers into account.

Impacts associated with the campground would also continue.

Activities that will continue to have an effect on the watersheds within the project area include grazing, recreational activities, roads and grazing by both permitted livestock and wildlife. These effects occur in a small portion of the watersheds within the project area and cumulatively would not exceed a threshold of being detrimental to the watersheds when combined with the proposed action.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Based on the design features associated with Alternative 2 and BMPs, the Proposed Action would be in compliance with the Forest Plan as well as other applicable direction (Robertson 2013).

Fisheries

The following resource information and analysis summarizes the Fisheries Report (Fogle 2013).

This analysis addresses the effects to fish species in three categories:

- Endangered Species Act (ESA) species listed as Threatened, Endangered, experimental, or candidate species by the U.S. Fish and Wildlife Service (USFWS). There are no Federally listed fish species under the ESA in the Hams Fork project area.

- U.S. Forest Service (USFS) Sensitive Species identified by the Regional Forester for the Intermountain Region. The Colorado River cutthroat trout and northern leathersides are the Sensitive Species found in the project area.
- Bridger-Teton National Forest Management Indicator Species (MIS) identified in the Forest Plan. Cutthroat trout and rainbow trout are designated MIS species present in the project area.

Direction from the Forest Plan is to provide adequate habitat for dependent fish populations (USFS 1990, p. 123). Sensitive Species Management Standard regarding fisheries management is to keep Intermountain Region designated Sensitive Species from becoming Threatened under the Endangered Species Act.

Affected Environment

Habitat conditions

The Upper Hams Fork River basin includes the river where it enters Viva Naughton Reservoir upstream to its headwaters. The river courses for about 40 miles with 20 miles through USFS land. The Hams Fork basin contains 49 perennial streams for a total of 252 stream miles. The majority of streams occur on either the Bridger-Teton National Forest or on private lands. The upper Hams Fork sub-watershed (HUC 1404010706) is crucial aquatic habitat for fish populations in the basin.

The WGFD Basin Management Plan for Hams Fork describes the project area as having generally good aquatic habitat conditions and stable flows, which account for greater trout abundance compared to the Hams Fork River below the USFS boundary. Extensive beaver activity and stable ponds have also contributed to better trout populations. Eroding banks are less common than in the Hams Fork proper as well. Typical trout cover in the form of large woody debris and canopy cover in tributary streams is not abundantly available (15-20%) but beaver ponds provide good cover and habitat for trout (WGFD 2011).

The West Fork drainage has unique intermittent flow patterns. The upper reaches, above Basin Creek, have short flowing water sections separated by dry reaches, limiting fish habitat availability and upstream distribution. Immediately downstream of the Basin Creek confluence a natural spring (Big Spring) contributes the primary flow for the West Fork. During summer, flows are typically good until directly downstream of the Allen Creek confluence where water subs-out and the stream channel often becomes dry by late summer. Water returns to the system from numerous springs a few miles upstream of the Hams Fork confluence.

Recent aquatic habitat surveys have been completed by WGFD personnel on the Hams Fork, Beaver Creek, Devil’s Hole Creek, Pole Creek, Elk Creek, Indian Creek, Burke, East Fork, Rock, Basin, and Kelly creeks. WGFD habitat data state that bank erosion (around 20%) in headwater streams in the project area are mainly caused by high spring flows common to this drainage. Some localized livestock impacts also exist in upstream areas (WGFD 2011).

A number of limiting habitat factors in the watershed affects trout abundance. High stream flow fluctuations may limit abundance and impact reproduction. Many headwater streams also have extremely cold water temperatures, limiting upstream fish distribution. The West Fork also has natural habitat limitations because of its intermittent flow patterns, which eliminates many miles of stream habitat. Another limiting factor to Hams Fork trout populations may be angling pressure and the rivers close proximity to Forest Service roads and campgrounds (WGFD 2011).

Fish species

Wild populations of brook trout, rainbow trout, and Colorado River cutthroat trout occupy the upper Hams Fork watershed in the project area with brook trout and rainbow trout being most abundant. Colorado River cutthroat trout occupy some headwater streams and brown trout are found in lower sections of the river downstream of the West Fork confluence. Rainbow trout are more abundant in the Hams Fork mainstem while brook trout tend to be more abundant in major tributaries, particularly the East and West Forks. Primary fish bearing streams include West Fork, East Fork, Beaver, Elk, Indian, and Pole creeks. Electrofishing surveys conducted by WGFD have documented trout abundance ranging from 50 per mile near the Indian Creek confluence (USFS campground), 300 rainbow trout per mile on Elk Creek, and 350 trout (rainbow trout and cutthroat trout) per mile on Indian Creek (WGFD 2011). WGFD manage the upper Hams Fork River as a wild basic yield fishery. Stocking was eliminated in 1995 and trout populations are supported by natural recruitment (WGFD 2011).

Sensitive Species - Colorado River cutthroat trout and Northern Leatherside

Two sensitive fish species are found within the project area, Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) and northern leatherside chub (*Lepidomeda copei*). Colorado River cutthroat trout are native to the project area and northern leatherside chub are possibly non-native to the project area.

The Forest Service is to maintain viable cutthroat trout populations identified in the Conservation Strategy for Colorado River Cutthroat Trout (Young 2008) and act cooperatively with the Wyoming Game and Fish Department in the management of fishery resources (USDA Forest Service 1990, p. 126). The Bridger-Teton National Forest is participating in a range-wide memorandum of understanding with state, Federal, tribal and private organizations to conserve Colorado River cutthroat trout. The goal of this memorandum of understanding is to assure the long-term viability of Colorado River cutthroat trout throughout their historic range.

Colorado River cutthroat trout

Colorado River cutthroat trout are not a major component of the fisheries in Hams Fork but are present in the project area. Forest Service and Wyoming Game and Fish Department's goals are to maintain genetic integrity of the species and maintain current populations. Colorado River cutthroat trout have hybridized with non-native salmonids in many areas, reducing the genetic integrity of this subspecies. As such, hybridization is clearly recognized as a major influence upon Colorado River cutthroat trout status.

A small population of Colorado River cutthroat trout occupies the headwaters of the Hams Fork River. This is the only known tributary on Hams Fork where Colorado River cutthroat trout are found with no present brook trout and rainbow trout. Both brook trout and rainbow trout are abundant downstream in the system but there appears to be some habitat/behavioral mechanisms preventing upstream movement and competing/hybridizing with Colorado River cutthroat trout (WGFD 2011). Devils Hole Creek also supports a population of Colorado River cutthroat trout but they are sympatric with rainbow trout. Devil's Hole lakes #1 and #2 are the only major lakes in the upper Hams Fork system but are currently fishless.

Northern Leatherside

The presence of northern leatherside chub was noted in 2006 in the West Fork. Northern leatherside are native to the Bear River drainage (WYNDD 2003) and are a Forest Service Sensitive Species. They are not native to the Hams Fork watershed but this population appears to

be relatively robust and may be an important source of fish for future conservation efforts in the species native range (WGFD 2011).

Management Indicator Species (MIS) - Colorado River Cutthroat Trout and Rainbow Trout

Colorado River cutthroat trout and rainbow trout are two fish species within the project area that are identified as Management Indicator Species for Bridger-Teton National Forest. Rainbow trout, however, are non-native to the Hams Fork drainage. Management indicators are "any species, group of species, or species habitat element selected to focus management attention for the purpose of resource production, population recovery, maintenance of population viability, or ecosystem diversity" (FSM 2605).

West Fork of Hams Fork fish populations are limited by intermittent flows in this tributary system. Recent surveys (2006) documented mostly brook trout and a few rainbow trout in flowing water portions of the West Fork, Kelley, Rock and Trail creeks with estimated abundance ranging from 16 to 739 brook trout per mile. Allen, Basin, Bird, Little Park, Hoch, Spring and Squirrel creeks along with numerous unnamed tributaries were also sampled during recent surveys but no trout were found. Brook trout dominate the trout population in this system and no Colorado River cutthroat trout were documented anywhere in the drainage in 2006.

Environmental Consequences

Indicators to assess impacts to water resources include the following

- Sediment delivery to stream channels
- Fish barriers that prevent fish migration

Spatial and Temporal Context for Effects Analysis

The direct, indirect and cumulative effects analysis area is the project area. Temporal effects were considered short term if less than ten years and long term if more than ten years into the past and future.

Alternative 1-No Action

Direct and Indirect Effects

Under Alternative 1 (No Action Alternative) none of the proposed unit treatments would occur. Fireline would not be constructed for prescribed burning, and no hazard tree removal would occur unless it was incorporated into another analysis in the future. The Elk Creek and West Fork Hams Fork bridges would not be replaced but ongoing Forest road maintenance would continue to occur. Any project design features proposed would not be implemented for this alternative.

Colorado River cutthroat trout

Fisherman will continue to access the Hams Fork from Forest Service Road 062 and cause direct mortality to Colorado River cutthroat trout. Fishing would continue to have a minor effect on the population. Some roads would continue to generate sediment that enter streams and cause a decrease in water quality. Roads identified in the Hydrology section as having sediment concerns were along Kelley Creek, Basin Creek and adjacent to the Hams Fork Campground.

The Colorado River cutthroat trout conservation population present in upper Hams Fork and Devils Hole Creek are isolated from populations of brook trout present downstream of the

campground on Hams Fork. The reason for this isolation is unknown as there are no barriers to upstream migration.

Under Alternative 1, Colorado River cutthroat trout would continue to be affected from sediment coming off of roads and fishing pressure from Forest Service Road 062 that parallels the river. These impacts currently exist and the population is stable and is expected to continue to be so in both the short and long term.

Northern leatherside

Alternative 1 would not change current land management practices and therefore would not alter current stream habitat conditions or stream flows that may influence Northern leatherside in the Hams Fork River. Current management likely has had no effect on Northern leatherside populations. The West Fork has natural habitat limitations because of its intermittent flow patterns, which eliminates many miles of stream habitat. Intermittent flows may provide Northern leatherside isolation from predatory fish present in Hams Fork.

Rainbow trout

Alternative 1 would not change current land management practices that would alter current stream habitat conditions or flows that may influence rainbow trout in the Hams Fork River. Current management likely has had no effect on rainbow trout populations. The West Fork has natural habitat limitations because of its intermittent flow patterns, which eliminates many miles of stream habitat available to rainbow trout.

Cumulative Effects

Cumulative effects for Alternatives 1 and 2 are addressed in the Cumulative Effects discussion under Alternative 2.

Determinations

Colorado River cutthroat trout: Alternative 1 “may impact individuals or their habitat, but is not likely to contribute to a trend towards Federal listing or loss of population viability” for Colorado River cutthroat trout. The determination is based on available information on species distributions and habitat (WGFD 2010) and using the following: topographic maps, GIS coverage, Wyoming Natural Diversity Database, field reconnaissance, previous surveys, as well as published scientific information. The rationale for this determination is based on the continued fishing pressure with the current management of the area. This minor negative effect is not enough to push the species towards listing.

Northern leatherside: Alternative 1 would have “no effect “ on Northern leatherside chub population viability or habitat for the species based on available information on species distributions and habitat using topographic maps, Wyoming Natural Diversity Database, field reconnaissance, previous surveys, as well as published scientific information. No action would not change this species’ habitat or interact with individual fish. As such there is no effect to the species.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 would have a neutral effect (no discernible positive or negative effect) on Colorado River cutthroat trout populations. The No Action alternative currently meets Forest Plan direction for maintaining viable Colorado River cutthroat trout populations at or near its potential (p. 126) agreed to in the Range Wide Conservation Agreement for Colorado River cutthroat trout. In the

present analysis analyzes the effect is at the level of the individual, it is likely that individual fish may be impacted form no action, but the effect to the species is neutral.

Alternative 1 would have a neutral effect (no discernible positive or negative effect) on Northern leatherside chub populations. This alternative meets Forest Plan direction for maintaining viable Northern leatherside chub populations at or near its potential (p. 126).

Alternative 1 complies with Forest Plan Standards for maintaining viable fish populations (USFS 1990, p. 126) by meeting the Sensitive Species Management Standard and Fish Passage Standard.

The Sensitive Species Management Standard includes 6 objectives to identify and improve the status of Sensitive Species and eliminate the need for listing. The objectives are:

1. Secure and if necessary enhance all known and suspected cutthroat trout populations.
2. Increase the number of populations by restoring genetically pure cutthroat trout within their native range.
3. Maintain greater than 80% bank stability on all streams with sensitive fish species unless the stream has been determined by a hydrologist to be unable to acquire that level of stability under natural geomorphic conditions.
4. Management activities will not contribute to increased stream temperatures beyond a maximum of 20˚C (68˚F) in stream segments with sensitive cutthroat trout populations or 30˚C (86˚F) in stream segments with northern leatherside chub.
5. Maintain or improve stream connectivity by preventing or removing physical, water quality, or water quantity barriers that fragment populations or habitat.
6. Water quality in streams meets applicable Wyoming State Water Quality Standards.

Objectives 1, 2, and 5 currently meet Wyoming Game and Fish Department (WGFD) objectives for cutthroat trout management in the Hams Fork headwaters. The Hydrologist and WGFD stream habitat inventory indicate that overall, riparian vegetation and stream channel conditions within the project area are good and comply with objective 3.

Wyoming Department of Environmental Quality data from 1998 and 1995 indicate temperatures below 10ºC and all nutrient values (nitrite + nitrate and phosphorus) were below the level of detection, so State water quality standards were met and meet objective 4 and 6.

Fish Passage Standard provides that streams with a fisheries resource, culverts installation would be designed to facilitate fish passage (USFS 1990 p. 126). In Alternative 1 any culvert or bridge replacement in the future would need to meet this standard. There are no culverts or bridges in the project area that have been identified as cutthroat trout barriers.

Alternatives 2-Proposed Action

There is no effect to Endangered fish species associated with the Colorado River system on this project. This determination is because no new water developments or depletions are proposed for this project.

Direct and Indirect Effects

Potential Treatment Effects – Hams Fork Vegetation project as described in the proposed action may impact individual fish from sediment created by increased human activity associated with the proposed project. The proposed project is intended to manipulate upland vegetation using small tract ground based logging, fuel reduction, and prescribed fire. Design features for fisheries, hydrology, and soils will eliminate impacts to riparian areas by removing them from the treatment area. Forest Plan standards and guidelines for logging, prescribed fire, road management, and fisheries management combined with state BMPs will further reduce sediment from entering rivers and streams.

Improvements to the road system including bridge replacement and road drainage will reduce sediment entering rivers and streams improving aquatic habitat. The effect of the proposed action on reducing sediment or causing a change in fish populations is impossible to detect in the short term (<10years) and would be difficult to attribute directly to the project.

Alternative 2 as proposed will have long term positive impacts on fish and aquatic passage from replacing Elk Creek and West Fork Hams Fork bridges. Bridge replacement would have a short-term impact on water quality during the removal of the existing bridges and construction of the new bridges. Long term benefits from replacing these two bridges would allow for a 100-year flood flow and would be less constricting on stream movement, allow for better sediment transport of the streams due to the appropriate sizing of the bridges and improve fish passage.

Aquatic Species or Habitat Effect – The proposed Hams Fork Vegetation project is not likely to have any short term (<10 year) positive or negative effect to fish habitat or populations. There may be some long term (>10 years) positive effects from converting conifer stands to aspen that may trigger beaver activity that would increase dam building that indirectly improves fish habitat. Improved fish habitat may improve the long term viability of native fish from competition and predation from nonnative brook trout. Alternative 2 would have a neutral (no discernible positive or negative) short term

Colorado River Cutthroat trout

The proposed unit treatments for timber salvage and prescribed fire to improve stands of aspen and whitebark pine will have no direct effect on cutthroat trout populations or habitat. Treatments are directed at upland vegetation and the connected actions to implement the actions have project design features including 100 foot buffers on area streams to reduce or eliminate sediment delivery to streams.

Direct effects from disturbing soil or entering streams with vehicles may generate sediment into streams which affects water temperatures, covers gravel that provide spawning habitat for aquatic organisms. These effects are avoided where possible by placing treatment areas greater than 100 feet from streams (design feature F-1, F-2, H-1,H-3) or minimized by implementing hardened approaches, culverts, temporary bridges or low water crossings at stream crossing as provided for in design features F-5, F-6, F-7, and F-8 when channel crossings are unavoidable. Units that encroach near Colorado River cutthroat trout bearing streams include unit 107 (salvage/ sanitation/commercial thinning unit) on the ridge south of Devils Hole creek. The unit is located 718 feet at its nearest point to Devils Hole Creek on a north facing timbered slope which is a great enough distance that no negative effects are anticipated. Adjacent to unit 107 are white bark pine improvement units 115, 117 and 119 that are greater than .25 km from water and will have no direct effect on fish habitat. On the upper Hams Fork units (Salvage/sanitation/aspen improvement treatment), there would be two temporary roads that are within 100’ of the East

Fork of Hams Fork that support cutthroat. Road design will avoid encroachment within the 100' stream buffer that may have indirect short term impact to the stream from sediment that is mitigated using design features F-5, F-6, F-7, and F-8. .

The project has been designed to avoid impacting Hams Fork and its tributaries. Silvicultural, prescribed fire units and road treatments are designed to protect fish habitat using design features F-1, that provide a minimum 100' buffer on intermittent and perennial streams and wetlands to prevent sediment and avoid disturbing riparian habitat. As stated in the hydrology section sedimentation from forest roads contribute an estimated 85 to 90% of sediment reaching stream in disturbed forested roads (Burroughs 1990). These impacts would be short term inputs (during the actual construction and obliteration) of sediment due to construction activities and would not be a long term adverse impact to fish or aquatic habitat.

Design features F-2, F-4, F-6, F-7 and F-8 require roads, landings, and skid trails be constructed and after completion reclaimed to eliminate sediment from reaching streams (WDEQ 2004).

WEPP modeling to determine sediment input into streams as a result of project treatments was determined to be minimal under Alternative 2 (Hydrology section) and therefore there would be minimal negative effects on fish spawning habitat. Design feature F-3 is designed to prevent fuel spillage from impacting water quality and no instream work is proposed on Devils Hole creek.

Fish habitat may be enhanced throughout the project area by favoring aspen regeneration that encourages beaver activity that enhances fish habitat (Olson and Hubert 1994).

Design features for Hydrology (H1-16) and Soil (SOIL 1,4,6) identified in chapter 2 combined with Forest Plan standards and guidelines for timber harvest and prescribed fire would be sufficient to eliminate long-term effects and possibly eliminate short-term effects to fish and fish habitat.

Northern leatherside

The proposed treatments in Alternative 2 that are near a Northern leatherside bearing stream (West Fork) are primarily hazard tree removal along forest system roads. When snags fall into streams they provide a source of large wood and shade for fish. However, the West Fork of Hams Fork is a wide, willow dominated riparian area and therefore, very few, if any, hazard trees are found in the stream influence zone. The lack of hazard trees in the area results in no direct effect to Northern leatherside populations or habitat under Alternative 2. Indirect effects from hazard tree removal from sediment associated with skid trail and landing will be minimized as disclosed in Alternative 2 in the hydrology section. Improvements to road drainage and bridge/culvert replacement on forest system roads would have beneficial long term indirect effects by reducing sediment into Hams Fork and improving hydrologic function that impact fish habitat. Short term direct effects from road work and bridge/culvert replacement that produce sediment into streams may have a negative impact to individual fish and habitat directly downstream from the source. These impacts can be expected to last less than one year and be offset by long term benefits from improved road drainage.

Rainbow trout:

Stream surveys indicate rainbow trout populations are found in the Hams Fork downstream from the FS campground. Hazard tree removal along Forest Service Road 062 that parallels Hams Fork may reduce the amount of available large woody debris that would end up in Hams Fork. Salvage/Sanitation treatments in Elk Creek and Shingle Mill Creek have a potential for indirect

effects to water quality in Hams Fork but is mitigated with 100' stream buffers on treatment units and road treatments designed to reduce and possibly eliminate sediment.

Cumulative Effects for Alternatives 1 and 2

Past logging, livestock grazing, and road building have modified fish habitat. The introduction of non-native fish species and invasive plants has altered stream channel function. Present dispersed recreation, wildfire, and firewood cutting have direct impacts to riparian vegetation from trampling and removal that have an indirect effect on increasing sediment delivery into stream.

Sediment delivery to stream channels

Effects of activities on sediment delivery are discussed in detail in the Hydrology cumulative effects section (p. 209). Historical timber treatments and wildfires contributed sediment into streams in the past, but sedimentation has decreased over time and is currently negligible. Current activities such as livestock grazing, Forest system roads and trails contribute sediment to streams as discussed in the Hydrology section. The East Fork Salvage & Sanitation project and the Pole Creek prescribed burn would add sediment to streams; however, they are both located downstream of Elk Creek campground and the Kelly Guard Station and therefore would not affect the two conservation populations of Colorado River cutthroat trout.

The Kelly Guard Station Fuels Reduction project mechanically thinned trees on 50 acres and contributed low levels of sediment into the West Fork of the Hams Fork. The effect on the one conservation population of Colorado River cutthroat trout is minimal. In summary, cumulative effects of past, present and reasonably foreseeable future activities, in addition to sediment delivery attributed to Alternatives 1 and 2 are below a level of concern.

Fish barriers that prevent fish migration

Cumulative effects of past and present activities that impede fish passage are limited to bridges on Elk Creek and West Fork of Hams Fork that constrict flows during high water events. Alternative 2 proposes to replace the existing bridges that would allow for a 100-year flood flow and would be less constricting on stream movement and provide for fish passage of all species and age classes of fish. None of the past, present, and reasonably foreseeable future activities listed in Appendix E are associated with fish passage issues.

Climate change

A gradual predicted increase in air temperature due to climate change in the reasonably foreseeable future may reduce the amount of water available to fish populations causing reductions in populations, but the effect is expected to be minimal.

Cumulatively, the described impacts above in addition to impacts associated with Alternatives 1 and 2 are below a threshold of concern to fish species in the Hams Fork project area.

Determinations

Colorado River cutthroat trout: Alternative 2 as described in the proposed action "may impact individuals or their habitat, but will not likely to contribute to a trend towards Federal listing or loss of population viability". The determination is based on available information on species distributions and habitat using Wyoming Game and Fish Department Basin Management Plan (WGFD 2010), Conservation Agreement and Strategy for Colorado River cutthroat trout, field reconnaissance, previous surveys, as well as published scientific information. In the short-term impacts may arise from bridge replacement and sediment addition by impacting individual fish. The effects from the proposed action will be beneficial in the long-term, because this alternative

improves fish passage and reduces sediment input. As a result the proposed action may impact individuals, but will not lead to listing.

Northern leatherside: Based on available information on species distributions and habitat I have determined that Alternative 2 would have a "beneficial "effect on Northern leatherside habitat and population viability. Long-term benefits to water quality from road improvements and bridge replacements are the primary reasons for the effects determination. There will be no short term impacts to northern leatherside because the fish is not present in or near the action areas. As a result the impact to the species will be beneficial.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 complies with Forest Plan Sensitive Species Management Standard for quantifiable objectives in the same manner as Alternative 1.

Fish Passage Standard in Alternative 2 is an improvement over Alternative 1 by providing for bridge replacement to facilitate fish passage. Under Alternative 2, any culvert installation would be designed to meet this standard.

Soils

The following resource information and analysis summarizes the Soils Report (Burgoyne 2013).

Affected Environment

The desired condition for soils is to maintain or improve soil productivity and quality and soil hydrologic function.

The vegetation in the project area is variable depending on elevation and aspect. The dominant forest type is lodgepole pine but aspen, spruce/subalpine fir, whitebark/limber pine and Douglas fir forests also exist. Open areas also exist with willow and riparian dominated wet meadows. Understory vegetation can be very dense in areas without logging history. Areas with intense logging history tend to have less ground cover and more open areas with bare soil exposed.

Soils are generally sedimentary in origin with mudstone, sandstone, and siltstone as the primary parent materials present. Approximately 8% of the soils within the project area tend to be unstable and are prone to slumps and landslides. The rocks range in ages in the project area from Cambrian to Quaternary. Soil textures range from fine sandy to clayey with skeletal soils present, but sandy loam and loamy soils dominate. Loess, limestone, and landslide deposits also exist within the project area. Throughout the landscape, the soil has developed in a mosaic pattern as dictated by topographic relief, vegetation, and aspect (USDA 1993)

Under the objectives outlined in the National Forest Management Act, the U.S. Forest Service has assembled the North American Long-Term Soil Productivity Research Program (LTSP). The LTSP has focused its attention on two soil properties that are most influenced by timber harvesting and fuel treatments and most related to forest integrity within the constraints of climate and topography: (1) soil organic matter (soil productivity and nutrients), and (2) soil porosity (Powers 1998). These soil properties are components of soil productivity as a whole and are used as a proxy of soil productivity because they can be measured.

These two issues are also the primary soil concerns for the Hams Fork Project area. Soil organic matter is influenced by fire, silvicultural prescriptions, timber harvests, and decomposition and

accumulation rates. Soil porosity is most influenced by mechanical compaction and a lack of bio-physical resiliency.

Soil Organic Matter

The importance of soil organic matter cannot be overstated (Jurgensen et al. 1997). This organic component contains a large reserve of nutrients and carbon, and it is dynamically alive with microbial activity. The character of forest soil organic matter influences many critical ecosystem processes, such as the formation of soil structure, which in turn influences soil gas exchange, soil water infiltration rates and soil water-holding capacity. Soil organic matter is also the primary location of nutrient recycling and humus formation, which enhances soil cation exchange capacity and overall fertility.

These processes have a direct and tremendous effect on site productivity and sustainability. Organic matter is the one component of the soil resource that, if managed correctly, can actually be improved by human activity. Manipulation of the organic constituents of the soil may be the only practical tool available for mitigating effects of harvesting systems that remove standing trees and dead and down trees, or cause extensive soil disturbance. Of the many organic materials incorporated in a forest soil, the woody component is in many ways the most important. To protect the sustainable productivity of the forest soil, a continuous supply of organic materials must be provided, particularly in harsh environments (Jurgensen et al. 1997).

Coarse Woody Debris & Soil Wood

Coarse woody debris and organic matter are good indicators of site resiliency and overall forest health. Organic matter including the forest floor and coarse woody debris is essential for maintaining ecosystem function by supporting moderate soil temperatures, improved water availability, and bio diversity (Page-Dumroese et al. 2010). Coarse woody debris amounts meet recommendations throughout the project area, except in some units with more intensive harvest histories. For these forest types 5-10 tons per acre of coarse woody debris is recommended (Graham et al 1994). Coarse woody debris, both standing (future recruitment) and down is important for site resiliency and recovery.

Ground Cover & Forest Floor

Soil cover from organic matter or vegetation averaged about 85% across all the units surveyed. Approximately 6% of the cover was woody material and the remaining 9% was bare soil or rock cover. Units with more intensive prior harvesting had more than 15% bare soil. Average observed depth of litter was one centimeter and duff was two centimeters (total organics is three centimeters) which is within the optimum range. The average optimum level of fine organic matter is 21 to 30% (Graham et al. 1994), which equates to 2 to 6 centimeters of surface litter and humus, depending on forest type. Optimum levels of fine organic matter relate to ectomycorrhizae fungus, which is a good indicator of healthy forest soil (Graham et al 1994).

In addition to cover directly on the soil surface, cover from vegetation can provide litter contributions in the future. Vegetative cover in the ground based thinning units was generally good, between 60 and 100%. Some of the units do have large open patches with no shade. Shade and vegetative cover are important factors in the recovery of these sites. Charcoal was also found in all the units indicating this ecosystem experiences fire and may therefore have shallower litter/duff layers overall. Some of the charcoal is likely from site preparation activities from past management as well.

Soil Porosity

Summary

Within the Hams Fork project area, soil porosity has been reduced on the skid trails and landings within the proposed treatments that have been harvested in the past. Reduced soil porosity leads to reduced ability of soils to exchange oxygen and carbon dioxide thus affecting the ability of soil organisms to survive. Reduced soil porosity also impedes root growth.

Discussion

Soil porosity refers to the amount and character of void space within the soil. In a “typical” soil approximately 50% of the soil volume is void space. Pore space is lost primarily through mechanical compaction. Gas exchange, soil water infiltration rates, and water holding capacity are three fundamental processes which are negatively impacted by compromised soil pore space.

Gas Exchange

Soil oxygen is fundamental to all soil biologic activity. Roots, soil fauna, and fungi all respire, using oxygen while releasing carbon dioxide. When gas exchange is compromised, biologic activity is also compromised. Maintaining appropriate soil biologic activity is paramount when considering long-term forest vitality.

Soil Water Infiltration Rates

Severely compacted soils do not allow appropriate water infiltration, leading to overland flow and associated erosion, sediment delivery, spring flooding, and low summer flows. Some recent advances in logging technology and mechanization have exacerbated the problem, as feller bunchers must travel to each tree, and slash is often piled with excavator type, tracked grapple equipment. Main skid trails and landings are the longest lasting detrimental disturbance, where many machines travel over the same route. Activities on moist soils are especially damaging. Work on dry or frozen soils maintains much more of a soil’s natural ability to quickly restore pore spaces.

Soil compaction leads to reduced soil porosity. Soil compaction is generally evaluated from 5 to 30 centimeters below the mineral soil surface. Specific depths for measurement are dependent upon soil type and management activities. Detrimental soil compaction has increased soil density (weight per unit volume) and strength that restricts root growth, reduces soil aeration, and inhibits water movement. In the Hams Fork project area, detrimental soil compaction was found on existing skid trails and old roads in 22 of the proposed ground based treatment units. Non detrimental soil compaction was also found in 41 of the units. See the Soil Specialist Report for detrimental disturbance percentages by unit (Burgoyne 2013 - appendix A).

The percent of coarse fragments is a measure of rock content in the surface six inches of mineral soil. Rock content is an indicator of the susceptibility of compaction on a specific soil type. Rock content over 35% will greatly reduce the effect of mechanical compaction (Welke and Fryles 2005). Generally coarse fragments in the Hams Fork project area are less than 35%. Areas with coarse fragments less than 35% are more susceptible to compaction. Half of the project areas soils are loamy and are more prone to compaction, while the other half are sandier with higher coarse fragment content and resist compaction more readily. Moisture is also an important factor in determining susceptibility to compaction, especially on finer textured soils. Dry soils are less likely to compact and have lower risk of compaction than moist soils (Welke and Fryles 2005). Even under moist conditions, coarse textured soils can compact.

General Soil Disturbance

Past harvesting activities including conifer removal, clearcuts with reserves and salvage/sanitation thinning occurred in many of the units proposed for treatment. Observed detrimental disturbance due to compaction was associated with old primary skid trails and landings. Other factors leading to detrimental soil disturbance and non-detrimental soil disturbance in many of these units was soil displacement, rutting and soil erosion caused from steep skid trails, bared soil, and dozer piling of topsoil. The average aerial extent of detrimental soil disturbance in units with a past harvest history was about 1% (within a general range of 0-5%). Grazing disturbance including compaction and erosion was also found. Compaction from cattle or sheep grazing is generally concentrated near water sources.

Environmental Consequences

Indicators:

- Acres of detrimental soil disturbance-includes harvesting, prescribed fire. This indicator is a proxy for soil productivity
- Miles of temporary road
- Number of new landings
- Miles of fire control line

Spatial and Temporal Context for Effects Analysis

For soils, the treatment unit (boundary of harvest or burn unit) serves as the effects analysis area. Harvest or fuel treatment units or groups of units are therefore considered the activity area for which direct, indirect, and cumulative effects on soil productivity are analyzed. Temporary roads, skid roads, and landings within unit boundaries are included in the disturbance analysis. System roads and long-term specified roads are considered part of the Forest transportation system and are not considered for detrimental soil disturbance.

The temporal scale for assessing soil resource environmental effects includes both short- and long-term impacts. For the purposes of this analysis, short-term effects are defined as those that occur within about 10 years following proposed vegetation treatments. Long-term effects are defined as those that occur within about 10-20 years or more following proposed vegetation treatments. The threshold for concern is whether or not the proposed or no action will not comply with the Forest Plan desired condition for soils which is to maintain or improve soil productivity and quality and soil hydrologic function. The cumulative effects analysis area is bounded in time by 10 years into the past and future and is bounded in space by the treatment area.

Alternative 1-No Action

Direct and Indirect Effects

Currently approximately 22 acres of the proposed units are in a detrimental soil condition. Recovery of existing impacted soils would continue through natural means (freeze/thaw cycles and root penetration into compacted soils). Litter and duff accumulations would continue to increase, unless removed by wildfire. Overall, trends towards increased soil productivity on those units with existing levels of detrimental soil disturbance would occur, but gradually. Coarse woody debris levels would continue to increase, unless removed by wildfire. The increase in coarse woody debris and litter and duff, would increase soil organic matter content, nutrient and

water holding capacity, and create microsites for organisms. Coarse woody debris will promote site resiliency and recovery in the future (Jurgensen et al. 1997; Page-Dumroese et al. 2010).

The probability of a high-severity fire within the project area during a given timeframe is unpredictable. However, when a fire breaks out, the chances for high-severity fire effects on soils can be much higher in untreated areas with excessively heavy fuel loads compared to those that have been treated, including post-harvest logging slash (Certini 2005; Cram et al. 2006; Graham et al. 2004; Gorman 2003; Keane et al. 2002).

Vegetation and fuel treatments would reduce the chance that a wildfire could have as severe an effect on the soils and surrounding private property in treated areas as it could in untreated areas because there would be fewer tons per acre of dead and dying fuels on treated sites.

The occurrence of a high-intensity wildfire would increase the potential for impacts to soils and soil productivity in severely burned areas, especially since the risk of soil erosion increases proportionally with fire intensity (Megahan 1990). Other effects would include the potential loss of organics, loss of nutrients, and reduced water infiltration (Wells et al. 1979). Burns that create very high soil surface temperatures, particularly when soil moisture content is low, almost completely destroy soil microbial populations, woody debris, and the protective duff and litter layer over mineral soil (Hungerford 1991, Neary et al. 2005). Nutrients stored in the organic layer (such as potassium and nitrogen) can also be lost or reduced through volatilization and as fly ash (DeBano 1991; Amaranthus et al. 1989).

Fire-induced soil hydrophobicity is presumed to be a primary cause of the observed post-fire increases in runoff and erosion from forested watersheds (Huffman et al. 2001). Though hydrophobicity is a naturally occurring phenomenon that can be found on the mineral soil surface, it is greatly amplified by increased burn severity (Doerr et al. 2000; Huffman et al. 2001; Neary et al. 2005).

Soil hydrophobicity usually returns to pre-burn conditions in no more than six years (DeBano 1981). Dyrness (1976) and other studies have documented a much more rapid recovery of one to three years (Huffman et al. 2001). The persistence of a hydrophobic layer depends on the strength and extent of hydrophobic chemicals after burning and the many physical and biological factors that can aid in breakdown (DeBano 1981). This variability means that post-fire impacts on watershed conditions are difficult to predict and to quantify.

Routine road maintenance activities such as blading, drainage improvements, and surfacing on existing dedicated roads would occur on 43 miles of road. These activities may increase short-term sediment movement from road surface runoff initially, but should be minimal, especially at road locations higher on the slope that are at a relatively low gradient and provide for sufficient buffer zones.

There would be no new landings, temporary roads or fire control line constructed under this alternative; therefore no impacts are expected from these activities.

Cumulative Effects

See cumulative effects for Alternative 2.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

As detailed in the Soils Report for this project (Burgoyne 2013), Alternative 1 would comply with the Forest Plan as well as the R4 soil quality standards.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Proposed activities would have some long- and short-term direct and indirect negative effects on forest soils. By implementing the project design features, the project would meet the Region 4 Soil Quality Standards, and would therefore not have a meaningful impact to soils.

Approximately 599 acres or 7% of the treatment area was estimated to be potentially disturbed following the mechanical treatments and prescribed burning activities proposed in Alternative 2 (Burgoyne 2013 - appendix A). The level of soil disturbance increase depends primarily on the amount or lack of existing skid trails. Activity units that have had little prior disturbance would show a greater incremental increase in potential detrimental disturbance than those units that contain a network of already existing skid trails. The resulting total disturbance within a unit is not necessarily additive to existing disturbance and potential disturbance from proposed activities. Units with greater current disturbance would likely have less additive disturbance because disturbance caused from proposed activities would overlap existing disturbance. Previous soil monitoring done within the project area in 2009 was used to predict detrimental soil disturbance from proposed activities on certain soil map units that were monitored (data in project record). In soil map units with no previous soil monitoring data and in hazard tree removal areas, it is predicted that mechanical harvest treatments would add approximately 10% disturbance to a unit and prescribed fire would add approximately 1% detrimental soil disturbance to a unit (Neihoff 2002; Vander Meer and Archer 2009). If a unit already has existing skid trails or other disturbance, new disturbance would overlap existing disturbance in many places. None of the units would be over the 15% detrimental soil disturbance Region 4 threshold of concern because of the overlapping disturbance with existing disturbance.

Mechanical Treatments (Treatments utilizing ground based harvesting equipment)

Mechanical fuel treatments include clearcut with reserves, patch clearcut with salvage/sanitation, salvage/sanitation with aspen improvement, salvage/sanitation, salvage, whitebark pine improvement, aspen improvement and hazard tree removal. Effects from ground based harvesting that may reduce soil productivity and lead to soil disturbance include:

- Compaction;
- Rutting and displacement;
- Degradation of the litter layer and soil organic matter caused by increased decomposition rates and lack of appropriate annual litter contributions;
- Lack of coarse woody debris;
- Possible weed incursions.

Effects from past logging operations are detectable up to 80 or more years. Newer logging systems create less soil disturbance. Proposed activities use techniques (such as leaving appropriate amounts of coarse woody debris, following slope restrictions, designating skid trails, utilizing rubber tired equipment, green tree retention) that maintain or promote natural soil bio-physical resiliency. The effect of proposed activities should be relatively short compared to techniques used in the past. If all natural elements and processes remain intact, we can expect soil impacts to be nearly undetectable within 20 to 40 years based on professional judgment and experience on these soil types. Freeze-thaw cycles, soil organisms, burrowing animals, and root growth would help alleviate compaction and rutting. Soil displacement may last longer, but design features minimize soil displacement.

Ground based harvesting activities are proposed on 7,892 acres. Ground based equipment would be restricted to operate only during dry or frozen soil conditions (project design feature SOILS-11). Detrimental disturbance levels were estimated using Niehoff (2002) as well as forest monitoring data from 2009. Ground based techniques are expected to create approximately 10% detrimental soil disturbance. This disturbance would not necessarily be additive to the current disturbance, but will overlap with existing disturbance. Reuse of existing skid trails and landings would decrease additive disturbance. None of these units would exceed R4 soil quality standards following implementation.

Prescribed Fire

Effects from fuel treatments could include severely burned soil, litter loss, nutrient consumption, increased available nitrogen, erosion and possible weed incursions. Prescribed fire is proposed on 730 acres, which will lead to approximately seven acres of detrimental soil disturbance.

The impacts of burning depend on levels of fire severity. Slash piles would result in the highest severity from concentrated burning. Litter and duff consumption would be likely to occur at high rates in pile burns. Small spread out piles would minimize litter loss. Prescribed under burning typically result in a positive benefit with a mosaic pattern of burned and unburned ground and predominately low severity burn. Effects are significantly reduced when soil moisture levels are above 25% (Neihoff 2002). Prescribed fire adds about 1% detrimental soil disturbance and recovery in about 10 years (Vander Meer and Archer 2009; Niehoff 2002).

Prescribed fire can increase available nitrogen for one to two years (Choromanska and DeLuca 2002). Burning slash piles could create extremely high temperatures in concentrated areas and would lead to volatilization of nitrogen, loss of phosphorus and potassium (DeBano 1981). If litter layers and organic matter is kept intact throughout the rest of the stand, nutrient losses would be minimal from burning slash and would be localized. Nitrogen-fixing plants can colonize sites following fire and help restore N in the ecosystem (Newland and DeLuca 2000; Jurgensen et al. 1997). Following fire, soil erosion can increase, which could also reduce the nutrient pool (Megahan 1990). Generally, if plants colonize sites following fire, nutrient levels can reach pre-fire levels quickly (Certini 2005). Charcoal deposited following fire also adds carbon to the soil (DeLuca and Aplet 2008).

Noxious weeds following burning have the potential to impact long term soil productivity since their presence can affect soil chemical properties. Knapweed can affect their growing environment, shifting soil properties to their favor (D'Antonio and Vitousek 1992). These changes can play out in long term shifts in plant composition as observed by Vinton and Burke (1995). Specific design features to limit spread and actively treat known populations is expected to minimize the potential of these effects (design feature NW-1).

Erosion

No change in soil erosion is expected from the proposed activities (harvesting and fuels treatments) because of remaining ground cover following treatment (design feature SOIL-1). Erosion impacts from skid trails, landings and firelines are discussed in the Hydrology Report (Robertson 2013) and also addressed by design feature H-6.

The Water Erosion Prediction Project model interface for Disturbed Forest and Range Runoff, Erosion and Sediment Delivery ("Disturbed WEPP") was run by the project hydrologist (Robertson 2013) for transects within the proposed units in areas with high erosion hazard and steep slopes. The chosen transects were directly adjacent to Trail Creek and Shingle Mill Creek to

assess potential sediment delivery to stream channels and riparian. The increase in sediment delivery and erosion would not be measurable following the proposed treatments (Hydrology Report Robertson 2013; Table 4).

Temporary Roads and Machine Fire Control lines

Temporary road construction causes soil compaction, displacement and reduced soil hydrologic and biologic function. Mileage of new temporary road is used as an effects indicator. Approximately four miles of new temporary road is proposed and would be rehabilitated under Alternative 2. This temporary road construction would lead to approximately 7.8 acres of detrimental soil disturbance. Machine built fire control lines would have similar effects to soils as temporary road construction and would be cross drained while in use and rehabilitated following treatments (design feature FM-2). Approximately 10.2 miles of machine control line are proposed leading to approximately five acres of detrimental soil disturbance.

Newly constructed temporary road rehabilitation would be used to recover this area as soon as harvesting operations finish. Recovery would likely be slower than other harvesting-related disturbance given the high traffic. Current temporary road construction practices address the potential negative impacts with stringent rehabilitation efforts where temporary road templates are restored to contour. Topsoil would be conserved and replaced where possible to further recovery. Road fill is covered in slash for biological and site amelioration (Project design feature ROADS-1).

