United States Department of Agriculture

Telegraph Vegetation Project

Final Environmental Impact Statement

Volume II – Part 2 of Chapter 3, Chapter 4, Glossary, Literature Cited, and Index

Forest Service | Helena-Lewis and Clark National Forest | Helena Ranger District | April 2016

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TELEGRAPH VEGETATION PROJECT
Final Environmental Impact Statement
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Abstract: This final environmental impact statement (EIS) considers four alternatives in detail. Alternative 1 is the no-action alternative, which provides a baseline for comparing the magnitude of environmental effects of the action alternatives. Alternative 2 would treat approximately 6,754 acres in the project area with a combination of intermediate harvest (434 acres), precommercial thinning (1,786 acres), regeneration harvest (3,484 acres), and prescribed fire (1,050 acres). Connected actions for alternative 2 would include 8.5 miles of temporary road construction (followed by full obliteration), 43.1 miles of road maintenance, 32.6 miles road reconstruction, and improvement of 6 road/stream crossings. Alternative 3 would treat approximately 4,185 acres in the project area with a combination of intermediate harvest (434 acres), precommercial thinning (1,289 acres), regeneration harvest (1,856 acres), and prescribed fire (606 acres). Connected actions for alternative 3 would include 3.4 miles of temporary road construction (followed by full obliteration), 41.8 miles of road maintenance, 28.7 miles of road reconstruction, 32.8 miles of road decommissioning, and improvement of 9 road/stream crossings. Alternative 4 (Preferred Alternative) would treat approximately 8,103 acres in the project area with a combination of intermediate harvest (360 acres), precommercial thinning (1,305 acres), regeneration harvest (4,671 acres), and prescribed fire (1,013 acres). Connected actions for alternative 4 would include 9.7 miles of temporary road construction (followed by full obliteration), 43.1 miles of road maintenance, 35.8 miles of road reconstruction, 32.8 miles of road decommissioning, improvement of 24 road/stream crossings, and 0.7 mile road construction (specified) to replace an existing segment of system road that is in a poor location.

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Sensitive Plants

Introduction

This section evaluates potential effects of the proposed Telegraph Vegetation Project to Threatened, Endangered and Sensitive (TES) plant species and serves as the biological evaluation for plants.

This section discusses the affected environment and environmental consequences of the proposed activities on botanical resources for the Telegraph Vegetation Project. No federally listed threatened, endangered, or proposed plant species are known to occur on the Helena National Forest (HNF) (USDI Fish and Wildlife Service 2014), or are suspected in the Telegraph project area. Whitebark pine is a Federal candidate species and a Region 1 sensitive species. With no effects expected for federally listed plants, this analysis is limited to Region 1 sensitive species and their habitats.

Sensitive species are species the regional forester identifies for which population viability is currently of concern, as evidenced by significant current or predicted downward trends in population numbers or density, or by significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (USDA Forest Service 2005). The Forest Service has established direction in Forest Service Manual 2600 – Wildlife, Fish, and Sensitive Plant Habitat Management (USDA Forest Service 2005) to guide habitat management for proposed, endangered, threatened, and sensitive plant species. This direction establishes the process, objectives, and standards for conducting a biological evaluation, and ensures that these species receive full consideration in the decision making process. This section contains extracts from the Botany Background Report (Davidson 2016, available in the project record), which was prepared as the sensitive plant biological evaluation for the Telegraph Vegetation Project.

Assumptions

The following assumptions were used:

- The sensitive species list and descriptions of HNF sensitive plant species are valid and were used for the analysis.
- Geographic information systems combined with habitat information, on-the-ground experience and past surveys is useful to screen areas of low probability of species occurrence.
- Reconnaissance of representative habitats is appropriate to determine the presence of sensitive plant populations.
- The effects of past activities are represented in the current condition of sensitive plant occurrences and habitats.
- Monitoring data useful for establishing trends of the Hall's rush populations in the project area is lacking. With few active threats to populations in the project area, and large numbers of occurrences reported in Montana, the trend is assumed to be stable for this species.
- Whitebark pine is reported to be in decline. With a lack of action, this trend is assumed to continue. With appropriate actions, such as the treatments proposed here, it is probable that the downward trend would stop, and even possibly reverse, in the treated areas.
- Standard buffers for riparian and wetland areas are assumed to be appropriate for protection of sensitive plant species that occur in these habitats.
- Natural disturbances including wildfire, floods, storm damage, and others are likely to occur in the future.

Information Used

The Montana Natural Heritage Program (MTNHP) maintains a statewide database for species of concern, including Region 1 sensitive plant species (MTNHP 2013, USDA 2011). Data from the MTNHP and HNF sensitive plant program were used for known sensitive plant populations. Ground reconnaissance was conducted in representative habitats within the Telegraph Project area by the HNF ecologist and trained field crews, and results were reported in the Telegraph Sensitive Plants NFMA report (Olsen 2009). Additional project surveys were conducted in 2012, resulting in one newly discovered Hall's rush occurrence (French and Kingsbury 2012). All proposed units were surveyed. Only the species on the sensitive species list that are known or suspected to occur on the HNF are included in specific species surveys. Other survey efforts have contributed to the base of knowledge concerning the presence or absence of sensitive plant habitats in the project area, including roadside surveys associated with noxious weed infestations (Barton and Crispin 2002) and wetland surveys contracted through the MTNHP (MTNHP 2009), as well as general vegetation inventories conducted in the past for the Forest Inventory and Analysis program, PACFISH/INFISH Biological Opinion plot inventory, and reconnaissance by the HNF ecologist. These survey results are located in the project record.

Methodology and Scientific Accuracy

The methodology used in this analysis includes overlay and interpretation of the best available data from several geospatial datasets including Montana Natural Heritage Program occurrence and predictive model data, aerial imagery, vegetation, soils, maps, as well as the current project's proposed areas of activity and others. Known occurrences are mapped and available in the project record. Any mapped data contains some inherent error, and these errors affect the accuracy of the analysis results.

Sensitive Plants, Affected Environment

Introduction

Sensitive species in the Northern Region of the Forest Service are those plant and animal species identified by the regional forester for which population viability is a concern. Because the proposed activities have potential to negatively affect sensitive plants, these effects were evaluated using the following indicators and measures useful in comparing differences between alternatives. These indicators are presented separately for each alternative in their respective sections and combined in the conclusions.

Table 248. Sensitive plant resource indicators and units of measure

Resource Indicator	Qualitative Units of Measure	Quantitative Units of Measure
Abundance	Presence or absence	Number of populations and/or plants affected
Suitable Habitat	Presence or absence (based on habitat type and site conditions encountered during surveys)	Acres of habitat affected
Species Viability	Determination category	

Whitebark pine is also analyzed as a special habitat in the Forested Habitats of Special Concern Background Report (located in the project record). One of the indicators used in that analysis is basically the same as above, that is, acres of whitebark pine in proposed action units.

Determination Categories

This biological evaluation reviews the proposed action and alternatives in sufficient detail to determine the level of effect that would occur to Region 1 Sensitive plant species. One of four possible determinations is chosen based on the best available scientific literature, a thorough analysis of the potential effects of the project, and the professional judgment of the botanist who completed the evaluation. The four possible determinations are:

- "No impact"
- "Beneficial impact"
- "May impact individuals but will not likely contribute to a trend towards federal listing or loss of viability"
- "Will impact individuals or habitat with a consequence that the action will contribute to a trend towards federal listing or cause a loss of viability to the population or species"

Project area characterization

The Telegraph Vegetation Project area includes 23,669 acres along the west side of the Continental Divide in the mountains about 15 to 20 miles southwest of Helena, Montana. Elevations range from 5,300 to 7,800 feet. The vegetation in this area is dominated by Douglas-fir and lodgepole pine forests, with some ponderosa pine occurring at lower elevations and subalpine fir, Engelmann spruce, and whitebark pine appearing at the highest elevations. Meadow complexes, riparian corridors, grassy openings, rocky slopes and talus are present throughout the area. Many of these habitats can support sensitive plant species.

Analysis Area

The analysis area for direct and indirect effects to sensitive plant species is the Telegraph Vegetation Project area. The project area is an appropriate size to assess the effects of proposed actions because all potential disturbances and effects to sensitive plants would occur within this boundary. This analysis assumes that the existing condition includes the effects of past actions and considers effects 10 to 20 years into the future, which allows adequate time to observe changes in vegetation.

The cumulative effects analysis area is the HNF, as effects on plant populations throughout the Forest are considered in determining potential impacts to the overall population.

Species Evaluated

The following Northern Region sensitive plant species are known or suspected to occur on the Helena National Forest (USDA 2011) and were evaluated for more specific habitat presence in the Telegraph project area:

Table 249. Sensitive plant species evaluated

Species (Family) Common Name	Habitat	Known to occur on HNF?	Known to occur in Telegraph project area?	Likelihood of occurrence in Telegraph project area
Amerorchis rotundifolia (Orchidaceae) Round-leaved orchis	Spruce forest around seeps or along streams, often in soil derived from limestone.	No	No	Unlikely – Known from the Rocky Mtn. Front and the northwest corner of Montana, with nearest occurrences about 70 miles from the project area.
Aquilegia brevistyla (Ranunculaceae) Short-styled columbine	Open woods and stream banks at mid-elevations in the montane zone.	No	No	Unlikely – In Montana, it is known only from the Little Belt Mountains, about 90 miles east of the project area.
Astragalus lackschewitzii (Fabaceae) Lackschewitz' milkvetch	Open, gravelly, calcareous soil and talus on ridge tops and slopes in alpine or subalpine zones.	No	No	Unlikely – Restricted to high elevation gravelly and rocky slopes and ridges, this species' habitat is not generally subject to human disturbance. The nearest occurrence is about 95 miles north of the project area.
Botrychium crenulatum (Ophioglossaceae) wavy moonwort	Various mesic sites from low to moderate elevations, including roadsides and other disturbed habitats. Sites may be partially shaded or open.	No	No	**Possible** – Known from the Beaverhead-Deerlodge National Forest and in western Montana, this species generally occurs in wet habitats with high ground cover. The project area contains wet habitats and previously disturbed areas.
Botrychium paradoxum (Ophioglossaceae) Peculiar moonwort	Mesic meadows associated with spruce and lodgepole pine forests in the montane and subalpine zones; also found in springy western red cedar forests.	Yes	No	**Possible** – This species is known from the Occidental Plateau, and near Irish Mine Hill. On the HNF, known populations are in sagebrush/rough fescue and rough fescue habitats. One *Botrychium* observation is reported within 3 miles to the west of the project area.
Cypripedium parviflorum (Orchidaceae) Small yellow lady's slipper	Fens, damp mossy woods, seepage areas, and moist forest-meadow ecotones in the valley to lower montane zones.	Yes, at least very close	No	Unlikely – One occurrence is mapped very close to the HNF near Helena, but the site has not been relocated since 1891.
Cypripedium passerinum (Orchidaceae) Sparrow's-egg lady's slipper	Mossy, moist, or seepy places in coniferous forests, often on calcareous substrates.	No	No	Unlikely – This species occurs in northwestern Montana, including Glacier National Park, and the nearest known location is about 80 miles north of the project area.