Hydrological recovery is expected within the first 10 years with soil infiltration rates lower than natural forest rates (Luce 1997; Foltz and Maillard 2003). For the long term, infiltration rates improve over time as freeze/thaw and plant roots improve soil porosity though rates would remain lower than adjacent natural forest soil (Switalski et al. 2004). Soil biological function restores as forest floor and native plant communities returns.

Road Maintenance and Reconstruction

Proposed road maintenance activities such as blading, drainage improvements, and surfacing on existing dedicated roads is proposed on 104 miles of road. Proposed road reconstruction activities such as realignment, curve widening, clearing and grubbing, and excavation work is proposed on 4 miles of road. These activities may increase short-term sediment movement from road surface runoff initially, but should be minimal, especially at road locations higher on the slope that are at a relatively low gradient and provide for sufficient buffer zones from streams.

Landings

Effects from landing construction could include soil compaction, litter loss, loss of coarse woody debris, increased potential for erosion, nutrient losses, loss of soil hydrologic and biologic function, and possible weed incursions.

Log landings are expected to be 0.25 to 0.5 acres is size. For analysis purposes, 380 landings (190 acres) was the estimated number of landings necessary for project implementation (Dasher 2012 project record). Actual numbers may vary slightly. Existing landings sometimes receive minor blading or small tree removal in order to prepare them for use. Erosion control measures would be used if needed to avoid movement from landing sites during maintenance and construction therefore resulting sedimentation is expected to be minimal. All landings will be rehabilitated and returned to pre-implementation conditions. Rehabilitation measures include re-contouring surfaces, ripping the surface to reduce compaction, seeding the surface where bare mineral soil is present and placing slash and other large woody debris along the surface to reduce soil erosion

(design feature ROADS-1). Subsoiling (i.e., ripping the surface, design feature SOILS-4) has been shown to be an effective tool in treating compacted soils in soil textures found in the project area that are susceptible to compaction including gravelly silt loams found in the project area (Kolka and Smidt 2004). Landing subsoiling has been shown to be effective at reducing soil bulk density as long as soil moisture levels are not high (Carr 1989).

Hand Line Construction

Effects from handline construction are generally minimal and include soil displacement and loss of organic matter from hand digging. Hand lines would be dug to bare mineral soil, which could also increase erosion potential in these areas while they are in use. Approximately 6.5 miles of hand line is proposed leading to approximately 2.4 acres of detrimental soil disturbance. These hand lines would be crossed drained while in use and rehabbed following treatment to avoid erosion and encourage vegetation growth (design feature FM-2). Although hand lines would disturb soil, less than 1% of a unit would be disturbed by constructing hand lines. Existing trails, roads, and ridgelines would be used as control lines where possible (design feature FM-2).

Noxious Weed Treatment

Approximately 1,376 acres are estimated for noxious weed control. Spraying of noxious weeds would occur on 301 acres along 124 miles of road (10 feet on both sides) and in 1,075 acres associated with skid trails and landings. Noxious weeds can have a detrimental effect on soil productivity through competition for resources such as space, light, water, and nutrients; and also through allelopathy. Allelopathy is defined as “chemical interactions among and between plants that do not include positive effects” (Foy and Inderjit 2001). For example, allelopathic weed species exude chemicals that can have a negative effect on native plant species. Canada thistle, spotted knapweed, and leafy spurge are known to be allelopathic (Foy and Inderjit 2001). Weed treatments would decrease the chances of detrimental effects on soils from noxious weed invasions.

Region 4 soil quality standards would be met; soil impacts would not affect more than 15% of the activity areas (FSH 2500-2011-1, USDA 2011). All proposed units would meet this standard and result in potential soil impacts that could affect up to 599 acres of the 8,622 acres proposed for treatment in the proposed action. Landings could affect up to 190 acres, temporary roads could affect up to 8 acres, machine control line up to 5 acres and hand control line could affect up to 2.5 acres of the proposed activity area. The total acreage that could be affected is 804.5 acres

Cumulative Effects for Alternatives 1 and 2

Cumulative effects include a discussion of the combined, incremental effects of human activities. For activities to be considered cumulative their effects need to overlap in both time and space with those of the proposed actions. For the soil resource, the area for consideration is the unit because effects on soils are site-specific.

Cumulative Effects from Mechanical Treatments and Prescribed Fire Treatments

Harvesting and prescribed fire activities would not overlap in time and space with past, ongoing, or foreseeable projects except where past disturbance has occurred. Existing soil conditions are discussed above. There are no other thinning activities proposed within the current proposed units; therefore no cumulative effects from thinning or prescribed fire will occur.

Wildfire and Fire Suppression

Active fire suppression has affected much of the Hams Fork project area over the past decades resulting in increased fuel loading. The proposed thinning would reduce potential fire behavior

(Fuels Report, Banister 2013). The benefits of fires with lower intensity and severity would include a reduced potential of excessive soil heating and sterilization as well as hydrophobic conditions that tend to increase sediment movement, flooding, and possible slope instability (DeDios Benavides-Soloria and McDonald 2005; Neary et al. 2005).

On small wildfires, disturbance from fire suppression activities is usually limited to hand tools; most hand fire-line construction has only minor impacts to the soil resource. Machine line using heavy equipment is also built during wildfire suppression. These machine lines are rehabilitated following suppression activities. During fire suppression, closed roads may be reopened for access and incorporated as fire line. As part of the post-fire work, the areas of disturbance are rehabilitated and the roads returned to their previous condition in most cases.

Road Maintenance and Decommissioning

All developed roads built in the past have a lasting effect on soil productivity due to compaction and displacement. Their maintenance for residence access, recreation, and forest management calls for ongoing use, which results in compaction and displacement through the project area.

Road maintenance includes culvert installation, blading, and brushing, and typically improves drainage and decreases erosion from water channeling down the road surface in the long run. For a detailed analysis and information on roads and related issues, see the Transportation and Hydrology sections.

Recreation

Disturbance from general motorized use and recreational access has been occurring and will continue throughout the units indefinitely. We anticipate no changes in the existing recreation profile. Other recreational activities that occur off the developed roads, such as the gathering of miscellaneous forest products and hunting, are occurring in the project area. Closing skid trails in this area following treatment as described in design feature ROADS-1 should prevent this occurrence and should not have additional effects on soils in the project area. Cumulative effects to soils from recreational vehicle use are not expected or are expected to be below a level of concern. See the Recreation section for further discussion on recreational vehicle use.

Grazing

There are 12 grazing allotments within the project area and the proposed treatment units are located in eight of them: Aspen Springs, Green Knoll, Sams Allan Creek, Indian Creek, Basin Creek, Devils Hole, Elk Creek and Hams Fork. The Hams Fork allotment is the only cattle allotment; the remaining seven allotments are grazed by sheep. The proposed treatment units are subject to cumulative grazing impacts. Impacts of grazing are limited to areas where the animals bed, lounge, trail, or access water. These areas are mostly small in aerial extent. Impacts include compaction, removal of groundcover, and displacement. Grazing will continue in the foreseeable future. Generally in this area compaction is limited to the grassland portions of the project area. The thinning units in which ground based equipment would be used are generally located in forested areas so there should be little or no overlap with sheep and cattle in the grassland areas. The Rangeland Resources Report (Cameron 2013b) for additional information on livestock transitory range.

Grazing effects do overlap in space and time with many of the prescribed fire treatments. Assessing units following implementation will be extremely important in determining when soils are resilient enough to handle cattle grazing. This design feature (R-2) will ensure that effects

from prescribed fire would be negligible prior to cattle or sheep returning to the units; therefore cumulative impacts to soils from grazing are not expected.

Noxious Weed Treatments

Areas of disturbed soil provide an optimal location for weed establishment and subsequent invasion (DiTomaso 2000). Weeds establish quickly and can increase erosion, deplete soil moisture, and alter nutrient levels (DiTomaso 2000). Because the roots of noxious weeds are often deeper than native grasses, they also contribute less organic matter near the soil surface (Sperber et al. 2003). Weeds would be sprayed along skid trails and at landings and would continue under current management. Refer to the Invasive Plants section for additional details.

Noxious weed monitoring and treatment would therefore occur as needed and would follow guidelines established in the Bridger-Teton National Forest Strategy and Action Plan for Invasive Species Management (USFS 2008). Effects to soil resources were analyzed in the document and its adaptive strategy. No additional effects to soils beyond what was analyzed for and disclosed in the environmental assessment for management of noxious weeds (USFS 2008) are expected to occur.

Cumulative Effects of Ongoing and Reasonably Foreseeable Activities:

The impact of creating 804.5 acres of detrimental soil disturbance when added to the impacts of past, present, and reasonably foreseeable actions would not move the analysis area away from compliance with the soil quality standards which are the threshold for this analysis.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

By implementing the resource design features the proposed activities would comply with the Forest Plan as well as the R4 soil quality standards.

The following Forest Plan standards and guidelines have been reviewed for the proposed actions. Alternative 2 (Proposed Action) in Chapter 2 lists applicable design features to ensure these standards and guidelines are met.

Silvicultural Restriction Standard - This standard would be met. On the soils identified as marginally unstable no logging activities are proposed on slopes greater than 55%.

Yarding Method Guideline - This guideline would be met. On slopes greater than 40% in the proposed thinning area identified, log yarding activities would use a system that suspends one end of the log (preferably the butt end).

Avoidance of Productivity Loss Standard – This standard would be met. Logging operations would occur on dry soils, existing skid trails would be reused where possible, temporary roads would be rehabbed, landings would be ripped and seeded or have woody debris placed over them.

Soil Displacement Standard - This standard would be met. Soil displacement and water runoff concentration would be minimized during yarding operations.

Soil Management Standard – This standard would be met. A slope-stability assessment or evaluation has been conducted for each analysis area.

Logging Method Guideline – This guideline would be met. Low ground disturbing equipment would be used during times of low soil moisture.

Onsite Erosion Guideline – This guideline would be met. Monitoring would be conducted after project is completed and then one year later.

Summary of Effects

The Hams Fork Vegetation Project would comply with the Bridger Teton Forest Plan for long-term soil productivity. The proposed silvicultural and fuel treatments in Alternative 2 are not expected to adversely affect soil resources because of design features that would be implemented as part of the management alternative. These design features would help to ensure that resource safeguards will be in place that would prevent adverse effects on the soil resource from occurring. Where effects cannot be avoided, reclamation is planned in order to minimize or negate detrimental levels of soil disturbance.

None of the treatment units would exceed R4 soil quality standards following implementation as approximately 13% detrimental soil disturbance would be expected as a result of ground based techniques used.

Alternative 2 would have the larger effect on soil resources totaling 804.5 acres of detrimental soil disturbance. That includes disturbance from treatment units (599 acres), four miles of new temporary road (7.8 acres), 380 new landings (190 acres), and 27.5 miles of fire control line (handline: 6.5 miles, machine line: 10.2 miles, black line: 10 miles and existing roads: 0.8 miles). This alternative proposes to treat 8,622 acres compared to zero treatment acres proposed under Alternative 1. Under Alternative 1, approximately 22 acres of detrimental soil disturbance already exist. Soil productivity changes would be expected to be greater under Alternative 2 than under Alternative 1 because of equipment disturbance to the forest floor. The activity areas would be expected to maintain forest floor across greater than 85% of the area and large wood, a combination of standing and down, would remain on site at levels specified by Graham et al. (1994).

Sensitive Plants

The following resource information and analysis summarizes the Botany Report and Biological Evaluation (Johnson 2013).

There are no known plant species listed as Threatened or Endangered within the Hams Fork project area. There are three sensitive plant species known to occur and nine other Sensitive Species have potential habitat present in the project area, but no known individuals are present. Two additional Management Indicator Species (MIS) have potential habitat present in the project area with no known individuals present. All sensitive and MIS plant species were analyzed in the Botany Report and Biological Evaluation (Johnson 2013) with the exception of aspen which is an MIS species identified by Bridger-Teton National Forest to represent aspen-dependent wildlife species and was also analyzed in the Biological Evaluation and Wildlife Report (DeLong 2013). All but three plant species would have no impacts associated with implementing Alternative 1 and 2 based on the lack of suitable habitat in the analysis area, or the fact that the proposed actions would not impact those species because the treatment areas do not overlap with their habitat. Therefore, two sensitive plant species (whitebark pine and Payson's milkvetch) are carried forward and summarized in this section and aspen is summarized in the Wildlife Species section (page 134) as a Management Indicator Species for wildlife dependent on aspen.

Affected Environment

Whitebark pine (Sensitive)

Within the Hams Fork project area there are about 10,500 acres of whitebark pine growing in pure and mixed stands. Within areas that have specific proposed treatments around 240 acres of whitebark pine occur within proposed mechanical treatments, around 170 acres are within areas proposed for hazard tree removal treatment, and there are no acres of known whitebark pine within areas proposed for prescribed burns. The primary threats to whitebark pine are successional replacement by shade-tolerant conifer species, mortality from native beetle epidemics, and an exotic fungal infection called whitepine blister rust.

Payson's milkvetch (Sensitive)

Payson's milkvetch is a small perennial plant that occupies forested habitats and has its largest populations in recently disturbed areas. The species is usually described as an early seral species that is largely dependent on disturbance. In the absence of natural disturbance the species is known from artificially disturbed areas such as clear cuts, road cuts, and burn piles. There are four known occurrences of Payson's milkvetch in the southwestern portion of the project area. Three of these occurrences are within areas that are scheduled for treatment. Some of the known occurrences are from observations that predate GPS technology and as such their mapped occurrences have a large spatial inaccuracy. As a result it is difficult to tell what treatment units some of the occurrences are in. At any rate, three of the known occurrences are in close proximity to proposed treatments and burns. The proposed treatments would likely create large amounts of habitat for this species, but may damage individual plants in the process.

Environmental Consequences

The following analysis indicators are used to measure the differences in alternatives for sensitive plants:

- The acres of potential or occupied habitat which would be impacted by vegetation treatment or the lack of such treatment

Spatial and Temporal Context for Effects Analysis

The direct and indirect effects analysis area for sensitive plants is the project area. Cumulative effects analysis area is the forested areas within the project area. The temporal boundary for the cumulative effects analysis is 10 years into the past and future.

Alternative 1-No Action

Direct and Indirect Effects

Whitebark pine

The effects of no action, which is to say the current management, on whitebark pine across its range are well documented (FWS 2011). There would be no direct effects to whitebark pine from Alternative 1 since no management activities would occur. However, the indirect effects to whitebark pine from this alternative would be generally negative in the project area. The decline in whitebark pine is driven, in large part, by past fire suppression and its continuing effects (altered successional dynamics and hyper-dense forests with periodic outbreaks of insects). Continued fire suppression in the range of whitebark pine is predicted to maintain or even accelerate the decline of the species (Tomback et al. 2001). The lack of fire-related disturbance in

subalpine areas has led to the encroachment of shade-tolerant fire-intolerant conifer species into whitebark pine stands. These species can eventually over-top and out-compete whitebark pine leading to a loss of whitebark pine habitat (FWS 2011). Additionally, fire suppression can lead to hyper-dense forests in areas around whitebark pine habitat. These hyper-dense forests are susceptible to episodic and epidemic outbreaks of native insects, which can spill over and cause mortality in whitebark pine. In the absence of management activities in this alternative continued fire suppression would exacerbate inter-specific competition and insect outbreaks, both of which would be negative for the species. The US Fish and Wildlife Service (2011) points out that a shift from a natural fire regime to a managed one is detrimental to whitebark pine. Additionally the same analysis identified current fire management practices as a threat to the species which limits its ability to recover on its own and makes it susceptible to damage from other factors (climate change, insect outbreaks, and fungal infection). As such, whitebark pine is susceptible to extinction due to changes in natural fire regimes (FWS 2011).

However, the No Action alternative would likely save individual whitebark pine trees from potential damage from the proposed fire and thinning. Additionally the risk of a stand-replacing wildfire would be increased with this alternative. Whitebark pine may benefit from this since the species is generally a pioneer species in some instances of stand replacing fire. This outcome however, would not be a certainty because there may be no nearby seed source to establish a pioneering cohort of whitebark pines. Seed-source losses from white pine blister rust and successional replacement make it unlikely that a ready source of whitebark pine seeds would be available. The long-distance transport of whitebark pine seeds by birds has been observed and may add some seeds to burned areas since the open spaces created by high-intensity fires are favored seed cache sites for many bird species.

Payson's milkvetch

Payson's milkvetch seems to require either natural or artificial disturbance to thrive. Like whitebark pine, Payson's milkvetch is likely to have declined due to the current management of the forests. Fire suppression and a lessening of timber harvest may have reduced the scale of disturbance on which this species may capitalize. While there are known occurrences of Payson's milkvetch in the analysis area, the conditions at those occurrences are likely moving away from ideal habitat as the old clear cuts and roads become grown over and the canopy closes. The observations in the area are from the early 1990's and the conditions have likely changed in the intervening two decades. Maintaining the current trajectory of those sites would likely lead to the species disappearing from the site until a future disturbance creates its habitat. However, because high-intensity fire is possibility under the action, there could be benefits to the plant because of its preference for disturbance. The No Action alternative is likely to continue to move the analysis area away from the habitat of Payson's milkvetch. Fewer acres of potential habitat of this species would be created under this alternative than under Alternative 2.

Cumulative Effects

Cumulative effects for Alternatives 1 and 2 are described under Alternative 2.

Determination of Effects:

Based on the analysis and information available a determination of "may impact individuals but is not likely to cause a trend to Federal listing or loss of viability" is made for whitebark pine and Payson's milkvetch for Alternative 1. This determination is supported by the following rationale:

- The lack of treatment under this alternative would sustain or accelerate several agents of mortality for whitebark pine including successional replacement of whitebark pine by shade tolerant conifers and mortality from native beetle epidemics.
- This alternative would sustain the successional alteration of Payson's milkvetch habitat. This alteration takes the form of canopy closure which moves habitat away from that which Payson's milkvetch can occupy.
- Neither the effects to whitebark pine nor Payson's milkvetch are enough to push either species towards listing as Threatened.
    - Whitebark pine is widely distributed across the Bridger-Teton NF and the detrimental effects of no action under this alternative are minor considering the range of the species, as a result the impacts to whitebark pine from this alternative are not enough to push the species towards listing
    - There are several occurrences of Payson's milkvetch across the Bridger-Teton NF and the likely loss of these four populations under the No Action alternative are not enough to push this species towards listing
- There are fewer acres of potential habitat that would be created under Alternative 1 than under Alternative 2 for both whitebark pine and Payson's milkvetch. There are more acres in Alterative 1 that would see the mortality of individual whitebark pine and Payson's milkvetch than in Alternative 2.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 would meet the Forest Plan Goal 3.3 and Objective 3.3(a) Protect National Forest Service Intermountain Region Sensitive plant and animal species and provide suitable and adequate amounts of habitat to ensure that activities do not cause (1) long-term or further decline in population numbers or habitats supporting these populations and, (2) trends towards Federal listing.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Whitebark pine

The proposed action seeks to alleviate threats to whitebark pine from successional replacement and native beetle mortality by moderating the factors that cause that mortality. Thinning of late successional conifers from whitebark pine stands would address that agent of mortality. Thinning and burning hyper-dense forests in the vicinity of whitebark pine would also reduce the probability that native beetles would reach epidemic conditions which reduces the likelihood of beetle-caused mortality to whitebark pine.

Alternative 2 specifically aims to improve around 200 acres of whitebark pine habitat as well as incidentally improving the general conditions for the species by thinning and burning in the analysis area. Several possible direct effects arise from thinning as described in Alternative 2. Since there are no known whitebark pines in any prescribed fire units (those units are at a lower elevation than whitebark pine) it is unlikely that there would be any direct effects from fire.

There is a small chance of direct damage of whitebark pine from thinning operations. While there is a design feature that protects most 5-needled pine trees (whitebark pine among them) it is possible that thinning operations could result in minimal unintentional or unavoidable physical damage to individual whitebark pines especially since the proposed whitebark pine improvements

include thinning around specific whitebark pine trees. Whitebark pine exists in areas that are proposed to have hazard trees removed, and since public safety is paramount such thinning could include dead or dying whitebark pine.

The indirect effects to whitebark pine from the management described in Alternative 2 generally have to do with the restoration of fire to a fire-adapted landscape. The implementation of prescribed fire to areas near whitebark pine would likely result in a decreased likelihood of insect outbreaks from nearby forests and possibly a decrease in inter-specific competition. The US Fish and Wildlife Service (2011) points out that fire in subalpine forests creates whitebark pine habitat. Additionally fire in these areas increases the likelihood that potential habitat would become occupied due to the caching behavior of birds which, for whitebark pine seed predators at least, prefer open spaces created by fire. This alternative would likely promote a mixed-intensity burn should a large-scale wildfire occur in the project area, versus a more intense burn likely under the no action alternative. A mixed-intensity burn is most likely to be beneficial to whitebark pine because it would reduce inter-specific competition and create a mosaic of open and thinned patches. Mixed-intensity fire would create habitat and increase the likelihood that it would become occupied due to caching behavior of birds. Mechanical thinning of competitors from whitebark pine stands would result in a reduction of inter-specific competition.

Payson's milkvetch

The proposed thinning and burning in Alternative 2 would create habitat for Payson's milkvetch. Since most of the proposed treatments are in former Payson's milkvetch habitat (forest) or would create it, this alternative could create around 8,400 acres of potential habitat. That is not to say that any of the habitat is guaranteed to become occupied. Payson's milkvetch is most often found in post-disturbance environments which would be created under this alternative. Direct effects to Payson's milkvetch may include the loss of individuals from the implementation of the proposed action (for example, by being crushed or burned). Indirect effects may include immediate improvement (by removing competing vegetation and opening the canopy) of the growing condition for plants already present on the site.. The introduction and control of noxious weeds could negatively impact this species, but design features are in place to avoid such negative interactions.

Design Features

There are many design features which are germane to the protection of sensitive and MIS plant species and their habitat (whether it be occupied or not) discussed in the Botany Report and Biological Evaluation (Johnson 2013). Highlighted below are design features pertinent to whitebark pine and Payson's milkvetch

- The Noxious Weed design feature (NW-1) requires that equipment not act as a vector of noxious weeds. This design feature protects all sensitive or MIS plant habitat
- A roads design feature (ROADS-1) directs that native species be used for rehabilitation, this decreases the chance that noxious or invasive weeds would establish following the disturbance from the treatments.
- All 4 Sensitive Plants design features would protect certain habitats from impacts from the proposed action
    - P-4 re-enforces the need to use native seed in restoration and establishes that natural revegetation be allowed to occur particularly where Payson's milkvetch may be benefitting from project associated disturbance.

- Silvicultural design features S-4 through S-6 protect whitebark pine from damage during project implementation
- A few wildlife design features prohibit restoration treatments to protect lynx habitat, this reduces the magnitude of benefit for whitebark pine and Payson's milkvetch.

Cumulative Effects for Alternative 1 and 2

The cumulative effects analysis area for this project are the areas of potential habitat for any of the sensitive or MIS species which have effects in the present analysis within the project area. Whitebark pine and Payson's milkvetch are the only Sensitive Species with potential effects from the proposed action. This potential habitat includes forested areas. The temporal boundary for this analysis is 10 years into the past and future. Within this analysis area past, present and reasonably foreseeable future activities that have the potential to impact the plants included in this analysis include cattle grazing, managed and unmanaged wildfire, timber harvest, fuels reduction projects, and insect and disease management. The indicator for determining the cumulative effects is the same as was used for determining direct and indirect effects (acres of potential sensitive plant habitat affected) and the threshold for concern is also the same (whether or not the action will push a Sensitive Species towards listing as Threatened).

For Sensitive Species there are policies and mitigation measures in place that reduce or eliminate impacts from these management activities. Because of these policies, the cumulative effects expected from the alternatives proposed for this project, when combined with the effects from the other management activities, are not expected to contribute to any change in status or viability of sensitive plants. This conclusion was reached by using the indicators for direct and indirect effects (the acres of potential or occupied habitat which would be impacted by thinning and burning or the lack of such treatment) from the proposed activities and adding them to the following expected effects from other management activities:

- Cattle grazing in the general area may impact Payson's milkvetch both positively and negatively, direct effects from grazing include the loss of above and below ground biomass through grazing and trampling. Indirect effects include the alteration, deterioration, or creation of potential sensitive or MIS plant habitat through disturbance.
- Road maintenance can create or alter potential habitat for sensitive or MIS species. Road maintenance can remove or kill individual sensitive or MIS plants.
- Herbicide, grazing or bio-control efforts to control invasive plants can have direct and indirect effects to sensitive and MIS plants. Herbicide application can be misapplied, bio-control agents can move to non-target species and grazing animals can damage non-target species. Removal or control of invasive plants can also alter the habitat away from or towards the potential habitat of a sensitive or MIS species.
- Natural and prescribed fire can directly affect Sensitive Species by burning individual plants. The same fires can indirectly affect sensitive plants by changing the habitat type (which is sometimes the goal of the project). In addition, fire suppression has led to increased fuel loading, canopy closure, and higher intensity wildfire. Fire is a natural disturbance in the ecosystem. In some areas, habitat succession and fire could possibly create or improve habitat for select plant species by opening up meadows or reducing the litter accumulation and competition from other plants. In other areas, wildfires or controlled fires would create high ground temperatures that could sterilize the soil and eliminate fungal species that are necessary for the survival of others. Fire also tends to favor post-fire germination of non-native species in environments where non-natives are abundant and/or native species are stressed.

- The prevalence of insect and disease outbreaks in the area has altered the forest character which has indirect effects to the potential habitat of some Sensitive Species. The loss of canopy species changes the biotic and abiotic character of the habitat by increasing the amount and duration of sunlight and increasing the amount of fine and course woody debris.

The actions and effects described above can be both additive and interactive to each other and to the direct and indirect effects described for the alternatives. As stated earlier, because current management and mitigation is designed to eliminate or reduce negative cumulative impacts by protecting sensitive and MIS plants from direct and indirect impacts, the cumulative effects to whitebark pine and Payson's milkvetch under both alternatives are expected to be minimal and will not lead either species towards listing as a Threatened species. The restoration of whitebark pine with the proposed action is on a fairly small spatial scale (around 200 acres). However, the thinning and burning in the proposed action will alleviate negative effects to whitebark pine from previous forest management action in the area around the Hams Fork watershed.

Determination of Effects:

Based on the analysis and information available a determination of "beneficial effects" is made for whitebark pine and Payson's milkvetch for Alternative 2. This determination is supported by the following rationale:

- One of the stated goals of this project is to improve the habitat and condition of whitebark pine. The proposed thinning and burning will reduce the likelihood that two of the major agents of mortality will kill individual whitebark pine in the analysis area. Implementing thinning and burning of surrounding forest reduces the chance that native beetles will reach epidemic proportions and spill over onto whitebark pine. Removing competing trees from around individual whitebark pine trees will increase the probability that those individuals will live and reproduce. There is the possibility that a small amount of individual whitebark pine would be damaged or killed under this alternative. However, a design feature is in place which prioritizes their survival and the possible benefits of this alternative far outweigh the loss of a few individuals. A mixed–intensity wildfire, more likely with the action alternative, would also benefit whitebark pine.
- Thinning and burning will create habitat for Payson's milkvetch and will alter the successional trajectory which is currently moving away from Payson's milkvetch habitat. There is the possibility that individual plants could be damaged or killed during implementation, but the large-scale creation of this species habitat far outweighs those negative effects.

There would be far more acres of potential habitat for whitebark pine and Payson's milkvetch created under this alternative than under the no action alternative.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 would meet the Forest Plan Goal 3.3 and Objective 3 3(a) Protect National Forest Service Intermountain Region Sensitive plant and animal species and provide suitable and adequate amounts of habitat to ensure that activities do not cause (1) long-term or further decline in population numbers or habitats supporting these populations and, (2) trends towards Federal listing.

Invasive Plants

The following resource information and analysis summarizes the Invasive Plants Report (Cameron 2013).

Affected Environment

There are 18 verified noxious weed sites within the proposed project area consisting of musk thistle, Canada thistle, dyer's woad and dalmatian toadflax. Although these noxious weeds sites cover several acres cumulatively the actual individual infestations, in general, are less than 2 acres. Figure 15 shows locations of current invasive plants within the project area. Site visits indicate sites are located along Forest roads and trails, past timber harvested areas and along the Forest boundary. In addition to the verified noxious weed sites, other unverified noxious weed sites may be present in the project area. If such infestations do exist they are likely relatively small in size and number as the majority of the proposed project area has been visited numerous times by field personnel trained in identifying noxious weeds.

Cheatgrass is another invasive species that may be present in portions of and immediately adjacent to the project area especially on south facing slopes. However, numerous site visits and a review of studies located in these areas suggest cheatgrass is at best only a minor component of these plant communities. Rather south facing slopes are dominated by natural plant communities including but not limited to mountain brush, mountain mahogany, and sagebrush (USDA 2012a).

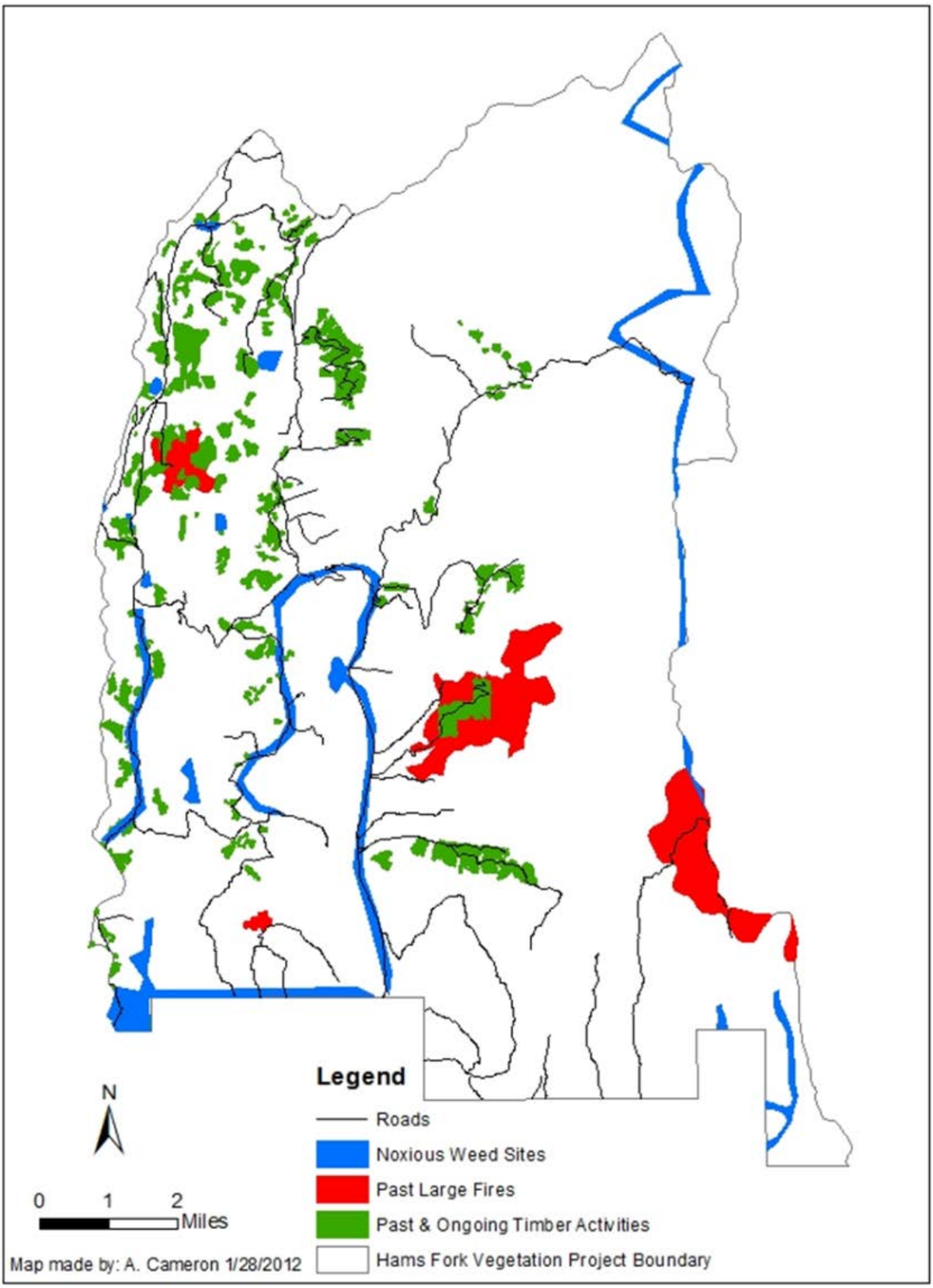


Figure 15. Invasive plant locations within the Hams Fork Vegetation project area

Environmental Consequences

Indicator used to compare alternatives: the number of acres with a higher potential for noxious weed establishment. The threshold for concern is whether the proposed or no action alternatives will fail to meet the USDA Noxious Weed Control Standard, which calls for effective management of noxious weeds.

Spatial and Temporal Context for Effects Analysis

The boundary for the effects analysis for invasive plants is the Hams Fork project area. The cumulative effects area for this analysis includes the project area and areas immediately adjacent to the project area. The cumulative effects analysis is bound in time from the establishment of the Bridger-Teton National Forest until the point in time a large intensity wildfire burns throughout the project area.

Alternative 1-No Action

Direct and Indirect Effects

Under this alternative, new noxious weed infestations would likely continue to occur at levels similar to the past with new infestations being either eradicated and/or quickly controlled. Previously existing noxious weed sites would likely continue to be controlled.

However, fuel loading would continue to occur within the project area and the risk of having a large and high intensity fire in the area would continue to increase (Duncan 2001). When this occurs, levels of disturbance would likely be much greater than those associated with the proposed alternative with literature predicting high levels of bare ground, extended upland erosion, surface runoff, a loss of nutrients, a loss of mycorrhizae, a loss of organic matter, sterilization of soil, possible delayed recovery times, and possible loss of forest productivity (DeBano and Neary 2005; Brown 2000; Reardon et al. 2005; Miller 2000; Ell et al. 2001; Elliot et al. 1999). The increased bare ground and weakened native plant communities would then be susceptible to noxious weed invasion. Further, site visits indicate there are areas where musk thistle and Canada thistle have invaded and become established following wildland fire (USDA 2012a).

Additionally, as with many high intensity wildfires it is likely that suppression efforts would occur. The end result would be an increased likelihood of having noxious weeds become established throughout much of the proposed project area as wildfire suppression efforts would be a vector for noxious weed seeds. The high amount of ground disturbing activities related to the wildfire and potential fire suppression efforts would provide ideal conditions for the establishment and proliferation of noxious weeds. Further, effective treatment of noxious weeds would be difficult because of the terrain of the area and its inaccessibility. The following effects would likely be observed should this occur. First, existing plant communities would be altered with a reduction in plant diversity occurring as noxious weeds became more and more prevalent. This shift in vegetative composition would then likely affect soil and watershed conditions with changes likely occurring in surface water runoff and water quality (Lacey 1989). In addition, wildlife populations would likely be affected (Bendunah and Carpenter 1989; Johnson et al. 1993; Johnson et al. 1994). Finally, the costs of attempting to control the spread of noxious weeds in the area would greatly increase (Lacey and Olson 1991; Wallace et al. 1992).

Cumulative Effects

The cumulative effects area for this analysis includes the project area and areas immediately adjacent to the project area. The cumulative effects analysis is bound in time from the establishment of the Bridger-Teton National Forest until the point in time a large intensity wildfire burns throughout the project area.

There would be no immediate cumulative impacts beyond those which are occurring, which include but are not limited to past and future fires, past and future timber projects, past and future recreational activities, and past and future grazing activities. Thus far and likely into the near future the impact of these effects on the establishment and spread of noxious weeds has been and would continue to be minor. However and as previously explained the probability of having noxious weeds become established and propagate throughout the project area is greatly increased should a high intensity wildfire burn throughout the proposed project area. The impacts of such a fire were discussed previously.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Invasive Plants Specialist Report (Cameron 2013) indicates that Forest Plan direction for noxious weeds would be met. The following applicable Forest Plan standard would be met under Alternative 1.

Noxious Weed Control Standard (USDA 1990, p.144): Effective management of noxious weeds would be accomplished by cooperating with the Wyoming Department of Agriculture and County weed control districts, using Integrated Pest Management techniques, following the procedures outlined in the Bridger-Teton Environmental Assessment for noxious weed control and appropriate technical guides. No toxic chemicals will be applied in a manner that will adversely affect non-target species.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Under this alternative, there would be an estimated 1,376 acres associated with the proposed silvicultural activities and proposed burns with a higher potential for noxious weed establishment (1,075 acres of newly disturbed ground associated with skid trails and landings and 301 acres along roads). However, it is likely noxious weeds will be sufficiently controlled through implementation of the Forest's Management of Noxious Weeds (USDA 2005).

Silvicultural Activities (not including prescribed burning):

Potential direct and indirect impacts associated with proposed silvicultural activities can be determined to a high degree of certainty by examining areas that have recently undergone similar treatments. There are several areas within and outside of the proposed project area that meet this criteria. A number of these areas were visited with studies being established at some areas. Data and site visits indicate some silvicultural activities have resulted in noxious weed infestations as approximately 10% (12 of 121) of verified noxious weed sites within the district are located at areas within previous silvicultural activities. Musk thistle and Canada thistle are the most common infestations with infestations of black henbane and dyer's woad also being documented. Six additional noxious weed sites are also located within 50 meters of previous silvicultural activities (USDA 2012c). While it is unlikely all of these infestations are directly or indirectly related to previous or ongoing silvicultural activities (due to other activities in and around these timber harvest areas which may have resulted in some of these infestations) it is probable that the majority of these infestations are related to silvicultural activities. As a result, one may reasonably

expect future silvicultural activities to result in an increased presence of noxious weeds throughout the project area. The potential for noxious weed establishment is most likely to occur along the 124 miles of roads within the proposed project area and 10 feet from each side of the road (for a total of 301 acres along the roads) and on 1,075 acres associated with the maximum area allowed for skid trails and landings. Therefore, a total of 1,376 acres are estimated for possible noxious weed establishment. This is likely a high estimate of potential noxious weed establishment.

Common noxious weed species likely to result from silvicultural activities include musk thistle and Canada thistle. However, other noxious weeds, which are only present in a few areas on the Kemmerer Ranger District and Bridger-Teton National Forest as well as other "new" noxious weeds not currently on the District or Forest may be brought onto the forest and become established. Fortunately, the likelihood of having new noxious weed infestations can greatly be reduced by the cleaning of silvicultural equipment before activities begin and when equipment is moved from one area to another as is required by design feature NW-1.

Proposed silvicultural activities may result in short-term changes in recreation use levels and use patterns. Some existing roads that are currently closed and not included in the Bridger-Teton National Forest road database will be used while a few new temporary roads will be constructed. These changes will likely result in an increased likelihood of new noxious weed infestations. However one may expect new noxious weed infestations would continue to be eradicated and/or controlled as has occurred previously through the Forest's Management of Noxious Weeds (USDA 2005).

Prescribed Burning:

Potential effects related to the proposed prescribed burning activities can be determined to a high degree of certainty by examining areas that have burned in the recent past with similar ecological conditions. At least four such areas exist within the project area. These previously burnt areas (Indian Creek area, Hams Fork Ridge, Tunp Ridge and Shingle Mill) were visited, studies were established, and findings are summarized below.

- Burns often resulted in the release of aspen.
- Original vegetation appeared to have retained the capacity to eventually dominate areas after burning suggesting productivity and site potential had been maintained.
- Depending on the area little to no noxious weeds were documented. Adjacent roads with noxious weed infestations may have been the vector for establishment and propagation into the burned areas with noxious weeds currently present. It is unclear what likely served as a vector for the infestations – fire, roads or a combination of fire and roads. However, it is likely if noxious weeds were present prior to the burn that the burn likely helps to facilitate their propagation as well.

One proposed prescribed burn (Burn #2) is adjacent to a verified noxious weed site. However, it is unlikely the prescribed burn would result in further establishment and propagation of noxious weeds than what is already occurring via wind, vehicles, and animal dispersal. In addition, it is likely the noxious weed site will be sufficiently controlled through implementation of the Forest's Management of Noxious Weeds as the proposed burn should not directly affect the adjacent noxious weed site (USDA 2005).

The remaining proposed prescribed burns should not result in the establishment and propagation of noxious weeds. This assertion is strengthened as site visits and studies at areas to be burned

and adjacent to areas to be burned revealed virtually no noxious weeds present with areas being dominated by native vegetation (Cameron 2013).

Proposed prescribed burning activities should not result in measurable increases in recreational activities in areas to be burned because no new roads would be opened to these areas. Therefore, because recreation use levels and patterns should not change in these areas the probability of having new noxious weed infestations related to recreational use and proposed prescribed burning should also not change.

Cumulative Effects

The cumulative effects area for this analysis includes the project area and areas immediately adjacent to the project area. Additionally the analysis was bound in time from the establishment of the Bridger-Teton National Forest until completion and recovery from activities proposed in the action alternative.

The list of present and future projects developed for this analysis was considered and the following are the types of projects that may contribute to a higher potential of noxious weed establishment. However, it is expected noxious weeds infestation will be sufficiently controlled through implementation of the Forest's Management of Noxious Weeds (USDA 2005). The increase in number of acres of potential noxious weed habitat with this alternative, when added to the effects of past present and reasonably foreseeable future activities, would not move the cumulative effects area away from meeting the Noxious Weed Control Standard.

Past and Planned Timber Harvesting Activities:

Impacts of past timber harvesting activities were previously described when analyzing potential direct and indirect effects of the proposed action. Noxious weeds will likely occur at these areas with infestations likely being sufficiently controlled through implementation of the Forest's Management of Noxious Weeds (USDA 2005).

Past and Potential Wildfires:

As previously discussed mixed-intensity wildfires have burned within the project area with studies indicating near to complete recovery. The proposed activity reduces the likelihood of a high intensity wildfire occurring which in return reduces the likelihood that noxious weeds would become established and spread throughout the project area.

Livestock Grazing and Wildlife:

Livestock grazing occurs within the project area during the summer. Livestock have the potential to spread seed or provide niches for noxious weeds establishment. For example, livestock may spread noxious weed seeds by depositing viable seeds in fecal pats with the amount of viable noxious weed seed depending upon the weed species (Blackshaw and Rode 1991; Lyon et al. 1992; Peinetti et al. 1993; Schauer et al. 2004). Also, livestock have the potential to cause a shift in vegetative composition and increase bare ground if heavy utilization is allowed to continually occur. The increased bare ground and weakened native plant communities would then be susceptible to noxious weed invasion. However the spread and propagation of noxious weeds by livestock as described above is highly unlikely because of the low level of noxious weed presence within and immediately adjacent to the project area; minimal use by livestock at areas actually proposed for treatment; light to moderate use levels at areas adjacent to areas proposed for treatment, and the implementation of the Forest's Management of Noxious Weeds has successfully controlled and/or eradicated noxious weed infestations (USDA 2012a; USDA 2012b; USDA 2005; site visits).

There are numerous wildlife including moose, elk, and deer within the project area. These animals have the ability to spread and propagate noxious weeds in a similar fashion as livestock. Additionally, noxious weeds are generally only present in relative small amounts within and adjacent to the proposed project area. As a result, it is not expected that wildlife would significantly contribute to the spread of noxious weeds within and adjacent to the project area.

Roads and Recreation:

Various roads are found throughout the project area. Recreationists are not required to spray their vehicles to prevent the spread of noxious weed seeds. As a result, noxious weeds are present along roads within the project area. It is expected that recreation would continue to be a vector for noxious weed establishments. However, one may expect new noxious weed infestations along roads would continue to be eradicated and/or controlled has as previously occurred through the Forest's Management of Noxious Weeds (USDA 2005).

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Invasive Plants Specialist Report (Cameron 2013) indicates that Forest Plan direction for noxious weeds would be met. The following applicable Forest Plan standard would be met under Alternative 2

Noxious Weed Control Standard (USDA 1990, p.144): Effective management of noxious weeds would be accomplished by cooperating with the Wyoming Department of Agriculture and County weed control districts, using Integrated Pest Management techniques, following the procedures outlined in the Bridger-Teton Environmental Assessment for noxious weed control and appropriate technical guides. No toxic chemicals will be applied in a manner that will adversely affect non-target species.

Transportation

The following resource information and analysis summarizes the Hams Fork Vegetation Project Transportation Analysis (Lusty 2013).

Methods for Analysis

Road history was found by using historic Government Land Office maps, Forest Service Transportation maps, Forest Service Visitor Use Maps, and USGS quad maps. The roads existing condition was derived from the Forest Service GIS roads coverage TransTrav_rd_feb12. Unauthorized roads were mapped using imagery and some on-the-ground verification field surveys. All data was clipped to the project area boundary. Information about the road system (including unauthorized roads, road use amount or type, road condition, closure type and effectiveness) changes over time and is never complete. Short term effects would be during project implementation and would be less than 10 years. Long term effects would be between 10 to 50 years.

Affected Environment

The roads analysis area is in the Kemmerer Ranger District of the Bridger-Teton National Forest including all or parts of T25N, T26N, T27N, R 118W, R117 ½ W, R 117W, and R116W. The analysis area is bordered by the Forest Boundary on the west and south and the 6th level Hydrologic Unit Boundary the north and east. This area is the same project area discussed in Chapters 1 and 2.

This area is 114 square miles and contains 102 miles of open road, and 14 miles of closed road. In addition, there are approximately 91 miles of historic roads that are not included in the Forest corporate road system but have been previously mapped. Some of these unauthorized roads are useable to vehicles and some have been closed with gates, Kelley humps, culvert removal, or downed logs and are not used by vehicles.

Road History

In 1977, the Forest Service began a process to identify areas that would be suitable for the National Wilderness Preservation system (Figure 16). Land areas were identified and evaluated for roadless characteristics. These inventoried roadless areas do have roads in them but were also identified as having the potential to meet the wilderness characteristics: capability, availability, and need. The Hams Fork project is located in two inventoried roadless areas, the Lake Alice-Commissary Ridge Area No. 03001 and the Nugent Park – Hams Fork Roadless Area No.03001A. There are also three areas in the transportation analysis area that were not identified as having potential wilderness characteristics.

According to historic maps and imagery analysis there have been approximately 14 miles of road built in inventoried roadless areas after 1979. Of these, approximately 6 miles are system roads that have been reconstructed for safety, management, and/or environmental reasons. The original roads that these 6 miles replaced have been reclaimed and are not part of the Forest transportation system.

Mapping efforts in the late 1980s and the early 1990s show a total of between 120 and 160 miles of roads in the analysis area, depending on who produced the maps and the reason for the maps. The large discrepancy in road miles is due to the similarities between some four wheel drive road and trails and the difficulty in mapping routes.

Road Description

System roads are inventoried in the Forest's transportation system. These roads are named, numbered, and described with several attributes such as surfacing, maintenance level, and length. These roads can be both open to public use and closed. Unauthorized roads exist on the ground but are not listed in the Forest's transportation system either because of incorrect mapping, a deliberate choice by the Forest for exclusion of the road because it was recently user-created.

A project level transportation analysis was done according to 36 CFR 212.5 (B) (1) where the road system and unauthorized roads were identified for safe and efficient travel for administration, utilization, and protection of National Forest System lands. This procedure was done according to the Forest Service Handbook 7709.55 Chapter 20 and Forest Service Manual 7712.

A science based roads analysis included mapping authorized and unauthorized roads, field verification of condition and use of these routes, and evaluation of these routes by an interdisciplinary team. The routes were evaluated by their benefits, problems, and risks and opportunities for travel management were identified.

Roads are assigned a road maintenance level defined as follows:

- Road Maintenance Level 1 – These roads are closed to traffic and receive basic custodial maintenance. These roads are expected to have a certain degree of deterioration.

- Road Maintenance Level 2 – These roads can be used by high clearance vehicles. Sedan traffic is not a consideration.
- Road Maintenance Level 3 – These roads provide safe travel for a prudent driver in a passenger car at slower speeds.

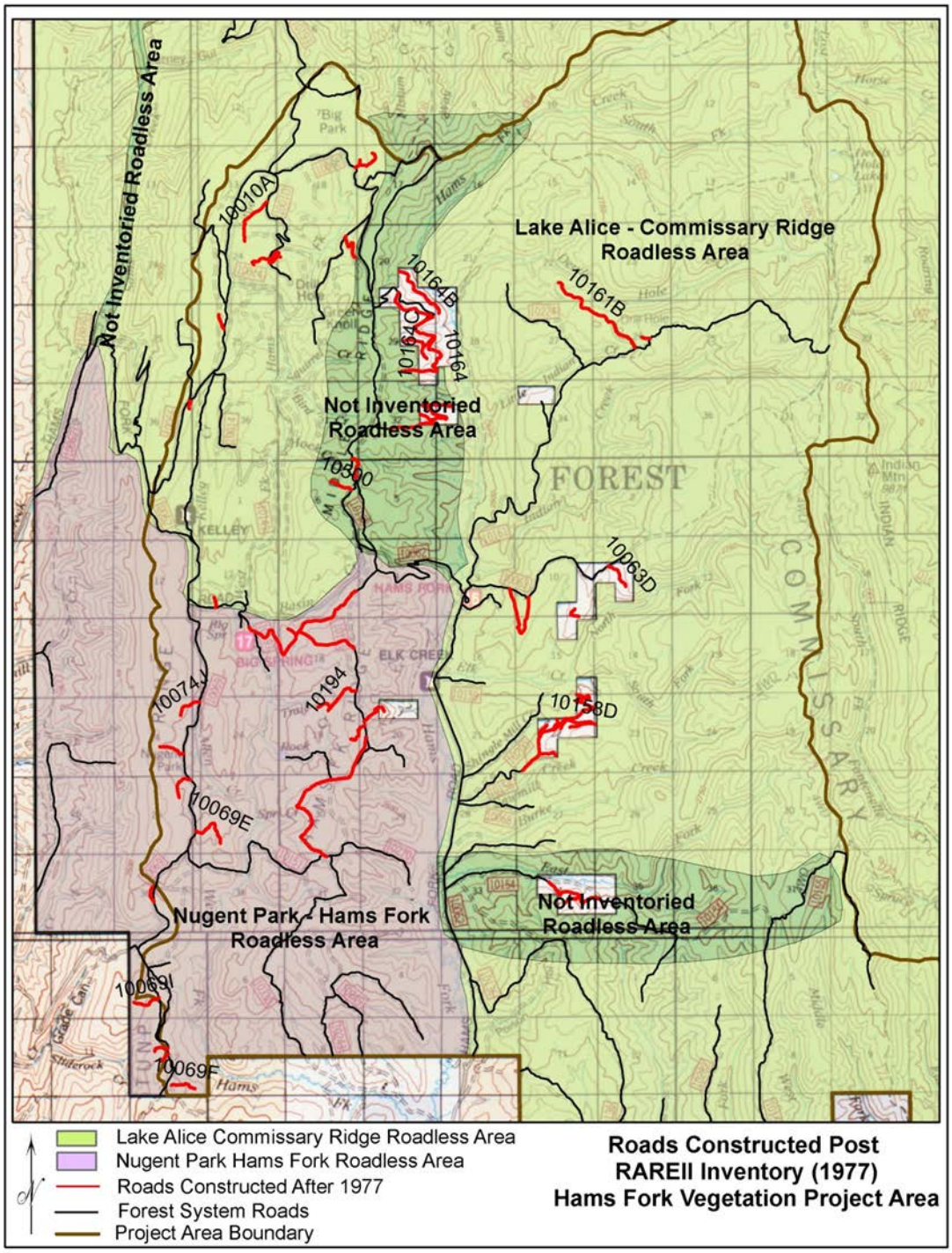


Figure 16. Inventoried roadless areas within the Hams Fork project area identified in 1977.

Table 46 displays the miles of existing road for DFC and maintenance levels within the Hams Fork project area.

Table 46. Miles of existing road by Desired Future Condition, maintenance level, and location with respect to inventoried roadless areas.

Desired Future Condition Area	Maintenance Level 3		Maintenance Level 2		Maintenance Level 1		
	Outside IRA	Inside IRA	Outside IRA	Inside IRA	Outside IRA	Inside IRA	Total
1b	0.0	1.9	2.9	7.5	0.9	0.0	13.2
2a	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9a	0.0	0.3	0.1	0.9	0.0	0.3	1.6
10	1.9	27.4	11.9	45.9	6.0	6.7	99.8
12	0.1	0.8	0.2	0.3	0.0	0.3	1.6
Total	2.0	30.5	15.1	54.6	6.9	7.2	116.2
Total per Maintenance Level		32.4		69.7		14.1	

Bridges

Four bridges are in the transportation analysis area, two of which are in poor condition. The Elk Creek bridge is located on Kelley-Hams Fork road at milepost 12.4 and passes Elk Creek. This bridge has an inventory load rating of 13 tons for HS20 truck. Empty logging, livestock, or equipment trucks have axle weights over 16 tons and will overload the bridge if they cross this structure. A large beaver dam is located approximately 200 yards upstream of the bridge, with other smaller dams throughout the upstream area. The dams are causing severe ponding, threatening the bridge approaches as well as the wingwall and abutment. The Elk Creek bridge has a longitudinally laminated deck with cribbing abutments and was built in 1956. The 2009 inspection of this bridge indicates that it is in poor condition with damaged curbs, ½” of deck abrasion, deck delamination and differential movement of superstructure, bulging, rotation, and settlement of the substructure, and wing wall separation. The bridge span constricts Elk Creek and does not provide any shoreline for terrestrial or amphibious habitat or high water level.

The West Fork Hams bridge is located on the Kelley-Hams Fork road at milepost 17.7 and passes the West Fork Hams Creek. This bridge has an inventory load rating of 12 tons for HS20 truck and the deck is delaminating. Loaded logging, livestock, or equipment trucks will overload this bridge if they cross it. This bridge has a longitudinally laminated deck with cribbing abutments and was built in 1956. The bridge has a 14 foot span which also constricts the flow of West Fork.

Gravel Pit

The Big Springs gravel pit is an existing pit on the Kelley-Hams Fork road (Figure 17). This pit was used to surface sections of roads in the area. This pit is currently used for spot surfacing soft sections of roads and is approximately 2 acres of disturbance. Small trees and some grasses are growing on the stable slopes, which are not showing signs of heavy erosion.

Figure 17. Big Springs gravel pit on the Kelley-Hams Fork Road.

Environmental Consequences

Transportation Issue 1: Hazard trees adjacent to open roads present a safety concern to Forest users.

- Indicator1: Miles of open road adjacent to potential hazard tree treatments.
- Threshold: Action should be taken as soon as practicable when high-priority danger tree hazards have been identified along National Forest System roads.

Transportation Issue 2: There are many existing roads not included in the Forest Transportation Inventory. Some of these roads were constructed for Forest management activities and can provide opportunities to increase forest health. These should be evaluated for contributing adverse environmental effects and/or to management activities. This evaluation should recommend whether to officially add the routes to the transportation system and at what maintenance level.

- Indicator 2: Miles of existing unauthorized road that will be added to the Forest Transportation System.
- Threshold: The amount of usefulness and adverse environmental effects.

Transportation Issue 3: Many of our roads are not maintained to accommodate safe travel by larger vehicles.

- Indicator 3: Miles of existing road maintained or reconstructed.

- Threshold: Arterial and collector routes should provide a safe transportation system while local routes should be driven with diligence by drivers.

Spatial and Temporal Context for Effects Analysis

The boundary for the effects analysis is the Hams Fork project area. Short term effects would be during project implementation and would be less than 10 years. Long term effects would be between 10 to 50 years. Present and reasonably foreseeable future projects within the project area were considered from present to 50 years out for the cumulative effects analysis.

Alternative 1-No Action

Direct and Indirect Effects

Hazard tree treatment would occur as Forest employees identify hazardous trees. Treatments would be more vigorous along main routes, guard stations, and campgrounds but would be less systematic and comprehensive than under the Proposed Action. The potential for trees to fall and block roads would increase over time as more trees die and rot.

The unauthorized roads analysis (Lusty 2013) will be available for Forest managers to use in large scale transportation analysis. No unauthorized roads are currently proposed for addition to the Forest transportation system under this alternative; however, changes to the Forest transportation system may or may not be made based on the unauthorized roads analysis pending other NEPA decisions.

Road maintenance would occur mainly on level 3 roads and as needed for resource protection on level 2 roads. Surface replacement, bridge replacement, and other large maintenance projects would occur as financial opportunities arise. Road maintenance budgets would likely remain smaller than what is required to adequately maintain all the Forest roads to their objective maintenance level. Assuming routine maintenance, under Alternative 1, approximately 43 miles of open roads would be maintained: 34 miles of roads within the inventoried roadless area and nine miles outside of the inventoried roadless areas.

Two bridge replacements are not proposed under this alternative but would eventually occur. It is possible that the bridges may become so structurally deficient that they become condemned and the section of Kelley-Hams Fork road between the bridges may become impassible. The Big Springs gravel pit would continue to be a borrow source for road repairs but would be smaller in size than with the Proposed Action Alternative. It is not likely that a crusher would be brought in to process a large amount of material from the pit.

Cumulative Effects

See cumulative effects for Alternative 2.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Transportation Analysis (Lusty 2013) contains additional detail concerning the findings in this section.

DFC Road Density - Open road densities meet Forest Plan desired future conditions (DFC) requirements DFC1B, 2A, 9A, and 10. However, the open road density exceeds the desired density in DFC 12. As noted, see the Wildlife Species section (Elk, Mule Deer and Moose) the weighted open road density used to ascertain Forest Plan standard compliance. The No Action alternative proposes no road construction or addition of unauthorized roads to the Forest

transportation system. Compliance with road densities would remain the same an under the existing conditions.

Road and Trail Drainage Standard – Routine road and trail maintenance activities would include evaluating these features for sediment delivery to live streams, lakes, and riparian areas. Maintenance activities would direct drainage from the road or trail surface so that it does not directly enter live streams, ponds, lakes, or impoundments. Water would be directed off the road or trail into vegetation buffer strips or controlled through other sediment reduction practices. Road maintenance would occur on less miles of road than with the Proposed Alternative.

Closed Road Use Standard – Closed or restricted roads would be used only when authorized by the Bridger-Teton National Forest Supervisor when recommended by the District Ranger. Unauthorized use of closed roads would continue to be patrolled and contained as much as possible. Mapping and evaluation of these closed roads would also continue.

Road Restriction Guideline – Existing road use restrictions such as the seasonal road closure on Indian Creek road and all season closures on many other roads would continue. Loads over the Elk Creek bridge and West Fork Hams bridge would still be limited.

Commercial Users Payment Standard – Commercial users of forest roads would continue to contribute to road maintenance as outlined in their agreement, permit, or other such arrangement with the Bridger-Teton National Forest

Streamside Road Standard – New road construction or relocation is not proposed with the No Action Alternative.

Road Maintenance in Riparian Areas Standard – Road maintenance activities would continue to avoid impacts to water quality and fish habitat.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Treatment of hazard trees near roads and campgrounds would be more aggressive and systematic with the proposed action and would improve safety for Forest visitors. Hazard trees would be removed along approximately 36 miles of road associated with the hazard tree removal treatment and along 68 miles of roads associated with other mechanical treatment types. Therefore, hazard trees would be removed from forested areas adjacent to 104 miles of road. Sight distance along roads would also be improved with hazard tree removal. The feeling of traveling in wild and rugged lands would be somewhat changed with this tree removal and increased road maintenance and reconstruction. Congestion along roads from the tree removal activities would be short term and may affect some travelers. Hazard tree removal may lead to firewood piles along roads, making firewood gathering easier to those in the area.

The Proposed Action alternative would have timber haul routes on approximately 87 miles of system roads that are open to the public. Approximately 5 miles of closed road would be administratively opened and used for a short duration of project implementation. Approximately 4 miles of existing unauthorized roads located outside the roadless area would be used and closed with berms, gates, or some method to prevent vehicles from using these routes. These existing unauthorized roads were constructed for timber harvest on once private land that is now under Forest Service jurisdiction. The roads were not added to the transportation inventory when the

land ownership was transferred. These 4 miles of road will be added to the Forest Transportation System as level 1 roads.

The roads that would be added to the system as level 1 roads were determined to be useful for vegetation management, fire suppression, weed treatment, etc. and this EA discloses potential environmental effects. According to 36 CFR 212.51(d) motor vehicle use on National System roads needs to be designated by vehicle class unless the road is limited to administrative use. The 4 miles of existing road would be closed with a gate and not open for public use.

Four miles of temporary roads would be constructed outside the roadless area and reclaimed after project activities. These temporary roads would be built to a minimum standard for logging equipment access and operation in treatment units. These temporary roads will be decommissioned and rehabilitated by reshaping and seeding to resemble surrounding landforms following project use. No new permanent roads would be constructed with the implementation of this alternative. These roads would not add to the roads in the area nor would they add any recreational opportunities.

Approximately 68 miles of open roads would be maintained under Alternative 2. Increased use of the road system from timber haul, prescribed fire vehicles, and other vegetation management activities would increase surface wear, sediment delivery from the road, and visitor interactions with project vehicles. There would be an increase of road work activities associated with the action alternative to make the roads safe and to also reduce their environmental impacts. The increase in road maintenance and reconstruction would likely improve the current condition of some roads and bring them closer to their standard condition.

Bridge replacement and the development of the Big Springs gravel pit would be more likely to occur with the proposed action since management activities could possibly drive the funding needed for the activities. Bridge replacement would result in safer structures able to safely pass larger vehicles.

The existing Big Springs gravel pit would be enlarged and would leave a wide spot in the road with a high cut bank at the end of operations. Stockpiles of crushed gravel may be present between crushing and hauling activities but would not inhibit travel past the pit. Crushing operations would be noisy and dusty for approximately one month during the summer or fall months and could occur in several different summers. Hauling operations would increase traffic for periods of time.

Cumulative Effects for Alternatives 1 and 2

The Hams Fork area was used for ranching and homesteading activities in the early 1900's. By the mid 1900's logging operations were frequent and the road system had grown and accessed many parts of the Forest. Grazing and treatment of forested vegetation are still occurring in the area along with prescribed fire and many recreation activities such as hunting, fishing, camping, hiking, horseback riding, and all-terrain vehicle riding. Livestock trucks, logging trucks, fire pump trucks, campers, and all-terrain vehicles wear the road surface away and, over time, will require more road surfacing. The road template is also affected by the use on the roads and requires maintenance or repair as the use continues. The East Fork Salvage and Sanitation project includes road repair, road drainage, and some spot surfacing which will return the East Fork road to its objective maintenance level. Heavy loads, such as loaded livestock trucks or heavy equipment, will continue to stress the Elk Creek bridge and the West Fork Hams bridge. These bridges will either get replaced or condemned. Condemnation of the bridges would reduce many

of the activities in the area. Future activities would likely be grazing, fuel reduction, hazard tree removal, prescribed fire and recreation activities.

Road condition affects many activities in the Hams Fork area. Frequent road grading, ditch and culvert cleaning, spot and surfacing allow safer and easier travel into areas. This, in turn, leads to more forest visitors impacting the Forest resources. Less maintenance, associated with Alternative 1, may reduce certain roads into 4-wheel-drive-only roads and prohibit traffic with horse trailers or other larger vehicles. Less maintenance may mean less visitor use to an area but may also mean more sedimentation from the road water interaction. The amount of road maintenance activities would likely continue to be rigorous for a length of time during project activities associated with Alternative 2 and drop to a minimal level for the next length of time.

Activities in the area, such as logging and recreation, affect the roads in direct proportion to the amount of use on the roads. More use of the roads wears surfacing away, increases sediment and/or dust production, and develops ruts or mud holes during wet weather. Road use is typically more than the amount of road maintenance needed for the entire road system in the area. Road maintenance is concentrated on the main routes with the secondary routes being maintained as needed for resource protection or as forest management activities direct.

Forest travel management activities will continue to try and control unmanaged recreation while providing for the useful need in the area. Forest project management activities will likely impact road condition and may or may not contribute to the maintenance of affected roads.

There are no other present or foreseeable future projects proposing to add unauthorized roads to the Forest Transportation System and, therefore, there would be no cumulative effect.

Cumulatively, removing hazard trees from forested areas along 104 miles of roads combined with past hazard tree removal would provide a greater safety benefit than under Alternative 1. The effects of 104 miles of road maintenance proposed under Alternative 2 may improve road conditions that are generally deteriorated as a result of road use during other past, present, and future activities, even when considering impacts to road condition associated with project implementation.

Figure 18. Dead and dying trees will be removed from roadsides under Alternative 2.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The ability to achieve the Forest Plan goals and objectives for the transportation system is achievable with both alternatives. There is a safe transportation system that provides access to a wide range of Forest uses while preserving environmental values. The proposed action however, provides a better opportunity to improve the existing roads with increased maintenance of some of the roads, even with the effects of increased traffic during project activities. More detailed information used in this compliance section is contained in the Transportation Analysis (Lusty 2013).

DFC Road Density: Current open road densities meet Forest Plan desired future condition (DFC) requirements in DFC 1B, 2A, 9A, and 10. The open road density would continue to exceed the desired density in DFC 12. (See Elk, Mule Deer, and Moose subsection of the Wildlife Species section (p. 110) for the weighted calculation). Alternative 2 does not change the open road density in DFC 12. Alternative 2 adds four miles of existing unauthorized roads as level 1 closed roads to the transportation inventory. Since these would be closed roads, the addition of the roads does not change current open road densities. Compliance with road densities would remain the same an under the existing conditions and Alternative 1.

Closed Road Use Standard – Five miles of closed or restricted roads would be used with this alternative. The roads would return to a closed status after project implementation. Four miles of unauthorized road would be added to the transportation inventory as closed roads and be available for project use in the future. Unauthorized use of closed roads would continue to be patrolled and contained as much as possible. Mapping and evaluation of these closed roads would also continue.

Road Restriction Guideline – Existing road use restrictions such as the seasonal road closure on Indian Creek road and all season closures on many other roads would continue unless otherwise needed for project activities. Loads over the Elk Creek bridge and West Fork Hams bridge would still be limited until the bridges were replaced.

Commercial Users Payment Standard – Commercial users of forest roads would continue to contribute to road maintenance as outlined in their agreement, permit, or other such arrangement with the Bridger-Teton National Forest. Timber purchasers would perform required maintenance and reconstruction activities as well as contribute to a surface replacement fund.

Streamside Road Standard – Road reconstruction would include sediment reduction methods to improve the effects of the existing roads to waterways. Temporary roads would avoid riparian areas. Where these areas cannot be avoided, sediment reduction practices would prevent degradation of water quality.

Road Maintenance in Riparian Areas Standard – Road maintenance activities would avoid impacts to water quality and fish habitat. If debris such as mud, dirt, or snow, needed to be removed from a roadway that was adjacent to a stream, the material would be hauled to a suitable disposal area.

Economics

The following resource information and analysis summarizes the Economics Report (Dasher 2013).

The management of the natural resources on the Bridger-Teton National Forest has the potential to affect local economies. People and economies are an important part of the ecosystem. Use of resources and recreational visitation to the national forests generate employment and income in the surrounding communities and counties, and generate revenues returned to the Federal treasury or are used to fund additional on-the-ground activities to accomplish resource management objectives.

Affected Environment

The analysis area for the efficiency analysis is the project area. The 74,276 acre Hams Fork project area is on the Kemmerer Ranger District of the Bridger-Teton National Forest and is located approximately 40 miles north of Kemmerer, WY in Lincoln County. All costs and revenues associated with the project decision were included in the analysis. Due to the action alternative producing lumber products as well as potentially providing jobs to the local communities the action alternative will utilize the described analysis area for comparison purposes.

The analysis area includes both the project area and the working area for local mills and timber purchasers expected to utilize the products. It is reasonably foreseeable, based on current timber sales under contract and locations of sawmills with in the region, that the timber may be transported numerous directions with the closest manufacturing sites located in southeastern Idaho and southwestern Wyoming.

Methods for Analysis

The economic measures for this analysis are project feasibility, financial efficiency, and economic impacts. Indicators used in the analysis of economic effects include estimates of appraised stumpage and the base rate in the feasibility analysis, present net value in the financial efficiency analysis, and jobs and labor income in the input-output analysis. These measures, including methodologies, are described below. Non-market values such as the value of recreation experiences and ecological services are by their nature difficult to quantify. The non-market aspects of each proposed activity are described in other resource sections of the environmental assessment and specialist reports.

Project feasibility

Project feasibility is used to determine if a project is feasible – will it sell, given current market conditions. It relies on the Region 4 Transaction Evidence Appraisal (TEA) System. The TEA uses regression analysis of recently sold timber sales to predict bid prices. The most recent appraisal model for the area of interest was used to estimate the stumpage value (predicted high bid resulting from the timber sale auction) for the timber project. The estimated stumpage value for each alternative is compared to the minimum rates (minimum return to the Federal treasury) for that alternative. If the feasibility analysis indicates that the project is not feasible (estimated stumpage value is less than the minimum rates), the project may need to be modified. The infeasibility indicates an increased risk that the project may not attract bids and may not be implemented.

Financial efficiency

Financial efficiency provides information relevant to the future financial position of the program if the project is implemented. As the Forest Service Handbook 2409.18 indicates, this analysis provides a comparison of anticipated costs and revenues that are part of Forest Service monetary transactions. Present net value is used as an indicator of financial efficiency and presents one tool to be used in conjunction with many other factors in the decision-making process. Present net value combines benefits and costs that occur at different times and discounts them into an amount that is equivalent to all economic activity in a single year. A positive Present net value indicates that the alternative is financially efficient. Financial efficiency analysis is not intended to be a comprehensive analysis that incorporates monetary expressions of all known market and non-market benefits and costs. Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited financial efficiency framework. These non-market benefits and costs associated with the project are discussed throughout the document.

According to OMB Circular A-94, present net value is the standard criterion for deciding whether a project is economically justifiable. Present net value is a way of comparing all monetarily valued costs and benefits, and is calculated by subtracting the discounted sum of costs from the discounted sum of benefits. A positive Present net value suggests the discounted sum of benefits is greater than the discounted sum of costs, and a negative present net value suggests the opposite.

Management of the forest is expected to yield positive benefits, but not necessarily financial benefits. Costs for restoration activities are based on recent experienced costs and professional estimates. Non-harvest related costs are included in the present net value analysis, but they are not included in appraised timber value.

Economic impacts

Economic impacts in terms of employment and labor income are used to evaluate potential direct, indirect, and cumulative effects on the impact area economy. Economic impacts are estimated using input-output analysis. Input-output analysis is a means of examining relationships within an economy, both between businesses and the final consumers; it captures all monetary market transactions for consumption in a given time period. The resulting mathematical representation allows one to examine the effect of a change in one or several economic activities on an entire economy, all else constant. This examination is called impact analysis and the input-output modeling tool most commonly used by the Forest Service is IMPLAN. The IMPLAN modeling system allows the user to build regional economic models of one or more counties for a particular year. The model for this analysis used the 2010 IMPLAN data. IMPLAN translates changes in final demand for goods and services into resulting changes in economic effects, such as labor income and employment of the affected area's economy.

The economic impact effects are measured by estimating the direct jobs and labor income generated by (1) the processing of the timber volume from the project, and (2) the dollars resulting from any restoration activities of the project into the local economy affected by the treatments proposed. The direct employment and labor income benefit employees and their families and, therefore, directly affect the local economy. Additional indirect and induced multiplier effects (ripple effects) are generated by the direct activities. Together the direct and multiplier effects comprise the total economic impacts to the local economy.

The data used to estimate the direct effects from the timber harvest and processing were provided by the University of Montana's Bureau of Business and Economic Research (Morgan et al. 2007).

This national data is broken into multi-state regions and is considered more accurate than that which is available from IMPLAN. The Central and Southern Rockies BBER Region (Arizona, Colorado, New Mexico, Utah and Wyoming) is used for this analysis given the concentration of sawmills in Wyoming and the proximity to mill locations in southeast Idaho that are expected to receive volume from this project. The BBER data represents the results of mill censuses that correlate production, employment, and labor income. The economic impact area for this project includes Lincoln and Uinta counties in Wyoming; Bear Lake County in Idaho.

Bridger-Teton National Forest Timber Program

From 2007 through 2012 the Bridger Teton National Forest has offered 41 commercial timber sales of varying sizes and products. Of which, 40 timber sales were awarded either at the time of bid opening, direct sales (non-competitive, sold directly to permittees or other agencies), sold off the shelf or re-offered and awarded. There was 1 timber sale during that time frame that was not awarded. At the current harvest levels, volume produced by the Bridger-Teton National Forest plays a role in the wood products and home heating economy of the economic impact area. The current structure of the Bridger-Teton National Forest Timber Program allows for the continued offering of commercial timber sales, as well as, providing for the continued public use of forest products.

Environmental Consequences

Effects indicators for comparison of alternatives:

- estimates of appraised stumpage in the feasibility analysis
- base rate in the feasibility analysis
- present net value in the financial efficiency analysis
- jobs and labor income in the input-output analysis

Spatial and Temporal Context for Effects Analysis

The economic impact area for this project includes Lincoln and Uinta counties in Wyoming; Bear Lake County in Idaho. Temporal effects considered begin at project implementation across a ten year period which is the estimated time required for full implementation of the project.

Alternative 1-No Action

Direct an d Indirect Effects

If the Hams Fork Vegetation Project was not undertaken, no additional direct effects on the local economy would occur under the No Action Alternative. However, current activities such as, road maintenance and noxious weed treatments, would continue to occur under current direction. Therefore, costs and any jobs or labor income associated with current activities are not a result of the No Action Alternative but, rather a continuation of current actions.

Indirect effects on local economic conditions could occur as a result of the No Action Alternative however, estimates of these changes are not available. For example, the lack of fuels treatment could increase wildland fire-related costs, such as property loss, lost revenues, and suppression costs. Fire suppression costs and risk to life and property should be less when wildland fires occur where hazardous fuels have been treated compared to areas where fuels have not been treated. This is commonly accepted since fires generally burn hotter, flame length is higher, and fires in tree canopies are more likely in non-treated areas. However, it is not possible to predict the level and costs of non-prescribed wildland fire under the No Action Alternative.

Cumulative Effects

Under the No Action alternative none of the proposed activities would occur. As a result, no activities would affect the identified indicators; therefore, there would be no cumulative effects associated with the No Action Alternative.

Alternatives 2-Proposed Action

Direct an d Indirect Effects

The proposed action alternative would treat up to 8,622 acres by a variety of different treatment types. With an estimated 114,876 CCF of timber products produced, an estimated 4 miles of roads re-constructed (outside the Identified Roadless Area), 68 miles of roads maintained, 36 miles of road maintenance associated with hazard tree removal, 4 miles of temporary roads proposed, and 730 acres of prescribed fire planned. Activities under this alternative will have economic consequences depicted below.

Project Feasibility

The estimation of project feasibility was based on the Region 4 Transaction Evidence Appraisal System, which is a residual value timber appraisal approach that takes into account logging system, timber species and quality, volume removed per acre, lumber market trends, costs for slash treatment, and the cost of specified roads, temporary roads, and road maintenance. The predicted stumpage rate from the feasibility analysis was compared to the base rate (revenues considered essential to cover regeneration plus minimum return to the Federal treasury). The stumpage rate and base rate are displayed in Table 47. The base rate, including essential reforestation costs, is the minimum $3.00 per CCF (hundred cubic feet). The appraised stumpage rate as a whole for the proposed action is $5.61 per CCF. For the proposed action, appraised stumpage rates are higher than the base rates, indicating that the alternative is feasible and likely to attract bids. In addition to the appraised stumpage rates the proposed action had a total predicted high bid of $8.36 per CCF. The predicted high bid from the feasibility analysis is used in the financial efficiency analysis for each alternative discussed below.

Financial Efficiency

The financial efficiency analysis is specific to the timber harvest and ecosystem management activities associated with the project (as directed in Forest Service Manual 2400–Timber Management and guidance found in the Forest Service Handbook 2409.18). Costs for sale preparation, sale administration, regeneration, and ecosystem restoration are included. All costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team. The expected revenue is the corresponding predicted high bid, $8.36 per CCF proposed action from the sale feasibility analysis times the amount of timber harvested. The predicted high bid is used for the expected revenue (rather than the appraised stumpage rate) since the predicted high bid is the best estimate of the high bid resulting from the timber sale auction. The actual timber value will depend on the market when the timber is sold, and may be higher or lower than the predicted high bid. The analysis included a relatively low Western Wood Products Association (WWPA) average value per thousand board feet (MBF). Present Net Value was calculated using Project Cost and Revenue Tool – Project Economic Impact Spreadsheet, (PCART-PEIT), a spreadsheet application developed for collecting the financial costs and revenues associated with project activities. For more information on the values or costs, see the project file.

Table 47 summarizes the project feasibility and financial efficiency, including the base rate, stumpage rate, predicted high bid, total revenue, and present net value calculations for all alternatives. One present net value indicates the financial efficiency of the timber sale, including

all costs and revenues associated with the timber harvest and required design features. A second present net value includes all costs for the proposed action, including other restoration activities. A 4 percent discount rate was used over a period of 10 years (2012–2021), the estimated time required for full implementation of the project.

Table 47 indicates that the proposed alternative is financially inefficient for the timber harvest and required design features, as well as for all activities, as indicated by the negative present net value. The present net value for the proposed action is -$323,473 for the timber harvest and required design criteria and -$836,169 for all planned activities. The total for all planned activities cost includes the replacement of two bridges along one of the haul routes that have been listed as deficient bridges. The implementation of the proposed action alternative would increase the likelihood of these bridges getting funding, through allocated funds and or partnership dollars. Therefore, the cost of the bridge replacement has been included in the efficiency analysis.

When evaluating trade-offs, the use of efficiency measures is one tool used by the decision maker in making the decision. Many things cannot be quantified, such as effects on wildlife, impacts on local economies, and restoration of watersheds and vegetation. The decision maker takes many factors into account in making the decision.

Table 47. Project feasibility and financial efficiency summary (2010 dollars).

Category	Measure	Alt 1-No Action	Alt 2-Proposed Action
Timber Harvest Information	Acres Harvested	0	8,622
	Sawtimber Volume Harvested (CCF)	0	114,876
	Base Rate ($/CCF)	$0.00	$3.00
	Appraised Stumpage Rate ($/CCF)	$0.00	$5.61
	Predicted High Bid ($/CCF)	$0.00	$8.36
	Total Revenue (Thousands of $)	0	940
Timber Harvest & Required Design Features	PNV (Thousands of $)	$0	-$323
Timber Harvest & All Other Planned Non-Timber Activities	PNV (Thousands of $)	$0	-$836

Table 48 lists the costs included in the present net value analyses, which includes all estimated project costs except for those already included in the timber appraisal. Planning costs (NEPA) were not included in any of the alternatives since they are sunk costs at the point of alternative selection. Sale preparation costs of $6.20/CCF and sale administration costs of $5.03/CCF were included in the analysis.

Table 48. Activity Expenditures by Alternative (those not included in appraisal)

Activity	No Action	Proposed Action
Sale preparation	$0	$712,523
Sale administration	$0	$577,826
Road reconstruction (Bridges)*	$0	$250,000
Silvicultural exams	$0	$2,568
Precommercial Thinning*	$0	$108,675
Prescribed Burning including site prep	$0	$172,280
Fireline Construction (saw/handline)	$0	$3,225
Fireline Construction (machine/hand)	$0	$7,140
Weed Monitoring and Spraying	$0	$19,798

*Contracted activities

Economic Impacts

In terms of employment and labor income, associated with the Hams Fork Vegetation Project activities (timber harvest, reforestation, restoration activities) are estimated with the IMPLAN input-output model described above. Timber production and restoration activities from this project would have direct and indirect effects on local jobs and labor income.

For timber harvest, the direct employment and labor income response coefficients (e.g., jobs and labor income per million cubic feet) were derived by the University of Montana's Bureau of Business and Economic Research. The indirect and induced multiplier effects were estimated using the IMPLAN model for the three-county impact area. For restoration activities, the direct, indirect and induced effects were derived using IMPLAN.

Table 49 displays total estimates (direct, indirect and induced) for employment (full- and part-time) and labor income that may be attributed to the alternatives. Since the expenditures occur over a 10-year period, the estimated impacts of jobs and labor income would be spread out over the life of the project. These are not new jobs or income, but rather jobs and income that can be attributed to this project.

Table 49. Total (direct, indirect and induced) employment and labor income - average annual.

Category	Alternative 1 -No Action	Alternative 2 – Proposed Action
Employment (Full and Part time jobs)		
Timber Harvest Activities	0	87.5
All Other Non-Timber Activities	0	.5
All Activities	0	88
Labor Income (thousands of 2012 dollars)		
Timber Harvest Activities	0	$27,659
All Other Non-Timber Activities	0	$225
All Activities	0	$27,883

IMPLAN estimates indicate the Proposed Action would maintain approximately 880 total jobs (direct, indirect and induced) and $27.8 million in total labor income (direct, indirect and induced) spread over the life of the project, or 88 jobs and $2.7 million annually (Table 57). Timber harvest would be responsible for the majority of the total jobs and the total labor income. The analysis assumes the timber volume processed would occur within the designated impact area. However, if some of the timber were processed outside the region, then a portion of the jobs and income would be lost by this regional economy.

Overall recreation visitation on the forest is not anticipated to change in the long-term however short-term shifts in use on the forest could occur. Consequently, no change in recreation related economic impacts are anticipated.

Cumulative Effects

The proposed action would be both economically feasible and efficient. The fact that this proposed action is feasible and efficient would not impact the feasibility or efficiency of other projects in the cumulative effects analysis area (the regional economic analysis area during the life of the project and 10 years into the past). Neither the project feasibility nor financial efficiency of the Proposed Action (which are the thresholds for this analysis) would be affected by actions and projects considered for cumulative effects (Appendix E). Impacts to area economic efficiency from the Hams Fork Vegetation Project would accrue alongside impacts from these other projects.

Additionally, employment and labor income impacts associated with other projects occurring in the area have the potential to accrue alongside the employment and labor income impacts from the Hams Fork Vegetation Project depicted in Table 49 above however, estimates of these employment and labor income impacts are not available.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans; Environmental Justice

While minority and low-income populations may exist in the area, the Proposed Action is not expected to have a disproportionately high and adverse human health or environmental effects on these communities. Impacts to local communities are expected to be negligible, and there is no reason to suspect that any impacts will disproportionately affect minority and low income populations. In addition, impacts to subsistence uses are not anticipated under this alternative.

Summary of Effects

Since no additional direct effects would result under the No Action Alternative, a comparison of financial efficiency measures is not possible. However non-quantifiable indirect effects on local economic conditions could result which differ from the proposed action. As discussed above, greater non-prescribed wildland fire related costs could result if fuels are left untreated under the No Action Alternative. Additionally, threats to human life, property and fire-fighter safety under the No Action Alternative would be greater than the Proposed Action Alternative.

The Project Feasibility and present net value associated with the alternatives are displayed above in Table 47. In order to completely examine economic efficiency, all costs and benefits associated with the alternatives should be considered which include costs and benefits that may not be quantified monetarily. Some of these benefits include decreased threat to life and property, decreased wildland fire suppression costs, and improved ecosystem health. Therefore, the financial efficiency measures presented here should not be viewed as a complete answer, but only alongside other social and ecological impacts.

The Economic Impacts associated with the alternatives are displayed above in Table 49. The Proposed Action Alternative would provide additional employment and labor income relative to the No Action Alternative as a result of timber harvest and associated activities. Overall recreation visitation on the forest is not anticipated to change in the long-term however short-term shifts in use on the forest could occur. Consequently, no change in recreation related economic impacts are anticipated under the alternative.

While minority and low-income populations may exist in the area, the alternatives are not expected to have a disproportionately high and adverse human health or environmental effects on these communities. However, possible employment and labor income impacts of the proposed action could support employment and income in the area which could benefit area minority and low-income populations.

Recreation

The following resource information and analysis summarizes the Recreation Report (Brown 2013b).

This section describes the recreation resource and addresses the expected effects the alternatives would have on the recreation resource in the Hams Fork drainage and surrounding area on the Kemmerer Ranger District. The project area analyzed for recreation includes approximately 102 miles of Forest System Roads open to the public, 34.24 miles of Forest System Trails, six developed recreation facilities, and one permitted outfitter/guide authorized site.