Species (Family) Common Name	Habitat	Known to occur on HNF?	Known to occur in Telegraph project area?	Likelihood of occurrence in Telegraph project area
Drosera anglica *(Droseraceae)* English sundew	With spaghnum moss in wet, organic soils of fens in the montane zone.	Yes	No	Unlikely – Known from Indian Meadows, in specialized fen habitat. Specialized fen habitats are not known to occur in the project area.
Drosera linearis *(Droseraceae)* Slenderleaf sundew	Wet, organic soil of nutrient-poor fens in the montane zone.	Yes	No	Unlikely – Known from Indian Meadows, in specialized fen habitat. Specialized fen habitats are not known to occur in the project area.
Epipactis gigantea *(Orchidaceae)* Giant helleborine	Stream banks, lake margins, fens with springs and seeps, often near thermal waters.	No	No	Unlikely – This species is typically associated with thermal seeps and springs. Thermal waters are not present in the project area.
Goodyera repens *(Orchidaceae)* Northern rattlesnake-plantain	North-facing, mossy forested slopes in the montane zone.	No	No	Unlikely – In Montana, this species is known from the Little Belt and Big Snowy Mountains, occurring about 100 miles west of the project area.
Grindelia howellii *(Asteraceae)* Howell's gumweed	Vernally moist, lightly disturbed soil adjacent to ponds and marshes, as well as similar human-created habitats, such as roadsides and grazed pastures. Known sites in Montana range from 3,000 to 4,800 feet in elevation.	No	No	Unlikely - This species is an endemic known only from a cluster of sites northeast of Missoula, and a single county in Idaho. The nearest occurrence is about 50 miles northwest of the project area. The project area is above 5,300 feet in elevation.
Juncus hallii *(Juncaceae)* Hall's rush	Subalpine parklands and moist meadows and slopes in the montane zone.	Yes	Yes	**Known** – 17 populations occur on the HNF. There are 10 occurrences within the project area.
Oxytropis podocarpa *(Fabaceae)* Stalkpod locoweed	Gravelly ridges and slopes, often on limestone, in the alpine zone.	No	No	Unlikely – Alpine habitats are not present in the project area, and the nearest occurrence is about 100 miles to the north.
Phlox kelseyi var. *missoulensis* (Polemoniaceae) Missoula phlox	Open, exposed, limestone-derived slopes in the foothills to exposed ridges in the subalpine zone.	Yes	No	**Possible** – Known occurrences exist within the combination analysis boundary. This species is not known within the project area, but limited areas of habitat may exist on open slopes in the project area.

Species (Family) Common Name	Habitat	Known to occur on HNF?	Known to occur in Telegraph project area?	Likelihood of occurrence in Telegraph project area
Pinus albicaulis *(Pinaceae)* Whitebark pine	Subalpine and krummholtz habitats in most mountain ranges.	Yes	Yes	**Known** – Whitebark pine occurs in mixed stands at the higher elevations in the project area.
Polygonum douglasii ssp. *austiniae* *(Polygonaceae)* Austin knotweed	Gravelly, often shale-derived soil of open slopes and banks in the montane zone. This species has been found on loose talus slopes in the Big Belts.	Yes	No	**Possible** – Mainly known from the Big Belts landscape, with the nearest occurrence about 25 miles from the project area. MTNHP shows occurrences present in all directions from the project area.
Saxifraga tempestiva *(Saxifragaceae)* Storm saxifrage	Vernally moist, open soil in meadows and on rock ledges in the subalpine and alpine zones. Elevations range from 7,920 to 9,900 feet.	No	No	Unlikely – Montana endemic known only from high elevations, west of the Continental Divide. The nearest occurrence is about 30 miles west of the project area. The known elevation range for this species is above those in the project area.
Schoenoplectus subterminalis *(Cyperaceae)* Water bulrush	Open water and boggy margins of ponds, lakes, and sloughs at 0.1-3 m depth in the valley, foothill, and montane zones.	Yes	No	Unlikely – Known from Indian Meadows, and sites in NW Montana, primarily west of the Continental Divide. The nearest occurrence is about 40 miles northwest of the project area.
Thalictrum alpinum *(Ranunculaceae)* Alpine meadowrue	Alpine meadowrue typically grows in moist montane and lower subalpine areas. In southwestern Montana, it occurs in moist alkaline meadows dominated by shrubby cinquefoil and Baltic rush, sometimes along stream channels.	No	No	Unlikely – In Montana, this species is known from sites in the southwest corner, in moist alkaline meadows. The nearest occurrence is about 50 miles southwest of the project area. Alkaline meadows are not known to occur in the project area.
Veratrum californicum *(Liliaceae)* California false-hellebore	Wet meadows and streambanks in the montane and subalpine zones.	No	No	Unlikely – In Montana, this species is known from four sites in the Bitterroot Valley. The nearest occurrence is about 65 miles southwest of the project area.

Species Unlikely to be Present

Fifteen Region 1 sensitive plant species are unlikely to occur in the project area (as indicated earlier in Table 249). Those 15 species will not be carried forward in this analysis. The following is additional rationale for eliminating those species (Olsen 2009):

- Due to the distance from known locations and differing regional climates, the Telegraph project area is likely outside the range of the following species: Round-leaf orchis (*Amerorchis rotundifolia*), short-styled columbine (*Aquilegia brevistyla*), Lackschewitz' milkvetch (*Astragalus lackschewitzii*), sparrow's-egg lady's slipper (*Cypripedium passerinum*), northern rattlesnake-plantain (*Goodyera repens*), Howell's gumweed (*Grindelia howellii*), stalkpod locoweed (*Oxytropis podocarpa*), alpine meadowrue (*Thalictrum alpinum*), and California false-hellebore (*Veratrum californicum*). Because the project area is likely outside their ranges, habitat for these species does not occur in the project area.
- Lackschewitz' milkvetch (*Astragalus lackschewitzii*), small yellow lady's slipper (*Cypripedium parviflorum*), English sundew (*Drosera anglica*), slenderleaf sundew (*Drosera linearis*), giant helleborine (*Epipactis gigantea*), stalkpod locoweed (*Oxytropis podocarpa*), storm saxifrage (*Saxifraga tempestiva*), water bulrush (*Schoenoplectus subterminalis*), alpine meadowrue (*Thalictrum alpinum*), and California false-hellebore (*Veratrum californicum*) all have specialized habitats (fens, other specific wet habitats, high-elevation rocky areas) that do not occur in the project area. These species will not be included in the effects analysis because their habitats are not suspected to occur in the project area.

Species Known or Possibly Present

Hall's rush and whitebark pine are the only sensitive plant species known to occur in the project area.

Hall's rush (*Juncus hallii*) is known from several locations on the HNF. In the Telegraph project area, Hall's rush grows in wet meadows, and is documented at 17 locations, including sites discovered in 2009 and 2012 during project surveys. It is rare, though widespread across the mountainous portions of southwestern and central Montana. Threats and potential negative impacts to most known occurrences appear to be minimal and the species is likely tolerant of some levels of disturbance (MTNHP 2013). The Montana Natural Heritage Program recently removed Hall's rush from their Species of Concern list, its status re-determined as low risk, low priority due to its occurrence in at least 15 subwatersheds, low threat levels, habitat trends that appear stable and overall low risk scores in all vulnerability factors. In the next revision of the Region 1 Sensitive Plants list, Hall's rush will likely be removed due to the number of populations that are now known in Montana, and lack of significant threats to its viability in the state (Shelley 2013, pers. comm).

In this project area, wet areas have been identified and surveyed for sensitive plants. Specifically suitable microsites within these habitats are not identified, so the full spatial extent of the mapped wet areas is used for quantifying the habitat for Hall's rush. In the Telegraph project area, there are 115 acres of mapped wetlands that could support Hall's rush habitat.

Whitebark pine (*Pinus albicaulis*) occurs in higher elevations throughout the HNF. Whitebark pine is a keystone species because of its various roles in supporting community diversity and a foundation species for its roles in promoting community development and stability (Keane et al. 2012). Whitebark pine forests are declining across most of their range in North America because of the combined effects of mountain pine beetle outbreaks, fire exclusion policies and actions, and white pine blister rust. It can be promoted by removing competing conifers and creating suitable sites for regeneration.

"The decline of whitebark pine comes from a synergism of natural and human-driven causes. Periodic, massive outbreaks of mountain pine beetle, killing mature whitebark pines, have been exacerbated by suppression of natural fires. A major reduction in high-elevation fires since the early 1900s has led to successional replacement of whitebark pine on more productive sites in the part of its range where it otherwise should be abundant…White pine blister rust is killing whitebark pine trees in the intermountain region, coastal ranges, and Canadian Rocky Mountains, and rangewide mortality is expected within one to several decades." (Tomback et al. 2001, p. 13)

Whitebark pine is dependent on fire to maintain dominance and vigor. It is shade-intolerant and susceptible to mountain pine beetle and the exotic disease white pine blister rust. The success of mountain pine beetle and white pine blister rust has been exacerbated by drought. See the Forested Habitats of Special Concern report for more detailed descriptions of these mortality agents and the ecology of whitebark pine. On the HNF, there is whitebark pine mortality from insects and disease, and evidence for the decline of this species is supported by recent Aerial Detection Survey reports and other whitebark pine monitoring. Again, see the Forested Habitats of Special Concern report for further details.

Keane and others (2012) published A Range-Wide Restoration Strategy for Whitebark Pine (*Pinus albicaulis*), providing a comprehensive strategy for whitebark restoration. The strategy contains four principles:

1. Promote rust resistance, by (a) supporting selective breeding programs to develop and deploy blister-rust resistant whitebark; (b) facilitating and accelerating natural selection for rust resistant trees by reducing competition, providing openings for natural seed dispersal and seedling survival; and (c) planting seedlings from trees known to have some level of resistance.
2. Conserve genetic diversity, by collecting and archiving seeds and growing and planting genetically diverse seedlings.
3. Saving seed sources, by protecting mature seed-producing resistant whitebark pine trees so that apparent rust-resistant seeds can be harvested in the future; and
4. Employing restoration treatments, by considering whitebark pine areas that are in decline for restoration treatments, including limiting the spread of blister rust, using fire to encourage regeneration, implementing silvicultural cuttings to reduce competition and increase vigor and reduce likelihood of mountain pine beetle attacks, planting rust-resistant seedlings to accelerate the effects of selection, and promoting natural regeneration and diverse age class structures to maintain ecosystem function and reduce landscape level beetle hazard, and to provide large populations for selection for rust resistance.

Recommended actions relative to these principles include assessments, planning, reducing disturbance impacts, gathering seeds, growing seedlings, protecting seed sources, implementing treatments, planting seedlings, monitoring activities, and conducting research (Keane et al. 2012).