Affected Environment

The Hams Fork drainage is actively used by recreationists year round for camping, hunting, hiking, stock use, OHV use, and snowmobiling. Dispersed recreation use, camping, and recreating outside developed sites and areas is the highest percentage of recreational use in the area. However, the Kelley Guard station is typically fully booked in the fall, and frequently rented out in the winter as well. There are multiple developed facilities in the project area including Guard Stations, trailheads, campgrounds, picnic areas, corrals, and outfitter/guide camps. Recreational use increases dramatically in the drainage late summer and fall, during the hunting season. However there are typically recreationists in the drainage at all times of the year camping, fishing, hiking, hunting, riding OHV's, and snowmobiling.

Visitor use in the Hams Fork project area is low in the summer and moderate to high in the fall, as compared to the rest of the Bridger-Teton National Forest. Based on data gathered during the 2009 and 2012 seasons the average monthly use is 100 visitors a month. The data from 2012 shows that use in the Hams Fork area peaked at 250 for the month of September.

Desired Future Condition

The Hams Fork project area contains five Desired Future Conditions (DFCs): 1B, 2A, 9A, 10 and 12. DFC 1B applies to a small section of the north-western corner of the project area, and represents 9% of the project area. Management emphasis in DFC 1B is on scheduled wood-fiber production and use, livestock production, and other commodity outputs. The Recreation Prescription in DFC 1B focuses on managing recreation to provide roaded natural appearing opportunities in roaded areas, and semi-primitive opportunities in other areas. DFC 2A represents the area in the north-eastern corner of the project area, representing 12% of the project area. DFC 2A areas are typically unroaded areas managed to give a quiet and almost primitive recreation experience. Recreation is managed to provide physical and social settings that provide primitive

and semi-primitive, non-motorized opportunities. DFC 9A applies to 3 small sections of the project area around the Kelley Guard Station, Hams Fork Campground, and Big Spring Picnic Site, and represents only 0.35% of the project area. DFC 9A is managed for campgrounds, noncommercial areas, and Forest Service administrative sites in roaded natural areas. DFC 10 applies to the majority, approximately 77%, of the project area. DFC 10 is managed to allow for some resource development and roads while having no adverse and some beneficial effects on wildlife. The recreation prescription for DFC 10 directs management for existing roaded recreation opportunities where they do not interfere with the objectives for the area. DFC 12 applies to a thin strip through the center of the project area, and represents 2% of the project area. DFC 12 is an area managed for high-quality wildlife habitat, big-game hunting, and dispersed recreation activities. The recreation prescription for DFC 12 focuses on managing recreation and other human activities to meet needs of the big-game species. A full description of the management and resource prescriptions per DFC can be found in Appendix A.

Recreation Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) is a recreation management tool used by the U.S. Forest Service to manage and administer natural settings for specific visitor experiences. Guided by the Forest Plan, the project area is managed for four ROS settings (US Forest Service 1990): Roaded Natural (RN), Semi-Primitive Motorized (SPM), and Semi-Primitive Non-Motorized (SPNM), and Primitive (P). Approximately 45% of the project area is classified as SPNM, with the remaining 55% made up of the other 4 classifications. Figure 19 illustrates the Recreation Opportunity Spectrum classifications of the project area along with an inserted table showing the breakdown of classification type, acres, and percent of the project area.

Developed Facilities

Guard Stations and Safety Shelters

There are two guard stations within the project area, the Kelley Guard Station and the historic Elk Creek Guard Station. In addition there are two safety shelter facilities within the project area which are open to the public in the winter time for snowmobilers and other winter recreationists as safe locations to find shelter from the elements and warm up before they continue on their way. The shelters are the Big Park Shelter and the Commissary Ridge Safety Shelter.

Campgrounds and Picnic Areas

The Hams Fork Campground is located in the center of the project area off of the main Hams Fork access road, FSR # 10062. The campground is located in a mixed conifer stand to the east of Hams Fork Creek, with campsites provided on either side of the road. There are a total of 13 public sites, and one host site in the Hams Fork Campground. Potable water, trash services, and vault toilet facilities are also provided. Hams Fork Campground is open on average from July 4 – September 30, or as weather and temperature permit. The campground receives low use by campers, as dispersed camping is the primary form of camping in the area. The campground sees a high amount of use by day users who are dispersed camping around the site and come in to use the trash, water, and bathroom facilities.

The Big Spring Picnic site is also in the Hams Fork Project area. The Big Spring Picnic Site is located at the scenic Big Spring. From the parking lot visitors follow the boardwalk through the willows up the rock trail to the falls, where you can see the spring gushing from the mountain side. If you follow the trail back into the trees there are two picnic sites with fire pits and grills.

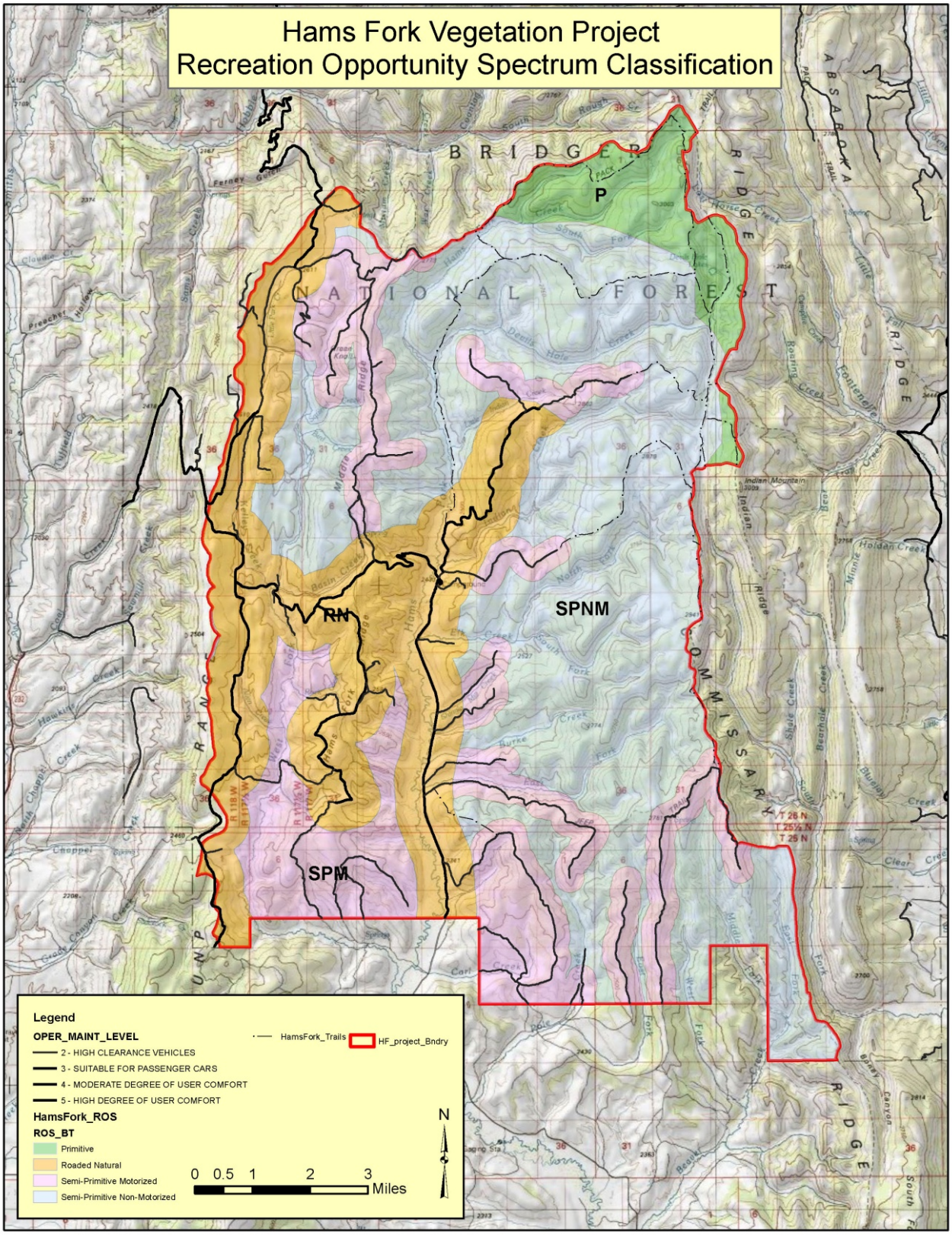


Figure 19. Hams Fork recreation opportunity spectrum classification.

Big Spring flows year round and is a popular stop for snowmobilers when traveling the groomed trail system in the winter.

Trailheads and corrals

There are four trailheads within the Hams Fork Vegetation Project area. Although all trailheads have some signing, the Hams Fork Trailhead located near the Hams Fork Campground has a set of corrals constructed at the site. The Hams Fork Trailhead provides access to the Hams Fork-Red Park Trail that enters into the largely unroaded area west of Commissary Ridge. The Hams Fork corral and trailhead is heavily used in the summer and fall by stock users packing into the back country for hunting but also by individuals camped at Hams Fork Campground to hold stock for day trips while they stay in the area.

The Indian Creek Ridge, Mistum Creek, and Big Park trailheads are low level developed sites, consisting of small parking areas (roughly 5-10 trucks and trailers) made of natural material and signing identifying the trailhead and connecting trails. These trailheads experience low levels of use during the summer primarily by individuals on horseback. During the fall hunting season however, use increases dramatically and trailheads can experience heavy usage during the elk and deer season both by foot traffic and by pack and saddle stock. All trailheads receive basic maintenance on an annual basis to ensure that they are accessible and functional.

Dispersed Recreation

Most visitors to the Hams Fork area tend to recreate in a dispersed fashion for a multitude of reasons. Although there are campgrounds in the area, many people prefer the element of solitude, sense of freedom, and unconfined recreation experience that dispersed camping offers. There are hundreds of miles of roads to drive, great fishing, and hundreds of miles of trails that can be accessed from the Hams Fork drainage. Although there is only one short ATV trail in the area, there is a large amount of use by ATV enthusiasts, as some of the open roads are difficult to get full size vehicles up. The easy access to the area from Kemmerer and Cokeville make this area a large draw to locals and non-locals alike. There is also the opportunity to catch one of the four native species of cutthroat trout in the area, so fishing enthusiasts, especially those participating in the annual Cutt-Slam contest put on by the Wyoming Game and Fish Department, typically spend a portion of their time in the area.

Developed Roads

The greatest recreational use in the Hams Fork drainage is dispersed recreation and camping off Forest System Roads. A Forest System Road is defined as “those roads that have been determined necessary for the protection, administration, and use of National Forest System Land.” Forest system roads (FSR) are numbered National Forest Roads that have been included in the Forest transportation system, are inventoried, maintained and managed by the Forest. Not all forest system roads are open to the public, but those that are open are identified in the Motor Vehicle Use Map developed by the Kemmerer Ranger District. These maps are free to the public and illustrate each open and legal route.

There are a total of 116 miles of Forest System Roads in the Hams Fork project area, 102 of which are open to the public. Additionally, the project area includes a portion of the Big Spring Scenic Backway. Forest system roads can be categorized by their maintenance level. There are three different maintenance levels represented in the project area, ranging from Level 1 to Level 3.

The description of the roads maintenance levels are as follows:

- Level 1: Closed to Public - Administrative Use
- Level 2: Suitable for High Clearance Vehicles only
- Level 3: Suitable for passenger cars

Table 50 shows the miles per maintenance level of currently existing Forest System roads in the project area.

Table 50. Miles of road per maintenance level

Maintenance Level	Miles of Road
1 – Closed/Admin Use	14
2 - High Clearance	70
3 - Suitable for Passenger Car	32
Total Miles of Road	**116**

The Big Spring Scenic Backway is a 68 mile long route that begins in Kemmerer and ends in Cokeville, and includes FSR# 10062, which runs through the project area. The Backway passes through the Hams Fork project on National Forest Land for approximately 17 miles. The backway derives its name from Big Spring, which is located in the Backway and is a beautiful spring that comes from the side of the mountain and crashes down a small series of falls.

Forest System roads that are open to the public (Level 2 - 3) are designated as legal, open motor vehicle routes per the Kemmerer Ranger District Motor Vehicle Use Map. Although there may be additional “roads” on the ground, these are user created, unauthorized routes, which are not included in the Forest system and therefore are not legal, open routes for the public to drive motorized vehicles on. Illegal and off road motor vehicle use does occur at a moderate to high rate in the Hams Fork drainage, mainly during hunting season when hunters take ATV’s off road to retrieve game. Some of the highest concentration of illegal off road use is off the main Hams Fork road to the west of Green Knoll in the West Fork Hams Fork drainage. A large amount of use occurs on temporary and decommissioned roads that were used in the past for timber harvest and forest management activities. Forest system roads are on a maintenance schedule for grading and drainage work. Level 3 roads hold a greater priority for maintenance work, and are traditionally maintained yearly, whereas Level 2 roads are only maintained when necessary.

Developed Trails

The project area includes portions of 14 Forest System trails, for a total of 34.24 miles. 13 of these trails are managed for non-motorized uses with design standards set to accommodate pack and saddle stock. One trail, however, is managed and designated for OHV use and the design standards are set to accommodate ATV’s and motorized vehicles up to 50” in width. Although the majority of use on these trails is pack and saddle stock, there is some foot traffic, mostly during the fall hunting season.

Primary access points in the project area are described above in the developed recreation section and are the Big Park, Mistum Creek, Hams Fork, and Indian Creek Ridge Trailheads. Trails are generally primitive in nature with few signs. The terrain becomes more and more rugged as distance increases away from the Hams Fork Road. The trails in the area receive low to moderate levels of use. In the summer a person may encounter one party while hiking on a trail during the

day. The highest use occurring during the fall hunting season from September 1st through October 31st, when trail users may encounter 5 – 7 parties a day, most utilizing pack and saddle stock.

All 14 trails are on the regular maintenance schedule for tread and drainage work. There is an ongoing need for signing, maintenance, and enforcement of travel regulations. Table 51shows the summary of trails along with the approximate miles located within the project area.

Table 51. Trail name, number, and length within the Hams Fork project area.

Infra Trail Number	Trail Name	Miles in Project Area
1003	S. Fontenelle	0.37
1004	Big Park-Red Park	4.61
1007	Roaring Creek	0.14
1008	Way Creek	0.01
1009	Has Fork-Red Park	11.39
1016	Bluejay - Indian Mtn.	1.22
1017	West Bear Trap	0.03
1026	Spruce Creek	0.11
1028	Devils Hole Lakes	0.8
1034	Indian Creek Ridge	2.2
1035	Elk Creek Ridge	3.99
1171	Commissary Ridge	7.2
1177	Hams Fork Cutoff	0.72
1192	Poison Hollow Connector - ATV Trail	1.45
Total Trail Miles within Project Area		34.24

Environmental Consequences

Issue

The project may result in conflicts with recreational users in the Hams Fork drainage. During the public comment period, comments were received that were concerned with the effects to recreation associated with opening more routes, closing routes, effects to hunters, and the overall impacts to recreation opportunities in the project area.

Indicators and thresholds

The following indicators were used in this analysis to evaluate the alternatives in the Hams Fork drainage and their effects on recreation:

Effects to Developed Sites

- Types and acres of treatments within developed site boundaries

Effects on Motorized and Dispersed Recreation

- Miles of reconstruction and improvements on existing Forest System Roads
- Miles of temporary and new roads to be constructed in the project area

- Miles of roads overlapped by proposed treatments.

Effect on Non-Motorized Recreation

- Miles of system trail within mechanized treatment units
- Miles of system trail within prescribed burn units

Effects on Recreation Opportunity Spectrum Classification

- Displacement of recreational opportunities by project facilities or modifications to the physical setting

The threshold for concern is whether or not the proposed or no action will not meet Forest Plan Standards and Guides, specifically those that relate to maintaining ROS designations and recreation objectives for each DFC.

Spatial and Temporal Context for Effects Analysis

The boundary for the effects analysis for the recreation resource will be the project area. Any effects to the recreation resource will originate within the project boundary and effects can be captured by the analysis of this area. Short term effects, both direct and indirect, for the purpose of this analysis are effects that are temporary, will only occur during a portion of the project time. Short term effects will generally not last longer than 1 year, but may last as long as the life of the project, approximately 5 years. Long term effects will be considered to be those effects that will last after the project has been completed, 5-20 years. This context, both spatial and temporal, will allow for an effective and concise evaluation of the impacts to the recreation resource and the impacts that the proposed action shall have.

The cumulative effects area for recreation is bounded in space by the full extent of the Hams Fork drainage and in time by 10 years into the past and 20 into the future. This area is being used to include all projects that may occur and have effects on the drainage as a whole and thus further affect the project area and the effects that will directly and indirectly occur from the proposed action. Activities in Appendix E were considered for cumulative effects.

Alternative 1-No Action

Direct and Indirect Effects

The No Action Alternative would not conduct any active restoration treatments (neither mechanical treatments nor prescribed burning) in the project area. Current management plans would continue to guide management of the project area. Forest Plan standards and guidelines and other laws, regulations, and policies required for national forest management would continue to be implemented for ongoing activities in the project area.

Developed Sites

Under the No Action alternative no treatments are proposed around any developed facilities. Management of developed facilities and sites would continue as currently managed. This would include the protection of trees around developed facilities with Verbenone pouches to combat bark beetle infestation, hazard tree reduction when necessary to protect public health and safety, fuels reductions, and general maintenance and upkeep projects. Since current management would continue, and no treatments are proposed under the No Action alternative, there would be no direct or indirect effects to developed facilities in the Hams Fork project area under this alternative.

Motorized and Dispersed Recreation

Under the No Action Alternative, management of the dispersed recreation resources would continue as currently directed by the Forest Plan and other guides, laws, and regulation. The No Action Alternative would not result in the construction of any temporary routes, close any existing system roads or add to the existing road system. Road maintenance and signing would continue to occur as currently directed. There would be no change to the miles and maintenance levels of roads as they are currently designated. As tree mortality increases there is always the potential for a safety risk on and around roadways, where hazardous trees could fall. The No Action Alternative does not propose any hazard tree treatments, so hazard trees would be dealt with on a case by case basis as identified, as current management directs, and may have potential to affect roads and dispersed recreation with their fall. The No Action Alternative would not preclude future proposals in the project area, including the forest wide hazard tree mitigation plan. There would be no effect to the roaded dispersed recreation resource due to the No Action Alternative.

Additionally, as there are no proposed vegetation treatments or prescribed burns in the No Action Alternative there would be no trail closures in the project area. Trail maintenance, including signing, tread work, trail clearing, and hazard tree removal would continue to occur as directed by the Forest Plan direction and trail standards and guidelines. There would there no direct or indirect effect to system trails as a result of the No Action Alternative.

The No Action Alternative does not propose any treatments, road improvements, or new road construction and thus would not have a direct effect on altering the current existing ROS classifications and characteristics. However, for the past several years trees have become increasingly vulnerable to the impacts of insect and disease. In addition, the history of fire suppression in the area has resulted in unnatural buildup of fuels, conifer encroachment, and overly dense timber stands have resulted in a changed vegetative composition. Noticeable tree mortality would continue to have an effect on the natural appearance and safety concerns in the project area. Under the No Action Alternative timber mortality rates most likely would continue, since the purpose and need of this proposal would not be met. The visitor’s perception of the recreational and visual experience may decline as mortality increases in the Hams Fork project area as an indirect effect of the No Action alternative, since there would be no treatment outside the natural processes.

Cumulative Effects

Under the No Action alternative none of the proposed unit treatments would occur. Fire line would not be constructed for prescribed burning, and no hazard tree removal would occur unless it was incorporated into another analysis in the future. The ongoing Forest road, trail, and developed facilities maintenance would continue to occur. Any project design features proposed would not be implemented for this alternative. The visitor’s perception of the recreational and visual experience may decline as tree mortality increases continues in the Hams Fork project area as an indirect effect of the No Action Alternative, since there would be no treatment outside the natural processes. As a result, no activities would directly or indirectly affect the identified indicators. Because Alternative 1 has no impact on any of the recreation indicators, there are no effects to add to past, present, or reasonably foreseeable effects on recreation. As a result, recreation resources in the analysis area will continue to meet Forest Plan standards and guidelines for recreation.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Compliance with the Forest Plan, Forest-wide Recreation Prescription, DFC, and ROS direction for the recreation resource was analyzed. Alternative 1 does not propose any change from current and existing management of the recreation resource. Current management is directed by and in compliance with Forest Plan Prescriptions and Guidelines.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Effects to Developed Sites

Alternative 2 proposes vegetation treatments and hazard tree removal around both the Hams Fork Campground and Big Spring Picnic Area. A total of 68 acres will be treated around these two facilities; 66 acres at Hams Fork Campground as part of hazard tree treatments, and 2 acres at Big Spring Picnic area. These treatments would have a direct, short term effect to these developed sites by necessitating the closure of the areas while the treatment is progress. The effect would be negated upon completion of the treatments in the area. The closures would be short term and only temporarily displace recreational users.

Additional direct effects to developed recreation facilities would be the temporary closure of access roads to the facilities as a result of proposed treatments. In all a total of 102 miles of roads would be directly affected by hazard tree treatments, and 66 miles of roads will be overlapped with proposed mechanical treatments for the sanitation and salvage in Alternative 2. These treatments have the potential to necessitate the closure of roads while the treatment is in progress for public safety. These temporary closures would directly affect access to all developed recreation facilities throughout the project area, as well as the outfitter camp on the north boundary and the Lake Alice Trailhead and Hobble Creek Campground outside the project area. To notify the public of road closures, design feature REC-1 and REC-4 would be implemented. Notification of road closures would occur via press releases, at the District Office, on the Forest Service website and on-site signage at the Forest Boundary and trailheads at least two weeks prior to operations.

Additionally, three of the nine proposed prescribed fires treatments could result in road closures for public safety as the burns are being implemented. Table 52shows the prescribed fire units and the roads, trails and facilities they would potentially affect. The effects of these treatments would most likely yield temporary closures of roads and therefore temporary closure of access to the facilities.

Table 52. Roads and trails potentially affected by prescribed burn treatments.

Unit Number	Acres	Roads/Trails	Miles Effected	Facilities Effected
1	265	10151; 10243; 10249	5	
2	51	10069	2	
3	7	10151; 10151C	2	
4	6	10062	3	Hams Fork CG; Hams Fork Trailhead
5	156	10062	2	Big Spring
6	65	10066; 10160	1.7	
7	36	10161	2	Indian Creek Trailhead
8	93	10066; 10164/1009	2/2(T)	

Unit Number	Acres	Roads/Trails	Miles Effected	Facilities Effected
		(T)		
9	51	10151	1.8	
TOTAL	730		20.5/ 2(T)	

The expansion of the Big Spring Gravel pit would not require temporary closures or any direct impact to any developed recreation facility. Indirectly, the gravel pit would provide a larger gravel source that could be used in the future to improve access roads and parking areas within developed recreation facilities including the Big Springs parking area as well as the Hams Fork Campground road.

Lastly, the proposed activities in Alternative 2 would result in the improved safety of recreational facilities and the public within the Hams Fork project area as a result of completed proposed vegetation treatments. By reducing dead and dying trees that have the potential to fall and harm the public, private property, and Federal property, and facilities, the overall safety of the developed recreation sites would be enhanced. Reduction of fuel caches by prescribed fire would also lower the risk of wildfire damaging developed facilities in the future.

Motorized and Dispersed Recreation

Under Alternative 2, there are 8,622 acres of mechanical treatments. Although some of these treatment areas are based around existing forest system roads, some are not. In Alternative 2 maintenance, reconstruction, and temporary road construction would occur on 112 miles of Forest System Roads. Four miles of new temporary roads would be constructed for project activities then subsequently decommissioned, and an additional 4 miles of unauthorized roads would be improved for project activities, then closed and added to the Forest System as Level 1 roads for administrative use at the termination of the project. Additionally, approximately 102 miles of roads would be directly affected by hazard tree treatments, and 66 miles of roads would be bisected by mechanical treatments, some of these areas will overlap, these portions of roads may require temporary closures to the public while treatments are occurring.

Maintenance of existing Forest System Roads would have the direct effect of improving access to the project area. Level 2 roads in particular can be in poor shape and difficult to access for any vehicle that is not a high clearance vehicle or an Off Highway Vehicle (OHV). The improved access has the potential to increase recreational use in the project area, as well as increased access to roads and areas that traditionally only see minimal use. An indirect result of the potential increase of users due to improved access to the area is the potential to increase visitor impacts on dispersed recreation. The higher volume of visitors could result in existing dispersed recreation sites seeing more consistent occupancy, and further site hardening; as well as the potential development of new hardened dispersed camps. As more visitors recreate on designated roads, the desire for some to find less crowded areas for recreation increases could result in an increase of illegal off road use by motor vehicles.

Although the new addition of roads to the Forest Road System will increase the road density of the area, they will not increase motorized recreational opportunities to the public. There is the potential for unauthorized vehicle use off forest system roads primarily on skid trails and temporary roads proposed by Alternative 2. However, use of skid trails by OHV's should be prevented by design features Roads-1 and Roads-4, which direct all roads, landings and skid trails created by project activities to be rehabilitated and returned to pre-implementation conditions,

effectively close all temporary roads and skid trails to OHV use, and avoid creating straight-line corridors where skid trails connect with open roads and trails. Therefore there should be minimal increase of illegal OHV use in the project area as a result of the proposed action.

Lastly, the expansion to the Big Spring Gravel Pit should have only a minimal effect on the existing road condition by the increase of traffic utilizing and hauling material from the pit. Traffic in general would increase during the life of the proposed action but would revert to pre-activity levels after the life of the project. The gravel that would be excavated from the pit would be the material that is used to improve the overall road condition within the project area.

Although there would be effects to dispersed motorized recreation, most would be short term. Alternative 2 does not propose to close any existing FSR's that are currently open legally to the public and would enhance public safety by removing dead and dying trees and maintaining and reconstructing roads. Alternative 2 would not have any long term or detrimental effects to the dispersed recreation resource.

Dispersed Non-Motorized Recreation

As stated in the existing condition there are 34.24 miles of forest system trails in the Hams Fork Project Area. Under Alternative 2, approximately 2 miles of trail #1009 Hams Fork-Red Park Trail could be affected by prescribed burns, leading to trail and area closures during the prescribed burn activity. Road closures as a result of treatments may also prohibit access to some trails and trailheads during proposed treatments. These trailheads include Big Park, Hams Fork, Indian Creek, and Elk Creek Trailheads. The design feature in Alternative 2 would help minimize the effects on non-motorized trail recreation by focusing on advanced public notification and planning treatments in close coordination with the trails manager and outfitter and guide permit administrator to reduce closures and ensure access to the backcountry especially during hunting season. Additionally these impacts would only last for a very short period of time, during project activity. It is anticipated that the Proposed Action would have no negative impact on non-motorized recreation.

Recreation Opportunity Spectrum Classification

Vegetation treatments, road improvement, temporary roads, and proposed additions to the Forest System Roads all have the potential to affect the setting indicators and standards and guidelines for Recreation Opportunity Spectrum Classifications. The proposed action does have the potential to affect the visual quality, remoteness, and access ROS indicators in the project area. It is not anticipated that the proposed action would have any impact to the visitor management, recreation development, social encounters, or visitor impact settings. The majority (89%) of the treatments proposed in Alternative 2 occur in Semi-Primitive Motorized (SPM) and Roaded Natural (RN) ROS areas. Table 53 shows the number of acres of treatment (mechanical, hazard tree, and prescribed fire) by ROS Classification. Figure 20 displays the treatments and temporary roads proposed in Alternative 2, along with the ROS classification of the area.

Table 53. Percent of proposed treatments by Recreation Opportunity Spectrum Class

ROS	Acres	% of Proposed Treatment
Primitive	0	0
Semi-Primitive Non-Motorized	920	11%
Semi-Primitive Motorized	3,432	40%
Roaded Natural	4,270	49%
Total Acres	8,622	

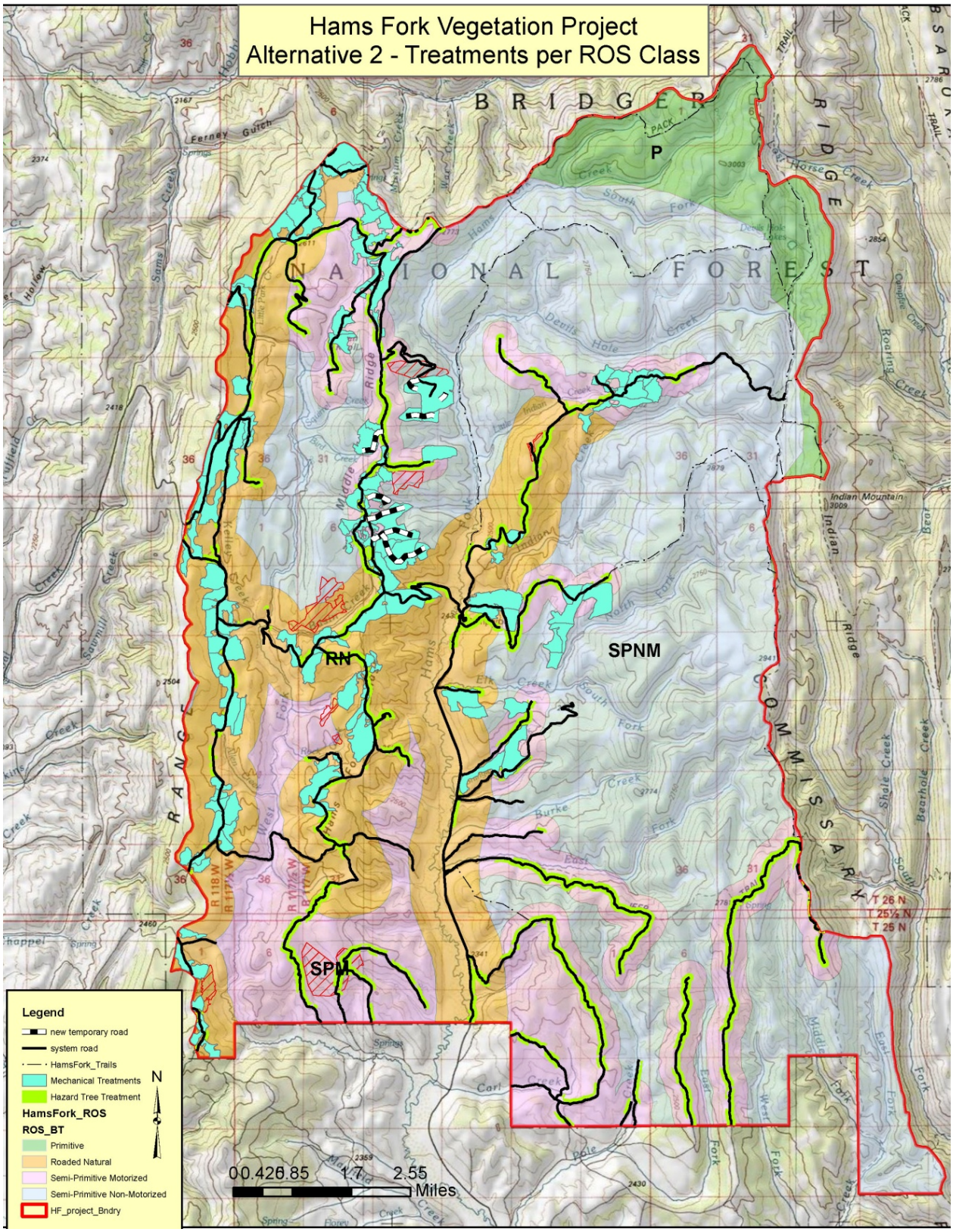


Figure 20. Proposed treatments and Recreation Opportunity Spectrum Class.

Treatments proposed in Alternative 2 have the potential to affect the visual quality of the recreation resource by modifying the visual resource with the impact of timber harvest, route construction, and prescribed fire. Semi-Primitive Non-Motorized ROS classification is the only ROS category that calls for the Retention Visual Quality Objective. The effect on visual resource would be a result of burned trees, timber harvest operations, and new route construction. These effects would primarily be short term as vegetation regrowth and temporary route obliteration would allow the resource to revert back to a more natural appearance. However, heavy timber regeneration takes longer, and would be a longer lasting visual effect. The treatments proposed in Alternative 2 would affect only 5% of the total SPNM classified area in the project area, therefore it is anticipated that the treatments in the proposed action would not affect the SPNM overall classification of the area. For a complete description to impacts to the visual resource refer to the visual resource section.

Impacts to the remoteness indicator of the ROS classification would be affected by the increase of human presence and activity during the time of treatment operation. Sights and sounds of human activity would increase as treatments are implemented and as temporary routes are built. This increase of activity would be short term however, and at the conclusion of treatments the sights and sounds of human activity would revert back to pre-project levels. Although there would be a short term effect, the overall impact to the remoteness indicator would not be lasting and would thus not modify the long-term classification of the SPNM and SPM portions of the project area.

Alternative 2 would impact the access setting indicator with the proposed development of temporary and new system roads. Additionally, the reconstruction and use of existing Level 1 roads, that currently are closed or decommissioned, would also affect the setting. Table 54 shows the miles of construction, reconstruction, or maintenance of temporary roads, existing Level 1 roads, and unauthorized roads that would be added to the Forest Roads System an existing Level 1 roads, and ROS classification of area where these roads are proposed in Alternative 2. The proposed road development is consistent with the standards and guidelines for both the Semi-Primitive Motorized and Roaded Natural Areas. However, in Semi-Primitive Non-Motorized access is to be via cross-country non-motorized travel and travel on non-motorized trails.

Table 54. Road development per Recreation OpportunitySpectrum (ROS) class.

ROS	Temporary Roads	Non –System Roads New Level 1	Existing Level 1 Reconstruction	Total Miles
P	0	0	0	0
SPNM	1.7	3	1.82	6.52
SPM	1.7	1	2.76	5.46
RN	0.6	0	0.12	.72
Total	4	4	4.7	12.7

The proposed action would develop 6.52 miles of motorized access into the SPNM classified portion of the project area. 1.82 miles of these roads would be the improvement and maintenance of existing Level 1 roads that were decommissioned after their last administrative use. Level 1 roads that are not open to public motorized access and infrequent administrative use are

consistent with the SPNM ROS classification. Approximately 4 miles of the proposed roads within the SPNM area, would be permanently added to the Forest Road System within the SPNM ROS classification. However, the roads being added to the Forest System would be Level 1 roads and decommissioned and closed to public access after the life of the project; these new routes are anticipated to not affect the long term ROS classification of the area.

The 1.7 miles of temporary roads proposed in Alternative 2 would be reclaimed and decommissioned at the termination of treatments in the area. All roads proposed in the SPNM portion of the project area would increase access to a small portion of the SPNM portion of the project area in the short term, life of the project. All roads proposed in SPNM would be decommissioned and rehabilitated after the life of the project, and although some short term effects would be realized to the SPNM access classification, the long term classification of the area would not be affected by Alternative 2.

Although some effects would occur to the ROS setting indicators in some ROS classes within the project area, most would be temporary in nature. The anticipated increase of use and proposed actions in Alternative 2 would not modify or permanently displace recreation uses or result in the permanent modification ROS Classifications within the project area.

Cumulative Effects

East Fork Salvage & Sanitation Project: The East Fork Salvage and Sanitation project has the potential to affect the ROS setting indicators, specifically the access, remoteness, and visual: The East Fork Salvage and Sanitation project has the potential to affect the ROS setting indicators, specifically the access, remoteness, and visual indicators, in a manner similar to that described in Alternative 2. Sanitation projects result in mechanical timber harvest which includes use by chainsaws, feller buncher and other mechanized equipment. Additionally, this project may require improvement to existing Forest Roads or the creation of new, temporary routes for hauling. Temporary routes could also lead to increased illegal off road vehicle use if temporary roads and skid routes are not effectively closed to motor vehicle use. The East Fork Salvage would compound the effects to the access, remoteness and visual indicators that were described in Alternative 2. Although East Fork would occur within the project area, it would not be occurring where mechanical treatments are proposed in Alternative 2. Overall, the East Fork Salvage could lead to an expanded area that would be disturbed by new roads as well as sights and sounds of human activity, disrupting the sense of remoteness of the ROS area.

Pole Creek Prescribed Burn: Prescribed burns can have an impact to the visual indicators in ROS areas. Some members of the public may believe that burned areas detract from the visual setting and negatively impact their recreation experience. The Pole Creek prescribed burn project has already modified the visual resource and has been considered as part of the existing condition. The primary area of the burn that is visible to the majority of the recreating public is grass and sage. The burned appearance of these fuel types are typically recovered within 1 year and difficult to see. The Pole Creek burn, combined with the proposed prescribed fires in Alternative 2 would lead to a larger portion of the recreational resource that would be affected with fire, increasing the acres burned that would be viewed by the public.

Kelley Guard Station Fuels Reduction: The fuels reduction around Kelley Guard Station reduced fuel loads and hazard trees from around the facility. The project was able to occur at times the facility was unoccupied from the public and did not disrupt public access to the site. The site has recovered since and it is difficult to see signs of this past project.

Kemmerer Historical Timber Treatments: The Kemmerer historical timber treatments were completed by 2009. Although there is the potential that timber treatments can affect ROS setting indicators, the current existing condition including the access, remoteness, and visual resources as they exist today which includes the impacts that these historical treatments had on the recreation resource.

BTNF Historical Wildfires: Burned areas can be perceived by the public to detract from the visual setting and negatively impact recreation experiences. Wildfire however is part of the natural ecological system. The current existing visual condition included any visual effects from these wildfires.

Administrative Sites Forest Health Protection Projects: Administrative sites forest health protection projects have the potential to affect developed facilities in the project area. Various treatments are currently used to protect the timber and facilities in administrative sites. These treatments include the placement of verbenone pouches to protect trees from bark beetle infestation, hazard tree removal, and fuel reduction to improve public safety and reduce potential for property damage as a result of dead or dying trees falling. These treatments can occur simultaneously with the proposed activities in Alternative 2 or when facilities are closed to the public and should not increase the time that administrative sites would need to be closed to the public.

Hazard Tree: Hazard tree removal has the potential to impact the visual quality for the ROS resource. The proposed hazard tree removal would occur within RN and SPM ROS classified areas. In these areas the treatments would be consistent with management and improve public safety. The hazard tree treatments that are proposed in Alternative 2 would expand on the treatment area that would be treated through the forest wide hazard tree project. This would make a greater section of roads safer to the public. Cumulatively, the two hazard tree projects could increase and prolong the sights and sounds of human presence in SPM areas. In summary, there is a potential for some current or reasonably foreseeable future projects to have some compounding cumulative effects. Cumulative effects would include increased short term impacts of the sights and sounds of people in semi-primitive recreation class areas, increased visual impacts as a result of concurrent timber harvests and prescribed burns, and an increased overall sense of reduced remoteness if project activities occurred back to back. However, in most instances these effects will be short term and only exist during the life of the projects. Increased sights, sounds, and presence of mechanical treatment will cease to have impacts to ROS classifications after project activities cease. Although some visual effects may persist in the long term, these will not result in the modification or permanent reclassification of any ROS classifications within the project area.

The effects from Alternative 2 on recreation resources when added to the effect on recreation resources from the above described activities will not move the analysis area away from complying with Forest Plan standards and guides associated with recreation. The effects from Alternative 2 will not cause a long term ROS reclassification for the analysis area, nor will they fail to meet the recreation objectives for each DFC.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Forest-wide Recreation Prescription directs managers to utilize the ROS classification system to direct management to provide a full range of recreation opportunities. Although there would be some minor impacts to certain setting indicators due to the proposed action, these effects would be short term and not affect the long term ROS classifications in the project area. As described in the effects analysis for Alternative 2, there would be no long term displacement of recreational

users or settings to force a change to the ROS classifications of the area. Even in areas managed for SPNM, the temporary routes, and new Level 1 routes would be decommissioned at the end of the project life and rehabilitated to pre-project condition. The proposed action is in compliance with ROS classification.

Additionally, the proposed action meets the Developed Facility Standard and Dispersed Use Area Standard by improving public health and safety at both dispersed and developed sites by the proposed hazard tree reduction. The proposed action is in compliance with the specific DFC Management and Resource Prescriptions for the project area, as temporary and new system roads that are proposed are in DFC 1B and 10 which manages for both motorized and non-motorized opportunities. Even the new road additions would not be open to the public after the project is completed. No motorized routes are proposed in DFC 2A which is managed exclusively for non-motorized use.

In conclusion, it has been determined that Alternative 2, the proposed action, is in compliance with all Forest Plan Management Prescriptions, Standards and Guidelines, and would achieve Forest Plan management direction.

Summary of Effects

Effects on Recreation —

Alternative 1, the no action alternative would have no effect on developed sites, motorized and dispersed recreation, or non-motorized recreation. There would be no comprehensive hazard tree removal under Alternative 1, resulting in case by case hazard tree treatment that would still serve to maintain public safety in developed sites, but would not widely improve safety of dispersed recreation in the project area. An indirect effect of the no action alternative would be on the visual recreation resource due to no management action being taken and allowing the resource to continue through the natural ecological process. As the natural ecological process continues, tree mortality would continue to increase, and there is the potential for visitor’s perception of the recreational and visual experience to decline. In conclusion, Alternative 1 would not drastically, nor irrevocably, impact or affect the overall condition of the recreation resource.

Alternative 2, the proposed action alternative, has the potential to affect a variety of recreation resources. Temporary closures on roads, trail, and developed sites would occur as a result of the proposed action. However these closures would be short term to ensure public safety during management activities. Additionally, there would be some effect to the visual and remoteness resource as management activities would result in timber harvest and some road construction and maintenance. However this effect would not be severe enough to displace recreation use permanently, or drastically alter the condition of the resource setting and classification of the area. Additionally, safety at both developed and dispersed recreation sites would improve as a result of hazard tree treatments proposed in Alternative 2. Table 55 shows the comparisons of effects by alternative.

Table 55. Comparison of effects on recreation by alternative.

Indicator	Alternative 1 – No Action	Alternative 2 – Proposed Action
Effect on Developed Sites	No closures to developed sites	Temporary closures to Developed sites during treatment implementation
		Temporary closures of access to Developed sites during treatment implementation
		Improved safety around developed sites due to hazard tree treatments.
		Improved site condition due to gravel removed from expanded gravel pit
Effect on Motorized and Dispersed Recreation	0 miles of Road Improvements	104 miles of Road Improvements – improved access could result in increased public pressure on the recreation resource
	0 miles of temporary roads	4 miles of temporary roads, could lead to increase illegal use of routes if not decommissioned according to design features
	0 miles of roads added to Forest System	4 miles of roads added to Forest System as Level 1 – could result in increased illegal use of routes if not decommissioned correctly.
	0 temporary closures of roads	Potential temporary closures on 102 miles of roads that bisect hazard tree treatment areas; 66 miles of roads that bisect mechanical and prescribed fire treatments
	No comprehensive hazard tree removal, would not improve	Improved safety at dispersed recreation sites due to hazard tree treatment's
Effect on Non-Motorized Recreation	0 miles of trails effected	Potential temporary closure to 2 miles of Trail #1009 – Hams Fork-Red Park Trail due to prescribed fire activity
	0 miles of trails closed	Potential temporary closures to Trailhead access due to treatments and road closures.
Effects on ROS Classification	Potential perception of visitors of negative visual impacts of the Recreation Resource due to continued tree mortality within the project area.	Effect to visual, remoteness, and access setting indicators of the ROS classification within the project area. Should not result in displacement of recreation opportunities or force a change of classification as addition of Level 1 (closed to the public) roads do not result in a permanent modification of ROS class

Visual Quality

Affected Environment

The Hams Fork project area has relatively high use for the Kemmerer District which includes small recreation developments, high use of dispersed camping areas, the Big Springs Scenic Backway across the area, two guard stations, a historic site, aspen habitat, livestock grazing, large stands of coniferous forests and a concentration of past timber sales on the west side of the project area. It is a key recreation area for the town of Kemmerer. The terrain of the Hams Fork watershed ranges from gentle to rugged; with elevations generally below 9,000 feet (9871-foot Indian Mountain is on the eastern edge of the area). Remote from population centers or major highways, the Hams Fork area is a local and regional attraction, offering dispersed roadside camping and backcountry recreation with little development. Gravel and native surface roads give access to much of the area, including campsites and jump-off points for foot and horse trails that penetrate the backcountry. Part of the Big Springs Scenic Backway makes a loop in the Big Park – Hams Fork area as it runs between endpoints in Cokeville and Kemmerer.

Scenic integrity on the Bridger-Teton National Forest is in decline, particularly in the Hams Fork watershed where dead trees in large numbers can be seen on much of the forest and public concern for aesthetics is rising.

Deciduous aspen trees are also present throughout the project area. These add striking visual diversity, especially when intermingled with conifer stands. These trees create an impressive scenic impact in the fall when the leaves have turned shades of golden and bright yellow. However, the aspen trees are in decline and are negatively impacting the visual quality of the area.

Forest Plan Direction

Visual Quality Objectives (VQO) in the Forest Plan are defined as desired levels of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. The visual quality objectives that apply to the management areas in Hams Fork Vegetation project are Retention, Partial Retention, and Modification of visual quality. The following defines the VQOs of Retention, Partial Retention, Modification and Maximum Modification. Guidelines for meeting VQOs are described in Forest Service Handbook 462, National Forest Landscape Management, Volume 2.

Retention: “Activities may only repeat form, line, color, and texture which are frequently found in the characteristic landscape, and should not be evident to casual forest visitors.”

Partial Retention: “Activities may repeat form, line, color, or texture which are found infrequently or not at all in the characteristic landscape, but remain visually subordinate to the visual strength of the characteristic landscape.”

Modification: “Activities of vegetative and landform alteration must borrow from naturally established line, form, color, and texture so that their visual characteristics are those of natural occurrences within the surrounding area when viewed as middle ground or background. Activities may visually dominate the original characteristic landscape.”

Maximum Modification: “Activities may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.”

Distance Zones:

- Foreground is the landscape found within 0 to ½ mile from the viewer.
- Middle ground is the landscape located ½ mile to 4 miles from the viewer.
- Background is the landscape located 4 miles + from the viewer.

The VQOs assigned to these sensitive travel routes are foreground Retention, middle ground Partial Retention, and background Partial Retention and modification. The VQOs, assigned in the sensitive viewpoints were used as the baseline for describing the existing condition and the effects of the Hams Fork Vegetation project.

Aspen Management Guideline – Aspen should be managed for its value as wildlife habitat and for its scenic value and fall colors.

The desired visual condition for the project area is described in the current forest plan so that management activities maintain or improve the quality of recreation opportunities. Management activities should not be evident or remain visually subordinate along forest arterial and collector roads and primary trails. In other portions of the area, management activities may dominate in foreground and middle ground, but harmonize and blend with the natural setting. Landscape rehabilitation is used to restore landscapes to a desirable visual quality. Enhancement aimed at increasing positive elements of the landscape to improve visual variety is also used.

Environmental Consequences

The indicator for differentiating between alternatives is whether or not the alternative will meet the VQOs discussed above.

This analysis evaluates the possible visual effects associated with landscape modifications particularly those associated with views from the Kelly-Hams Forks Road (1002), Nugent Road (10069) and Wyoming Big Springs Scenic Backway Road.

Spatial and Temporal Context for Effects Analysis

The Hams Fork project area boundary was used to conduct the visual (scenery) resource analysis for this project. Field visitations indicated that the proposed activities would not be visible from Commissary Ridge which is the highest point in the area. Therefore, the analysis used for disclosing potential effects to the scenic resources was limited to the foreground areas (within ¼ mile) of the roads, recreation sites, and administrative sites identified in the proposed action. Sites and corridors identified for treatment were used as the critical viewing locations from which potential effects were described. A field visit to each site unit and corridor was made to determine existing resource conditions including vegetation, slope and topography, aspect, and general visual characteristics. Consideration was given for background, middle ground, and particularly foregrounds views of proposed treatment areas and desired future condition for landscape restoration. Short-term in this analysis refers to those effects that last from the point of implementation up to 5 years. Long-term in this analysis refers to those effects greater than 5 years.

Alternative 1-No Action

Direct and Indirect Effects

Current visual quality would diminish under the No Action Alternative because dead trees in large numbers would continue to be seen on much of the Hams Fork watershed and would continue to decline as vegetation dies further. Disturbance regimes and events such as wildfires, winds,

insects and disease would continue to shape and change the vegetation of Forest landscapes. Therefore, the fear of fire and its effects to the scenic resources would continue.

In time, conifers would continue to encroach upon aspen clones with the possibility of some loss of clones over the next decade. Portions of conifer stands may continue to decline and die due to pests and diseases as experienced in other portions of the watershed, all of which may cause a reduction in visual variety class and textures of the project area.

Although visual quality would not be improved and would continue to decline under this alternative, Forest Plan VQOs would be met.

If high intensity fires were to occur, there would be a temporary loss to scenery values; but over time scenery would gradually recover over the next several decades toward partial retention and retention of visual quality.

Cumulative Effects

The visual impacts of past and present activities are described in the existing condition section. Reasonably foreseeable activities, other than this alternative, such as routine road maintenance and continued recreation are not expected to change the overall visual quality. The effects of the no action alternative as described above would contribute to the existing decline in visual quality. However, cumulative visual quality impacts would nevertheless meet Forest Plan VQOs.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The No Action Alternative would comply with the visual quality objectives (VQOs) of Bridger-Teton National Forest Land and Resource Management Plan

Alternatives 2-Proposed Action

Direct and Indirect Effects

Alternative 2 would improve scenic quality beyond the low integrity of the forested landscape described under current conditions and under Alternative 1. From a visual perspective, dead trees should be a very low percentage of a typical healthy, properly functioning landscape. The treatment areas include some dead whitebark pine, but predominately lodgepole pine dead from mountain pine beetle. Minor amounts of mature fir are encroaching abundant aspen stands, Douglas-fir, Engelmann spruce are present in the overstory. Treatments would create age class diversity through regeneration harvests which would improve scenery in the long-term. Mechanical and prescribed fire would create opportunities to remove conifer encroachment and encourage seed germination. Enhancement of aspen communities and increased aspen regeneration would enhance visual quality due to increased scenic fall colors. Management practices would generally follow guidelines for the retention and partial retention visual quality objective (VQO). Short term deviations from the VQO are permitted, if the resulting resource management meets the management area's goals for the DFCs and Management Areas which would be the case under this alternative. See the National Forest Landscape Management Handbook (USFS 1974) for definitions of VQOs and how they are applied (, p. III-87). This alternative would have a direct positive affect upon scenic resources. Alternative 2 would have both short-term (less than 5 years) and long-term (greater than 5 years) effects to the visual quality/scenery of the area and these effects would meet the Forest Plan standards and VQOs established for the project area.

The visual effects of forest management activities would be greatest during implementation and immediately following completion of the project. Within 5 years, vegetation would begin to grow, transitioning a change in color from brown to light green. Green tree retention retained in the management areas would reduce the overall contrast of new growth with the surrounding forest. From 5 to 10 years after tree removal, young trees become established reaching a height of approximately 15 feet and further reduce the color contrast with adjacent forested areas. After 30 years, the emerging forest would achieve a height of maturity. Color contrast at this point would be near that of mature growth forest and only textural differences would be apparent. Edge lines forming the boundary of harvested areas also would become less apparent; the appearance further reduced by asymmetrical design.

Table 56 displays the number of treatment acres proposed under Alternative 2 by visual quality objective.

Table 56. Acres of treatment type by visual quality objectives for Alternative 2.

Treatment	Retention Acres	Partial Retention Acres	Modification Acres	Maximum Modification Acres
Aspen Improvement	147	5		
Clearcut W/Reserves	0	39		
Patch Cut w/ Salvage/ Sanitation	175			
Salvage	793	435	404	141
Salvage /Sanitation	167	759	243	239
Salvage/Sanitation w/ Aspen Improvement	346	382	326	46
Salvage/ Sanitation/ Commercial Thin	90	52	5	
Salvage/Sanitation/Commercial Thin w/ Aspen Improvement	174			
White Bark Pine Improvement	173	34		
Hazard Tree Removal	941	655		
Facilities Hazard Tree	2			
Prescribe Fire	327	29	114	30

The visual effects of forest management activities would be greatest during implementation and immediately following completion of the project. Within 5 years, vegetation would begin to grow, transitioning a change in color from brown to light green. Green tree retention retained in the management areas would reduce the overall contrast of new growth with the surrounding forest. From 5 to 10 years after tree removal, young trees become established reaching a height of approximately 15 feet and further reducing the color contrast with adjacent forested areas. After 30 years, the emerging forest would achieve a height of maturity. Color contrast at this point would be near that of mature growth forest and only textural differences would be apparent. Edge lines forming the boundary of harvested areas also would become less apparent; the appearance further reduced by asymmetrical design.

Effects of Vegetative Treatments

Salvage – In the foreground viewing distance the tree stands will appear more green and open and this will allow observers to see further into the stand. Short term visual effects will not be noticeable to the casual observer once the trees are removed, the slash piles are burned, and grasses and shrubs grow in covering cut stumps. Retention visual quality objective (VQO) will be met.

Salvage/Sanitation- Dead and infested trees would be felled and removed from the site which would improve the visual appearance in terms of forest health. The dominance of gray would be reduced from the analysis area. This type of treatment has limited short-term visual effects which will be visible as red-needled slash. Slash treatments should not have long-term effects for visual resources. Burn piles would generally be burned within one year. The long-term visual effects of burn piles and treatment areas are not expected to be noticeable to the casual observer. Lopping and scattered slash would be visually evident, but they will fade after one year. Treatments are located in visual quality objective (VQO) of foreground Retention, Partial Retention, Modification and Maximum Modification; middle ground Retention, and Partial Retention. The treatment would meet all VQOs assigned.

Salvage/Sanitation/Commercial Thin –This treatment would not occur in inventoried roadless areas. Treatment units are located in VQO of Modification background viewpoint, Retention middle ground viewpoint and Partial retention in the middle ground viewpoints. This type of treatment has limited short-term visual effects and essentially no long-term effects. Once the trees are removed, slash burned, small skid trails and roads rehabilitated the visual effects of this treatment would greatly lessen. Temporary roads, landings, and skid trails would be rehabilitated and returned to pre-implementation conditions. These VQOs would be met as the treatment would likely go unnoticed within 5 years thereby meeting VQO of Retention. Visual effects of this treatment are considered minor and would meet the VQOs assigned.

Salvage/Sanitation with Aspen Improvement -. The treatment will thin conifer from aspen tree stands. This treatment has visual effects which could be perceived by forest visitors as openings in the vegetative canopy and could continue to appear as more open until the young trees within the units grow to approximately 10-15 feet in height. Slash and stumps would be visible in the short-term (less than 5 years) until new grass and seedlings grow to a size great enough to screen theses effects. Most of these units have an allocated Modification and Maximum Modification VQO. These units will meet these VQOs in the both short and long term. All these actions will move the forest towards desired conditions for aspen communities that resemble a natural range of structural diversity, provide resiliency to future disturbances and maintain scenery on the landscape in perpetuity.

Aspen Improvement - Aspen would likely dominate the regeneration and enhanced aspen stands would improve scenic opportunities during the fall. Treatment may include jackpot pile burning or broadcast burning. Short-term visual impacts within foreground viewing of aspen treatments and stands will appear very open and may have a mosaic look to them, with an advanced understory growing up from aspen clones. These actions will move towards seral aspen desired conditions, therefore meeting Retention, Partial Retention and Modification VQOs that resemble a natural range of structural diversity and provide resiliency to disturbance. Aspen which have been shaded out would be regenerated immediately after treatment, improving scenery with a quick green up of color in the spring and yellow in the fall.

Whitebark Pine Improvement – This treatment will have visual short-term effects in which stands of whitebark pine will appear very open. Stands may look like cut openings depending on the density of dead trees and live trees which varies by site. Often this type of treatment mimics natural vegetation patterns that currently exist on the landscape and the effect is generally visually appealing, since it will be seen from the middle ground and background

Patch Clearcut with Salvage/Sanitation: Salvage sanitation treatments would open the forest canopy so you can see through it. Often this type of treatment mimics natural vegetation patterns that currently exist on the landscape and the effect is generally visually appealing. Slash and stumps and blackened ground surfaces, a result of burning of activity fuels, would be visible in the short-term (less than 5 years) until new grass and brush grew up to a size great enough to screen these visual effects. Units planned for patch clearcut treatment can be seen from the Hams Fork road in the background viewing zone. The patch clearcuts have visual quality objectives that range from partial retention in the middle ground to retention in the background. When the design features are implemented on the ground these treatments would meet the VOQ's of Partial and Modification.

Clearcut with Reserves: The treatment mimics natural vegetation patterns that currently exist on the landscape and the effect is generally visually appealing. As with the above treatments, slash and stumps and blackened ground surfaces, a result of burning activities for fuels, would be visible in the short-term (less than 5 years) until new grass and brush grow up to a size great enough to screen these visual effects. Clearcuts would have a difference in color and texture until the clearcut has re-grown so that the effects of the treatment are no longer discernible to the casual observer. Units planned for clearcut with reserve treatments have a visual quality objective of Partial Retention which would be met. These units can be seen in the background from Hams Fork road. Several design features are part of Alternative 2 and are designed to reduce potentially negative visual impacts.

Salvage/Sanitation/Commercial Thin: Commercial thinning is a treatment that thins tree stands and is primarily noticed as a textural change of the existing forest canopy. Treatment units are located in VQOs of Maximum Modification background viewpoint, Retention middle ground viewpoint, and Partial retention middle ground viewpoints. This type of treatment has limited short-term visual effects and essentially no long-term effects. Once the trees are removed, slash burned, and small skid trails and roads rehabilitated the visual effects of this treatment would greatly lessen. These VQOs would be met as the treatment would likely go unnoticed within 5 years thereby meeting VQO of Retention. Visual effects of this treatment are considered minor and would meet the VQO's assigned. All ground operations disturbances and small tractor skid trails would be rehabilitated to a natural appearing landscape. Visual simulations show that changes in the size, amount, intensity, direction, pattern of vegetation, should not be evident.

Prescribed Fire - Results of the prescribed burning activities would only be noticed up close as blackened ground surfaces. Crowns of the trees would remain green. The visual effects of this treatment would meet the VQO of Retention, Partial Retention, and Modification.

Hazard Tree Removal –These treatments are located in units which have VQOs of foreground Modification, Partial Retention, and Retention. This type of treatment has limited short-term visual effects and essentially no long-term visual effects. The visual effects of this treatment would meet the VQO of Retention, Partial Retention and exceed Modification. Tree stumps created during removal operations would be less than 12" on flat ground and or 4" on the uphill side of the stump in order to be unnoticeable.

Reduction of hazardous fuels can have benefits to scenery within the project area, especially in the long term (approximately 30 or more years). After the forested portion of the landscape recovers and attains Retention VQO levels, more visual diversity is anticipated. Many of the detailed benefits would be the same as the foreground effects for Alternative 2, described above. Other long-term benefits to middle ground and background view sheds are:

- Enhanced and more diverse mosaic patterns at a broad landscape scale.
- Enhanced aspen fall color and dramatic aspen mosaic patterns throughout all seasons in the long term.
- Younger regenerated stands provide accentuated and fine textures across the slopes while enhancing the chromatic forest hues inherent to each.

Impacts would be negligible in grasslands, riparian areas, and sagebrush flats due to their rapid recovery (within a season).

Facility Protection- Short-term impacts during implementation would include pile burning of branch debris and trees which have their lower branches removed. Visual impacts to the casual visitor will last two seasons. A more maintained landscape appearance would meet the Visual Quality Objective of Retention.

Effects of Bridge and Road Work

Activities proposed for skid trail construction and road maintenance include: replacing culverts, improving road drainage and road surfaces, placing gravel, and bringing existing open roads up to best management practice (BMP) standards. The alternative proposed utilizes existing road systems and reclaims four miles of temporary roads outside of the IRA, reconstructs four miles of unauthorized roads outside of the IRA, and replaces two bridges. The most noticed visual effect of these road work activities would be visible ground disturbance evidenced by the lightly colored soils and gravels on and near the main roads in the project area. Additionally an expansion of an existing visually evident rock quarry would be expanded to 5 acres to supply gravel to roads. Crushing and borrow activities would likely occur in phases over the period of several years. Pit walls and floor would be smoothed and cleaned at the end of the phase of operations. Stockpiles of gravel may be present at the pit between crushing and spreading operations if they are also done in phases. Replacement of the bridges would blend into the existing stream channels and would be re-vegetated with native riparian seed. Most of the visual effects of this work would visually recover once vegetation is established. All, except for the quarry which was built prior to the proposed project, would meet the Retention VQO which is the most restrictive. Once the rock supply is exhausted, the site would be restored to natural appearing conditions, at which time it would met a VQO of Retention.

Effects of Prescribed Burning

All of these prescribed burning units would reduce ladder fuels in the forested habitat types and restore natural vegetation habitat types, especially aspen regeneration, in the action alternative. All burns are in the background viewing zone of the sensitive travel routes and would not be evident to the casual forest visitor traveling along roads. Effects of prescribed fire vary in intensity and visual recovery. Low intensity fires primarily burn only ground surfaces and would be visually recovered by a flush of green grass and forb growth the following spring. Mixed severity prescribed fires would also burn ground surfaces but would potentially kill individuals and small patches of trees as well. The characteristic landscape changes appear less intense in the middle ground but are not evident because the existing tree canopy is screening it from view. The effects of prescribed burning are relatively minor in appearance in the background. The landscape

treated with fire for vegetation restoration tends to recover quickly, often within one year. The prescribed burning activities planned for the Hams Fork project would meet the visual quality objectives of Modification, Partial Retention and Retention in the long term. The prescribed burning does not introduce any evident form, color, or texture. The prescribed fire burning would not be noticeable to the casual visitor in the background and slightly noticeable in the middle ground viewing distances along the travel roads.

Visual Effects on IRAs

The proposed Hams Fork project would have minimal visual impacts in the form of vegetation textures from the hazard tree removal and thinning of trees on the overall integrity of the IRA's. These would be short-term impacts associated with mechanical treatments. However, these impacts would show recovery within a few seasons and in the long-term these impacts would be hard to distinguish or see. This alternative does not involve road construction and is not within areas recommended for wilderness designation. There would be no long-term visual effects to roadless area characteristics or wilderness attributes in the inventoried roadless area within the project area.

Cumulative Effects

The visual impact of past and present activities are described in the existing condition section. Reasonably foreseeable activities, other than this alternative, such as routine road maintenance and continued recreation are not expected to change the overall visual quality. The visual quality improvements resulting from this alternative will improve visual quality thus contributing positively to the cumulative visual effects. As a result, all Forest Plan VQOs would be met

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 would meet Forest Plan direction for the management of the visual resource in the project area.

Summary of Effects

The visual quality/ scenery of the Hams Fork project area may be affected in the short-term less than 5 years) by actions proposed under Alternative 2 (Proposed Action), but visibility would decrease to unnoticeable effects in the long-term (greater than 5 years). These visual effects would vary in duration and intensity depending upon where on the landscape the proposed activities take place and the proposed treatment type. Many of the proposed activities are visible from the main roads with the project area boundary. These actions would add scenic attributes to the forest that resemble a natural range of structural diversity and provide resiliency to disturbance.

Under Alternative 2, mechanical treatments and prescribed burning would create a natural mosaic pattern in many areas of the Forest. These areas would have more rocky natural-appearing openings and a diverse plant understory. Other new openings would have aspen growing in them. Overall, the landscape would have an increase in diversity of age classes. This would improve visual conditions by adding variety to the landscape that is more sustainable than current conditions.

Cultural Resources

The following resource information and analysis summarizes the Hams Fork Vegetation Project Cultural Resource Report (Schoen 2012), which was submitted to the Wyoming State Historic Preservation Office on March 29, 2012.

Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic properties. Regulations 36 FCR 800, which implements Section 106, outlines the procedures for the identification of historic properties and for consulting with the State Historic Preservation Office on the effects the undertaking may have on historic properties.

Affected Environment

Cultural resources include prehistoric sites, historic sites, buildings, structures, and traditional cultural properties. These resources are the remains of past patterned human activity. Prehistoric and historic sites can be significant, or eligible for the National Register of Historic Places, if they meet one of the following characteristics: A) associated with events that have made a significant contribution to the broad patterns of our history, B) associated with the lives of persons significant in our past, C) embody the distinctive characteristics of a type, period or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or D) have the ability to yield important information about the past. Those sites that have been determined eligible for the National Register are referred to as ‘historic properties’.

A total of 4811 acres of the analysis area has received intensive cultural resource inventory over the last 30 years with an additional 985 acres inventoried specifically for the Hams Fork Vegetation Project. As a result of these inventories, 28 sites have been recorded which include eight prehistoric sites and 20 historic sites. Four of these sites have been determined eligible for the National Register of Historic Places, 17 have been determined not eligible and 7 remain unevaluated. There are no sites in the analysis area that are listed on the National Register.

The cultural resource inventory conducted in 2010 and 2011 specifically for the Hams Fork Vegetation Project concentrated on the proposed mechanical treatment units and access routes leading to those units. Cultural resource inventories for burn units, fire line construction and landings will occur as unit specific burn plans are developed of the duration of project implementation in accordance with the Programmatic Agreement with the Wyoming SHPO (USDA 2008).

Environmental Consequences

Spatial and Temporal Context for Effects Analysis

The analysis area for cultural resources is the project perimeter while the Area of Potential Effect (APE) includes mechanical treatment units, roads, landings, burn units and areas affected by fire line construction. Effects considered were during project implementation (less than 10 years).

Cultural resources are commonly evaluated under Section 106 of the National Historic Preservation Act based on potential effects the undertaking may have on the resource. An impact to a cultural resource may have an adverse effect, no adverse effect, or no effect. Examples of adverse effects include, but are not limited to:

- Physical destruction of or damage to all or part of the property

- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance
- Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features

A no adverse effect determination is made when the undertaking's effects do not meet the criteria listed above or conditions are imposed to avoid adverse effects. A no effect determination is made when the proposed undertaking will not impact the historic property. These indicators are used to evaluate the impacts of the alternatives to cultural resources.

Alternative 1-No Action

There is no potential for an absence of vegetation management activities, including prescribed fire and maintenance of roads, landings, and fire lines, to have direct effects to any cultural resources. Indirect effects of no action could result in increased fuel loads on undetected or recorded sites. Heavier fuel loads increase the chance of high intensity fire, which has more potential to damage undetected or recorded sites. Another indirect effect of no action is a greater chance of fire suppression activity to damage cultural resources because ground disturbing fire suppression activity may occur on previously recorded or un-detected sites. As a result, a determination of no adverse effect is made for Alternative 1.

Cumulative Effects

The cumulative effects analysis area is bounded in time by 10 years in the past and the life of the project in the future and in space as the project area. Past and present activities in the analysis area have not resulted in negative impacts to cultural resources. In addition there are no reasonably foreseeable activities that would negatively impact cultural resources; Forest Service activities are designed to avoid such impacts. Therefore, although there are potential indirect impacts from the no action alternative, there are no other impacts that would add to these. Thus the total cumulative effects are the same as the indirect effects described above.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

No project treatments would be implemented therefore the No Action Alternative would be in compliance with the National Historic Preservation Act of 1966.

Alternatives 2-Proposed Action

There is always the potential that vegetation management activities could have direct effects to previously undetected cultural resources. These effects could include the damage or destruction to prehistoric sites or standing wood features, such as cabins. Mechanical equipment used to harvest and remove timber, or to maintain roads, landings or fire lines could also damage archeological sites and features.

Prescribed fires across sites with only a surface scatter of artifacts generally do little if any damage. Direct effects can usually be avoided by adjusting unit boundaries so as to exclude sensitive site areas. There will be no direct effects to recorded eligible sites; however there is the potential for direct and indirect effects to undetected sites.

Indirect effects could result if vegetation is removed from an archeological site leaving that site exposed to surface erosion or increased artifact collecting by the public. Indirect effects can also be mitigated by adjusting unit boundaries so as to avoid sensitive site areas, or conducting post-harvest/burn surveys to identify site locations and recover additional scientific data.

The cultural resource surveys conducted to-date within the analysis area indicates that there are no eligible historic or prehistoric sites within the proposed mechanical treatment units. Therefore, there will be no direct or indirect effects to cultural resources if the proposed action is implemented.

Cumulative Effects

There will be no direct or indirect effects to cultural resources from Alternative 2. As a result, there are no effects to add to the past, present and reasonably foreseeable project activities in the analysis area. Therefore, there would be no cumulative effects associated with the Proposed Action Alternative.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

A cultural resource survey report detailing the results of the 2010 and 2011 field seasons was submitted to the Wyoming State Historic Preservation Office (SHPO) on March 29, 2012 with a recommendation that all historic properties would be avoided by project implementation and that no historic properties would be affected by the project. The Wyoming State Historic Preservation Office concurred with this recommendation in a letter dated April 11, 2012.

If any cultural materials are discovered during project implementation, work in the area shall be halted immediately and the materials will be evaluated by an archeologist or historian meeting the Secretary of the Interior's Professional Qualification Standards. Mechanized equipment would not be used within the site boundary plus a 50 foot buffer around the site for all sites that are eligible for, or listed on, the National Register of Historic Places.

Climate Change

The following information on climate change summarizes the climate change information provided in the Silviculture Report (Bruch 2013) and the Fuels Report (Banister 2013).

Affected Environment

Ongoing climate change research has been summarized in reports produced by the United Nations Intergovernmental Panel on Climate Change (IPCC) (http://www.ipcc.ch/). These reports have confirmed that accelerated climate change is already happening, that it may accelerate more rapidly in the future, and that human greenhouse gas emissions, primarily carbon dioxide emissions, are a main source of accelerated climate change. While uncertainties remain, regarding the exact timing and magnitude of the regional impacts of global climate change, the substantial volume of scientific evidence supports the view that continued increases in greenhouse gas emissions will lead to increased global climate change. The primary greenhouse gas emitted by human activities in the United States in 1990 - 2007 was carbon dioxide (CO_2), representing approximately 85 percent of total greenhouse gas emissions. The largest source of CO_2, and of overall greenhouse gas emissions, was fossil fuel combustion (Executive Summary of the 2008 US-EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2007). United Nations Intergovernmental Panel on Climate Change (IPCC) (http://www.ipcc.ch/).

The role of climate as a driver in ecosystem function is well established (Stenseth et al. 2002). Long-term climate trends have the potential to exacerbate greenhouse gas emission issues and represent a large challenge for all land managers. Throughout the Intermountain West, scientists project increases in temperatures and changes in precipitation patterns that would likely result in reduced snowpack, earlier spring snowmelt and runoff, lower stream flows in summer, altered

groundwater recharge, and increased soil moisture stress. These changes may lead to more frequent and longer drought periods, more insect outbreaks, declining water supplies in an era of increasing demand and more intense wildfire seasons.

The effects of climate change on the Bridger-Teton National Forest and specifically the Hams Fork project area are gradual and slight. The following changes in Western Wyoming's climate and hydrologic systems are predicted by members of the scientific community over the next several decades. Some changes are already apparent (Karl et al. 2009, Harris et al. 2006, Furniss et al. 2010).

- Average air temperatures increasing. Summer temperatures projected to increase by up to 7 to 10 degrees F by 2080-2099 compared with a 1960 to 1979 baseline.
- Approximately 5-10% increase in spring precipitation compared with a 1960-1979 baseline by the 2080s-2090s. The proportion of precipitation falling as snow decreasing.
- More extreme events (droughts, heat waves, floods, heavy rainfall events). Longer, more severe droughts between rains.
- In this snowpack-dominated runoff regime, timing of peak runoff will shift to earlier in the spring and base flows (summer low flows) will be lower.
- Water quality
    - Higher water temperatures, especially during low-flow periods (summer). As a result, dissolved oxygen levels in water bodies will be lower.
    - Higher magnitude storm events lead to increased sediment production from uplands and increased channel scour, so higher sediment in runoff. Negative impacts of sediment (and associated pollutants) will be amplified by longer periods of low stream flows that are unable to transport sediments downstream.
    - Increased nutrient inputs to streams if wildfire frequencies increase. Higher water temperatures would increase stream productivity, further decreasing dissolved oxygen levels.
- Changes in the sediment transport capability of streams would lead to a change in channel morphologies, especially in downstream "response" reaches.

A changing climate may affect forests in several ways, ranging from direct effects on temperature and precipitation, as well as indirect effects of increased atmospheric CO_2 concentrations on tree growth and water use, further alteration of fire regimes, and changes in range and severity of pest outbreaks. Climate change has the potential to transform entire forest systems and shift forest distribution and composition. Some modeling estimates show that boreal forests may decline as much as 50 percent (Noss, 2001). As a result, the importance of adaptive forest management approaches that enhance ecosystem resilience to disturbance will increase (Malmsheimer et al, 2008). Management must develop strategies that anticipate increased insect and disease epidemics and increases in wildfire frequency and severity due to climate change.

Trees are a major depository of significant amounts of the earth's recyclable carbon, thereby helping offset the large amounts of carbon dioxide (CO_2) emitted by factories, motor vehicles, and other sources. When trees burn down or die, much of that carbon is returned to the atmosphere. Consequently, it can take decades for forest re-growth to sequester the amount of carbon emitted in a single, stand replacing fire. The reduction of wildland fires through active management has significant impacts on reducing greenhouse gas emissions (Malmsheimer et al. 2008).

Wildfires of a nature that reduce entire stands of timber not only inject great quantities of carbon into the atmosphere, but change the landscape through soil erosion and the subsequent alteration of watersheds. It has been estimated that active management of forest landscapes has the potential to decrease the acreage burned by high intensity wildfires by 50 to 60 percent (Finney 2000). Prescribed fire managers follow stringent air quality and burn plan requirements. In addition to detailed weather and fuel modeling, prescribed burn emissions must comply with Federal and state air quality requirements.

Resistance is the capacity of an ecosystem to avoid or withstand disturbance, such as anticipated increased insect and disease epidemics and wildfires. Management actions should aim at increasing resistance and thus forestall damage and protecting valued resources, such as water, Endangered species, wildland-urban interface areas, and special forest stands. Resiliency is defined as the ability of an ecosystem to recover quickly from a disturbance by promoting ecological processes and diversity in vegetative composition and structure (Noss 2001). Treatments that promote both resistance and resiliency include thinning of overstocked stands, prescribed burning, removal of invasive species, and restoration of native species. This general principle of maintaining ecosystems through resistance and resiliency can also be applied to landscapes affected by climate change.

Malmsheimer et al. (2008) also point out that active forest and wildland fire management strategies can dramatically reduce CO2 emissions while conserving wildlife habitat, preserving recreational, scenic, and forest values, and reducing the threat of wildfires to communities and critical infrastructure. Furthermore, the success of a sequestration strategy depends on ensuring full stocking, maintaining ecosystem health, minimizing soil disturbance, and reducing increased losses due to tree mortality, wildfires, insect, and disease. For example, treatments such as thinning are known to reduce competition for soil moisture and nutrients, thus reducing competition-based stress and increasing resistance to attacks from insects and disease and resilience to drought and weather anomalies (Malmsheimer et al. 2008).

Environmental Consequences

Alternative 1-No Action

Direct and Indirect Effects

The no action alternative would have continued impacts on climate change associated with ongoing human activities. In addition, Alternative 1 creates the potential for a larger wildfire which would alter the landscape. Under this alternative there is an increase potential for carbon to be released during a high intensity wildfire.

Cumulative Effects

The effects of Alternative 1 on climate change in addition to the effects of activities listed in Appendix E are minimal and below a threshold of concern.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

This analysis is consistent with Forest Service guidance for addressing climate change in project-level environmental analyses.

Alternatives 2-Proposed Action

Direct and Indirect Effects

Activities related to prescribe burns involve the production of greenhouse gases including carbon dioxide which contributes to global climate change. However, project level emissions alone are not sufficient to cause climate change. Release of carbon dioxide during prescribed burning of 730 acres and potential secondary treatment of up to 7,892 acres would occur under Alternative 2. Based on the size of the project area and the amount of burning proposed the addition of greenhouse gas from the project will be minimal. Forests also remove carbon from the atmosphere. Removal of dead and dying trees (approximately 85,599 CCFs) would remove stored carbon from the forest and would reduce the likelihood of large unmanaged fires burning resulting in reduced carbon dioxide released into atmosphere.

Alternative 2 addresses site specific forest health, wildlife habitat, and hazardous fuels conditions, trends, and risks that exist within the project area today. Based on our current knowledge, the proposed actions are consistent with adaptation actions and strategies recommended for managing forests in light of climate change (Millar et al. 2007; Joyce et al. 2008; Puettmann 2011; Ryan et al. 2008).

Cumulative Effects

Greenhouse gas emissions produced in the Kemmerer Ranger District through this project may contribute to the cumulative effects of such gases on climate change.

The current state of the science does not allow for specific analysis of the impacts of greenhouse gas emissions at the local or regional level. Any analysis of the impacts from this project on climate change would be speculative and is therefore not analyzed further.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

This analysis is consistent with Forest Service guidance for addressing climate change in project-level environmental analyses.

Summary

The true effects of either alternative on climate change are unknown; however, either scenario results in a minimal impact to climate change. On the flip side, the effects of climate change are unknown at a project level and minimal; however, an increase in temperatures with a decrease in moisture would be expected to contribute to the following situations:

- more acres would likely burn in a more compressed time frame,
- fire weather conditions would be hotter and drier, thus increasing fire behavior such as high intensity fires,
- high intensity fire behavior would consume live canopy fuels on a larger scale, and
- fires would be more difficult for firefighters to control.

Chapter 4 Consultation and Coordination

The Forest Service consulted the following individuals, Federal, state, tribal, and local agencies during the development of this environmental assessment:

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Bureau of Land Management
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Wyoming Landscape Conservation Initiative
Wyoming State Game and Fish Department
Wyoming State Forestry Division
Wyoming State Historic Preservation Office
Lincoln County Commissioners
Lincoln County Planning
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Teton Conservation District/ Biomass Group
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The Honorable Senator Michael Enzi
The Honorable Congresswoman Cynthia Lummis
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Shoshone-Bannock Tribes
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Please see the project mailing list located in the project record.

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Appendix A:

Forest Plan Direction and Applicable Laws and Executive Orders

Forest Plan Direction

The purpose and need for the Hams Fork Vegetation Project primarily addresses Forest Plan Goal 4.3 and Objectives 4.3 (a-b) and is consistent with the direction laid out in the desired future conditions (DFCs). Additional Forest Plan goals and objectives can be found on pages 112-121 in Chapter 4 of the Bridger-Teton Land and Resource Management Plan (Forest Plan, U.S. Forest Service 1990) and in the specialist reports in the project record.

Forest Plan Goals and Objectives

The Hams Fork Vegetation Project is designed to move the project area towards the following Forest Plan goal and objectives.

Goal 4.3 - Overall diversity of [forest] and riparian habitats within the Bridger-Teton National Forest are enhanced as timber is removed. (US Forest Service 1990, Bridger-Teton Land and Resource Management Plan, p. 119)

Objective:

- 4.3(a): Provide for vegetative species and age diversity, genetic quality, and forest appearance.
- 4.3(b): Provide for diverse habitats to ensure viable populations of Management Indicator Species.

In meeting the Forest Plan Goal 4.3 and Objectives 4.3(a-b), the Hams Fork Vegetation Project would secondarily contribute to the Forest Plan Goal 1.1 and Objectives 1.1(a-b).

Goal 1.1 – Communities continue or gain greater prosperity. (USDA Forest Service 1990, Bridger-Teton Land and Resource Management Plan, p. 112-113)

Objective:

- 1.1(a): Provide an average annual volume of 12 million board feet of green sawlogs for mills in operation.
- 1.1(b): Provide at least 5 million board feet of timber annually to allow continued use of forest products and employment in commercial firewood, house logs, and similar industries.

- 1.1(c): Provide timber volumes at costs that reflect current market values and as small and large product sales to meet local demand.

Forest Plan Desired Future Conditions

Desired Future Conditions (DFCs) in the Forest Plan are explained below. Complete descriptions for all the DFCs for the Bridger-Teton National Forest may be found in the Forest Plan (US Forest Service 1990 pp. 144-248).

Forest-wide

Vegetation: General Prescription- Vegetation management activities enhance diversity of plant communities and various successional stages of those plant communities within the Management Areas. For aspen, priority is placed on perpetuating stands being invaded by conifers. Vegetation treatment projects are designed to retain diverse age classes. (Forest Plan, US Forest Service 1990 p.127)

Protection: Fire Prescription: Provide an appropriate fire protection and use program that is economically efficient, responsive to land management objectives and provides for public safety and protection of property values. (Forest Plan Fire Management Amendment, U.S. Forest Service 2004).

Protection: Pests Prescription: Endemic and epidemic pest populations are managed to reduce or eliminate their threat to resources and people's enjoyment of the Bridger-Teton National Forest. (Forest Plan, US Forest Service 1990 pp.144)

DFC 1B: Substantial Commodity Resource Development with Moderate Accommodation of Other Resources (Forest Plan, US Forest Service 1990 pp. 153 – 158). The project area contains approximately 6,500 acres (9%) in DFC 1B.

Area Theme: An area managed for timber harvest, oil and gas, and other commercial activities with many roads and moderate to occasionally substantial emphasis on other resources.

Management Emphasis: Management emphasis is on scheduled wood-fiber production and use, on livestock production, and on other commodity outputs.

Recreation Prescription: Recreation is managed to provide Roaded Natural appearing opportunities in roaded areas, and Semi-Primitive opportunities in other areas. Roaded recreation opportunities are compatible with timber, livestock grazing, and minerals development. Recreation activities suitable for this area include dispersed, road-oriented uses such as firewood gathering, roadside camping and day use, off-highway (OHV) use on open routes, hunting, and winter sports. Use of closed roads for semi-primitive forms of recreation such as horseback riding and hiking is suitable.

Vegetation - Timber Prescription: A full range of biologically appropriate silvicultural practices is used to emphasize production and use of sawtimber and other wood by products. Timber harvest is scheduled.

Aspen Management Guideline: Aspen should be managed for its value as wildlife habitat, emphasizing browse and cover for big-game species, and for providing seasonal colors.

Access: Roads Prescription: Management of the area requires an extensive road system with some seasonal and long-term road closures. Most vehicle access is limited to arterial and collector roads. Seasonally, local roads may be accessible. Some roads remain open to vehicles, and the main roads are maintained for passage of all vehicles.

DFC 2A: Non-motorized Recreation Areas (Forest Plan, US Forest Service 1990 pp. 161 – 164). The project area contains approximately 8,600 acres (12%) in DFC 2A.

Area Theme: An unroaded area managed to give a quiet, almost primitive recreation experience.

Management Emphasis: Management emphasis is to maintain or enhance Primitive and Semi-primitive Non-motorized dispersed recreation opportunities.

Recreation Prescription: Manage the physical and social setting to provide Primitive and Semi-primitive, Non-motorized opportunities.

Vegetation - Timber Prescription: Only silvicultural practices necessary to meet specific recreation objectives are used. Timber harvest is not scheduled. Few, if any opportunities to use wood fiber for firewood and other products exist.

Aspen Management Guideline: Aspen should be managed for its value as wildlife habitat, emphasizing browse and cover for big-game species, and for providing seasonal colors.

Access: Roads Prescription: Roads are only built for exploration or development of existing oil and gas leases or to access validated mining claims.

DFC 9A: Developed and Administrative Sites (Forest Plan, US Forest Service 1990 pp. 221 – 224). The project area contains approximately 300 acres (1%) in DFC 9A.

Area Theme: An area managed for campgrounds, other noncommercial areas, and Forest Service administrative sites, including related roads and sites.

Management Emphasis: The management emphasis is on existing and proposed developed recreation sites and Forest Service administrative sites: campgrounds, picnic grounds, trailheads, visitor information centers, water-related recreation facilities and concentrated use areas in Roaded Natural areas.

Recreation Prescription: Developed recreation is the focus, but management includes campgrounds, picnic areas, and Forest Service administrative sites.

Vegetation - Timber Prescription: Only vegetation management practices which preserve or enhance recreation values are used. Timber harvest is not scheduled. Vegetation management practices provide limited opportunities to obtain firewood and other products.

Aspen Management Guideline: Aspen should be managed for its value in providing seasonal colors.

DFC 10: Simultaneous Development of Resources, Opportunities for Human Experiences and Support for Big-game and a Wide Variety of Wildlife Species (Forest Plan, US Forest Service 1990 pp. 233 – 239). The project area contains approximately 55,500 acres (75%) in DFC 10.