In the Telegraph combination and project area, whitebark is present on subalpine fir climax habitat types. This landscape does not contain the elevations and sites where whitebark would be a treeline dominant. It is a minor and often understory component in sites dominated by lodgepole pine and/or subalpine fir and Engelmann spruce. In the Telegraph Vegetation Project area, whitebark pine occurs on at least 1,102 acres, identified during silvicultural diagnoses. See the Forested Habitats of Special Concern report for further details of the existing condition of whitebark pine.

Four additional species are identified as possibly present in appropriate habitats and are carried forward in this analysis for the following reasons:

1. Wavy moonwort (*Botrychium crenulatum*) is known from the Beaverhead-Deerlodge National Forest, immediately adjacent to the HNF and adjacent to the Divide landscape area. This species has not been found to date on the Helena National Forest; however, wavy moonwort habitat may exist in the project area along stream bottoms, around seeps, in meadows, wet roadside swales, and roadsides/disturbed areas.
2. Peculiar moonwort (*Botrychium paradoxum*) is known from two populations on the HNF, both in the Divide landscape area. One occurrence is within 3 miles of the project area, and peculiar moonwort habitat may occur in the project area in mesic meadows and roadsides/disturbed areas.
3. Missoula phlox (*Phlox kelseyi* var. *missoulensis*) has been found in each of the four landscape areas of the Forest. The Montana Heritage database identifies eight populations on the HNF. Three new populations were located in 2008, and three additional populations were found in 2009, while the Forest was validating a model that predicts sensitive plant habitat. There may be habitat for Missoula phlox in the project area along wind-swept ridges and forb-dominated meadows.
4. Austin knotweed (*Polygonum douglasii* ssp. *austiniae*) is known from 11 occurrences on the HNF. All of these are in the Big Belts landscape area. Additional occurrences exist in other directions, some within about 25 miles, so the project area is within the range of this species. Austin's knotweed habitat may exist in the project area in talus slopes, other sparsely vegetated areas, and possibly along roads.

Moonworts – Wavy moonwort and peculiar moonwort share similar typical habitats and ecology, so they are grouped for discussion.

Moonworts are small perennial ferns, and produce just one short-lived leaf with sporangia above ground each year. They commonly occupy previously disturbed sites, where exposed mineral soil provides conditions necessary for germination of its spores. For a number of years, new plants exist entirely underground as the juvenile plants mature into reproductive individuals. It is also common for individual mature moonwort plants to remain dormant underground in a given year and produce no above-ground leaf (Ahlenslager and Potash 2007). Some moonwort habitats, especially those created by human disturbances as well as fire, are considered to be ephemeral, and moonworts must colonize newly available habitats to stay ahead of successional changes (Zika et al. 1995). In addition, moonworts require endophytic mycorrhizae for at least a portion of their life cycle, and the presence or absence of this fungal associate probably plays a major role in the initiation of new populations. Moonworts tend to occur in areas where some mineral soil is exposed or has been exposed within the last 10 to 30 years. This probably has to do with the ability of arriving spores to percolate into the soil and perhaps also with the establishment and ecology of the appropriate mycorrhizal fungi. Management activities, including grazing, that maintain these conditions may also maintain moonwort populations (Ahlenslager and Potash 2007) and thus give some occurrences greater longevity.

Habitat for moonworts in the Telegraph project area is mostly found within or adjacent to the mapped wetlands and stream corridors. Specific disturbed areas, including roadside habitats are not readily identifiable in this analysis, and their acreage would be very small. For this analysis, the combined area of the mapped wetlands and stream corridors was used to estimate the amount of moonwort habitat. In the Telegraph project area, this calculates to about 875 acres where moonwort habitats could occur.

Missoula phlox is a low-growing perennial that inhabits gravelly windswept ridges and sometimes forb-dominated meadows on open, exposed limestone-derived slopes. As of October 2012, the

Montana Natural Heritage Program database contained records of 28 occurrences in Montana, with 9 of those on the HNF. One of a cluster of three occurrences is on National Forest System lands 2 miles north of the project area, and within the Telegraph combination boundary. Another one of those three occurrences is within the Telegraph combination boundary, but on private land. Also within the combination boundary, but not in the project area itself, are three additional occurrences of Missoula phlox, toward the west. It has not been found in the Telegraph project area, but some habitat does exist. For this analysis, the authoring botanist identified these areas by interpreting maps, imagery, and vegetation GIS layers. About 319 acres of exposed ridges and open areas were identified as potential habitat for Missoula phlox.

Austin knotweed is sparsely distributed in mountainous areas of Montana from the Rocky Mountain Front to the Madison and Gallatin Ranges. As of October 2012, the Montana Natural Heritage Program database contained records of 32 occurrences in Montana, with 10 of those on the HNF. Sites are usually on open, gravelly, sparsely vegetated slopes with shale-derived soils and are not generally impacted by human activity. Some sites however, are along forest roads and are susceptible to weed invasion and other disturbances. This species has also been found on loose talus slopes in the Big Belts. There are some areas of potential habitat for Austin knotweed in the Telegraph project area, and for this analysis, the authoring botanist identified these areas by interpreting maps, imagery, and vegetation GIS layers. About 426 acres of open slopes and talus were identified as potential habitat for Austin knotweed. The majority of these areas are also identified as potential Missoula phlox habitat.

Missoula phlox and Austin knotweed will also be grouped for discussion of effects, due to their similar habitats.

Summary of Sensitive Plant Indicators, Existing Condition

Sensitive plant indicators were identified in table 248. Table 250 summarizes the current measures of the identified indicators for sensitive plant species considered in this analysis.

Table 250. Sensitive plants and their resource indicators, existing condition

Species	Abundance	Suitable Habitat
Botrychium crenulatum Wavy moonwort	Not known, but suspected to occur.	Habitat could occur in or adjacent to 875 acres of wetland/riparian habitats.
Botrychium paradoxum Peculiar moonwort	Not known, but suspected to occur.	Habitat could occur in or adjacent to 875 acres of wetland/riparian habitats.
Juncus hallii Hall's rush	Present, with 17 occurrences in the project area.	115 acres of possible habitat in mapped wetlands.
Pinus albicaulis Whitebark pine	Present, part of one larger population.	1,102 acres, whitebark pine present as a minor stand component.
Phlox kelseyi var. *missoulensis* Missoula phlox	Not known, but suspected to occur.	319 acres of potential habitat in project area.
Polygonum douglasii ssp. *austiniae* Austin knotweed	Not known, but suspected to occur.	426 acres of potential habitat in project area.

Sensitive Plants, Environmental Consequences

Effects Common to All Alternatives

Regardless of which alternative is chosen, some conditions and processes influencing sensitive plants would continue. Vegetation succession and natural disturbances would continue, with likely occurrences of events such as wildfire, flood, mass wasting, erosion, sedimentation, and storm damage (ice, wind throw, etc.).

The spread of noxious weeds has potential for adverse impacts on sensitive plant populations and habitats. Existing weed populations would continue to exist and expand, although control treatments would still occur and keep many populations in check. Noxious weeds can cause habitat degradation because they can outcompete desired plant species for water, space, and nutrients. Noxious weeds can dominate plant communities and tend to form monocultures which negatively impact biological diversity. This weed competition to individual plants and communities can result in a loss of species diversity and effects to sensitive plants and their habitats. Even with continued weed control treatments, existing weed infestations would likely expand, especially in undocumented, inaccessible sites. Drift from herbicides sprayed to help control weeds can also have detrimental effects to sensitive plants. This risk is reduced by adhering to label instructions for applying specific herbicides, and by applying measures in the Helena Final Environmental Impact Statement and Record of Decision for the Helena National Forest Weed Treatment Project that require a 100-foot buffer around sensitive plant species when applying herbicides (USDA 2006). Within this buffer, only hand-pulling of weeds would be allowed.

Wildfire could (and likely will) occur in the project area, regardless of the alternative chosen. The potential exists for wildfire to have a short-term adverse effect on sensitive plant habitats, but no long-term effects in most cases. Plant response to fire is a result of the interaction between severity of the fire and the individual plant species' inherent resistance to injury and ability to recover (Brown and Kapler Smith 2000). Fire has certain beneficial effects on whitebark pine (see section on whitebark pine ecology above). Mortality of herbaceous species is more dependent on the length of time plants are exposed to high heat, determined by the amount of duff and woody fuel consumed by the fire, than flame length and fire line intensity (Armour et al. 1984). The effect of wildfire on sensitive plant habitats, therefore, would depend on the weather, surface fuel conditions, and type of fire. Higher fuel loadings, which can lead to longer residence time in terms to fire, has the potential to damage herbaceous sensitive plant habitats.

Wildfires also risk enhancing noxious weed invasions if severe fires damage the native vegetation. Large stand-replacing fires are known to increase the risk of infestation by noxious weeds (D'Antonio 2000). Canada thistle, bull thistle, knapweeds, Dalmatian toadflax, and cheatgrass have been shown to increase following wildfire (Harrod and Reichard 2001).

For species in specialized habitats (wet or open exposed areas), wildfire effects would be considerably less. Wet habitats would continue to experience occasional flooding and movement of sediments.

Wavy Moonwort and Peculiar Moonwort

Although no moonwort species are known to exist in the project area, moonwort habitats on the larger landscape would continue their ephemeral nature, with individual occurrences becoming established in some locations (often as a result of disturbance), while others would succumb to successional changes as the overstory tree canopy continues to develop and/or expand (Ahlenslager and Potash 2007). The known moonwort occurrence nearby suggests that additional populations

probably do exist in the area. Wildfire at an occupied site could damage above-ground plant parts or kill the entire plants if enough heat penetrates the soil (Ahlenslager and Potash 2007). Wildfire could also create new areas of habitat that may be colonized and maintained until earlier successional stages are eventually passed (Zika et al. 1995).

Hall's Rush

Wildfire would not likely affect Hall's rush occurrences or habitat beyond a light scorching due to the high moisture in its habitat. No major effect to Hall's rush occurrences or habitats is expected with any alternative. In action alternatives, impacts to these wet meadow habitats would be prevented by buffering activities. Only very minor effects are possible with the action alternatives, and they are described in those sections.

Whitebark Pine

Due to the relatively minor whitebark pine presence, and lack of the habitat types and topography where whitebark pine could be expected to dominate, none of the alternatives would considerably alter the abundance or health of whitebark pine at the landscape or Forest scales, or measurably impact the viability of whitebark pine across its range. At these broad scales, the overall decline of whitebark pine due to the factors identified by the USFWS (2011) would generally continue.