Area Theme: An area managed to allow for some resource development and roads while having no adverse, and some beneficial, effects on wildlife.

Management Emphasis: Provide long-term and short-term habitat to meet the needs of wildlife managed in balance with timber harvest, grazing, and minerals development. All surface-disturbing activities are designed to have no effect, or beneficial effects, on wildlife.

Recreation Prescription: Existing roaded recreation opportunities continue where they do not interfere with the objectives for this area. Areas of both Semi-primitive Motorized and Semi-primitive Non-motorized are provided.

Vegetation - Timber Prescription: Silvicultural practices including scheduled timber harvest emphasize achieving desired wildlife habitat conditions while developing long-term, overall big-game hiding cover values. Utilization of firewood and other products is encouraged in ways compatible with maintaining wildlife values.

Aspen Management Guideline: Aspen should be managed for its value as wildlife habitat and for providing seasonal colors while emphasizing its value as habitat for selected Management Indicator Species.

Access: Roads Prescription: Management of the area requires a moderate road system to provide commodity and public access. Most travel is limited to arterial and collector roads with seasonal or long-term closure of many local roads for wildlife security.

DFC 12: Backcountry Big-game Hunting, Dispersed Recreation, and Wildlife Security Areas (Forest Plan, US Forest Service 1990 pp. 241 – 246). The project area contains approximately 1,600 acres (2%) in DFC 12.

Area Theme: An area managed for high-quality wildlife habitat and escape cover, big-game hunting opportunities and dispersed recreation activities.

Management Emphasis: Management emphasis is on providing such important habitat for big-game as winter ranges, feedgrounds, calving areas, and security areas. Management provides for habitat capability and escape cover, and maintained Semi-primitive Non-motorized opportunities that emphasize big-game hunting opportunities.

Recreation Prescription: Recreation and other human activities are managed to meet needs of the big-game species.

Vegetation - Timber Prescription: Silvicultural practices emphasize preserving and enhancing critical big-game habitat values. Timber harvest is not scheduled. Vegetation management practices provide opportunities to obtain firewood and other products.

Aspen Management Guideline: Aspen should be managed for its value as wildlife habitat and for providing seasonal colors while emphasizing browse and cover for big-game species.

Access: Roads Prescription: Management of the area requires a limited amount of open roads for public access and some commodity removal. Most travel is limited to arterial and collector roads with long-term closure of most local roads for wildlife security.

Forest Plan Standards and Guidelines

Relevant Forest Plan standards and guidelines are presented by resource area in specialist reports (available on the Bridger-Teton National Forest website). In Chapter 3 of this environmental assessment alternatives are evaluated as to their compliance with Forest Plan standards and guidelines by resource area.

Forest Plan Amendment: Northern Rockies Lynx Management Direction:

The Record of Decision for the Northern Rockies Lynx Management Direction (USDA Forest Service 2007) is an amendment to the Bridger-Teton Forest Plan. The management direction, applies to occupied, mapped lynx habitat. Objectives that apply to the project area include:

- Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.
- Provide a mosaic of habitat conditions through time that support dense horizontal cover, and high densities of snowshoe hare. Provide winter snowshoe hare habitat in both the stand initiation structural stage and in mature, multi-story conifer vegetation.
- Focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover.

The project area is designated as a lynx analysis unit (LAU). The Biological Assessment for the Hams Fork Vegetation Project (DeLong 2013b) discusses this Forest Plan amendment and evaluates the compliance of the Proposed Action alternative with the lynx direction.

Forest Plan Amendment: Revision of fire management standards and guidelines

In 2004, fire management standards and guidelines were updated in the Forest Plan. The Fire/Fuels Specialist Report (Banister 2013) discusses fire management standards and guidelines and evaluates the compliance of each alternative with this direction.

Applicable Laws and Executive Orders

Shown below is a partial list of Federal laws and executive orders pertaining to project-specific planning and environmental analysis on Federal lands. The Hams Fork Vegetation project adheres to the following legal requirements:

American Antiquities Act of 1906: This act prohibits the unauthorized excavation of, or damage to, any historic or prehistoric ruins or objects situated on Federally owned lands.

Archaeological Resources Protection Act of1979 (ARPA): The purpose of ARPA is to protect irreplaceable archaeological resources on Federal and Indian lands. Prohibits the release of information concerning the nature and location of archaeological resources to the public

Clean Air Act of 1970, as amended: The purpose of the Clean Air Act is to protect and enhance the quality of the nation's air resources.

Clean Water Act of 1977: The objective of this act is to restore and maintain the integrity of the nation's waters. This objective translates into two fundamental goals: (1) eliminate the discharge of pollutants into the nation's waters; and (2) achieve water quality levels that are fishable and swimmable. This act establishes a non-degradation policy for all Federally proposed projects.

Endangered Species Act of 1973, as amended: The purpose of this act is to provide for the conservation of Endangered fish, wildlife, plants, and their habitats.

Executive Order 11593: Executive Order 11593 requires Federal agencies to provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the Nation. Federal agencies are required to administer cultural properties under their control in a spirit of stewardship and trusteeship for future generations, and to initiate measures necessary to direct their policies, plans, and programs in such a way that Federally owned sites, structures, and objects of historical, architectural or archaeological significance are preserved, restored and maintained.

Executive Order 11988: Executive Order 11988 requires Federal agencies to take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains when carrying out their responsibilities.

Executive Order 11990: Executive Order 11990 requires Federal agencies to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands when carrying out their responsibilities.

Executive Order 12898: Executive Order 12898 directs each Federal agency to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The President also signed a memorandum on the same day, emphasizing the need to consider these types of effects during National Environmental Policy Act (NEPA) analysis. On March 24, 1995, the U.S. Department of Agriculture completed an implementation strategy for the executive order. Where Forest Service proposals have the potential to disproportionately adversely affect minority or low-income populations, these effects must be considered and disclosed (and mitigated to the degree possible) through NEPA analysis and documentation.

Executive Order 12962: Executive Order 12962 requires that Federal Agencies evaluate the effects of Federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of the order.

Executive Order 13186: Executive Order 13186 directs executive departments and agencies to take certain actions to further implement the Migratory Bird Treaty Act. Federal agencies that undertake actions that may affect migratory birds must develop and implement a Memorandum of Understanding (MOU) with the Fish and Wildlife Service that would promote the conservation of migratory birds. Federal agencies must also

"ensure that environmental analysis of Federal actions required by NEPA …evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern."

Migratory Bird Treaty Act of 1918, as Amended: The purpose of this act is to establish an international framework for the protection and conservation of migratory birds.

Multiple-Use Sustained-Yield Act of 1960: This act states that renewable surface resources of the National Forests shall be developed and administered for multiple use and sustained yield. Due consideration shall be given to the relative values of the various resources in particular areas.

National Environmental Policy Act of 1969, as amended (NEPA): NEPA establishes the format and content requirements of environmental analysis and documentation. The entire process of preparing this EA was undertaken to comply with NEPA.

National Forest Management Act of 1976 (NFMA): This act guides development and revision of National Forest Land Management Plans. All alternatives were evaluated in terms of compliance with NFMA.

National Historic Preservation Act of 1966 (NHPA): Expands protection of historic and archaeological properties to include those of national, State, and local significance and directs Federal agencies to consider the effects of proposed actions on properties eligible for or included in the National Register of Historic Places.

Appendix B

Description of treatment units and map series for the Hams Fork Vegetation Project Alternative 2 (Proposed Action)

Table 57. Description of mechanical treatment units for the Hams Fork Vegetation Project Alternative 2 (Proposed Action)

Unit #	Acres	Treatment Type	Estimated % Dead	Disease Intensity	% Aspen Component	Post Treatment of Slash/Fuels
2	67	Salvage	60%+			A
3	9	Patch Clearcut w/ Salvage/Sanitation	60%+			B
4	41	Salvage/Sanitation w/ Aspen Improvement	5-20%	Low	Understory	B
5	30	Salvage	5-20%			A
6	84	Salvage/Sanitation w/ Aspen Improvement	5-20%	Low	Understory	B
9	73	Salvage/Sanitation w/ Aspen Improvement	20-40%	Moderate	5%	B
10	36	Salvage/Sanitation/Commercial Thin	20-40%	Low		B
11	66	Salvage/Sanitation w/ Aspen Improvement	20-40%	Low	5%	B
12	89	Salvage/Sanitation w/ Aspen Improvement	5-20%	Low	15%	B
13	35	Salvage/Sanitation w/ Aspen Improvement	40-60%	Low	5%	B
14	33	Salvage	5-20%			A
15	24	Salvage	60%+			A
16	174	Salvage/Sanitation/Commercial Thin w/ Aspen Improvement	5-20%	Low	Understory	B
17	21	Patch Clearcut w/ Salvage/Sanitation	60%+			B
18	60	Patch Clearcut w/ Salvage/Sanitation	40-60%			B
20	134	Salvage	20-40%			A
21	98	Salvage	20-40%			A
22	25	Patch Clearcut w/ Salvage/Sanitation	20-40%			B
23	129	Salvage	20-40%			A

Unit #	Acres	Treatment Type	Estimated % Dead	Disease Intensity	% Aspen Component	Post Treatment of Slash/Fuels
24	37	Aspen Improvement	5-20%		50%	B
25	6	Salvage/Sanitation/Commercial Thin	60%+	Low		B
26	7	Patch Clearcut w/ Salvage/Sanitation	60%+			B
27	8	Patch Clearcut w/ Salvage/Sanitation	40-60%			B
28	14	Salvage	20-40%			A
29	40	Aspen Improvement	5-20%			B
30	20	Patch Clearcut w/ Salvage/Sanitation	20-40%		30%	B
31	16	Patch Clearcut w/ Salvage/Sanitation	5-20%			B
32	32	Salvage/Sanitation/Commercial Thin	40-60%	Low		B
33	5	Aspen Improvement	5-20%		60%	B
34	103	Salvage/Sanitation w/ Aspen Improvement	40-60%	Low	1%	B
35a	57	Salvage/Sanitation w/ Aspen Improvement	20-40%	Low	5%	B
35b	36	Salvage/Sanitation	20-40%	Low		B
36	103	Salvage	20-40%			A
37	135	Salvage	20-40%			A
38	33	Salvage/Sanitation/Commercial Thin	20-40%	Low		B
39	10	Patch Clearcut w/ Salvage/Sanitation	5-20%			B
40	14	Salvage/Sanitation/Commercial Thin	5-20%	Low		B
41	13	Clearcut w/ Reserves	20-40%			B
42	8	Clearcut w/ Reserves	20-40%			B
43	6	Clearcut w/ Reserves	5-20%			B
44	8	Salvage/Sanitation/Commercial Thin	5-20%	Low		B
45	17	Salvage/Sanitation/Commercial Thin	40-60%	Low		B
46	16	Salvage	40-60%			A
47	11	Clearcut w/ Reserves	40-60%			B

Unit #	Acres	Treatment Type	Estimated % Dead	Disease Intensity	% Aspen Component	Post Treatment of Slash/Fuels
48	70	Aspen Improvement	20-40%		40%	B
49	14	Salvage	40-60%			A
50	37	Salvage	40-60%			A
51	161	Salvage/Sanitation w/ Aspen Improvement	40-60%	Low	5%	B
52	15	Salvage/Sanitation	40-60%	Low		B
53	35	Salvage	40-60%			A
55	72	Salvage	20-40%			A
63	101	Salvage	40-60%			A
64	15	Salvage	5-20%			A
65	7	Salvage	20-40%			A
71	11	Salvage/Sanitation w/ Aspen Improvement	5-20%	Low	5%	B
72	52	Salvage/Sanitation	5-20%	Low		B
73	35	Salvage	20-40%			A
74	7	Salvage/Sanitation	40-60%	Low		B
75	19	Salvage	5-20%			A
76	83	Salvage/Sanitation	5-20%	Low		B
77	17	Salvage/Sanitation	20-40%	Low		B
78	28	Salvage/Sanitation	40-60%	Low		B
79	37	Salvage/Sanitation w/ Aspen Improvement	40-60%	Low	1%	B
80	46	Salvage	40-60%			A
81	13	Salvage	5-20%			A
82	54	Salvage	5-20%			A
83	54	Salvage/Sanitation w/ Aspen Improvement	40-60%	Low	1%	B
84	52	Salvage/Sanitation	40-60%	Low		B
87	13	Salvage	60%+			A

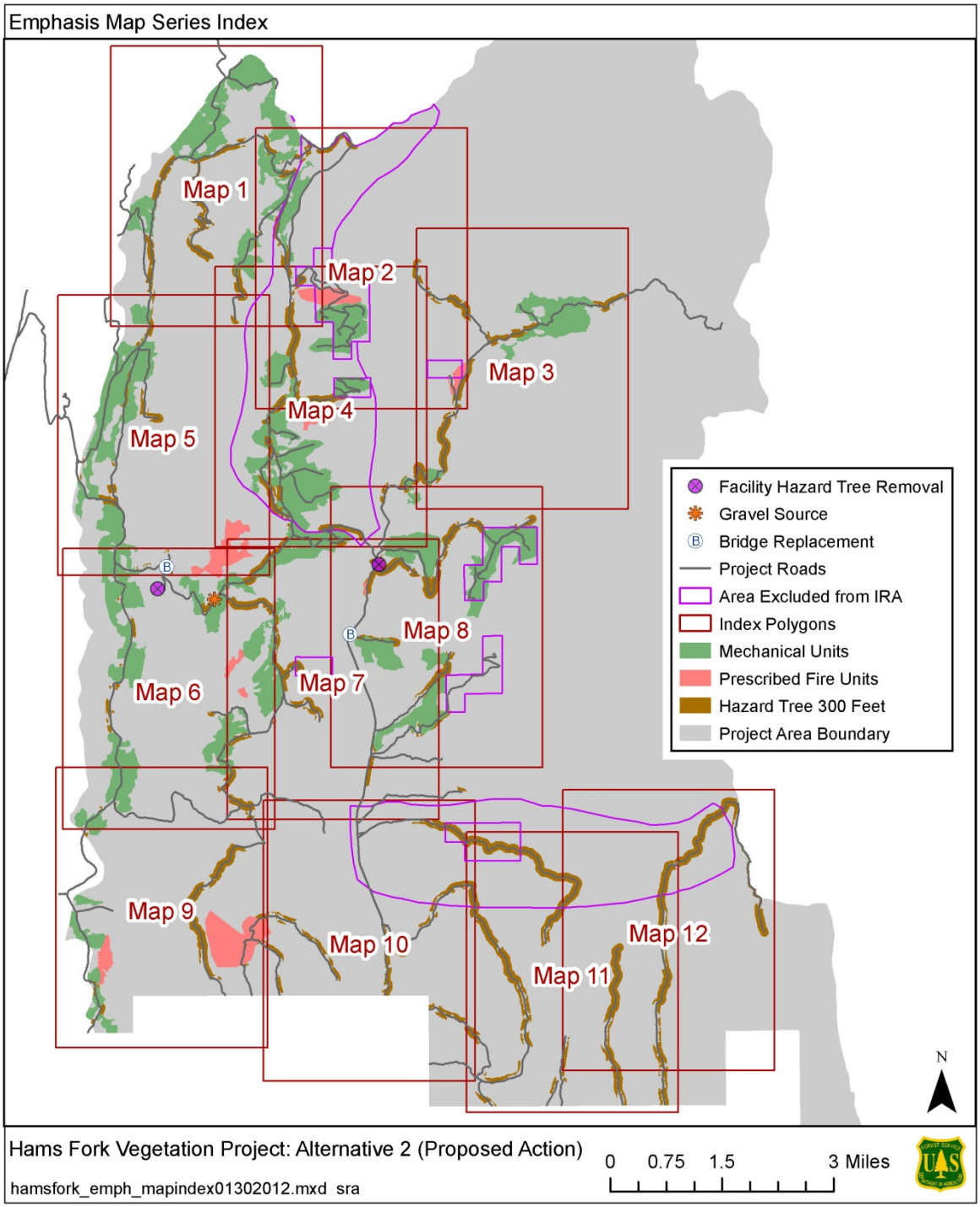
Unit #	Acres	Treatment Type	Estimated % Dead	Disease Intensity	% Aspen Component	Post Treatment of Slash/Fuels
88	35	Salvage/Sanitation	5-20%	Low		B
89	12	Salvage/Sanitation	40-60%	Low		B
90	42	Salvage/Sanitation	5-20%	Low		B
92	11	Salvage/Sanitation	20-40%	Low		B
94	99	Salvage/Sanitation	40-60%	Low		B
95	64	Salvage	5-20%			A
97	13	Salvage/Sanitation w/ Aspen Improvement	40-60%	Low	Understory	B
102	14	Salvage/Sanitation w/ Aspen Improvement	60%+	Low	5%	B
103	12	Salvage/Sanitation w/ Aspen Improvement	20-40%	Low	1%	B
104	25	Salvage/Sanitation w/ Aspen Improvement	40-60%	Low	20%	B
106	14	Salvage/Sanitation	40-60%	Low		B
107	31	Salvage/Sanitation	60%+	Low		B
108	9	Salvage/Sanitation	20-40%	Low		B
112	40	Whitebark Pine Improvement	60%+	Low		B
115	27	Whitebark Pine Improvement	60%+	Low		B
116	51	Whitebark Pine Improvement	20-40%	Low		B
117	29	Whitebark Pine Improvement	40-60%	Low		B
118	37	Whitebark Pine Improvement	60%+	Low		B
119	23	Whitebark Pine Improvement	20-40%	Low		B
120	19	Salvage/Sanitation	60%+	Moderate		B
123	22	Salvage/Sanitation	20-40%	High		B
124	17	Salvage/Sanitation	20-40%	Moderate		B
125	10	Salvage	20-40%			A
129	13	Salvage/Sanitation w/ Aspen Improvement	40-60%	Low	1%	B
130	22	Salvage/Sanitation w/ Aspen Improvement	20-40%	Moderate	5%	B

Unit #	Acres	Treatment Type	Estimated % Dead	Disease Intensity	% Aspen Component	Post Treatment of Slash/Fuels
131	16	Salvage/Sanitation	5-20%	High		B
132	28	Salvage/Sanitation	5-20%	High		B
133	25	Salvage	5-20%			A
134	20	Salvage	5-20%			A
135	14	Salvage/Sanitation	20-40%	Moderate		B
137	50	Salvage/Sanitation	5-20%	Low		B
138	24	Salvage	5-20%			A
139	25	Salvage/Sanitation	20-40%	Low		B
140	36	Salvage/Sanitation	5-20%	Moderate		B
141	41	Salvage	5-20%			A
142	50	Salvage/Sanitation	20-40%	Low		B
143	32	Salvage	20-40%			A
145	24	Salvage/Sanitation w/ Aspen Improvement	40-60%	Low	5%	B
146	36	Salvage	40-60%	Low		A
147	29	Salvage/Sanitation	20-40%	Low		B
148	40	Salvage/Sanitation	40-60%	Low		B
149	18	Salvage/Sanitation	40-60%	Low		B
150	26	Salvage/Sanitation	40-60%	Moderate		B
151	67	Salvage	20-40%			A
152	25	Salvage	20-40%			A
154	40	Salvage/Sanitation	5-20%	Low		B
155	31	Salvage/Sanitation	20-40%	Moderate		B
156	50	Salvage/Sanitation	60%+	Low		B
162	42	Salvage/Sanitation w/ Aspen Improvement	5-20%	Moderate	20%	B
163	41	Salvage/Sanitation w/ Aspen Improvement	20-40%	Low	30%	B

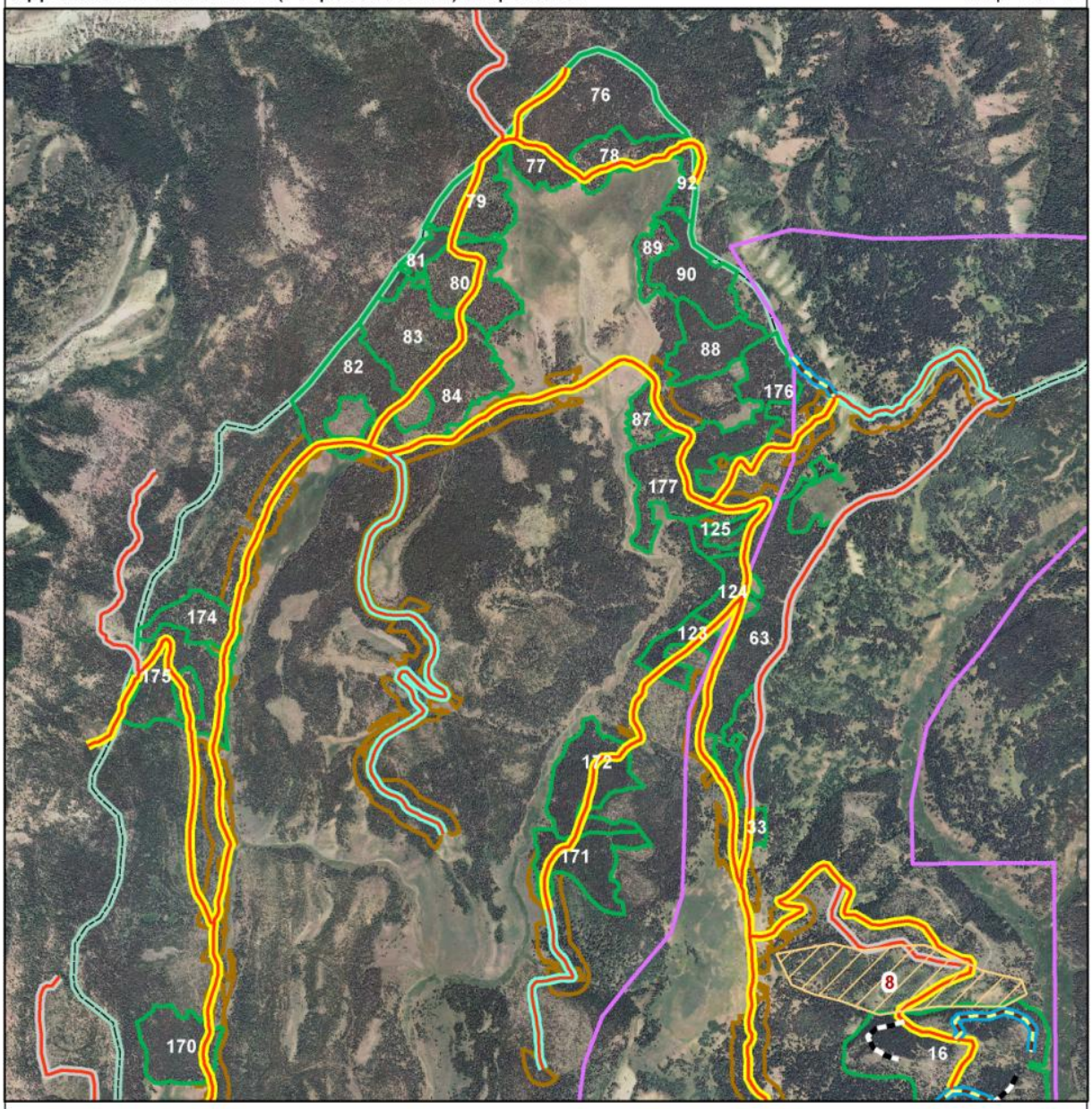
Unit #	Acres	Treatment Type	Estimated % Dead	Disease Intensity	% Aspen Component	Post Treatment of Slash/Fuels
164	37	Salvage/Sanitation	20-40%	Low		B
166	44	Salvage	20-40%			A
167	47	Salvage	20-40%			A
168	24	Salvage/Sanitation	40-60%	Low		B
169	16	Salvage	20-40%			A
170	39	Salvage/Sanitation	5-20%	Low		B
171	41	Salvage/Sanitation	60%+	Moderate		B
172	52	Salvage	60%+			A
174	26	Salvage	20-40%			A
175	59	Salvage/Sanitation w/ Aspen Improvement	60%+	Low	1%	B
176	53	Salvage/Sanitation	60%+	Low		B
177	39	Salvage/Sanitation	40-60%	Moderate		B
178	20	Salvage/Sanitation	5-20%	Low		B
179	57	Salvage/Sanitation	20-40%	Moderate		B
180	18	Salvage/Sanitation	40-60%	Low		B
181	30	Salvage/Sanitation	40-60%	Low		B
182	23	Salvage/Sanitation w/ Aspen Improvement	40-60%	High	5%	B

Table 58. Prescribe burn units for the Hams Fork Vegetation Project Alternative 2 (Proposed

Unit #	Acres	Treatment Type	Aspen Component	Beetle Activity
1	265	Prescribed Fire	Yes	Yes
2	51	Prescribed Fire	Yes	Yes
3	7	Prescribed Fire	No	Yes
4	6	Prescribed Fire	Yes	No
5	156	Prescribed Fire	Yes	Yes
6	65	Prescribed Fire	Yes	Yes
7	36	Prescribed Fire	Yes	Yes
8	93	Prescribed Fire	Yes	Yes
9	51	Prescribed Fire	Yes	Yes


Emphasis Map Series Index
Map 1
Map 2
Map 3
Map 4
Map 5
Map 6
Map 7
Map 8
Map 9
Map 10
Map 11
Map 12
Facility Hazard Tree Removal
Gravel Source
Bridge Replacement
Project Roads
Area Excluded from IRA
Index Polygons
Mechanical Units
Prescribed Fire Units
Hazard Tree 300 Feet
Project Area Boundary
N
Hams Fork Vegetation Project: Alternative 2 (Proposed Action)
hamsfork_emph_mapindex01302012.mxd sra
0 0.75 1.5 3 Miles

Appendix B. Alternative 2 (Proposed Action) Map Series — Map 1 of 12



Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)

0 0.25 0.5 1 Miles

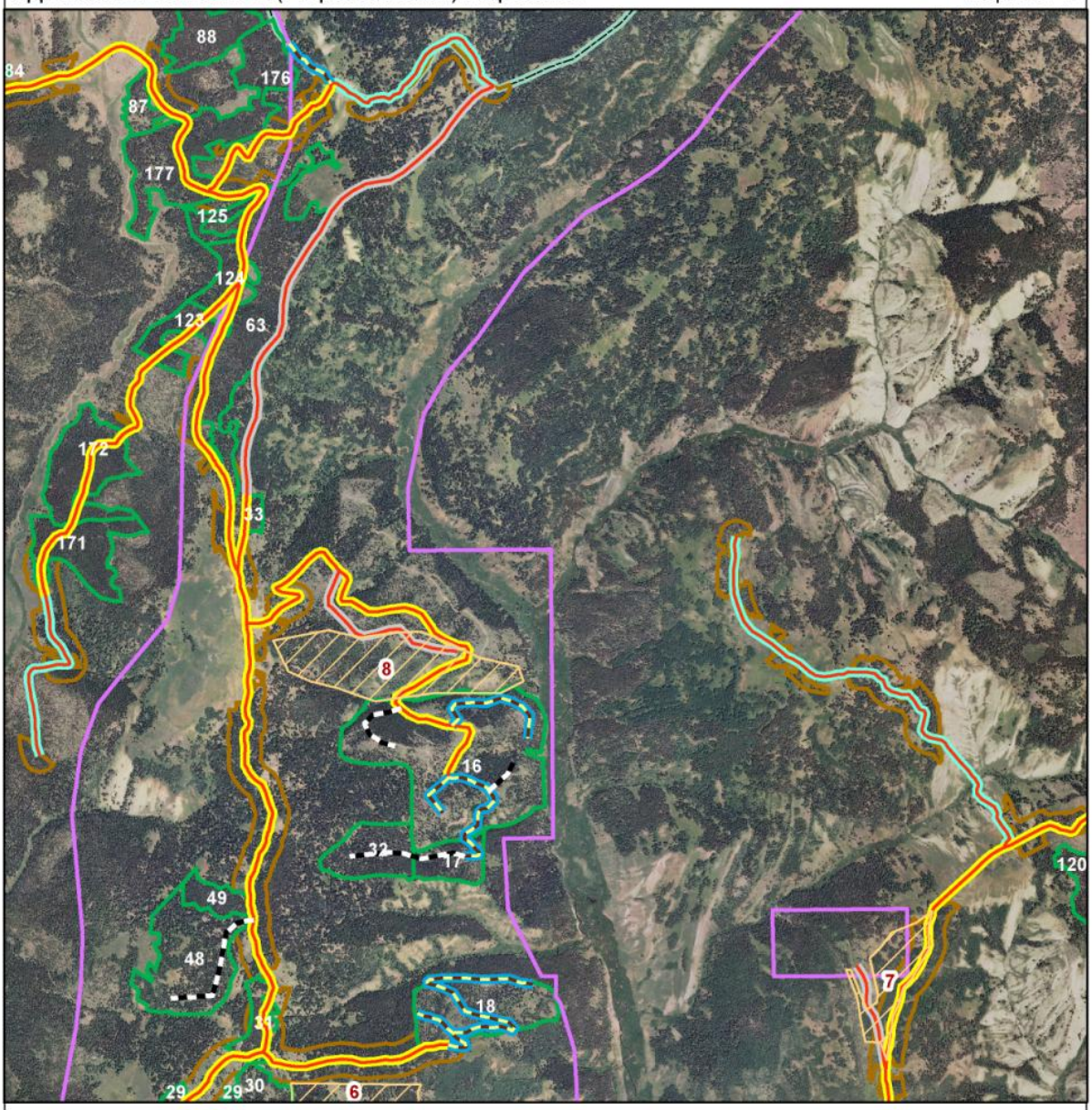
N

- Forest System Road
- Unauthorized Road
- New Temporary Road
- Road Maintenance
- Hazard Tree Road Maintenance
- Road Reconstruction
- No Road Work Proposed
- Prescribed Burn Treatment Units
- Mechanical Treatment Units
- Hazard Tree Removal
- Project Area Boundary
- Bridger-Teton Nat'l Forest Boundary
- Facility - Hazard Tree Removal
- Gravel Source
- Bridge Replacement
- Non-IRA Areas
- CWPP Wildland-Urban Interface

hf_ch2_imagery_map1.mxd May 21, 2013 sra

Appendix B. Alternative 2 (Proposed Action) Map Series

Map 2 of 12



Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)

0 0.25 0.5 1 Miles

N

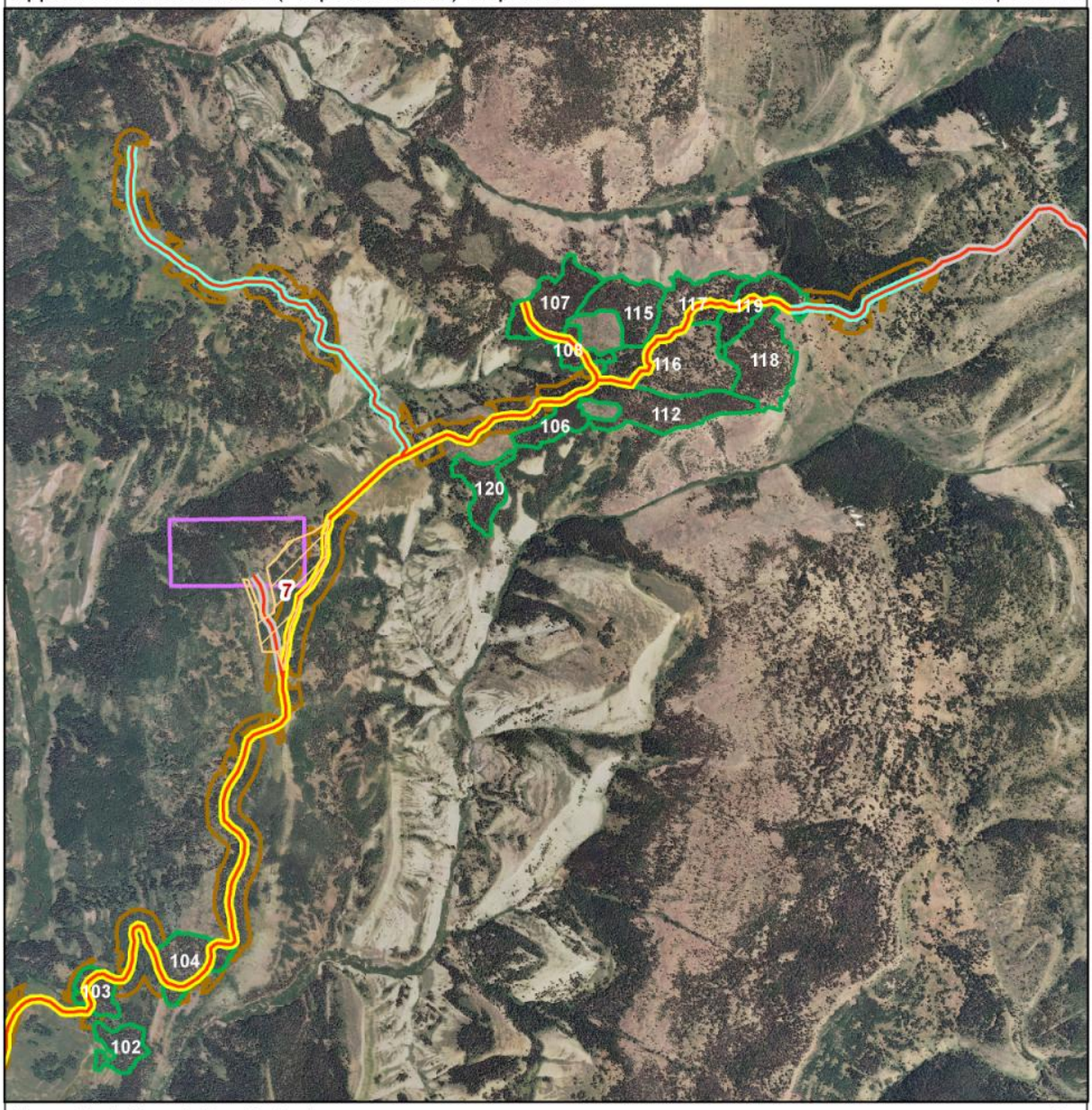
Forest System Road
Unauthorized Road
New Temporary Road
Road Maintenance
Hazard Tree Road Maintenance
Road Reconstruction
No Road Work Proposed

Prescribed Burn Treatment Units
Mechanical Treatment Units
Hazard Tree Removal
Project Area Boundary
Bridger-Teton Nat'l Forest Boundary

Facility - Hazard Tree Removal
Gravel Source
Bridge Replacement
Non-IRA Areas
CWPP Wildland-Urban Interface

hf_ch2_imagery_map1.mxd May 21, 2013 sra

Appendix B. Alternative 2 (Proposed Action) Map Series — Map 3 of 12



Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)

0 0.25 0.5 1 Miles

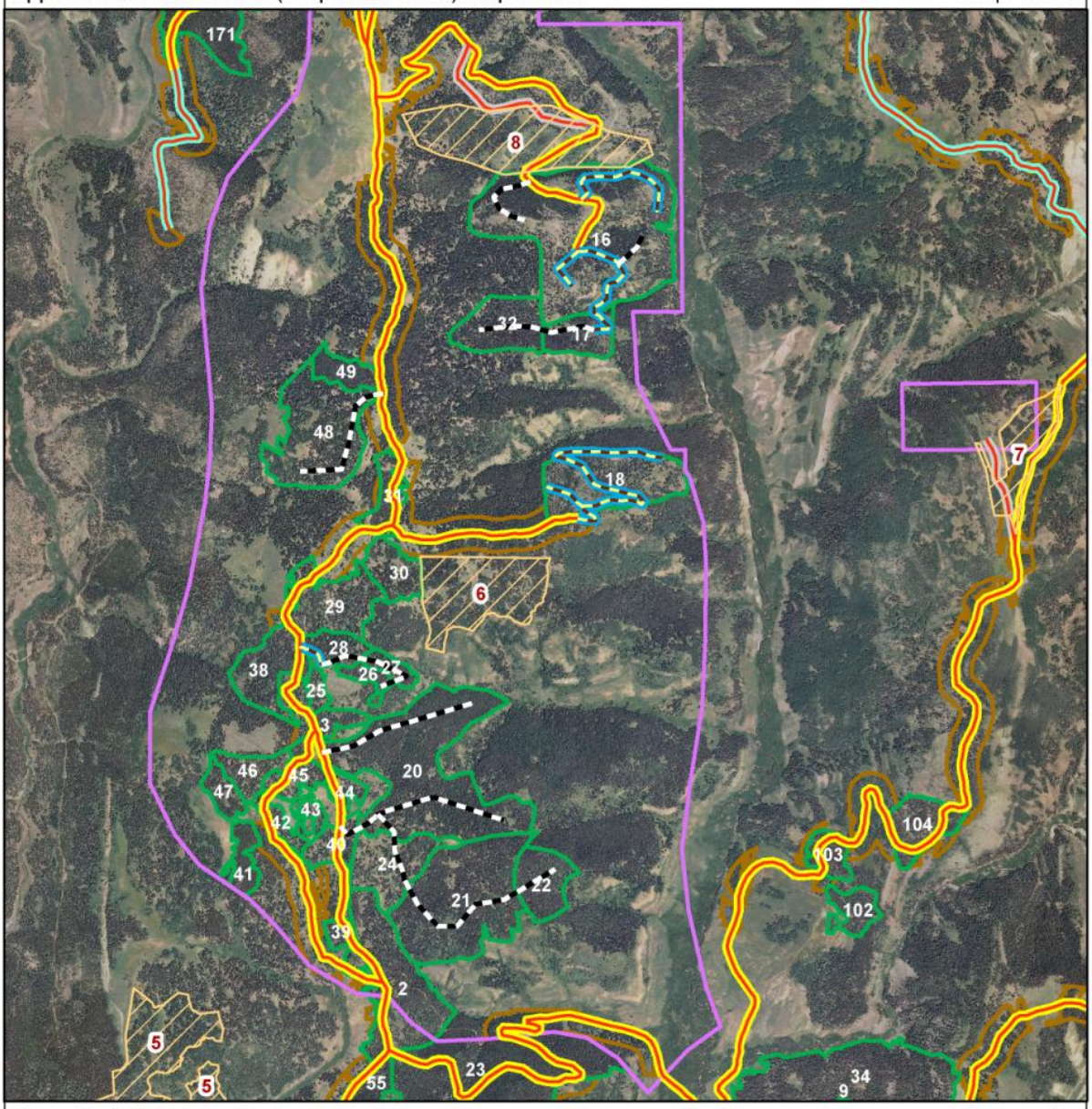
N

- Forest System Road
- Unauthorized Road
- New Temporary Road
- Road Maintenance
- Hazard Tree Road Maintenance
- Road Reconstruction
- No Road Work Proposed
- Prescribed Burn Treatment Units
- Mechanical Treatment Units
- Hazard Tree Removal
- Project Area Boundary
- Bridger-Teton Nat'l Forest Boundary
- Facility - Hazard Tree Removal
- Gravel Source
- Bridge Replacement
- Non-IRA Areas
- CWPP Wildland-Urban Interface

hf_ch2_imagery_map1.mxd May 21, 2013 sra

Appendix B. Alternative 2 (Proposed Action) Map Series

Map 4 of 12



Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)

0 0.25 0.5 1 Miles

N

- Forest System Road
- Unauthorized Road
- New Temporary Road
- Road Maintenance
- Hazard Tree Road Maintenance
- Road Reconstruction
- No Road Work Proposed
- Prescribed Burn Treatment Units
- Mechanical Treatment Units
- Hazard Tree Removal
- Project Area Boundary
- Bridger-Teton Nat'l Forest Boundary
- Facility - Hazard Tree Removal
- Gravel Source
- Bridge Replacement
- Non-IRA Areas
- CWPP Wildland-Urban Interface

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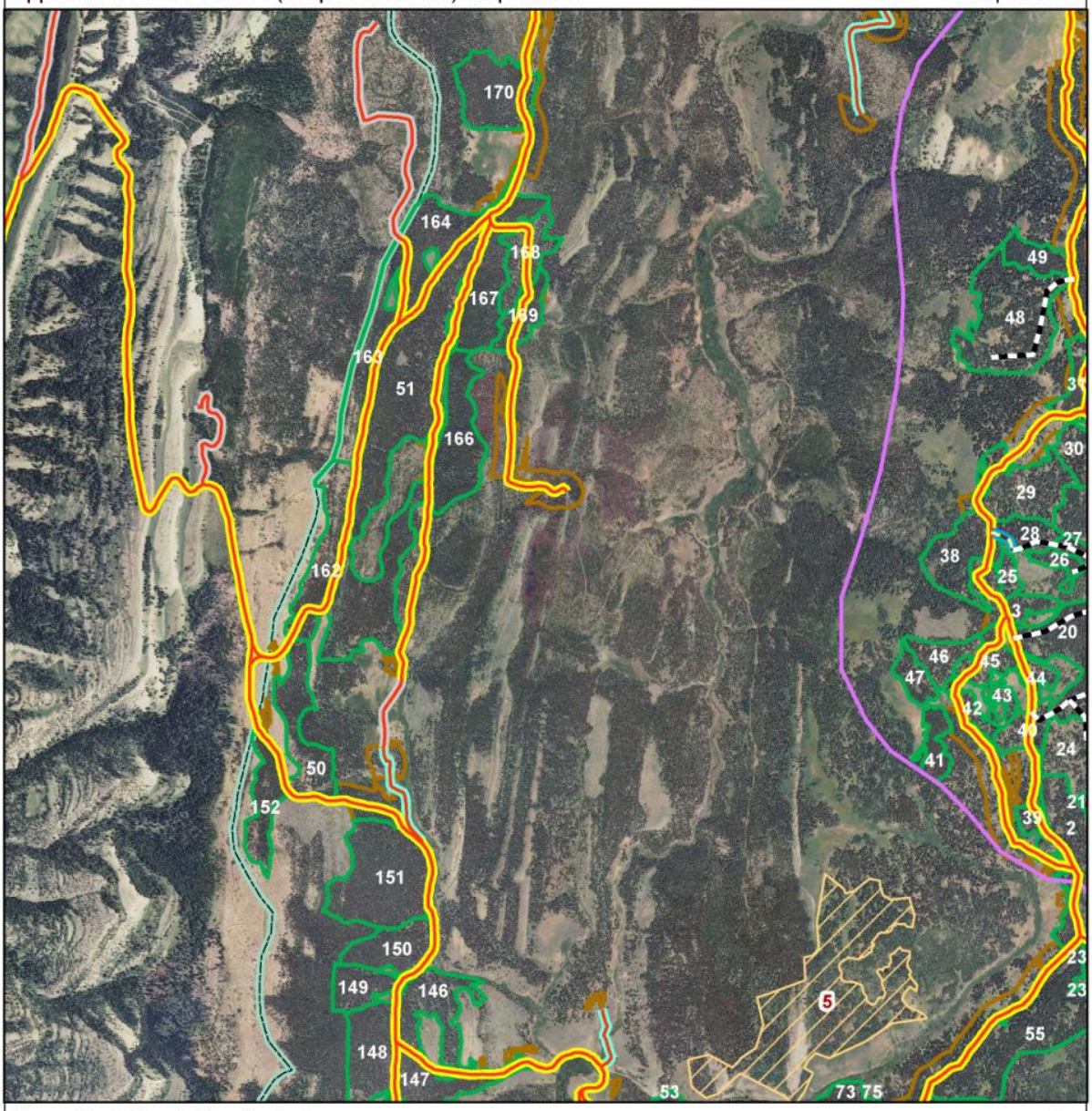
Appendix B. Alternative 2 (Proposed Action) Map Series