Insect outbreaks and white pine blister rust would continue to affect whitebark pine, along with weather and wildfire events. In the event of wildfire, the opportunity to selectively retain desirable rust-resistant individuals is lost, and the happenstance pattern of fire severities would determine the type and magnitude of effects to whitebark pine. Considering the unknowns of future wildfire incidents and effects, including differing wildfire behavior expected as a result of vegetation treatments, whitebark pine is still likely to burn in such events in the future, experiencing a range of fire intensities and a mix of beneficial and adverse effects. Higher wildfire severity could adversely affect whitebark pine by killing mature seed-bearing trees (possibly including important rust-resistant individuals), thus making regeneration less prevalent.

In areas without fire or other appropriate disturbances, over time, whitebark pine may cease to be a stand component in the absence of natural disturbance or management intervention due primarily to competition from other tree species and the limited availability of seed trees and suitable regeneration sites.

Missoula Phlox and Austin Knotweed

Wildfire poses very little threat to the open habitats of Missoula phlox and Austin knotweed. Wildfire could actually help maintain these habitats by removing conifer encroachment along the edges of the openings. Noxious weed invasion is likely the greatest threat for these habitats in the Telegraph Vegetation Project area.

Effects Common to All Action Alternatives

For both alternatives, vegetation treatments include the following:

- Intermediate harvest
- Precommercial thinning
- Regeneration harvest
- Prescribed fire

In order to haul materials and access the treatment areas, the following road activities are proposed:

- Temp road construction, followed by full obliteration
- Road maintenance
- Road reconstruction
- For alternatives 3 and 4 only, 0.5 mile of new road construction would connect Road 4100-A1 to Road 123

Ground disturbance would vary across treatment areas and between units, depending on the logging system and equipment used, if any. Intermediate harvests would be accomplished by mostly ground-based equipment (two cable logging units are identified). Roughly one quarter of the precommercial thinning units are proposed for ground-based equipment, with the remainder done by hand (chainsaw). Regeneration harvests are mostly ground-based, with some cable logging. Prescribed fire is accomplished completely by hand treatment methods.

The effects of ground disturbance on sensitive plants would be similar in all action alternatives, and include direct impacts such as mechanical damage, human trampling, and defoliation to any undiscovered occurrences, as well as increased risk of noxious weed infestation for all sensitive plant habitats. The known Hall's rush occurrences would be protected from all project activity effects by specific design features. Adverse impacts to whitebark pine would also be minimized through specific design features. Some individual whitebark pine would likely be damaged or killed in the activities, but the whitebark pine would benefit overall from the treatments. Whitebark pine habitat conditions would be improved by removing competing conifers and providing suitable conditions for survival. There are no other known occurrences of sensitive species in the project area; however, if undiscovered occurrences are present, those plants may be directly impacted by ground-disturbing activities.

The potential for additional infestations and/or spread of noxious weeds would likely be higher in treatment areas due to the increase in disturbed areas available for colonization and movement of equipment, vehicles, and personnel providing transport vectors for weeds. Several preventive and control measures would be implemented to reduce noxious weed impacts, including control treatment for known sites, weed-free requirements for equipment entering the project area, monitoring, and follow-up control treatment. Even though weed treatments would likely be stepped up in the project area during and after implementation, there would likely be some infestations that remain undiscovered or otherwise escape treatment. Weed control treatments are rarely completely successful, and some infestations are likely to continue to persist and produce seed. These infestations have potential to affect or invade habitats for any of the sensitive species.

Wildfire risks would generally be reduced with the action alternatives, varying by proximity to treatment units as well as a host of other factors.

Wavy Moonwort and Peculiar Moonwort

Existing moonwort habitats would be mostly unaffected due to riparian buffers and these moonworts' preference for wet/moist sites. However, some habitats may exist in drier sites (peculiar moonwort can occur in rough fescue habitats, and roadside swales can sometimes provide suitable habitat for both moonworts). Most of the moonwort habitat in treatment units would be included in appropriately buffered riparian and wetland areas, and thus, protected from major disturbances. Some habitats in drier sites, including appropriate roadside locations, could be directly impacted by the ground disturbance associated with the vegetation treatments and road maintenance and reconstruction activities. Moonwort individuals, if present, could be damaged or killed by these activities.

On the other hand, disturbance in appropriate places can create new moonwort habitat, and these new habitats can be important for sustaining populations across the landscape as older occupied sites are lost to succession. Because moonworts tend to favor disturbed areas (Zika 1995), the action alternatives would generally improve habitat conditions. So, there would be potential for adverse effects to individuals, if present, and beneficial effects to moonwort habitats from both action alternatives.

Prescribed fire treatments would not likely affect the typical wetter moonwort habitats, but drier and ecotonal moonwort habitats could be burned or scorched from prescription fires backing into these boundary areas from adjacent burn units. Prescribed burning could actually help provide an appropriate amount of disturbance in some areas to create or perpetuate moonwort habitats. Individuals would be top-killed by fire, and would likely survive low-severity fires to continue leaf production the following year.

Because of their small size, moonwort species are easily overlooked, and these plants may be present even in areas that were previously surveyed. If present, these moonwort species could be impacted by road reconstruction, maintenance, or obliteration activities, in addition to ground disturbance and fire in treatment units. The action alternatives would generally promote habitat for these two moonwort species by creating more open conditions, and providing disturbance, thus possibly creating sites suitable for future colonization.

Hall's Rush

Hall's rush populations and habitat would be protected from all major effects from ground disturbance by the specific avoidance of known occurrences and restricted activities in and around its riparian habitat. With these protection measures in place, no direct effects from the activities are expected.

Prescribed fire treatments would not likely affect the wet meadows where Hall's rush grows, due to the lack of woody fuels and high moisture in the meadows. Ignitions would not be allowed within RHCAs.

Whitebark Pine

The action alternatives would promote whitebark pine by creating more open conditions, reducing shade-tolerant conifer competition, reducing susceptibility to insects, fire, and pathogens, creating sites suitable for re-establishment, and/or retaining live trees where available.

Units containing whitebark pine would be harvested to remove competing species and create post-disturbance conditions suitable for whitebark establishment. Treatments would remove lodgepole pine and subalpine fir, allowing whitebark to grow and establish new seedlings.

Within treated areas on the appropriate habitat types, with the action alternatives whitebark pine is more likely to be retained and increased as a stand component. While the scale of this effect is relatively minor, the action alternatives would help to conserve whitebark genetics to the extent possible and ensure individuals are available for continued regeneration and natural selection processes into the future.

Mechanical treatments could incidentally damage or kill some whitebark pines as tree removal equipment and personnel maneuver about the treatment areas. Some mortality can be expected in prescribed burn areas as well.

In untreated areas, increased competition from other conifers would continue.

Further details of anticipated effects to whitebark pine are described in the Forest Habitats of Special Concern report.

Missoula Phlox and Austin Knotweed

Habitats for Missoula phlox and Austin knotweed would be mostly unaffected by proposed activities. Many areas of affected habitat are small openings within treatment units (inclusions). Harvests and thinnings would be done in forested areas, and Missoula phlox and Austin knotweed habitats are non-forested. Prescribed fire and tree removal along the edges of these openings would help to maintain these open habitats by setting back conifer encroachment. Undiscovered occurrences could be impacted by prescribed fire. In these openings, prescribed fire would likely burn quickly and with low severity through the grasses. In the less vegetated areas where Missoula phlox and Austin knotweed would likely occur, prescribed fire effects would be even less severe. Assuming a fire response similar to a closely related species, Hood's phlox (*Phlox hoodii*), Missoula phlox could be top-killed if burned over, but would likely survive and sprout new growth from its thick base or caudex (Gucker 2006). Austin knotweed is an annual plant, so top-kill would be fatal for the unlucky individuals, and this could decrease its seed production for that year. Adverse effects from prescribed fire would be short-term. Beneficial effects of prescribed fire include mortality of conifer encroachment into the openings and the renewal of nutrient cycling processes.

Alternative 1, No Action

Direct and Indirect Effects

If alternative 1 is chosen no vegetation treatments would occur and no new roads would be constructed. The opportunity to recover economic value of the dead and dying trees would be lost, as well as the opportunity to efficiently regenerate new stands to a desired species mix and density. In the long-term fuel loading would continue to increase over the project area as trees killed by the mountain pine beetle epidemic continue to fall. The risk for higher severity wildfire would be higher under alternative 1 than alternative 2, 3, or 4, as there would be more continuous fuels across the project area. The opportunity to actively enhance special habitats such as whitebark pine stands would be missed, and downward trends would continue for these species.

No effects would occur to sensitive plants under this alternative except those noted in the Effects Common to All Alternatives section. With the lack of activities, there would be no direct effects to sensitive plant species. Indirect effects could result from continued successional changes and natural disturbances, as discussed earlier in the Effects Common to All Alternatives section. Forest stands currently at risk for mountain pine beetle infestation would continue to experience increased mortality. Large numbers of dead trees would remain in the areas otherwise proposed for treatments. Their presence would contribute to accumulating fuel loads and there would be a higher probability of a larger, higher severity wildfire with this alternative. As a potential uncontrolled future event with many possible outcomes, the effects of a higher severity wildfire are equally unpredictable for sensitive plant species. In general, though, there would be a higher probability of sensitive plant occurrences and habitats being affected by wildfire. Current sensitive species trends would continue and are described below, along with any specific notes about higher severity wildfire.

Wavy Moonwort and Peculiar Moonwort

Moonwort habitats would continue to exist in suitable moist habitats. Moonwort trends in Montana are unknown, but are assumed to be stable. Though some threats exist to individual occurrences, the species as a whole is not highly threatened by any single or combination of potential impacts in the state (MTNHP 2013). Higher severity wildfire as described in alternative 1 would pose no additional

risk to moonwort habitats due to the activities reducing fuel loading. Any wildfires would have mixed effects, including damage to individuals and habitats, and creation of new habitats.

Hall's Rush

Hall's rush populations are apparently stable in Montana with few risk from threats (MTNHP 2013). The 11 known occurrences in the project area would continue to exist. Halls rush and its wet meadow habitats would likely remain relatively unchanged. Wildfire occurring at a higher severity due to accumulated fuels because of fire exclusion and mountain pine beetle mortality, could increase the chance for scorch damage to individuals and other wet meadow vegetation from radiant heat of adjacent burning forest.

Whitebark Pine

In their 12-month finding on a petition to list whitebark pine, the U.S. Fish and Wildlife Service confirms "evidence of a substantial and pervasive decline throughout almost the entire range of the species" (USDI Fish and Wildlife Service 2011). A downward trend for whitebark pine would continue in this project area under the no-action alternative, with increasing competition from lodgepole pine and subalpine fir occurring.

In the event of a higher severity wildfire due to accumulated fuel loading, individuals and entire stands could be killed and experience at least some natural regeneration following. Opportunities to retain apparently rust-resistant individuals would be decreased.

Because whitebark pine is already a sparse component in the area, with no whitebark-dominated stands, continued downward trends could result in a loss of its viability in the project area if activities are not implemented.

Missoula Phlox and Austin Knotweed

Trends of Missoula phlox and Austin knotweed are unknown, but are assumed to be stable. Noxious weeds and recreation impacts are identified as the most likely threats to most populations (MTNHP 2013). There is some chance that weeds and routine road maintenance could be currently affecting roadside habitats by soil and vegetation mechanical disturbances and weed competition.

Irreversible and Irretrievable Commitments

There would be some irretrievable commitments due to the continuing downward trend expected for whitebark pine. Losses through mortality and reduced seedling establishment would continue to reduce whitebark pine presence in the project area. There are no other irreversible or irretrievable commitments regarding sensitive plants for this alternative.

Cumulative Effects

The cumulative effects analysis area is the HNF, because effects on plant populations throughout the Forest are considered in determining potential impacts to the overall population. Cumulative effects described here for the no-action alternative also apply for the action alternatives.

Cumulative effects from the list of projects noted in the appendix B of the Sensitive Plants Specialist Report would be minimal. The projects that have occurred since 1993 have had field surveys to determine whether those actions would impact sensitive plant populations. Where sensitive plant populations were found, populations were appropriately buffered from treatment. The actions listed in appendix B of the Sensitive Plants Specialist Report could impact individuals or habitat, but will not likely contribute to a trend toward Federal listing or cause a loss of viability to the populations or species.

Past activities may have caused minor impacts to sensitive plants or their habitats. The effects of past activities are reflected in the existing condition of the current sensitive plant populations. Particularly for those sensitive species related to disturbance (moonworts, whitebark pine, some habitats for Austin knotweed), these past actions likely resulted in mixed effects (possible damage or loss of individuals, but improvement of habitat conditions in some affected areas).

Present or ongoing activities that could be contributing to cumulative effects are also described in appendix B of the Sensitive Plants Specialist Report. Grazing, special use permits, and noxious weed treatments make up the bulk of the ongoing projects occurring within the project area. There are only minor effects to sensitive plant habitats resulting from ongoing activities, with a low probability of impacting individuals.

Reasonably foreseeable activities that could affect sensitive plants or their habitats are also addressed in appendix B of the Sensitive Plants Specialist Report.

Alternative 2–Proposed Action

In developing alternative 2 through an interdisciplinary approach, this alternative would include the following treatments.

Table 251. Proposed vegetation treatments, alternative 2

Treatment Type	Prescription	Acres
Intermediate Harvest	Improvement Cut, Slashing, Jackpot Burn	434
Sub-Total		434
Precommercial Thinning	Precommercial Thin	1,758
	Precommercial Thin, Underburn	28
Sub-Total		1,786
Prescribed Fire	Slashing, Broadcast Burn	1,039
	Slashing, Handpiling, Burning Piles	11
Sub-Total		1,050
Regeneration Harvest	2-Aged Seedtree with Reserves	16
	2-Aged Seedtree with Reserves, Site Prep Burn	166
	2-Aged Shelterwood with Reserves, Site Prep Burn	155
	Clearcut with Leave Trees	651
	Clearcut with Leave Trees, Jackpot Burn	1,046
	Clearcut with Leave Trees, Site Prep Burn	1,355
	Clearcut with Reserves, Site Prep Burn	95
Sub-Total		3,484
Grand Total	Total Vegetation Treatment Acres	6,754

Table 252. Road activities, alternative 2

Road Activity	Miles
Temp Road Construction, followed by Full Obliteration	8.5
Road Maintenance	43.1
Road Reconstruction	32.6
Total Haul Route Miles	84.1

Direct and Indirect Effects

Effects to each species from these activities are described earlier in the Effects Common to All Action Alternatives section. The geographic extent of the activities (and effects) is the only difference between the action alternatives. Alternative 2 proposes an intermediate amount of vegetation treatment and associated road activities.

Wavy Moonwort and Peculiar Moonwort

Of the total 875 estimated acres where moonwort habitat could occur in the project area, about 100 acres (11 percent) are within alternative 2 treatment units. Potential moonwort habitat could also occur along about 1.7 miles of proposed road activities. A summary of the moonwort habitat overlay analysis results are presented below.

Table 253. Moonwort indicators, alternative 2

Alternative 2 Vegetation Treatments (acres)	Affected Moonwort Habitat
Intermediate Harvest	9.4
Precommercial Thinning	48.1
Prescribed Fire	14.1
Regeneration Harvest	27.6
Total Vegetation Treatment (acres)	99.2
Alternative 2 Road Activities (miles)	**Affected Moonwort Habitat**
Temp Road Construction, followed by Full Obliteration	0
Road Maintenance	1.2
Road Reconstruction	0.5
Total Haul Route (miles)	1.7

Hall's Rush

There are 115 estimated acres of potential Hall's rush wetland/meadow habitat in the project area. About 56 of those acres (49 percent) are within alternative 2 vegetation treatment units. These areas occur entirely as inclusions and mapped edge overlap with adjacent wetland areas.

Table 254. Hall's rush indicators, alternative 2

Alternative 2 Vegetation Treatments (acres)	Affected Hall's Rush Habitat	Affected Hall's Rush Occurrences
Intermediate Harvest	9.4	0
Precommercial Thinning	33.9	0
Prescribed Fire	0.3	1
Regeneration Harvest	12.3	6
Total Vegetation Treatment (acres)	55.9	
Alternative 2 Road Activities (miles)	**Affected Hall's Rush Habitat**	**Affected Hall's Rush Occurrences**
Temp Road Construction, followed by Full Obliteration	0	0
Road Maintenance	0.2	0
Road Reconstruction	0.1	0
Total Haul Route (miles)	0.3	
Total Number of Affected Occurrences		7

Of the 11 known occurrences in the project area, 7 are within treatment units or are adjacent to treatment units. One occurrence is adjacent to prescribed fire unit 122. Six occurrences are within or adjacent to regeneration harvest units 60, 63, and 66. Specific design features would give these occurrences a buffer from the proposed activities. No direct effects are expected for these occurrences.

As described in the Effects Common to All Action Alternatives section, Hall's rush habitat would be included in appropriately buffered riparian and wetland areas, and thus, protected from major disturbances. Although no direct effects to the species or its habitat are expected, some indirect effects could result from the increased risk of spreading noxious weeds, which could invade Hall's rush habitats, compete with individuals, and reduce habitat suitability. With noxious weed treatments continuing in the area, these effects are expected to be very minor, and would not affect Hall's rush presence or abundance in the project area.

Whitebark Pine

About 70 percent (781 acres) of the total 1,102 acres of known whitebark pine habitat in the project area would be affected by vegetation treatments. Impacts could also occur along the 9.9 miles of proposed road activities. As described earlier, some negative effects (including loss of some individuals) would likely occur, but the greater effect would be the beneficial results from removing competing conifers and promoting regeneration.

Table 255. Whitebark pine indicators, alternative 2

Alternative 2 Vegetation Treatments (acres)	Affected Whitebark Pine Habitat
Intermediate Harvest	0
Precommercial Thinning	48
Prescribed Fire	3
Regeneration Harvest	730
Total Vegetation Treatment (acres)	781
Alternative 2 Road Activities (miles)	**Affected Whitebark Pine Habitat**
Temp Road Construction, followed by Full Obliteration	1.3
Road Maintenance	2.6
Road Reconstruction	6.0
Total Haul Route (miles)	9.9

Missoula Phlox

Of the total 319 estimated acres where habitat could occur in the project area, about 44 acres (14 percent) are within alternative 2 treatment units. Potential Missoula phlox habitat could also occur along about 1.4 miles of proposed road activities. The Missoula phlox habitat overlay analysis results are presented in Table 256.

Table 256. Missoula phlox indicators, alternative 2

Alternative 2 Vegetation Treatments (acres)	Affected Missoula Phlox Habitat
Intermediate Harvest	0.1
Precommercial Thinning	7.0
Prescribed Fire	32.0
Regeneration Harvest	4.5
Total Vegetation Treatment (acres)	43.6
Alternative 2 Road Activities (miles)	**Affected Missoula Phlox Habitat**
Temp Road Construction, followed by Full Obliteration	0.3
Road Maintenance	0.6
Road Reconstruction	0.5
Total Haul Route (miles)	1.4

Austin Knotweed

Of the total 426 estimated acres of potential habitat in the project area, about 55 acres (13 percent) are within alternative 2 treatment units. Potential Austin knotweed habitat could also occur along about 1.6 miles of proposed road activities. Possible impacts are described earlier in Effects Common to All Action Alternatives.

Table 257. Austin knotweed indicators, alternative 2

Alternative 2 Vegetation Treatments (acres)	Affected Austin Knotweed Habitat
Intermediate Harvest	0.1
Precommercial Thinning	7.5
Prescribed Fire	41.5
Regeneration Harvest	5.8
Total Vegetation Treatment (acres)	54.9
Alternative 2 Road Activities (miles)	**Affected Austin Knotweed Habitat**
Temp Road Construction, followed by Full Obliteration	0.4
Road Maintenance	0.7
Road Reconstruction	0.5
Total Haul Route (miles)	1.6

Irreversible and Irretrievable Commitments

There is potential for some incidental whitebark pine individuals to be killed or damaged during treatment operations from equipment operation and/or prescribed fire. However, this would be minimized through the design features described. The individual trees impacted could be lost; however, these trees can be replaced and therefore, would only be an irretrievable impact to whitebark pine. The magnitude of this loss is expected to be very minor. Because the treatments also involve creating conditions suitable for natural regeneration and tree planting where possible, overall whitebark would be promoted and the new seedlings established would outnumber those potentially lost. Thus, the impacts would be an irretrievable commitment with no irreversible commitments.

Cumulative Effects

Please see the cumulative effects tables in appendix B of the Sensitive Plants Specialist Report for a description of projects. Under alternative 2, cumulative effects would likely be minimal, given that

field surveys are conducted and appropriate protection measures are used for all ongoing and future projects.

The effects from these projects, when combined with the effects of alternative 2 of the Telegraph Project, would not result in a trend toward Federal listing for any sensitive plant species.

Alternative 3

Alternative 3 was developed based on internal and external resource issues that were identified through scoping. Key issues that drove the development of this alternative are:

- Modifying treatments within elk security areas and other wildlife use areas, especially where some green stands still exist.
- Minimizing temporary road construction.
- Dropped harvest treatments in WUI zones that meet lynx habitat guidelines.
- Maintaining effective elk habitat within elk security areas.
- Modifying precommercial thinning densities to retain more elk hiding cover.

Alternative 3 represents a reduction in treated acres as compared to of alternative 2, and includes the following activities.