Map 5 of 12



Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)

0 0.25 0.5 1 Miles

N

Forest System Road
Unauthorized Road
New Temporary Road
Road Maintenance
Hazard Tree Road Maintenance
Road Reconstruction
No Road Work Proposed

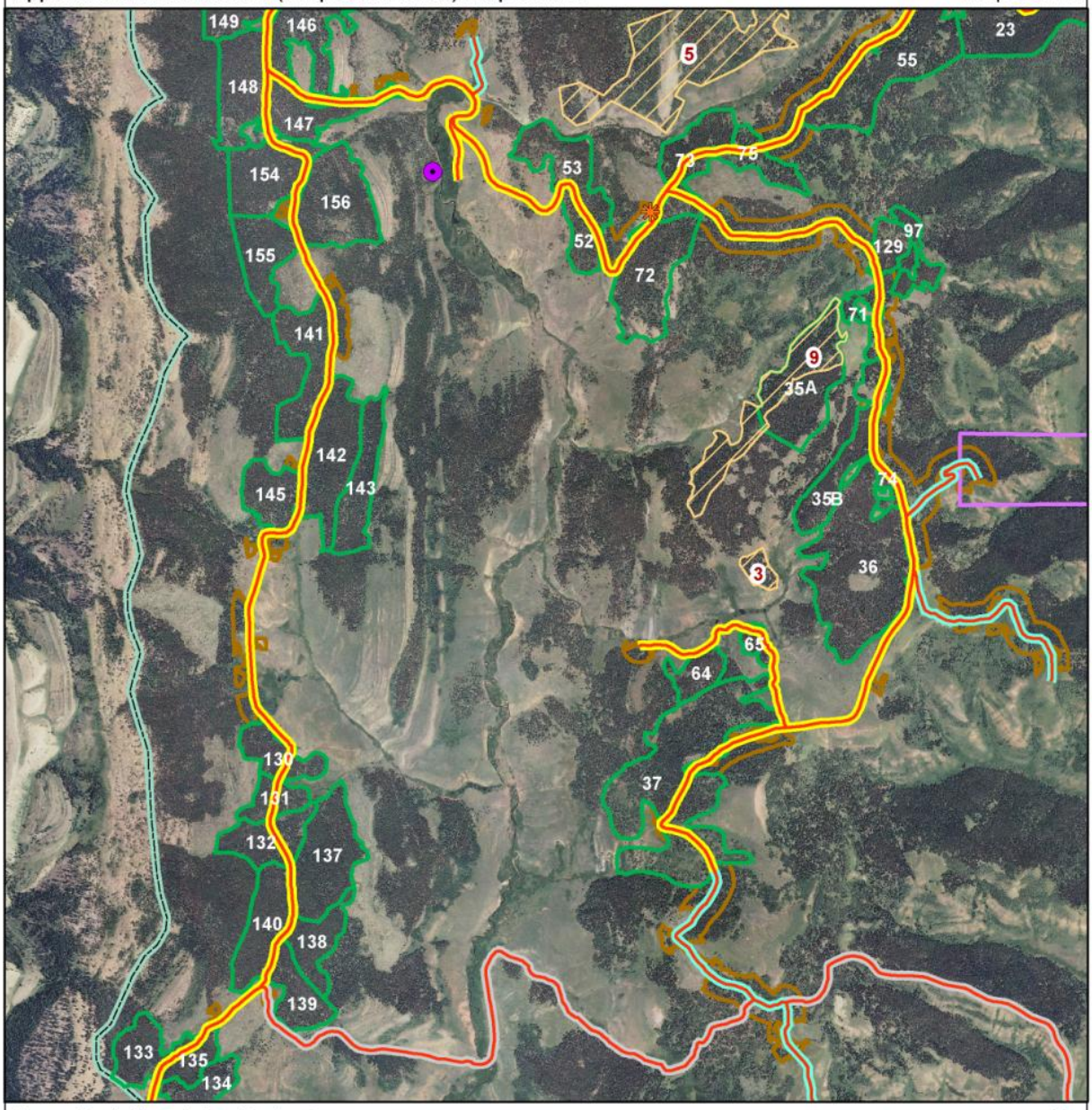
Prescribed Burn Treatment Units
Mechanical Treatment Units
Hazard Tree Removal
Project Area Boundary
Bridger-Teton Nat'l Forest Boundary

Facility - Hazard Tree Removal
Gravel Source
Bridge Replacement
Non-IRA Areas
CWPP Wildland-Urban Interface

hf_ch2_imagery_map1.mxd May 21, 2013 sra

Appendix B. Alternative 2 (Proposed Action) Map Series

Map 6 of 12



Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)

0 0.25 0.5 1 Miles

N

- Forest System Road
- Unauthorized Road
- New Temporary Road
- Road Maintenance
- Hazard Tree Road Maintenance
- Road Reconstruction
- No Road Work Proposed
- Prescribed Burn Treatment Units
- Mechanical Treatment Units
- Hazard Tree Removal
- Project Area Boundary
- Bridger-Teton Nat'l Forest Boundary
- Facility - Hazard Tree Removal
- Gravel Source
- Bridge Replacement
- Non-IRA Areas
- CWPP Wildland-Urban Interface

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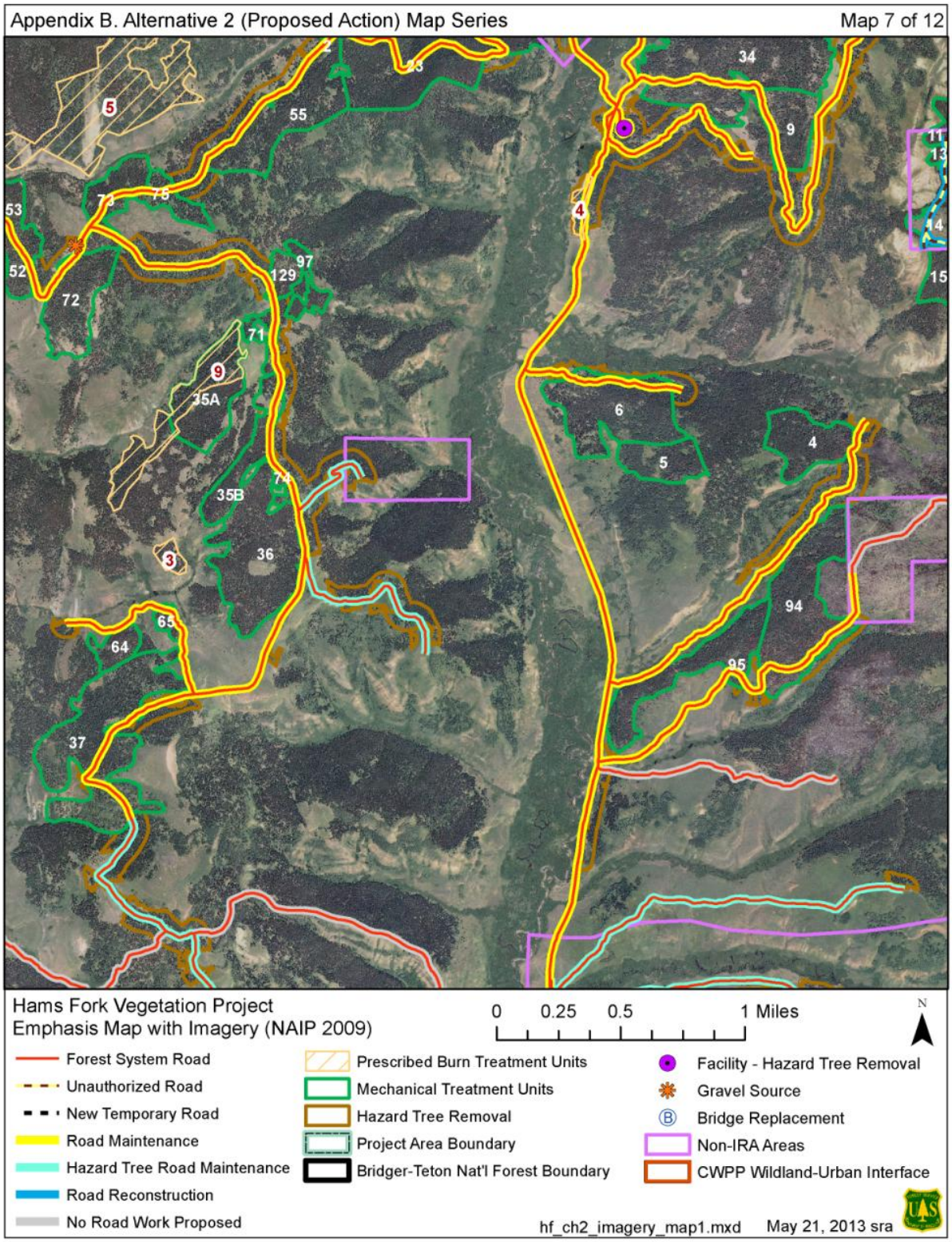
Appendix B. Alternative 2 (Proposed Action) Map Series
Map 7 of 12
Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)
0 0.25 0.5 1 Miles
N
Forest System Road
Unauthorized Road
New Temporary Road
Road Maintenance
Hazard Tree Road Maintenance
Road Reconstruction
No Road Work Proposed
Prescribed Burn Treatment Units
Mechanical Treatment Units
Hazard Tree Removal
Project Area Boundary
Bridger-Teton Nat'l Forest Boundary
Facility - Hazard Tree Removal
Gravel Source
Bridge Replacement
Non-IRA Areas
CWPP Wildland-Urban Interface
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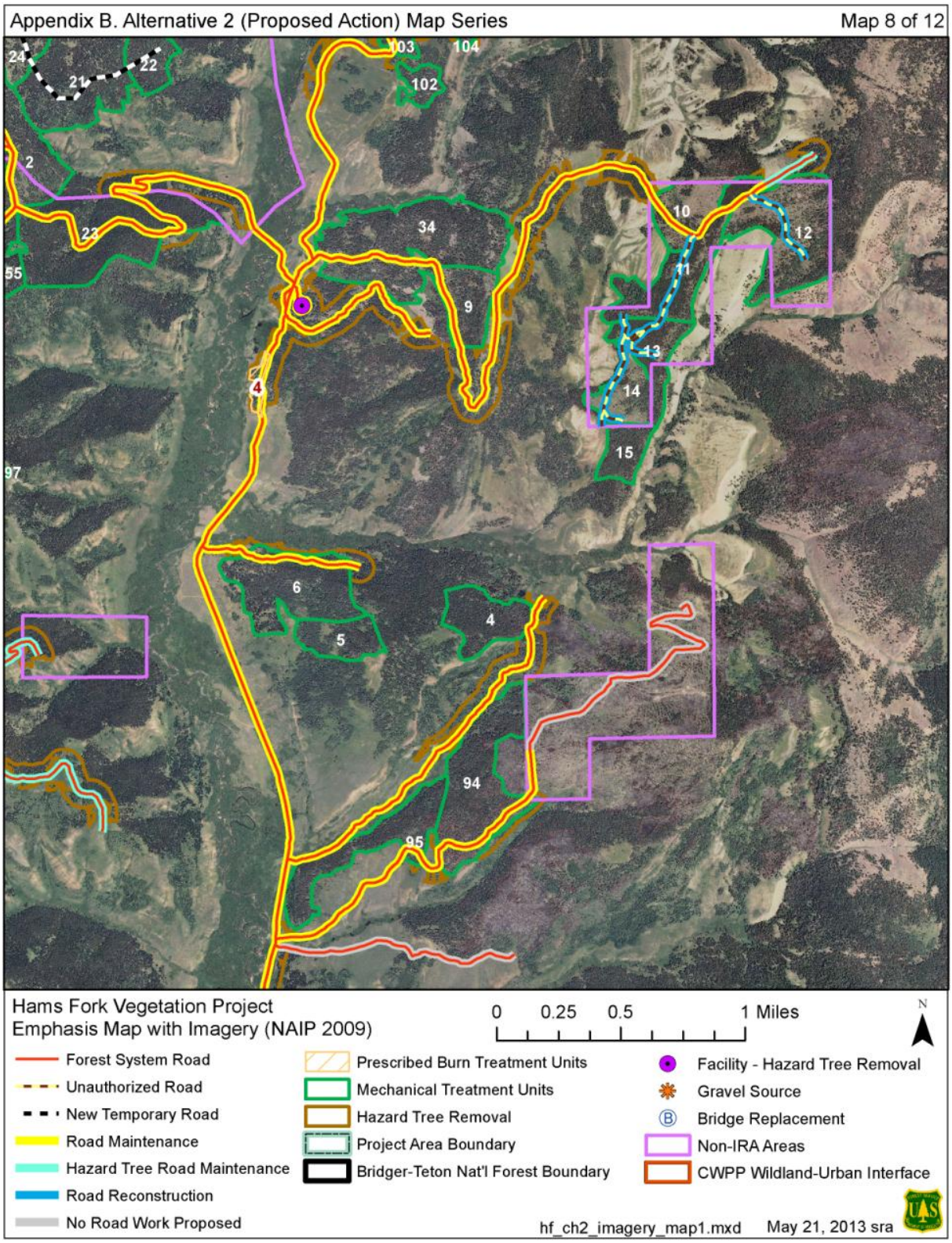
Appendix B. Alternative 2 (Proposed Action) Map Series
Map 8 of 12
24
21
22
103
104
102
2
23
55
34
9
10
11
12
13
14
15
4
97
6
5
4
94
95
Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)
0 0.25 0.5 1 Miles
N
Forest System Road
Unauthorized Road
New Temporary Road
Road Maintenance
Hazard Tree Road Maintenance
Road Reconstruction
No Road Work Proposed
Prescribed Burn Treatment Units
Mechanical Treatment Units
Hazard Tree Removal
Project Area Boundary
Bridger-Teton Nat'l Forest Boundary
Facility - Hazard Tree Removal
Gravel Source
Bridge Replacement
Non-IRA Areas
CWPP Wildland-Urban Interface
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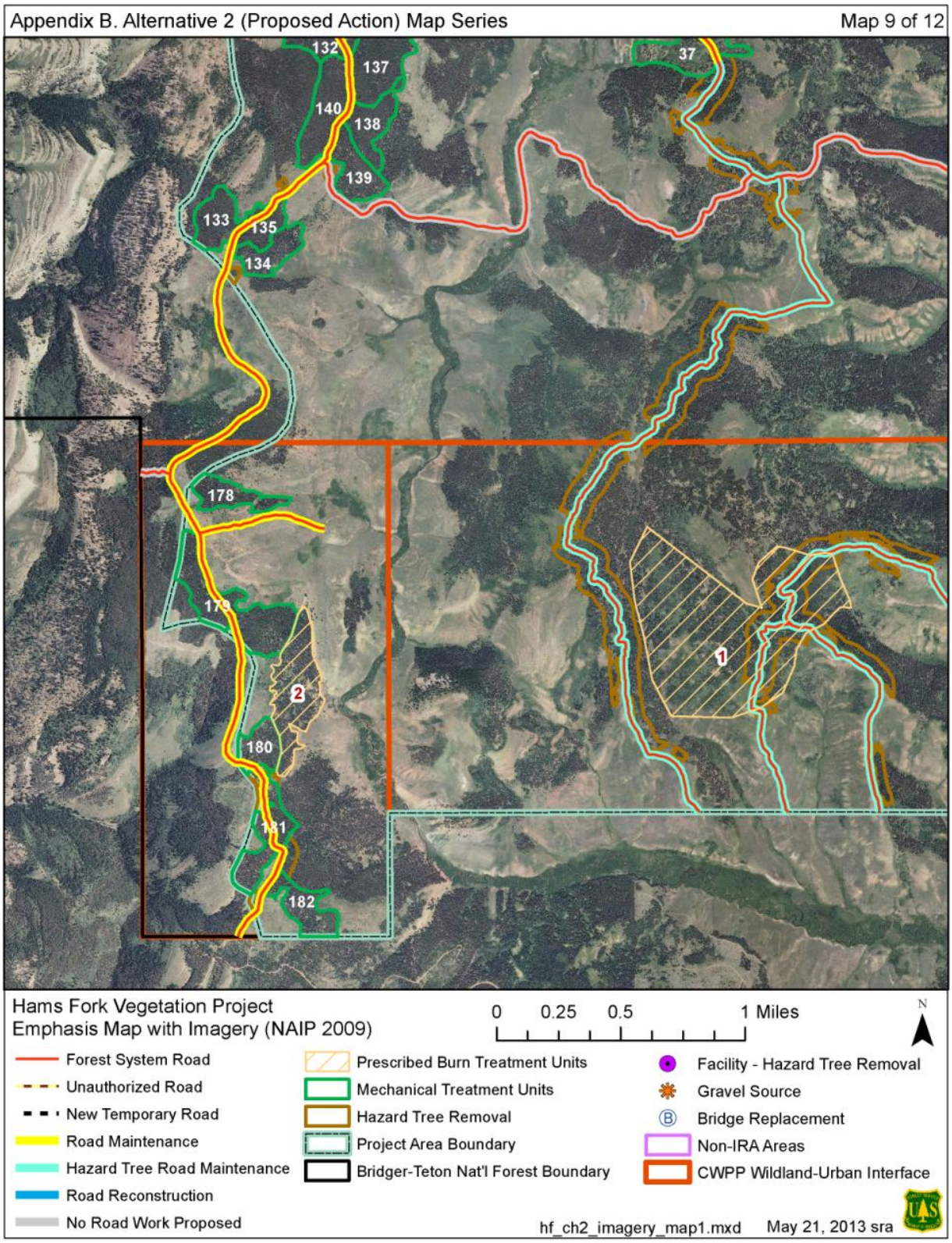
Appendix B. Alternative 2 (Proposed Action) Map Series
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132
137
37
140
138
139
133
135
134
178
179
2
1
180
181
182
Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)
0 0.25 0.5 1 Miles
N
Forest System Road
Unauthorized Road
New Temporary Road
Road Maintenance
Hazard Tree Road Maintenance
Road Reconstruction
No Road Work Proposed
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CWPP Wildland-Urban Interface
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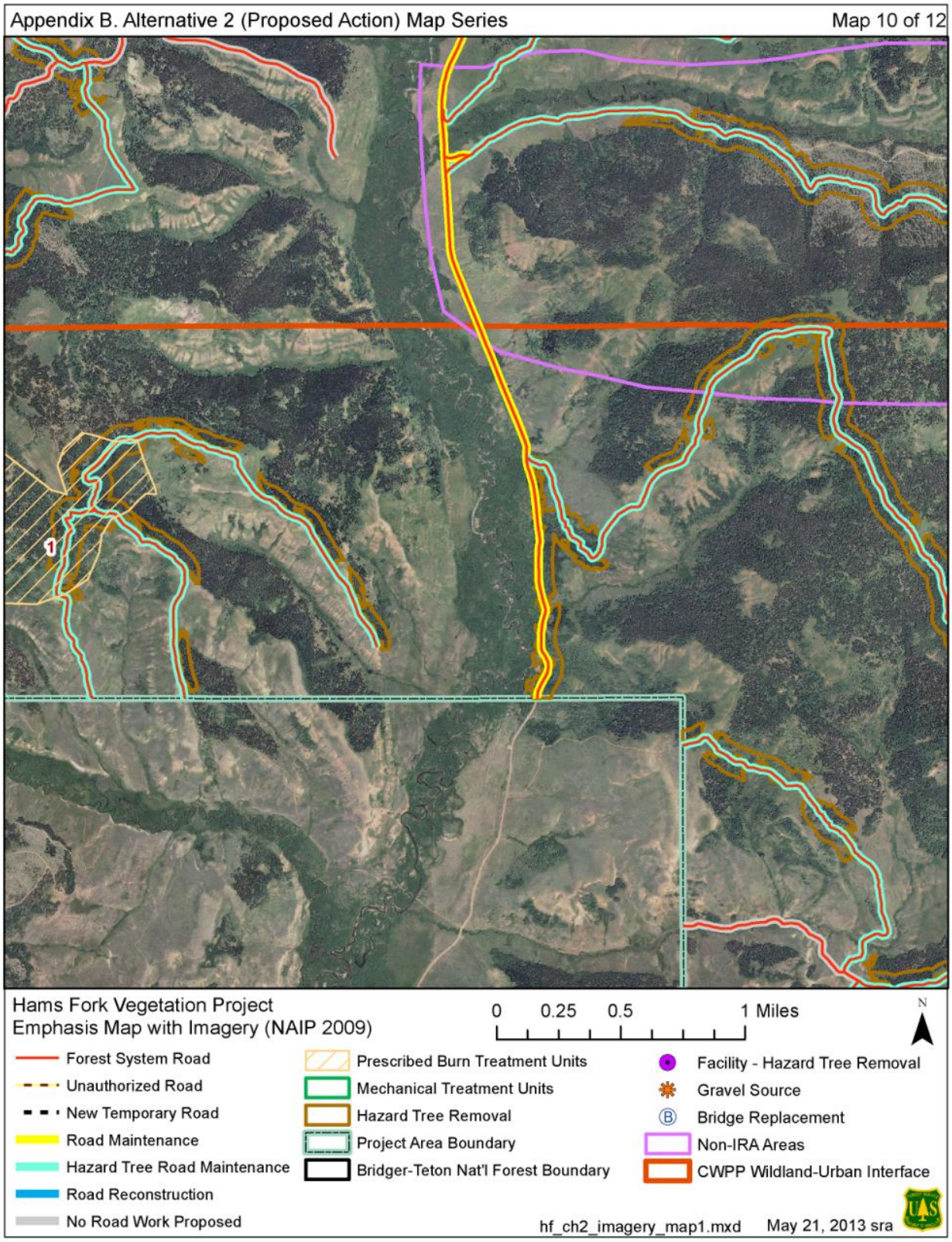
Appendix B. Alternative 2 (Proposed Action) Map Series
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1
Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)
0 0.25 0.5 1 Miles
N
Forest System Road
Unauthorized Road
New Temporary Road
Road Maintenance
Hazard Tree Road Maintenance
Road Reconstruction
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Bridge Replacement
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CWPP Wildland-Urban Interface
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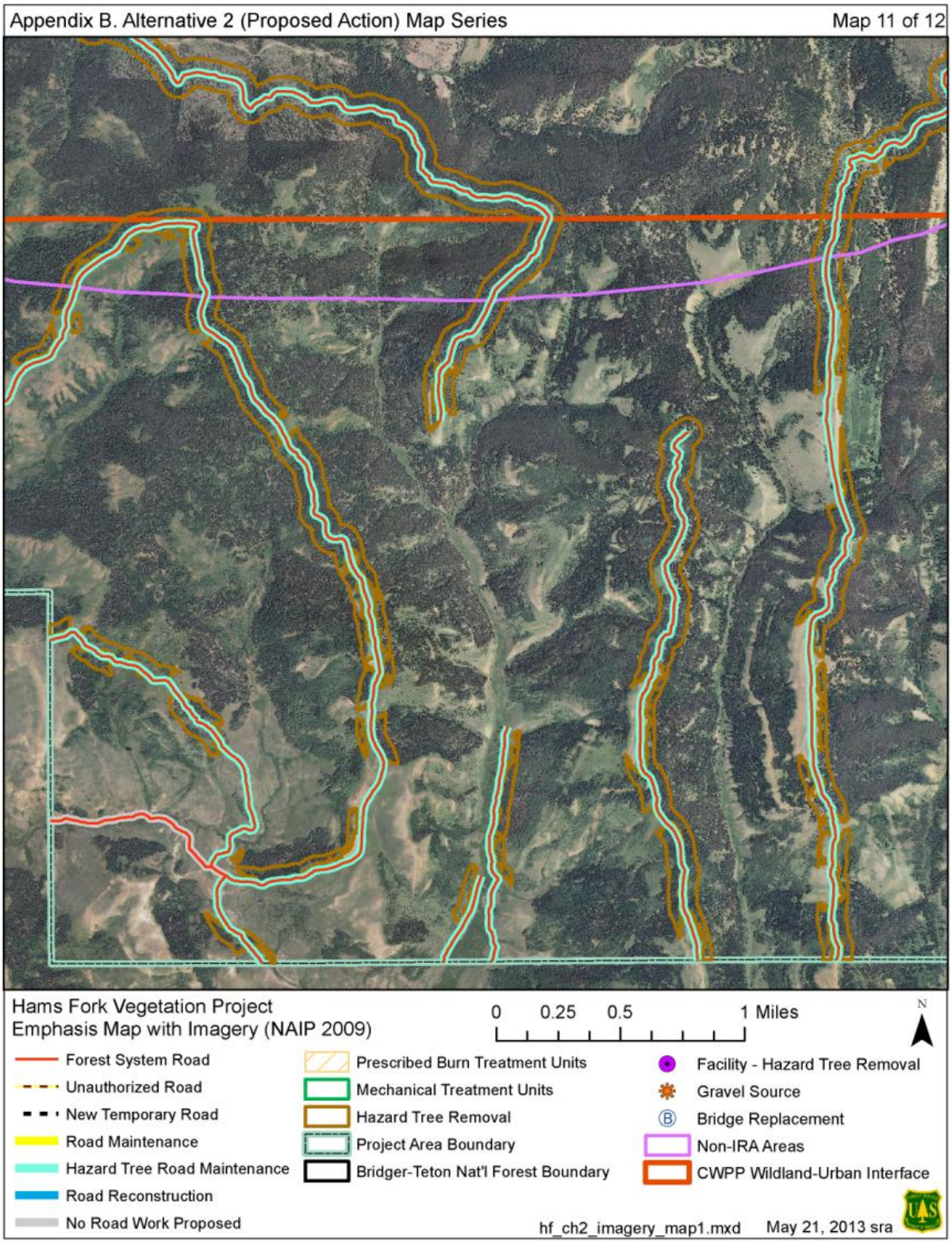
Appendix B. Alternative 2 (Proposed Action) Map Series
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Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)
0 0.25 0.5 1 Miles
N
Forest System Road
Unauthorized Road
New Temporary Road
Road Maintenance
Hazard Tree Road Maintenance
Road Reconstruction
No Road Work Proposed
Prescribed Burn Treatment Units
Mechanical Treatment Units
Hazard Tree Removal
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CWPP Wildland-Urban Interface
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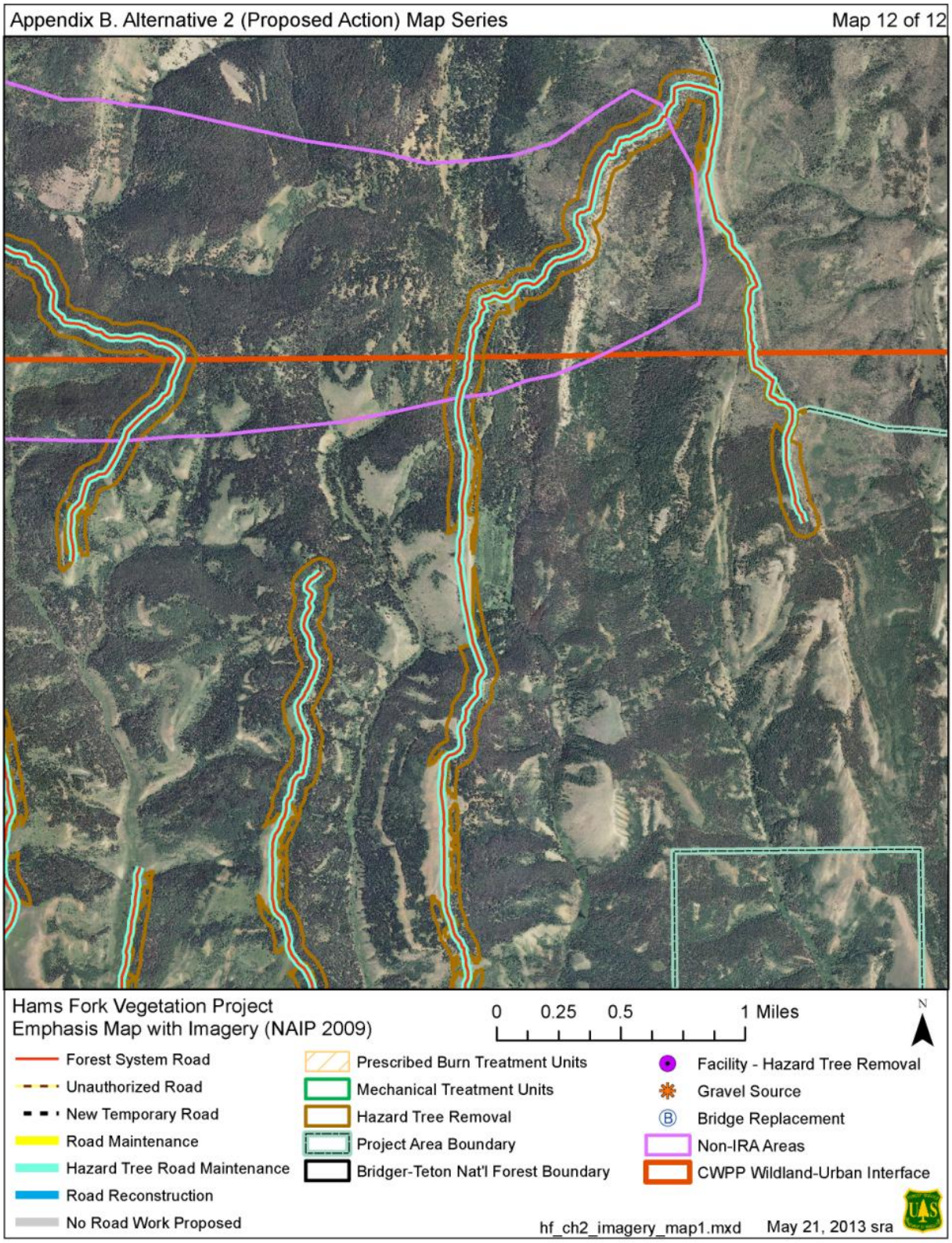
Appendix B. Alternative 2 (Proposed Action) Map Series
Map 12 of 12
Hams Fork Vegetation Project
Emphasis Map with Imagery (NAIP 2009)
0 0.25 0.5 1 Miles
N
Forest System Road
Unauthorized Road
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Road Maintenance
Hazard Tree Road Maintenance
Road Reconstruction
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Appendix C

Description of Silviculture Treatments

Salvage[1] **-** Treatment objective is to remove dead and dying trees due to mountain pine beetles to reduce fuel loading with the secondary benefit of recouping economic value. Dead trees would be felled and removed from the site. 1,773 acres are proposed for this treatment type.

Salvage/Sanitation[2]**-** Treatment objective is to suppress the incidence of dead, dying and infested trees (mountain pine beetle, dwarf mistletoe, comandra blister rust, and other diseases) to reduce fuel loading and enhance the health of the stand with the secondary benefit of recouping economic value. Dead and infested trees would be felled and removed from the site. 1407 acres are proposed for this treatment type.

Salvage/Sanitation/Commercial Thin[2] **–** Treatment objective is to suppress the incidence of dead, dying and infested trees (mountain pine beetle, dwarf mistletoe, comandra blister rust, and other diseases) and reduce overall stand density levels to promote tree vigor and reduce susceptibility to future losses from insect and disease. Removing trees highly susceptible to insect infestation would improve forest health and vigor by reducing stand densities to 80 sq. ft/acre. The treatment would reduce fuel loading while recouping the economic value from the trees on site. Trees would be felled and removed from the site. This treatment would not occur in inventoried roadless areas. 146 acres are proposed for this treatment type.

Salvage/Sanitation/Commercial Thin with Aspen Improvement[2] **–** Treatment objective is to remove dead, dying and infested trees (mountain pine beetle, dwarf mistletoe, comandra blister rust, and other diseases), reduce overall stand density levels to promote tree vigor and reduce susceptibility to future losses from insect and disease, and create healthy stands of aspen with conifer composition of less than 15% .Removing trees highly susceptible to insect infestation would improve forest health and vigor by reducing stand densities to 80 sq. ft./acre.

The treatment would reduce fuel loading and increase stand health while recouping the economic value from the trees on site. Trees would be felled and removed from the site. Conifers within two tree-lengths of aspen trees would be felled to stimulate aspen regeneration. This treatment would not occur in inventoried roadless areas. 174 acres are proposed for this treatment type.

Salvage/Sanitation with Aspen Improvement[2] **-** Treatment objective is to suppress the incidence of dead and infested trees (mountain pine beetle, dwarf mistletoe, comandra blister rust, and other diseases) and to create healthy stands of aspen with conifer composition of less than 15%. Conifers within two tree-lengths of aspen trees would be felled to stimulate aspen regeneration. Trees would be felled and generally removed from the site. 1100 acres are proposed for this treatment type.

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[1] The Northern Rockies Lynx Management Direction has an exception for incidental removal of snowshoe hare habitat in multi-story mature or late successional forests (hare habitat), during salvage harvest. In order to protect the best hare habitat, no treatments were planned in units where horizontal cover averaged more than 48%. To minimize impacts to hare habitat, salvage operations would occur in units that averaged from 35% to 48%; skid trails/landings would be designed to impact less than 10% of the area; and post mechanical slash/fuel treatments would use methods to avoid impacts on the hare habitat. No broadcast or jackpot burning would be conducted.

[2] In order to protect hare habitat, these treatments would only occur in units where horizontal cover measurements averaged less than 35%, because units averaging less than 35% are not considered hare habitat. In these units, skid trails would not exceed 15 percent of the unit. Depending on the amount of timber removed and site conditions, post mechanical slash/fuel treatments may incorporate methods such as: whole tree yarding, lop and scatter, machine pile, hand pile, broadcast burn, jackpot burn, or any other methods to meet resource objectives.

Aspen Improvement[3] **-** The objective of the treatment is to create stands of young healthy aspen with conifer composition of less than 15%. Conifer trees, with the exception of five needle pine, would be felled, treetops may be lopped and scattered to hamper ungulate dispersion and subsequent browsing of aspen suckers and/or saplings. Treatment may include jackpot pile burning or broadcast burning. Aspen would likely dominate the regeneration. 153 acres are proposed for this treatment type.

Clearcut with Reserves[3] – The treatment objective is to regenerate lodgepole pine and maintain a two-aged stand structure through the retention of reserve trees. With the exception of the reserve trees essentially all trees would be removed. Approximately 5-10% of the stand would be retained to mimic islands of trees left following a mixed severity fire. These trees should be left in clumps of a minimum of 2-3 acres for harvest efficiency and windthrow protection. Selection of stands was based on presence of mature lodgepole pine overstory with a subalpine fir understory. Trees would be felled and removed from the site and regeneration would occur by natural means. This treatment would not occur in inventoried roadless areas. 39 acres are proposed for this treatment type.

Patch Clearcut with Salvage/Sanitation[3] **-** A modification of the clearcut regeneration method, clearcut patches up to 10 acres in size would be completed in a portion of the unit to provide regeneration primarily for lodgepole pine. Essentially all of the trees in the patch clearcut would be removed. The remaining portion of the stand surrounding these patches would be treated with: a) salvage to remove dead and dying trees killed by mountain pine beetle, and b) sanitation for dwarf mistletoe, or comandra blister rust in lodgepole pine, both to recover future losses from insect and disease. Trees would be felled and removed from the site and regeneration would occur by natural means. This treatment would not occur in inventoried roadless areas. 175 acres are proposed for this treatment type.

Whitebark Pine Improvement [3] **-** Treatment objective is to reduce competition and release healthy whitebark pine. Conifers other than whitebark pine may be felled for 10 - 15 feet around immature whitebark pine or 30 feet around cone bearing whitebark pine trees. Planting disease resistant white bark pine seedlings in openings would occur to increase regeneration. In addition, salvage treatment of primarily lodgepole pine, and improvement treatments which promote quaking aspen, Douglas fir, and Engelmann spruce may occur where identified and feasible. Trees would be felled and removed from the site. 207 acres are proposed for this treatment type.

Prescribed Fire[3] **-** Fire would be used in aspen and lodgepole pine stands to promote regeneration and age-class diversity of these early successional species. In aspen stands with lower fuel loading, pretreatment (felling or slashing) of conifers may be necessary to increase fire intensity prior to ignition. Regeneration would be provided by natural means and would be monitored for stocking and browsing levels. Ignition methods would vary depending on stand structure and may include drip torch, heli-torch, terra-torch (truck mounted torch) and/or other commonly used and approved ignition devices to accomplish the desire effect. 730 acres are proposed for this treatment type.

[3] In order to protect hare habitat, these treatments would only occur in units where horizontal cover measurements averaged less than 35%, because units averaging less than 35% are not considered hare habitat. In these units, skid trails would not exceed 15 percent of the unit. Depending on the amount of timber removed and site conditions, post mechanical slash/fuel treatments may incorporate methods such as: whole tree yarding, lop and scatter, machine pile, hand pile, broadcast burn, jackpot burn, or any other methods to meet resource objectives.

Hazard Tree Removal[4] – Dead, dying and other hazardous trees would be felled, decked and slash piled and burned or removed within 300 feet from roads. A hazardous tree is any tree that may fail due to a structural defect and, as a result, may cause property damage or personal injury. Tree failure is difficult to predict with certainty due to the complex interaction between a tree and its environment. Every tree will eventually fail; therefore, knowledge of tree species, site characteristics, and local weather conditions and patterns are essential when evaluating tree hazards. A defective tree is hazardous only when its failure could result in damage to something of value. The following tree specific criteria will be used to identify hazardous trees for this project. Any one or more of these criteria will qualify a tree as hazardous.

1. Dead trees of any species

2. Trees with significant defects:
   - Canker rots
   - Root rots
   - Trunk injuries (mechanical damage, stem decay, etc.)
   - Crown defects (broken or damaged branches, forked tops, dead tops, etc.)

3. Dying trees
   - About 1/3 dead/dying plus dead limbs and branches
   - Foliage transparency 40% + (thin crown, off-color or dwarfed foliage)
   - Borer attacks obvious and abundant - the presence of insect activity, such as bark beetles or mountain pine beetles, may indicate that a tree has been weakened by other agents Research shows that dead, mature lodgepole pine trees begin to fall after three years and that the majority of trees fall within 14 years (Mitchell and Preisler 1998).

Hazard tree removal would occur along access roads to Hams Fork treatment units as well as National Forest Transportation System roads open to the public (maintenance levels 2-3) and haul routes closed to the public. Where feasible, the sale of forest products would be employed to help cover the costs of felling and removing hazard trees. Where sale and/or removal are not feasible, hazard trees would be felled to eliminate the danger and left in place or made available to fuelwood permits holders. 2,716 acres are proposed for this treatment type.

Portions of the acres estimated for hazard tree removal may not be implemented if it is not feasible to remove hazard trees because physical land features make access infeasible due to slope, hydrology, soils, and lack of access, and even lack of hazard trees. The areas implemented for hazard tree removal would take these factors into account during treatment layout.

Facility Protection- Dead, dying, diseased and other hazardous tress would be removed to address visitor safety at Big Springs' picnic area and at Hams Fork Campground. An approximate 2-acre area around the Big Springs trail and picnic site would have hazardous trees hand-felled, slash piled by hand, and burned at the site. The trees at Big Spring picnic area are not accessible for forest product removal. Hams Fork Campground is approximately 15 acres (acres included under Hazard Tree Removal treatment) where hazardous trees may be hand-felled and mechanically removed, and the slash piled by hand and burned.

[4] The Northern Rockies Lynx Management Direction has an exception for incidental removal of snowshoe hare habitat in multi-story mature or late successional forests (hare habitat), during salvage harvest. In order to protect the best hare habitat, no treatments were planned in units where horizontal cover averaged more than 48%. To minimize impacts to hare habitat, salvage operations would occur in units that averaged from 35% to 48%; skid trails/landings would be designed to impact less than 10% of the area; and post mechanical slash/fuel treatments would use methods to avoid impacts on the hare habitat. No broadcast or jackpot burning would be conducted.

Appendix D

Design Features for Alternative 2 (Proposed Action)

The project design features are part of Alternative 2, the Proposed Action and are intended to minimize or avoid potential adverse environmental effects while meeting project objectives. As much as possible, design features are site-specific and include rationales for including them in the Proposed Action.

Resource Headings

All Resources (AR)	Roads, Skid Trails, Landings (ROADS)
Cultural Resources (CR)	Sensitive Plants (P)
Fisheries (F)	Silviculture (S)
Fuels Management (FM)	Smoke Management (SM)
Hydrology (H)	Soils (SOILS)
Noxious Weeds (NW)	Visual Quality (VQ)
Range (R)	Wildlife (WL)
Recreation (REC)	

Table 59. Design Features for the Hams Fork Vegetation Project under Alternative 2.