Table 258. Proposed vegetation treatments, alternative 3

Treatment Type	Prescription	Acres
Intermediate Harvest	Improvement Cut, Slashing, Jackpot Burn	434
Sub-Total		434
Precommercial thinning	Precommercial Thin	1,261
	Precommercial Thin, Underburn	28
Sub-Total		1,289
Prescribed Fire	Slashing, Broadcast Burn	595
	Slashing, Handpiling, Burning Piles	11
Sub-Total		606
Regeneration Harvest	2-Aged Seedtree with Reserves	16
	2-aged Seedtree with Reserves, Broadcast Burn	29
	2-Aged Shelterwood with Reserves, Site Prep Burn	132
	Clearcut with Leave Trees	288
	Clearcut with Leave Trees, Jackpot Burn	547
	Clearcut with Leave Trees, Site Prep Burn	838
	Clearcut with Reserves, Site Prep Burn	6
Sub-Total		1,856
Grand Total	Total Vegetation Treatment Acres	4,185

Table 259. Road activities, alternative 3

Road Activity	Miles
Temp Road Construction, followed by Full Obliteration	3.4
Road Maintenance	41.8
Road Reconstruction	28.8
New Construction	0.7
Total Haul Route Miles	74.6

In comparison to alternative 2, alternative 3 proposes about 38 percent fewer vegetation treatments, and about 11 percent fewer road activities.

Direct and Indirect Effects

Effects to each species from these activities are described earlier in the Effects Common to All Action Alternatives section. The geographic extent of the activities (and effects) is the only difference between the action alternatives. Alternative 3 proposes fewer acres of vegetation treatment and fewer miles of road activities.

Wavy Moonwort and Peculiar Moonwort

The effects to moonwort habitats would be the same as for alternative 2, except reduced from 99.2 acres to 59.6 acres of potentially impacted habitat. This reduced acreage represents about 7 percent of the total potential moonwort habitat in the project area. Moonwort habitats could also be present and impacted along 1.7 miles of road activities (the same as for alternative 2).

Table 260. Moonwort indicators, alternative 3

Alternative 3 Vegetation Treatments (acres)	Affected Moonwort Habitat
Intermediate Harvest	9.4
Precommercial Thinning	28.2
Prescribed Fire	5.2
Regeneration Harvest	16.8
Total Vegetation Treatment (acres)	59.6
Alternative 3 Road Activities (miles)	**Affected Moonwort Habitat**
Temp Road Construction, followed by Full Obliteration	0
Road Maintenance	1.2
Road Reconstruction	0.5
Total Haul Route (miles)	1.7

Hall's Rush

Because alternative 3 dropped unit 60, and units 63a and 66a are smaller than their respective alternative 2 units, there would be fewer potential impacts to Hall's rush from regeneration harvest. As a result of these changed units, two additional Hall's rush occurrences would be far enough removed from proposed activities (over 500 feet) that they would be entirely unaffected by alternative 3 activities. Five occurrences would be close enough to proposed activities to warrant buffering.

Thirty of the 115 estimated acres (26 percent) of potential Hall's rush wetland/meadow habitat in the project area are within alternative 3 vegetation treatment units.

Although no direct effects to the species or its habitat are expected, some indirect effects could result from the increased risk of spreading noxious weeds, which could invade Hall's rush habitats, compete with individuals, and reduce habitat suitability.

Table 261. Hall's rush indicators, alternative 3

Alternative 3 Vegetation Treatments (acres)	Affected Hall's Rush Habitat	Affected Hall's Rush Occurrences
Intermediate Harvest	9.4	0
Precommercial Thinning	16.5	0
Prescribed Fire	0.3	1
Regeneration Harvest	3.8	4
Total Vegetation Treatment (acres)	30.0	
Alternative 3 Road Activities (miles)	**Affected Hall's Rush Habitat**	**Affected Hall's Rush Occurrences**
Temp Road Construction, followed by Full Obliteration	0	0
Road Maintenance	0.2	0
Road Reconstruction	0.1	0
Total Haul Route (miles)	0.3	
Total Number of Affected Occurrences		5

Whitebark Pine

Alternative 3 would affect 334 acres of whitebark pine habitat, with mostly beneficial effects, similar to alternative 2, but 415 fewer acres would be affected. Vegetation treatments would occur on about 33 percent of the whitebark pine habitat in the project area.

Table 262. Whitebark pine indicators, alternative 3

Alternative 3 Vegetation Treatments (acres)	Affected Whitebark Pine Habitat
Intermediate Harvest	0
Precommercial Thinning	29
Prescribed Fire	3
Regeneration Harvest	334
Total Vegetation Treatment (acres)	366
Alternative 3 Road Activities (miles)	**Affected Whitebark Pine Habitat**
Temp Road Construction, followed by Full Obliteration	0
Road Maintenance	1.4
Road Reconstruction	5.0
New Construction	0
Total Haul Route (miles)	6.4

Missoula Phlox

Alternative 3 has potential to affect about 34 of the total 319 acres (10 percent) of Missoula phlox habitat in the project area with beneficial effects to habitat and possibly adverse effects to individuals, if present, from vegetation treatments. Habitat could be affected along 1.4 miles of road activities as well (the same as alternative 2).

Table 263. Missoula phlox indicators, alternative 3

Alternative 3 Vegetation Treatments (acres)	Affected Missoula Phlox Habitat
Intermediate Harvest	0.1
Precommercial Thinning	7.0
Prescribed Fire	24.4
Regeneration Harvest	2.0
Total Vegetation Treatment (acres)	33.5
Alternative 3 Road Activities (miles)	**Affected Missoula Phlox Habitat**
Temp Road Construction, followed by Full Obliteration	0.3
Road Maintenance	0.6
Road Reconstruction	0.5
New Construction	0
Total Haul Route (miles)	1.4

Austin Knotweed

About 41 of the total 426 acres (10 percent) of potential habitat for Austin knotweed in the project area could be affected by alternative 3 vegetation treatments, with beneficial effects to habitat and possibly adverse effects to individuals, if present. In addition, habitat or individuals could be affected along 1.6 miles of road activities (slightly less than alternative 2).

Table 264. Austin knotweed indicators, alternative 3

Alternative 3 Vegetation Treatments (acres)	Affected Austin Knotweed Habitat
Intermediate Harvest	0.1
Precommercial Thinning	7.5
Prescribed Fire	30.7
Regeneration Harvest	2.9
Total Vegetation Treatment (acres)	41.2
Alternative 3 Road Activities (miles)	**Affected Austin Knotweed Habitat**
Temp Road Construction, followed by Full Obliteration	0.3
Road Maintenance	0.7
Road Reconstruction	0.5
New Constructioin	0.1
Total Haul Route (miles)	1.6

Irreversible and Irretrievable Commitments

The irreversible and irretrievable commitments are the same as described for alternative 2, with the potential effects occurring on 415 fewer acres than those treatments occurring in whitebark pine with alternative 3 as shown in Table 264.

Cumulative Effects

Please see the cumulative effects tables in appendix B of the Sensitive Plants Specialist Report for a description of projects. Under alternative 3, cumulative effects would likely be minimal, given that field surveys are conducted and appropriate protection measures are used for all ongoing and future projects.

The effects from these projects, when combined with the effects of alternative 3 of the Telegraph Project, would not result in a trend toward Federal listing for any sensitive plant species.

Alternative 4

Alternative 4 was developed to address additional public comments. A common concern heard from landowners during the public meetings and field trips was reducing the risk to their private land and structures during a wildfire event. Alternative 4 seeks additional opportunities to modify fuels (mechanical and prescribed fire) adjacent to infrastructure/private lands and within the prevailing wind path.

- Treatments designed to complement fuels reduction activities on private land have been added to this alternative. This includes using mechanical equipment within units that were analyzed for prescribed fire only in alternative 2 or 3. Approximately 1.5 miles of temporary road would be necessary to access these treatment areas.
- Comments recommended using mechanical equipment to remove fuel from treatment units located near existing roads within the Jericho Mountain Inventoried Roadless Area (IRA). Field recognizance validated that the use of mechanical equipment would be a more effective means to rearrange and remove dead and down fuel in these units. Within the IRA, in alternative 4 mechanical treatments would replace some of the hand only treatment proposed in alternatives 2 and 3.
- Additional treatment units were recommended to further enhance existing fire suppression strategies, locating treatments contiguous to existing treatments and/or natural fuel breaks. These areas connecting proposed harvest units would strengthen the long term fire suppression strategies for this portion of the Divide Landscape. These treatment units, as designed, would also reduce resource impacts and costs associated with post activity fuels disposal.
- Public comment brought forward the recommendations of Dr. Mark Finney's "Fire on the Landscape" presentation in Helena, Montana on June 17, 2015. Dr. Finney recommends the use of prescribed fire following harvest activities to change the fuel structure and increase effectiveness in mitigating wildfire spread. In response to this comment prescribed fire treatments have been included in the harvest and precommercial thinning treatments identified in alternative 2 and 3.
- A modified treatment, whitebark pine restoration, was included in precommercial thinning units outside the wildland urban interface (WUI). This prescription treats units outside the WUI originally proposed for precommercial thinning with daylighting only of individual or groups of whitebark pine, leaving the matrix at current stem densities to simultaneously address Northern Rockies Lynx Management Direction.

Alternative 4 proposes an overall increase in treated acres as compared to alternative 2, and includes the following activities:

Table 265. Proposed vegetation treatments, alternative 4

Treatment Type	Prescription	Acres
Intermediate Harvest	Improvement Cut, Slashing, Jackpot Burn	360
Sub-Total		360
Precommercial thinning	Precommercial Thin	1,277
	Precommercial Thin, Underburn	28
Sub-Total		1,305
Whitebark pine release		158
Sub-Total		158
Mechanical Rearrangement of fuels	Mechanical rearrangement of fuels, followed by prescribed fire	596
Sub-Total		596
Prescribed Fire	Slashing, Broadcast Burn	854
	Slashing, Handpiling, Burning Piles	159
Sub-Total		1,013
Regeneration Harvest	2-Aged Seedtree with Reserves	16
	2-Aged Seedtree with Reserves, Site Prep Burn	166
	2-Aged Shelterwood with Reserves, Site Prep Burn	225
	Clearcut with Leave Trees	174
	Clearcut with Leave Trees, Jackpot Burn	2,720
	Clearcut with Leave Trees, Site Prep Burn	1,370
	Clearcut with Reserves, Site Prep Burn	0
Sub-Total		4,671
Grand Total	Total Vegetation Treatment Acres	8,103

Table 266. Road activities, alternative 4

Road Activity	Miles
Temp Road Construction, followed by Full Obliteration	9.7
Road Maintenance	43.1
Road Reconstruction	35.8
New Construction	0.7
Road Decommsioning	32.8
Total Haul Route Miles	89.3

In comparison with alternative 2, alternative 4 proposes about 23 percent more vegetation treatments, and about 6 percent more road activities.

Direct and Indirect Effects

Effects to each species from these activities are described earlier in the Effects Common to All Action Alternatives section. As compared with alternative 2, alternative 4 proposes more acres of vegetation treatment and more miles of road activities. The resulting overlaps with each species' habitat and occurrences are presented below and inventory of each species would be conducted prior to implementation of road decommissioning.

Wavy Moonwort and Peculiar Moonwort

The effects to moonwort habitats would be the same as for alternative 2, except increased from 99.2 acres to 130.9 acres of potentially impacted habitat. About 15 percent of the total potential moonwort habitat in the project area is within vegetation treatment units. Moonwort habitats could also be present and impacted along 2.0 miles of road activities (0.3 mile more than alternative 2).

Table 267. Moonwort indicators, alternative 4

Alternative 4 Vegetation Treatments (acres)	Affected Moonwort Habitat
Intermediate Harvest	9.2
Precommercial Thinning	47.8
Prescribed Fire	31.9
Regeneration Harvest	42.0
Total Vegetation Treatment (acres)	130.9
Alternative 4 Road Activities (miles)	**Affected Moonwort Habitat**
Temp Road Construction, followed by Full Obliteration	0.02
Road Maintenance	1.2
Road Reconstruction	0.8
New Construction	0
Road Decommsioning	Inventory prior to implementation
Total Haul Route (miles)	2.0

Hall's Rush

The same vegetation treatment units are in the same proximity to Hall's rush occurrences as alternative 2, so the same seven occurrences have potential to be affected. The effects to these occurrences are the same as those described for alternative 2 and in Effects Common to All Action Alternatives.

About 62 of the 115 estimated acres (53 percent) of potential Hall's rush wetland/meadow habitat in the project area are within alternative 4 vegetation treatment units.

Although no direct effects to the species or its habitat are expected, some indirect effects could result from the increased risk of spreading noxious weeds, which could invade Hall's rush habitats, compete with individuals, and reduce habitat suitability. With noxious weed treatments continuing in the area, these effects are expected to be very minor, and would not affect Hall's rush presence or abundance in the project area.

Table 268. Hall's rush indicators, alternative 4

Alternative 4 Vegetation Treatments (acres)	Affected Hall's Rush Habitat	Affected Hall's Rush Occurrences
Intermediate Harvest	9.2	0
Precommercial Thinning	33.9	0
Prescribed Fire	5.8	1
Regeneration Harvest	12.6	4
Total Vegetation Treatment (acres)	61.5	
Alternative 4 Road Activities (miles)	**Affected Hall's Rush Habitat**	**Affected Hall's Rush Occurrences**
Temp Road Construction, followed by Full Obliteration	0	0
Road Maintenance	0.2	0
Road Reconstruction	0.3	0
New Construction	0	0
Road Decommissioning	Inventory prior to implementation	Inventory prior to implementation
Total Number of Affected Occurrences		5

Whitebark Pine

Alternative 4 would affect 943 acres of whitebark pine habitat, with mostly beneficial effects, greater than alternative 2.

Table 269. Whitebark pine indicators, alternative 4

Alternative 4 Vegetation Treatments (acres)	Affected Whitebark Pine Habitat
Intermediate Harvest	0
Precommercial Thinning	48
Prescribed Fire	14
Regeneration Harvest	716
Total Vegetation Treatment (acres)	943
Alternative 4 Road Activities (miles)	**Affected Whitebark Pine Habitat**
Temp Road Construction, followed by Full Obliteration	0.7
Road Maintenance	1.4
Road Reconstruction	5.9
New Construction	0
Road Decommissioning	Inventory prior to implementation
Total Haul Route (miles)	8.0

Missoula Phlox

Alternative 4 has potential to affect about 258 of the total 319 acres (81 percent) of Missoula phlox habitat in the project area with beneficial effects to habitat and possibly adverse effects to individuals, if present, from vegetation treatments. Habitat could be affected along 1.7 miles of road activities as well (0.2 mile more than alternative 2).

Table 270. Missoula phlox indicators, alternative 4

Alternative 4 Vegetation Treatments (acres)	Affected Missoula Phlox Habitat
Intermediate Harvest	0.1
Precommercial Thinning	7.0
Prescribed Fire	230.3
Regeneration Harvest	20.2
Total Vegetation Treatment (acres)	257.7
Alternative 4 Road Activities (miles)	**Affected Missoula Phlox Habitat**
Temp Road Construction, followed by Full Obliteration	0.3
Road Maintenance	0.7
Road Reconstruction	0.6
New Construction	0
Road Decommissioning	Inventory prior to implementation
Total Haul Route (miles)	1.7

Austin Knotweed

About 269 of the total 426 acres (63 percent) of potential habitat for Austin knotweed in the project area could be affected by alternative 4 vegetation treatments, with beneficial effects to habitat and possibly adverse effects to individuals, if present. In addition, habitat or individuals could be affected along 1.7 miles of road activities (slightly more than alternative 2).

Table 271. Austin knotweed indicators, alternative 4

Treatment	Affected Austin Knotweed Habitat
Alternative 4 Vegetation Treatments (acres)	
Intermediate Harvest	0.1
Precommercial Thinning	7.5
Prescribed Fire	230.3
Regeneration Harvest	31.0
Total Vegetation Treatment (acres)	268.9
Alternative 4 Road Activities (miles)	
Temp Road Construction, followed by Full Obliteration	0.3
Road Maintenance	0.7
Road Reconstruction	0.6
New Construction	0.1
Road Decommissioning	Inventory prior to implementation
Total Haul Route (miles)	1.7

Irreversible and Irretrievable Commitments

The irreversible and irretrievable commitments are the same as described for alternative 2, with the potential effects occurring on just 3 fewer acres than the treatments occurring in whitebark pine with alternative 4 as shown in Table 271.

Cumulative Effects

Please see the cumulative effects tables in appendix B of the Wildlife Background Report for a description of projects. Under alternative 4, cumulative effects would likely be minimal, given that field surveys are conducted and appropriate protection measures are used for all ongoing and future projects.

The effects from these projects, when combined with the effects of alternative 4 of the Telegraph Project, would not result in a trend toward Federal listing for any sensitive plant species.

Conclusions

Alternative 1, the no-action alternative, would have no new soil-disturbing activities that would disturb sensitive plant populations.

Alternative 2, the proposed action, would have the highest level of soil-disturbing activities with the highest level of potential to affect sensitive plant populations. With specific design features in place, this alternative may impact individuals but would not contribute toward a trend for Federal listing or loss of viability. Although some adverse impacts are likely, whitebark pine would benefit from this alternative. Some individual whitebark pine would likely be damaged or killed in the activities, but the whitebark pine would benefit overall from the treatments. Whitebark pine habitat conditions would be improved by removing competing conifers and providing suitable conditions for survival.

Alternative 3 would have a lower level of soil-disturbing activities than alternative 2, and therefore, a lower level of potential to affect sensitive plant populations. With specific design features in place, this alternative may impact individuals but would not contribute toward a trend for Federal listing or loss of viability. Although some adverse impacts are likely, whitebark pine would benefit from this alternative. Some individual whitebark pine seedlings would likely be damaged or killed in the activities, but the whitebark pine would benefit overall from the treatments. Whitebark pine habitat conditions would be improved by removing competing conifers and providing suitable conditions for survival.

Alternative 4 would have a greater amount of soil disturbance than alternative 2, and therefore, the greatest potential to affect sensitive plant populations and habitats. With specific design features in place, this alternative may impact individuals but would not contribute toward a trend for Federal listing or loss of viability. Although some adverse impacts are likely, whitebark pine would benefit from this alternative, as described above for alternative 2.

A comparison of sensitive plant indicators for each alternative is presented below. Rationales for the determinations follow the table.

Table 272. Sensitive plant indicators, all alternatives

Species	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
Botrychium crenulatum Wavy moonwort	Abundance: Not known, but suspected Suitable Habitat: 875 acres in project area Determination category: No impact	Abundance: No known occurrences affected Suitable Habitat: 99.2 acres vegetation treatments, 1.7 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: No known occurrences affected Suitable Habitat: 59.6 acres vegetation treatments, 1.7 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: No known occurrences affected Suitable Habitat: 131 acres vegetation treatments, 2.0 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability
Botrychium paradoxum Peculiar moonwort	Abundance: Not known, but suspected Suitable Habitat: 875 acres in project area Determination category: No impact	Abundance: No known occurrences affected Suitable Habitat: 99.2 acres vegetation treatments, 1.7 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: No known occurrences affected Suitable Habitat: 59.6 acres vegetation treatments, 1.7 miles road activities Determination category; May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: No known occurrences affected Suitable Habitat: 131 acres vegetation treatments, 2.0 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability

Species	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
Juncus hallii Hall's rush	Abundance: Present, 17 occurrences. Suitable Habitat: 115 acres in project area Determination category: No impact	Abundance: 7 occurrences in or near units Suitable Habitat: 55.9 acres vegetation treatments, 0.3 mile road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: 5 occurrences in or near units Suitable Habitat: 30.0 acres vegetation treatments, 0.3 mile road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: 7 occurrences in or near units Suitable Habitat: 62 acres vegetation treatments, 0.5 mile road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability
Pinus albicaulis Whitebark pine	Abundance: Present, one population. Suitable Habitat: 1,102 acres in project area Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: increased regeneration expected Suitable Habitat: 781 acres vegetation treatments, 8.6 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: increased regeneration expected Suitable Habitat: 366 acres vegetation treatments, 6.4 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: increased regeneration expected Suitable Habitat: 943 acres vegetation treatments, 8.0 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability

Species	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4
Phlox kelseyi var. *missoulensis* Missoula phlox	Abundance: Not known, but suspected Suitable Habitat: 319 acres in project area Determination category: No impact	Abundance: No known occurrences affected Suitable Habitat: 44acres vegetation treatments, 1.5 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: No known occurrences affected Suitable Habitat: 34 acres vegetation treatments, 1.4 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: No known occurrences affected Suitable Habitat: 258 acres vegetation treatments, 1.7 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability
Polygonum douglasii ssp. *austiniae* Austin knotweed	Abundance: Not known, but suspected Suitable Habitat: 426 acres in project area Determination category: No impact	Abundance: No known occurrences affected Suitable Habitat: 55 acres vegetation treatments, 1.6 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: No known occurrences affected Suitable Habitat: 41acres vegetation treatments, 1.6 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability	Abundance: No known occurrences affected Suitable Habitat: 269 acres vegetation treatments, 1.7 miles road activities Determination category: May impact individuals but would not contribute toward a trend for Federal listing or loss of viability

The determinations above are supported by the following rationales:

- Alternative 1, the no-action alternative, would have no new soil-disturbing activities that would affect sensitive plant populations.
- Undiscovered sensitive plant occurrences may exist in the project area and could be impacted by proposed activities. If additional sensitive plant populations are located within the project area appropriate mitigation (e.g., site avoidance, avoid concentration of fuels on sites to be burned) would be followed upon consultation with a Forest Service botanist.
- Minor effects to a small percentage of the sensitive species habitats in the project area would not affect species viability or suitability of the habitats present.