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
All Resources				
AR-1	Resource Protection	Following design features will be attached to the decision document and be made part of all contractual agreements and be adhered to during project implementation.	All units	IDT developed
Cultural Resources				
CR-1	Protect cultural resources.	A cultural resource survey has been conducted in accordance with the 2008 Programmatic Agreement Among the U.S.D.A. Forest Service, Wyoming Forests, Wyoming State Historic Preservation Officer, and Advisory Council on Historic Preservation regarding compliance with the National Historic Preservation Act on the National Forest and Grasslands of Wyoming. All prescribed fire units will be surveyed prior to project implementation. Historic	All units	2008 Programmatic Agreement (Forest Service et al. 2008)

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
		and prehistoric sites that have been determined eligible for the National Register will be avoided by all project activities. Eligible sites will be flagged prior to project implementation to ensure that these sites are avoided and protected.		
CR-2	Protect cultural resources.	If any cultural resource sites are discovered during implementation, all project activities in the vicinity of those resources will cease until evaluation occurs.	All units	36 CFR800.13
Fisheries				
F- 1	Protect Fisheries habitat and water resources	The following would not be allowed within 100 feet of perennial and intermittent streams or wetlands (which includes wet swales, riparian areas, and spring areas): For slopes greater than 25%, refer to H-1 for larger buffer zones. Ground-based harvest equipment, except when on approved roads or on approved temporary crossing structures, Landing construction, Fireline construction with exception of a fire holding concern in which case fireline would be rehabilitated as described in FM-2. Prescribed fire ignition (although fire is allowed in these areas, H4), No pile burning, Machine piling of slash.	All units	*Silviculture Best Management Practices: Wyoming Non-point Source Management Plan* (WDEQ, 2004), *Wyoming Forestry Best Management Practices* (Wyoming State Forestry Division, 2006) brochure, and *Soil and Water Conservation Practices Handbook* (FSH 2509.22, R-1/R-4 Amendment No. 1). Forest Plan Logging in Riparian Area Std p.133, SWA Water Quality Std p.136 (Forest Service 1990)
F- 2	Protect Fisheries habitat	During construction and implementation of roads, landings, and skid trails, install means of sediment filtration where roads, landing, and skid trails, including the toes of fills, are within 100 feet of perennial or intermittent stream channels.	All units	
F- 3	Protect water quality and aquatic resources	No fuel storage or equipment refueling would occur within 150 feet of perennial stream channels or intermittent channels. Where more than five gallons of fuel or other petroleum products are being stored on-site, they would be stored on an impermeable surface to avoid groundwater contamination in the event of a spill.	All units	
F- 4	Protect Fisheries habitat	All new temporary roads would be stabilized (obliterated, recontoured, seeded, and covered—i.e., Elimination Condition 4) after harvest operations. This includes removal of crossing structures and re-establishing natural channel form through crossing sites. Landings will be properly drained and ripped to reduce compaction.	All units	
F- 5	Protect Fisheries	At identified locations, stream /road crossing approaches shall be armored. Roads should not drain directly into streams, placing waterbars above approaches draining into filters	All units	Specialist

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
	habitat	before draining into riparian areas.		
F- 6	Protect Fisheries habitat	If the locations of temporary roads change significantly from their proposed locations-- and in particular if they change to be either near streams or to include channel crossings—additional specialist input, and approval by the Forest Service, will be required.	All units	Specialist
F- 7	Protect Fisheries habitat	Culverts, temporary bridges, or low water crossings will be required on temporary roads at all locations where it is necessary to cross stream channels. These structures will be designed and installed to provide unobstructed stream flow and fish passage and minimize damage to stream channels.	All units	WDEQ (2004) Silviculture Best Management Practices. Wyoming Nonpoint Source Management Plan
F-8	Protect spawning cutthroat trout and fry	No instream work is allowed from May 15th to July 1st on cutthroat trout bearing streams.	All units with cutthroat trout	Specialist
Fuels Management				
FM-1	Reduce activity fuels and protect soils productivity.	Residual slash will be treated on site primarily through pile, jackpot, or broadcast burning, or removed of slash from site. To a lesser extent, residual slash will be lopped and scattered on site. For broadcast burning retain at least 8-10 tons per acre in activity fuels within activity units to provide for consistent coverage of fire.	All Units with prescribed burning or pile burning.	Anderson – 13 Fuel Models
FM-2	Contain fire and protect soils and water resources.	Construct control line as needed to ensure prescribed fire stays within unit boundaries, using minimum impact tactics without compromising safety. Preference should be given to use of existing trails, roads, rock outcrops, barren or wet areas, aspen stands, and areas of low density brush and conifers as needed. All constructed fire line would be cross-drained while in use and rehabilitated when operations are complete to avoid potential for erosion and encourage regeneration. Install water bars as described in H-6.	Prescribed fire units as proposed.	Specialist MIST Tactics
Hydrology				
H-1	Protect water resources.	Unless dictated by safety protocol such as hazard tree removal or holding concerns during fireline construction, implement no ignition\no treatment buffers on live streams or streams with and without riparian vegetation as follows: 0-25% slope use a 100 foot buffer. Percent slope calculate buffer widths as follows: 103 ft plus 3 feet for every one percent side slopes, (Forest Plan Sediment Control Standard, Forest Plan Water Quality Standard, WY BMP	Both sides of all perennial and intermittent	*Wyoming Nonpoint Source Management Plan*, *Silviculture Best Management Practices* (Wyoming

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
		P15, WY BMP P40, Forest Plan Streambank Vegetation Standard-Floodplains, Wetlands and Riparian Areas). If felling of hazard trees is necessary within the buffer, retain whole down trees on the ground unless they pose a risk to stream crossing structures.	streams supporting riparian vegetation for both mechanical treatments and prescribed fire units.	DEQ, 2004) WY BMP P15 and WYBMP P40 and the Forest Plan's Logging in Riparian Area Standard p.133, . Sediment Control Standard p.136, Water Quality Standard p.136 (USDA Forest Service 1990)
H-2	Protect water resources.	Within prescribed no ignition/no treatment buffers, no ground-based harvest equipment will be allowed except when on approved roads or on approved temporary crossing structures.	All mechanical treatment units	Specialist
H-3	Protect water resources.	For any wetlands and ponds, no mechanized equipment or ignition of pile burning should occur within these wetlands. Hand and aerial ignition should be no closer than 100 feet from delineated boundaries of wetland and ponds.	All units	Executive Order 11990 - Protection of Wetlands, Wyoming Nonpoint Source Management Plan, Silviculture Best Management Practices (WDEQ, 2004) WY BMPs 2, 10
H-4	Protect water resources	Back-burning is allowed into prescribed stream buffers or riparian areas but burning should not exceed low-intensity (WY BMP P40, FP Goal 4.3(c)).	All prescribed fire units	WDEQ (2004) WY BMP P40 p. 75, Forest Plan Goal 4.3(c) p.119 (Forest Service 1990).
H-5	Protect water resources	No skid trails within riparian areas (BMP 14.06, WY BMP P3, P6, and P7) unless evaluated/recommended by Aquatic Resource Specialist and approved by the line officer.	All mechanical treatment	Wyoming DEQ (2004) WY BMP P3, P6, and P7

<table>
<tr><th>Design Feature by Resource</th><th>Resource Objective(s)</th><th>Design Feature</th><th>Units/ Location</th><th>Source</th></tr>
<tr><td></td><td></td><td></td><td>units</td><td></td></tr>
<tr><td>H-6</td><td>Protect water resources; minimize surface runoff and sediment transport.</td><td>Install water bars or small earth dams (i.e. soil humps) on temporary roads, landings, skid trails and fire control lines to prevent or minimize the volume of water flowing over these areas and associated erosion. Used to divert surface water to where it will not cause erosion. Can be constructed with a shovel, but mechanical equipment is most common. Spacing recommendations should be based on soil type, topography, road dimensions, road aspect and climate.

Use the following water spacing guide. Spacing is in feet.

Skid Trails and Fire Control Lines
<table>
<tr><th>Grade %</th><th>Granitic or Sandy Soils</th><th>Clay or Loam</th><th>Shale or Gravel</th></tr>
<tr><td>5 - 10</td><td>250</td><td>300</td><td>400</td></tr>
<tr><td>11-25</td><td>150</td><td>200</td><td>300</td></tr>
<tr><td>Over 25</td><td>75</td><td>100</td><td>150</td></tr>
</table>
Temporary Roads and Landings
<table>
<tr><th>Grade %</th><th>Granitic or Sandy Soils</th><th>Clay or Loam</th><th>Shale or Gravel</th></tr>
<tr><td>2 - 5</td><td>400</td><td>500</td><td>600</td></tr>
<tr><td>6-12</td><td>200</td><td>250</td><td>300</td></tr>
</table></td><td>ALL mechanical treatment units</td><td>WDEQ and WSFD 2006, Wyoming Forestry BMP #23, p.30.

WDEQ (2004): Wyoming Nonpoint Source Management Plan, Silviculture Best Management Practices, #40, p. 75</td></tr>
<tr><td>H-7</td><td>Minimize effects of road building and harvesting activities in Riparian Areas.</td><td>Layout of the harvest boundaries and buffers will be conducted when wetlands, channels, and other aquatic features can be identified.</td><td>All units.</td><td>Wyoming DEQ, (2004) WY Silviculture BMP Practice 3: Riparian Area Designation.</td></tr>
</table>

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
Noxious Weeds				
NW-1	To reduce the risk of spreading noxious weeds.	The purchaser will be required to clean all logging and/or construction equipment prior to entry onto the project and/or sale area. This cleaning shall remove all soil and plant parts and material that may carry noxious weed seeds into the project or sale area. Only logging and construction equipment inspected by the Forest Service will be allowed to operate within the sale and/or project area.	All units	Management of Noxious Weeds on Bridger-Teton National Forest EA (USFS. 2005)
Range				
R-1	Protect improvements	Range improvements will be protected.	All units	Specialist
R-2	Protect resources	Vegetation resources will be monitored following prescribed fire(s) to determine if a period of rest from livestock grazing is needed.	All units	Specialist
Recreation				
REC-1	Protect public safety during operations.	Develop safety requirements in timber contracts for all treatment units along roads and trails with an eye toward minimizing restrictions on access while still promoting safety. Notify the public about any temporary closures during implementation. Notification would occur via press releases and on-site signage at District Office, Forest Boundary, and trailheads at least two weeks prior to operations.	All units	Specialist
REC-2	Minimize impacts to recreationists and recreation facilities.	No piles of activity fuels would be placed in roads or trails.	All units	Specialist
REC-3	Minimize impacts to national forest outfitters.	Coordinate with the district trails manager and outfitter and guide permit administrators prior to and during implementation to provide real time information on treatment locations and trail and road closures.	All Units	Specialist
REC-4	Minimize impacts to hunters and	Keep the public informed of active timber harvest, vegetation treatments, and prescribed burns during hunting season (Sept 15 - November 1) through any of the following: press releases, information at district offices, updates to the web and/or postings on Forest	All Units	Specialist

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
	visitors	information boards including maps and the description of the location and type of activities that are occurring to reduce conflicts with recreational use and big game hunting.		
Roads, Skid Trails, Landings				
ROADS-1	Protect soil and water resources, and discourage unauthorized motorized use.	All temporary roads, landings, and skid trails will be rehabilitated and returned to pre-implementation conditions. Rehabilitation measures can include re-contouring surfaces, ripping the surface to reduce compaction, seeding surface with native seed species where bare mineral soil is present, placing slash and other large woody debris along surface to reduce soil erosion, assuring adequate cross-drainage, and effectively closing to OHV use.	All units	Wyoming Forestry Best Management Practices Water Quality Protection Guidelines Specialist
ROADS -2	Protect soil productivity.	Suspend hauling operations if rutting exceeds four inches for a distance greater than 50 feet and skidding if rutting exceeds four inches for a distance greater than 20 feet, until conditions improve.	All haul routes and skid trails	Wyoming Forestry Best Management Practices Water Quality Protection Guidelines, Specialist
ROADS -3	Provide a safe transportation system.	Existing roads used for timber haul shall be maintained or reconstructed to provide proper drainage and safety for all Forest users.	All haul routes	
ROADS-4	Protect visual quality.	Where feasible, construction of skid trails should avoid creating straight-line corridors when the skid trails connect with open system roads and trails. Temporary roads and skid trails will be held to the minimum number, width, and length.	All mechanical units	Specialist
ROADS-5	Protect visual quality.	Temporary roads should avoid following the fall line of the slope and should not be located in swale bottoms as feasible. The alignment should be curvilinear and cut slopes should be less than 5 feet in height.	All units with temporary roads	Specialist
ROADS-6	Resource protection	The staging area for new bridge replacement at Elk Creek should be located on the north side of Elk Creek for resource protection	Elk Creek bridge	Specialist
ROADS-7	Resource protection	No road improvement on the Elk Creek Road (Forest Road 10159) from the Hams Fork Road east for 200 yards for resource protection.	Forest Road 10159	Specialist

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
Sensitive Plants				
P-1	Protect potential habitat for sensitive plant species.	There will be no hand or aerial ignition areas of sparse or alpine vegetation.	All units	Specialist
P-2	To protect sensitive plant species.	There will be no piling on the ridgeline or the upper slopes in the sparsely vegetated forbland.	All units	Specialist
P-3	Site protection	If TES plants are discovered at any time, the botanist will be consulted for the appropriate management of the resource.	All units	Specialist
P-4	Ecological integrity of TES plant habitats	Planting or seeding will include native plant species as recommended by the Forest Service native species policy (FSM 2070). This policy emphasizes the use of native plant seed, whenever possible. Seeding will be used as a reclamation tool only where resource damage would occur without it. Otherwise, sites will be allowed to re-vegetate naturally from the localized adjacent seed source. For the benefit of TES plant habitats, it is required that only native species be used for seeding.	All units	Specialist
Silviculture				
S-1	Protection of conifer and aspen regeneration	Monitoring of regenerated stands will determine need for protection from ungulate damage until the stands meet regeneration criteria. The following protection methods may be employed depending on type of damage. 1. Fence areas receiving damage. Fencing will not be used in known wild ungulate migration routes or in critical winter range. 2. Use a range rider to move cattle from the areas receiving damage. 3. Place salt to entice ungulates away from areas receiving ungulate damage. 4. Defer grazing until the areas meet regeneration criteria. 5. Include an aspen grazing standard in the cattle allotment annual operating plan. 6. Modify the season the areas are grazed. 7. Use a jackstrawing technique, where appropriate as determined by a resource specialist, to protect aspen regeneration from overbrowsing by ungulates.	All units	Forest Plan Reforestation Guideline p. 130

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
		8. Protect vegetation understory in Lynx sensitive areas to maintain suitable habitat requirements.		
S-2		The maximum allowed size of an opening created by application of even-aged management will be 40 acres regardless of forest cover type. Larger openings may result from natural catastrophic conditions such as fire, insect or disease attack, or windstorm.	All mechanical units	Forest Plan Reforestation Guideline p. 130
S-3	Limit mechanical openings in forest habitat to protect big-game hiding cover.	In DFC 10 areas, maximum size of created openings will be 25 acres with an expected average of 15 acres.	Clearcut and patch clearcut units in DFC 10 which total 214 acres. Units:3,17,18,22,26,27,30,31,39,41,42,43,47	Forest Plan Created Opening Size Standard P. 238.
S-4	Protection of seed bearing whitebark pine trees.	Five needle pines will not be cut in the project area.	All units	Specialist
S-5	Whitebark pine regeneration	Following prescribed fire treatments, rust resistant whitebark pine seedlings or seed should be planted in created openings	All WBP Units	Keane, R.E. and Parsons, R.A. 2010
S-6	Protect residual trees.	Burn piles will be located to minimize or avoid damage to residual trees.	All units	Specialist
S-7	Protect old-growth and address human safety	Hazard trees removal will only be conducted for up to 100 feet from roads in designated old-growth stands.	Along open forest system roads with adjacent designated old growth stands	Specialist

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
Smoke Management				
SM-1	Ensure that air quality standards are met.	All burning within the State of Wyoming will comply with the Wyoming DEQ Air Quality Division Standards and Regulations (WAQSR) for Smoke Management as outlined in Chapter 10, Section 4 of the WAQSR and the associated Smoke Management Program Guidance Document.	All units	Wyoming DEQ Air Quality Division Standards and Regulations (WAQSR) for Smoke Management, Ch. 10, Sec. 4 and associated Smoke Management Program Guidance Document.
SM-2	Provide timely notification of planned ignitions.	The general public, private landowners adjoining the project area, and others specified in the burn plan will be notified at least one week prior to ignitions taking place. At a minimum, this will be accomplished through press releases and as appropriate though public meetings.	All prescribed fire units	Specialist
SM-3	Ensure that air quality standards are met.	Implement Best Available Control Technologies (BACT) during prescribed burning operations to limit emissions to the extent possible. Techniques and methods may include, but are not limited to: scheduling burn periods; applying dispersion forecasts; fuel preparation and configuration; limiting the amount of burning; and using ignition and burning techniques that minimize smoke production.	All prescribed fire units	Wyoming DEQ Air Quality Division Standards and Regulations (WAQSR) for Smoke Management,
SM-4	Ensure that air quality standards are met.	To minimize the negative effects of smoke and associated pollutants on visibility and human health, smoke management plans are required as part of every prescribed fire implementation project. Complete a prescribed burn plan prior to any burning that includes mitigation measures to minimize smoke impacts and to comply with state and Federal air quality regulations. Monitor mitigation of smoke-related impacts caused by prescribed fires in accordance with WDEQ-AQD regulations.	All prescribed fire units	Wyoming DEQ Air Quality Division Standards and Regulations (WAQSR) for Smoke Management,
Soils				
SOILS-1	Reduce erosion	Maintain ground cover at 60 percent or higher following harvest. Scatter slash and debris across unit as evenly as possible.	All units	WDEQ(2004): Practices #40, p. 75
SOILS-2		Avoid placing skid trails on slopes greater than 25 percent.	All units	Specialist

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
	Minimize erosion potential to maintain soil productivity.			
SOILS-3	Minimize erosion potential to maintain soil productivity	Designate landings on slopes less than 12 percent.	All units	Specialist
SOILS-4	Maintain soil productivity and reduce compaction and erosion	Sub-soil (i.e., rip the surface 4-6 inches) skid trails and log landings to reduce compaction. Place slash and woody material on soil surface to prevent erosion.	All units	Avoidance of Soil Forest Plan Standard: Avoidance of Productivity Loss Standard p. 132
SOILS-5	Maintain soil productivity	Skid trails will be designated and not exceed 15 percent of the unit in area (USDA Forest Service 2003). See WL-5 for salvage units and hazard tree removal areas, skid trails and landings not to exceed 10 percent of the unit.	All units except salvage units and hazard tree removal areas	Specialist
SOILS-6	Maintain soil productivity and reduce erosion	Monitor the fire severity post prescribed burn to determine areas of high burn intensity to implement any erosion control needs.	All units	Specialist
SOILS-7	Maintain soil productivity and reduce erosion	Burn when soil moisture contents are relatively high to minimize overheating of soils.	All units	Specialist
SOILS-8		Maintain 5 to 10 tons per acre of down woody debris (slash) to maintain soil productivity	All units	Specialist; Graham et al 1998

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
SOILS-9	Protect Soil Productivity	On soils that are classified as Stable/Marginally Stable/Marginally Unstable on slopes greater than 40 percent but less than 55 percent, logs will be yarded by raising one end of the log (preferably the butt end).	All units	Forest Plan Standard: Silvicultural System Restriction Standard p.129
SOILS-10	Protect Soil Productivity	Mechanical treatments will be avoided on soils that are classified as Marginally Unstable on slopes greater than 55 percent, or soils classified as Unstable on slopes greater than 40 percent.	All units	Forest Plan Standard: Silvicultural System Restriction Standard p.129
SOILS-11	Protect soil productivity, reduce rutting and compaction	Ground based activities should occur on dry or frozen soils to avoid compaction or rutting. This is especially important on sensitive soils	All units	Specialist
SOILS-12	Protect soil productivity, maintain slope stability	Openings will be limited to 2 acres or less on soils classified as unstable on slopes less than 40 percent. No openings will occur on slopes greater than 40 percent.	All units	Forest Plan Standard: Silvicultural System Restriction Standard p. 129
Visual Quality				
VQ-1	Protect visual quality.	Tree stumps created during thinning operations outside of roadless areas would be a maximum height of 12 inches on flat ground or four inches on the uphill side of the stump on slopes.	All mechanical treatments outside the roadless area	Specialist
VQ-2	Protect visual quality.	Tree stumps created during thinning operations inside of roadless areas should be less than 6 inches in height.	All mechanical treatments inside the roadless area	Specialist
VQ-3	To protect the	Coordinate with the Forest Landscape Architect during contract development. Equipment	Foreground	Specialist

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
	scenic integrity.	will be removed at the time of project completion.	Retention and Roadless Area	
VQ-4	To protect the scenic integrity.	When located within 150 feet of roads, unit boundaries and tree markings shall be painted on the side facing away from viewer or marked with flagging as appropriate.	All units	Specialist
VQ-5	To protect the scenic integrity.	For perimeter control in prescribed fire units, avoidance of long, straight lines is desirable, if situation-appropriate.	Retention and Partial Retention	Specialist
VQ-6	To protect the scenic integrity.	To lessen the visibility of slash by the Forest visitor, pile and burn or remove construction and harvest generated slash within 300 feet of the main road (Forest Development Road #10062)	All units along FDR 10062	Specialist
Wildlife				
WL-1	Protect TES species. Minimize or avoid adverse impacts on TES habitat.	If Threatened or Endangered species are discovered at any time, the District Wildlife Biologist will be consulted for the appropriate management or mitigation, including site avoidance and/or timing restrictions.	All	Forest Plan - Sensitive Species Management Standard, Fisheries and Wildlife Prescription. Endangered Species Act
WL-2	Minimize or avoid adverse effects to lynx habitat. Guide selection and implementation of treatment units.	If, prior to completion of project implementation, more than 30 percent of the lynx habitat (i.e. forested areas) in a Lynx Analysis Unit (LAU) is in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat (i.e. early seral stage), no additional habitat may be regenerated by vegetation management projects. Stand initiation structure may be created due to unplanned natural events such as wildfire and wind, or management actions on lands outside of national forest jurisdiction.	All forested areas in LAU. Salvage[1] and Hazard Tree treatment will not be counted towards the 30 % of	NRLMD VEGS1, Endangered Species Act

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
			lynx habitat.	
WL-3	Minimize or avoid adverse effects to lynx habitat. Guide selection and implementation of treatment units.	Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS lands within an LAU in a 10-year period.	All forest treatments except for Salvage and Hazard Tree Areas	NRLMD VEGS2, Endangered Species Act
WL-4	Minimize or avoid adverse effects to lynx habitat. Guide selection and implementation of treatment units.	No pre-commercial thinning that reduces snowshoe hare habitat is allowed, except in six exceptions. The only exception that applies to this project is: "6. To restore whitebark pine."	No pre-commercial thinning, except for whitebark pine restoration Units 112, 115, 116, 117, 118, 119	NRLMD VEGS5, Endangered Species Act
WL-5	Minimize or avoid adverse effects to lynx habitat. Guide selection and implementation of treatment units.	Do not conduct vegetation treatments that reduce snowshoe hare habitat in multi-story mature or late successional forests (i.e., hare habitat with horizontal cover of ≥48%). Limit vegetation treatments in moderate quality snowshoe hare habitat (35-47% horizontal cover) to salvage operations, including hazard tree removal. Skid trails/landings in salvage units will be designed to impact less than 10% of the area; and post-mechanical slash/fuel treatments will use methods to avoid impacts on the hare habitat. No broadcast or jackpot burning will be conducted in salvage units. An exception is for hazard tree removal within 100 feet of open system roads, as the purpose of this treatment is for public safety. Within 100 feet of open system roads, hazard trees would be removed in some forested areas having ≥48% horizontal cover, but the maximum 10% footprint would be required to minimize impacts. This exception does not apply to the zone from 100 to 300 feet from roads. In this zone, hazard tree removal would not take place unless horizontal cover is demonstrated to be <48%.	All units	NRLMD VEGS6, Endangered Species Act, Berg 2010
WL-6	To provide habitat	Meet requirements of the Habitat Effectiveness Standard by maintaining open-road densities of ≤1 mile of road per square mile (in DFC 10) and less than ≤ 0.25 miles of road	All roads and units	Forest Plan – Habitat

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
	effectiveness in key wildlife areas through regulation of vehicle traffic.	per square mile (in DFC 12). To meet the rigors of current science, miles of "road" for purposes of habitat effectiveness includes all roads and motorized trails used by motorized vehicles. A habitat effectiveness analysis and habitat security analysis would be run to determine if any additional mitigation (e.g., seasonal closures) may be needed in DFC 10 and 12 areas. Harvest and burning operations requiring motorized access will only be allowed from July 1 to September 30 on Route numbers 10161, 10224, 10200, and east half of 10063.	as applicable (e.g., Units: 4, 94, 102,103,104,106,107,108,112, 115, 116, 117, 118, 119, 120,186,187)	Effectiveness Standard (USDA Forest Service 1990 p. 124), Road Management Standard (pp. 239, 246); Hiding and Security Cover Guideline (pgs. 235, 243). Kemmerer Ranger District motor vehicle use map.
WL-7	Protect big-game crucial winter range from disturbance. Only moose CWR is in the project area.	Big-game Winter Range Standard – "Human Activity and disturbance in crucial big-game winter range will be restricted from November 15 to April 30 if big-game are present in the area." Follow current Special Orders that restrict human access to areas in the Hams Fork Project Area. The District Wildlife Biologist may work with the WGFD to grant exceptions on a case-by-case basis if they determine the activity will not cause harm to wintering moose, or will provide long-term benefits that outweigh the short-term impacts. Activities that equate to actions available to the public, involving non-mechanical short-term human presence, or limited to open roads and landings, are not restricted; e.g. loading, hauling, road maintenance, surveys and marking on foot are allowed .	Units that fall within WGFD designated CWR which totals 2,137 acres. See BTNF 2011 Special Order Number 04-03-303	Forest Plan – Big-game Winter Range Standard. (USDA Forest Service 1990 p. 124)
WL-8	Protect elk calving habitat. Minimize or avoid adverse impacts on elk calving grounds.	Elk Calving Area Standard – "Human activity and disturbance will be restricted in elk calving areas from May 15 - June 30 if elk are present in the area." Follow current Special Orders that restrict human access to areas in the Hams Fork Project Area. Wildlife Biologists may work with the WGFD to grant exceptions on a case-by-case basis if they determine the activity will not cause harm to calving elk, or will provide long-term benefits that outweigh the short-term impacts.	Units that fall within WGFD designated Elk Calving which totals 2,447 acres. See Current	Forest Plan - Elk Calving Area Standard (USDA Forest Service 1990 p. 124)

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
			Special Order Number 04-03-303	
WL-9	Protect elk calving areas.	Big-Game Habitat Guideline – "…maintain about 30 percent of the brush/grassland range in a brush/forb type, emphasizing maintenance of the aspen or conifer/brush vegetation type." Units 2,3,4,5,6,9,10,11,12,13,14,15,16,17,18,20,21,22,23,24,26,27,28,29,30,31,32,34,36,37,50,51,52,53,55,64,72,73,94,95,97,102,103,104,106,107,108,112,115,116,117,118,119,120,130,131,132,133,134,135,137,138,139,140,141,142,143,145,146,147,148,149,150,151,152,154,155,156,162,163,164,166,174,175,178,179,180,181,182,186,187, 188	See design feature column	Forest Plan, Big Game Habitat Guideline p. 236
WL-10	To protect important elk wallow complexes from disturbance.	Elk Wallow Standard – "Trail and open road locations will be designated and managed to protect elk wallow complexes." Roads will be designed to avoid active elk wallow complexes. All temporary roads will be reclaimed and closed to vehicle traffic after operations are complete.	All new temporary roads, approximately 4 miles.	Forest Plan - Elk Wallow Standard p. 124
WL-11	Minimize adverse impacts on cavity-nesting, snag-roosting, species, and bark-gleaning birds; and to species using down woody material (e.g., small mammals, snowshoe hares), which	• For 6 to 20-acre non-contiguous treatment units adjoining forestland that meets the Snag Habitat Guideline, maintain an average of ≥1 snag/acre clustered together in groups, with 1 group for every 5 acres (approximately). • For 6 to 20-acre treatment units that do not adjoin forestland that meets the Snag Habitat Guideline and for contiguous treatment units totaling > 20 acres combined, maintain an average of ≥3 snags/acre clustered together in groups, with 1 group for every 3-5 acres (approximately). • For all treatment units >5 acres: (1) ≥75% of retained snags must be Douglas fir or Engelmann's spruce (highest priority), or subalpine fir, to the extent pre-treatment composition includes large trees of these species; (2) ≥25% of retained snags must be in the largest dbh class in the unit, based on pre-treatment conditions; and (3) all retained snags must be ≥10 inches. • The District Biologist will be notified and given the opportunity to mark suitable snags that adhere to the above criteria and that meet wildlife needs during unit layout.	All mechanical treatments especially in DFC 10 and 12 areas, and except for Hazard Tree Areas	Harris 1999, Brown 2003, Hardy 2000, Bunnel 2002 Thomas et al. (1979) Bull et al. (1997) Self (2001) Butler et al. (2004)

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
	provide prey.			
WL-12	To minimize adverse impacts on wildlife species requiring coarse woody material, and to provide for future forest habitat (e.g., soil inputs).	Retain a minimum of 10-15 tons per acre of coarse wood material in all harvest/treatment units, with ≥75% of this tonnage consisting of logs that are ≥12 inches at the large end. "…Dead and down woody material will not exceed an average depth of 18 inches. An average of 2 dead or cull-leaning trees per acre during the mature stage will be sought. To be acceptable, leaning trees will be greater than 8 inches in diameter and 40 feet in length, and will be lodged in adjacent trees." "Two or more brush piles about 10 feet across and 7 feet high per acre may also be retained."	All mechanical treatments especially in DFC 10 and 12	DFC 10 & 12 Dead and Down Large Woody Material Standard Pgs. 236 and 244 Thomas et al. (1979) Sikkink et al. (2009)
WL - 13	Retain recruitment snags for cavity nesting species within Salvage areas.	Any live trees incidentally damaged during salvage operations are to be left on site.	All Salvage units.	Harris 1999, Brown 2003, Hardy 2000, Bunnel 2002
WL-14	To protect nesting migratory birds, nests, eggs, and chicks. Minimize or avoid adverse effects to migratory birds.	During the primary nesting season (May 15 to July 20) activities that physically alter or remove nesting habitat will be restricted; e.g. burning or harvesting trees. The District Wildlife Biologist may work with the USFWS to grant exceptions on a case-by-case basis if they determine the activity will not cause harm to nesting birds, or will provide long-term benefits that outweigh the short-term impacts. Activities open to the public, involving short-term human presence, or limited to open roads and landings, are not restricted; e.g. loading, hauling, road maintenance, surveys, and marking would be allowed.	All	Migratory Bird Treaty Act (MBTA), 2008 MOU between USFS and USFWS to protect migratory birds, consultation with WGFD. Region 4 Migratory Bird Resource Synthesis (2012)
WL-15	Avoid take of nesting owls and cavity nesters that may breed	Do not conduct mechanical operations or prescribed fire operations between January 15th and May 15, unless pre-implementation territory and nest searches are conducted. Where detected, nest sites will be identified and avoided according to the conditions. The District Wildlife Biologist may work with the USFWS to grant exceptions on a case-by-case basis if they determine the activity will not cause harm to nesting birds, or will provide	All	MBTA, 2008 MOU between USFS and USFWS to protect migratory birds, consultation

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
	earlier than other migratory birds.	long-term benefits that outweigh the short-term impacts.		with WGFD.
WL-16	To minimize or avoid adverse effects to nesting goshawks and great gray owl; and to protect their nests, eggs, and chicks.	No vegetation treatments will be allowed within a 40 acre perimeter around known active goshawk/great gray owl nests (with the nests roughly in the center of the 40 acres), and no vegetation treatment activities will be allowed within a 0.5-mile radius (minimum of 420 acres) from known active goshawk/great grey owl nests from March 1 through August 15. “Known-nests” include those that are found prior to sale of timber.	All	MBTA, FS Sensitive Species, Moose-Gypsum EIS, Wyoming Game and Fish Department, Reynolds et al. 1992, Graham et al. 1999, and site-specific conditions.
WL-17	To minimize or avoid loss of habitat, altered hydrology, reduced water quality, barriers to movement, reductions in forested veg. quality, soil compaction, crushing of individual adults and juvenile frogs and toads.	No new temporary roads, new permanent roads, or road widening, and no timber harvest or mechanical treatment (except possibly aspen regeneration treatments with timing restrictions) within 100 feet of amphibian breeding sites.	All units	Forest Plan Objective 3.3(a); Sensitive Species Management Standard; references to scientific information in report for sensitive amphibian report.
WL-18	To minimize or avoid loss	To the greatest extent possible, no new temporary roads, new permanent roads, or road widening (1) within 200 yards of spotted frog and boreal toad breeding sites, and (2) within	All units	Forest Plan Objective 3.3(a);

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
	of habitat, altered hydrology, reduced water quality, barriers to movement, reductions in forested veg. quality, soil compaction, crushing of individual adults and juvenile frogs and toads.	100 ft. of riparian areas within 1/3 mile of breeding sites. If vegetation treatment occurs within 100 ft. of riparian areas, a minimum of 20 dead/live trees (≥10 inches) need to be retained per acre.		Sensitive Species Management Standard; references to scientific information in report for sensitive amphibian report.
WL-19	To minimize or avoid loss of habitat, altered hydrology, reduced water quality, barriers to movement, reductions in forested veg. quality, soil compaction, crushing of individual adults and juvenile frogs and toads.	Avoid the use of off-road heavy equipment, including skidders, within 1/3-mile of amphibian breeding sites prior to June 30. Additional timing restrictions may be needed within 200 yards of spotted frog and boreal toad breeding sites (e.g., to avoid dispersal period of froglets and toadlets).	All units	Forest Plan Objective 3.3(a); Sensitive Species Management Standard; references to scientific information in report for sensitive amphibian report.
WL-20	Minimize Disturbance	Activity Management Guideline — “All management activities should be concentrated to within the shortest period of time and to the smallest possible area at a time” (pgs. 234 and 243 of Forest Plan). To meet this guideline, which is important for minimizing disturbance to	All units	Activity Management Guideline (Forest Plan pgs. 234 and

Design Feature by Resource	Resource Objective(s)	Design Feature	Units/ Location	Source
	of Wildlife	a range of wildlife species (including elk, mule deer, moose, goshawks, and great gray owls), a minimum of seven compartments would be established and mechanical treatment would only take place in one compartment at a time.		243), Scientific information in the Biological Evaluation and Wildlife Report
WL-21	Minimize or avoid adverse effects to lynx habitat. Guide selection and implementation of treatment units.	Hazard trees would be removed (salvage treatment) within 300 feet of roads except that forestland having ≥48% horizontal cover 100-300 feet from roads would not be treated.	Hazard tree removal treatment	Specialist
WL-22	Avoid to extent possible or minimize impacts on grizzly bears	For all people implementing the project, there will be requirements for maintaining clean camps, proper food storage and garbage disposal measures, and personal safety measures in bear country. In addition to these requirements, workers involved with timber harvest activities will be educated about the protected status of grizzly bears, importance of proper food storage and garbage disposal in bear country, and appropriate human behavior in bear country	All units	Consultation with U.S. Fish and Wildlife Service

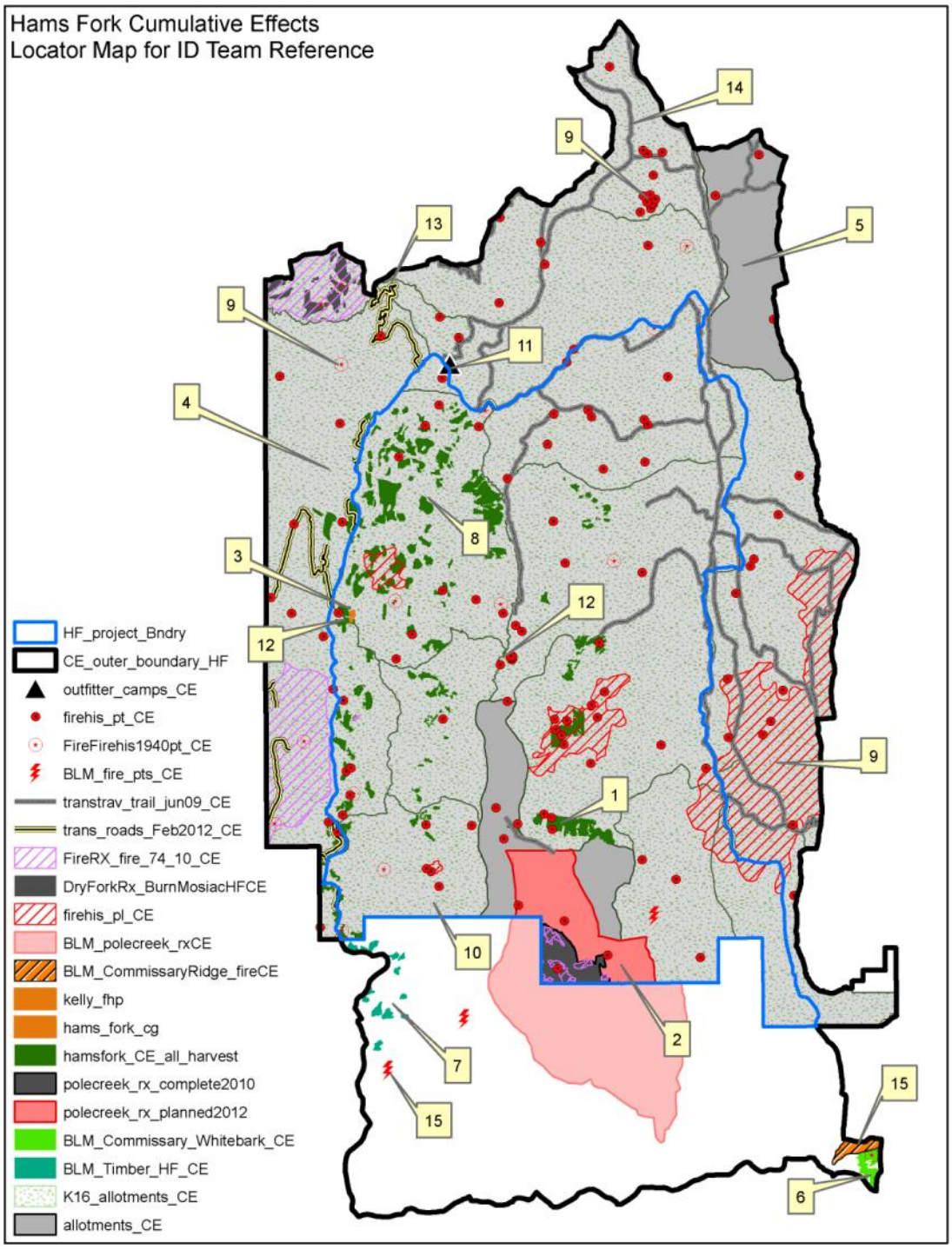
Appendix E

Past, present, and reasonably foreseeable future activities considered for the cumulative effects analysis.

Map ID#	Project Name	Units	Type	Actions	Implementation	Jurisdiction	Map Comments
1	East Fork Salvage & Sanitation (CE) (East Fork II Timber Sale)	Formally 169 acres / Updated = 156 ac (250 ac in NEPA)	Salvage/ Sanitation	Mechanical Thinning	First contract defaulted / Was re-offered and awarded under new contract	FS	Inside project boundary
2	Pole Creek Prescribed Burn (CE)	Approx. 3000 acres FS / 7500 acres BLM/State	Fuels Reduction/ Wildlife Habitat	Rx Fire 30-60% aspen, bug-infested conifer, grass-sage meadows	Started in 2010. Completion expected 2012-2014	FS/BLM/State	inside & outside project boundary
3	Kelly Guard Station Fuels Reduction (Admin Auth)	50 acres	Fuels Reduction	Mechanical Thinning	Complete 2011	FS	inside project boundary
4	Kemmerer Grazing & Rangeland Vegetation Management (EIS)	121,124 acres / 13 sheep allotments	Grazing Management	Continual livestock grazing with adaptive management	On Hold	FS	inside & outside project boundary
5	Kemmerer Grazing	133,004 acres	Grazing Management	Livestock Grazing	Indefinitely	FS	inside & outside project boundary

Map ID#	Project Name	Units	Type	Actions	Implementation	Jurisdiction	Map Comments
6	BLM Commissary Ridge Whitebark Pine	183 acres	Vegetation Restoration	Mechanical Thinning	Scheduled 2012+	BLM	outside project boundary
7	BLM all timber treatments	219 acres	Restoration	Mechanical Thinning	1981-1993	BLM	outside project boundary
8	Kemmerer historical timber treatments	3543 acres (some overlapping)	Various	Various mechanical treatment methods	1965-2009	FS	inside & outside project boundary
9	BTNF historical wildfires	15 fires / 118 fires / 9563 acres	Wildfire	Suppression/Fire Use	1940-2010	FS	outside project boundary
10	Kemmerer RX fires	6283 acres of NEPA boundaries	Various	Prescribed Fire	1995-2010	FS	inside & outside project boundary
11	Outfitters and Guides Camp Locations	1 camp	Special uses	Special Uses	Indefinitely	FS	outside project boundary
12	Administrative Sites Forest Health Protection Projects	24 acres	Forest Health / Hazard Tree Removal	Mechanical Sanitation / Slashing / Piling/ Carbaryl and Verbenone applications	2006 - Ongoing	FS	inside project boundary
13	Hazard Tree - Forest-Wide (CE/EA)	22 miles / All open system roads level 2-5	Safety	Roadside Hazard tree removal - 100ft	On hold or Cancelled	FS	outside project boundary / Not in SOPA yet

Map ID#	Project Name	Units	Type	Actions	Implementation	Jurisdiction	Map Comments
14	FS Trail Maintenance	101 miles / All Trails	Recreation	Trail Maintenance/ Reconstruction	Indefinitely	FS	inside & outside project boundary
15	BLM historical fires	4 fires / 182 acres	Wildfire	Suppression	1985-2002	BLM	outside project boundary


Hams Fork Cumulative Effects
Locator Map for ID Team Reference
HF_project_Bndry
CE_outer_boundary_HF
outfitter_camps_CE
firehis_pt_CE
FireFirehis1940pt_CE
BLM_fire_pts_CE
transtrav_trail_jun09_CE
trans_roads_Feb2012_CE
FireRX_fire_74_10_CE
DryForkRx_BurnMosiacHFCE
firehis_pl_CE
BLM_polecreek_rxCE
BLM_CommissaryRidge_fireCE
kelly_fhp
hams_fork_cg
hamsfork_CE_all_harvest
polecreek_rx_complete2010
polecreek_rx_planned2012
BLM_Commissary_Whitebark_CE
BLM_Timber_HF_CE
K16_allotments_CE
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