- Moonwort species could be impacted by road reconstruction, maintenance or obliteration activities, in addition to ground disturbance and fire in treatment units. The action alternatives would generally promote habitat for these two moonwort species by creating more open conditions, and providing disturbance, thus possibly creating sites suitable for future colonization.
- Hall's rush is considered stable and with few threats in Montana, recently removed from the MTNHP Species of Concern list, its status re-determined as low risk and low priority.
- A specific design features protects Hall's rush occurrences from adverse effects.
- Units which contain whitebark pine potential regeneration would be harvested to remove competing species and create post-disturbance conditions suitable for whitebark regeneration and establishment.
- Specific design features protect whitebark pine from most adverse effects.
- Missoula phlox and Austin knotweed habitats exist within harvest and thinning units primarily as inclusions of open areas. Due to the lack of trees in these openings, harvest and thinning activities would not take place there. Most of the overlap between Missoula phlox and Austin knotweed habitat and the proposed activities is in prescribed fire units. In these areas, prescribed fire could run through the openings and have short-term effects to Missoula phlox and Austin knotweed habitat and individuals, if present.

Forest Plan Consistency

All alternatives of the Telegraph Vegetation project are consistent with Regional direction, Forest Plan guidance, and the Endangered Species Act because there are no federally listed threatened or endangered plant species in the project area, and, although some individuals may be affected, sensitive species would not trend toward Federal listing or lose their viability in this area. Whitebark pine and Hall's rush are the only two known sensitive species known in the project area, and there are design features for their protection. Surveys are currently occurring or have been completed for past, present, and reasonably foreseeable actions. If new populations are found, they will be protected from ground disturbance or herbicide application. As directed by the Forest Plan, if any of the species of special concern are verified, appropriate measures would be taken

Noxious Weeds

Introduction

The Telegraph Vegetation Project proposes vegetation management treatments in the Telegraph Vegetation project area in Powell County on the Helena Ranger District of the Helena National Forest. This section discusses possible effects of proposed activities on noxious weeds. Two areas are addressed in this analysis; the Telegraph project area, and the Telegraph Combined Boundary area. The combined boundary, which is defined by two elk herd units and 6th level watersheds, serves as the cumulative effects area for this analysis.

Weeds have been expanding on the Helena National Forest (HNF) for many years which includes the project area. A variety of factors has contributed to the spread of noxious weeds including wildfire, ground disturbance, off-highway vehicle use and the inherent ability of noxious weeds to out compete native vegetation.

The Telegraph project area encompasses approximately 23,669 acres, with 2,291 acres mapped as being infested by noxious weeds. The combined boundary area has noxious weeds mapped on 3,872 acres. Weed infestations range from areas of 5 to 10 individual plants to linear patches along roads and trails, to large patches of greater than 20 acres. Patch infestation levels range from light (1 percent canopy cover) to high (>50 percent canopy cover).

There are 10 State of Montana noxious weed species within the proposed project boundary: butter and eggs (*Linaria vulgare*), Canada thistle (*Cirsium arvense*), Dalmatian toadflax (*Linaria dalmatica*), houndstongue also known as gypsyflower (*Cynoglossum officinale*), hoary alyssum (*Berteroa incana*), meadow hawkweed (*Hieracium caespitosum*), orange hawkweed (*Hieracium aurantiacum*), oxeye daisy (*Leucanthemem vulgare*), spotted knapweed (*Centaurea stoebe)*, and St. Johnswort (*Hypericum perforatum*). Three additional Montana noxious weeds, diffuse knapweed (*Centaurea diffusa*), leafy spurge (*Euphorbia esula*), and sulfur cinquefoil (*Potentilla recta*), do not occur in the project area but do occur in the combined boundary. Although not listed as noxious weeds in Montana, cheatgrass (*Bromus tectorum*), common mullein (*Verbascum thapsus*), and musk thistle (*Carduus nutans*) are non-native, invasive plants that are also present within the proposed project boundary. Therefore, a total of sixteen invasive plants will be analyzed. The dominant weed species in the project area are Canada thistle, spotted knapweed, and gypsyflower.

This section analyzes the existing condition and the potential consequences of proposed actions and alternatives on noxious weeds. An underlying assumption for all alternatives is that the Forest noxious weed treatment program would continue to treat weeds within the project area annually, as funding permits, regardless of whether the proposed project is implemented. All areas of proposed activity, including timber harvest, thinning, prescribed fire, temporary and new road construction, and road reconstruction, are assumed to increase susceptibility to new or spreading infestations of noxious weeds. Areas where more intense ground disturbance and canopy reduction are considered to have greater susceptibility and risk of new weed infestation and expansion of existing populations.

Alternative 1, the No Action alternative, would have no new soil disturbing activities that tend to increase weed invasion, however weed infestations would continue to expand. This alternative would have a greater risk of an intense wildfire which would increase the risk of weed expansion and invasion in the future. Noxious weeds would continue to be treated within the project area as funding allows.

For all action alternatives, the level of risk associated with noxious weed spread is low, determined through a noxious weed risk evaluation (Appendix D). The low level of risk is mainly due to the relatively low susceptibility of the affected habitat types. However, without weed treatment it is predicted that there will be an increase in the rate of spread of weeds under each action alternative due to predictions of soils disturbance for each treatment unit, and the roads activities. Utilizing expected soils disturbance and the Montana Noxious Weed List (MTDA 2015) to identify which invasive species to manage across the forest, as well as project specific invasive plant risk assessments/evaluations, high risk units were identified under each action alternative. Risk assessments/evaluations help identify threats to native vegetation as a result of project related ground disturbance and invasive species within or near the project area.

Alternative 2, the Proposed Action, includes a total of 518 acres of noxious weed infestations within proposed treatment units. New or expanded weed infestations would be most likely in the 86 units with high levels of canopy removal and/or mechanical equipment use, and along road corridors. It is estimated that there would be 1,998 acre of weed treatment within the project area. This total acreage would be greater than Alternative 3 but less than Alternative 4.

Alternative 3, includes a total of 409 acres of noxious weed infestations within proposed treatment units. New or expanded weed infestations would be most likely in the 70 units with high levels of canopy removal and/or mechanical equipment use, and along road corridors. It is estimated that there would be 1,772 acre of weed treatment within the project area. This total acreage would be least amount of weed treatment when compared to Alternative 2 and Alternative 4.

Alternative 4, includes a total of 694 acres of noxious weed infestations within proposed treatment units. New or expanded weed infestations would be most likely in the 96 units with high levels of canopy removal and/or mechanical equipment use, and along road corridors. It is estimated that there would be 2,439 acre of weed treatment within the project area. The total acreage for this Alternative 4 would be greatest amount of weed treatment when compared to Alternative 2 and Alternative 3.

Prior to implementation, to prevent further expiation of weed infestation, weeds would be treated within treatment units, along haul routes and within a half mile of the treatment units.

With implementation of the required design features and recommended monitoring, the spread of weeds in the project area and weeds associated with project activities would be reduced. With repeated monitoring and continued treatment within the project area, new and existing have the potential to be controlled.

Assumptions

The following assumptions were used:

- Invasive plants are aggressive and have the potential to spread rapidly across landscapes. The Helena National Forest utilizes the Montana Noxious Weed List (MTDA 2015) and project specific invasive plant risk assessments/evaluations to identify which invasive species to treat.
- The analyses and decisions made in the record of decision for the Helena National Forest (HNF) Weed Treatment Project FEIS are incorporated in noxious weed analysis and management on the HNF.
- Any soil disturbing activity has the potential to increase noxious weed invasion and spread. It is assumed that the maximum amount of soil disturbance would not exceed 15 percent of units

pursuant to Forest Plan Standards for detrimental soil disturbance and Region 1 Soil Quality Standards (USDA Forest Service 2014).

- Additional increases in noxious weed spread and associated increases in infested acres is anticipated as a result of additional non-soil disturbing activities that result in the alteration of plant community structure and composition (e.g., reduce canopy cover, reduced basal cover, etc.).
- As of 1996, invasive plant species had invaded 6 to 7 million acres of NFS lands with an observed annual rate of spread of 8 to 12 percent (USDA Forest Service 1998). Local data does not currently exist to determine the annual rate of spread of invasive plants on the Helena Lewis & Clark National Forest (HLC). However it is assumed that the national average rate applies. Disturbance is widely recognized as a primary influence on plant community composition and is frequently implicated in the spread of invasive exotic plants (Hobbs and Humphries 1995).
- It is assumed that the upper range of the average annual rate of spread (12 percent) would apply within project units and that when applied to project unit data, would result in an accurate estimation of the minimum expected infested acres resulting from project activities.
- The acres impacted by detrimental soil disturbance (DSD) would be invaded by noxious weeds.
- Predictions of DSD provided within the Telegraph Soil Resource Background Report represent a reasonable estimation of total disturbance to be expected within each unit.
- The unit specific design features recommended within the Telegraph Soil Resource Background Report would be implemented.
- Herbicide use in accordance with the requirements specified in the HNF Weed Treatment Project FEIS (USDA Forest Service 2006 and 2007a) is appropriate for noxious weed management on infested lands.
- Weed treatment would be mostly by herbicide use and effectiveness is estimated to be approximately 80 percent.The HNF has found herbicide use to be approximately 70 to 90 percent effective. Effectiveness of biocontrol agents varies greatly from 0 to over 90 percent (USDA Forest Service 2007b).
- Early and aggressive treatment of new infestations would likely result in much smaller infestations than projected.
- The Forest noxious weed treatment program would continue to treat noxious weeds within the project area annually, as funding permits, regardless of whether the project occurs or not.
- Mapped Weed Acres are reflected by polygons within which there is at least 1 percent noxious weed cover. There are weeds outside those polygons that are too scattered to map, or are infestations that have not been discovered yet.

Information Used

The following methods and associated data were used to analyze the current condition of invasive species within the project area. The methods and data are also used to analyze the effects of proposed activities and associated potential increases in noxious weed infestations.

- Weed infestation data was updated in the summer of 2015. Surveys were concentrated around road corridors and within and around treatment units. New infestation data was collected if at

least 1 percent was an area was coved by noxious weeds. Existing weed infestations were updated to capture change in infestation size, percent infestation and add weeds not currently identified.

- Infestation data is entered into the NRM system, a system of database tools for managing agency data across the forest. Invasive plant infestation data (spatial and tabular) is stored and can be retrieved for later reference and analyses. NRM has been continually updated with inventoried infestations with a special emphasis on correcting geospatial data through the use of GPS units. For the purposes of this analysis invasive plant inventory data collected over the past several years has been summarized to characterize the current condition and trend of invasive plants within the Telegraph Project area.
- Summarization of existing Geospatial Information Systems (GIS) data as entered through the Threatened, Endangered, and Sensitive Plants, and Invasive Species (TESP-IS) database and reported through the Geospatial Interface (GI).
- Summarization of HLC transportation system data.
- Summarization of existing Forest Service Activity Tracking System (FACTS) data
- Summarization of total post activity DSD (%) per unit as provided in the Telegraph Soil Resource Background Report;
- Literature review of the best available science.

The aforementioned information was used to complete an Invasive Plant Risk Evaluation. The intent of this invasive plant risk evaluation is to determine the level of risk of invasion and/or increased infestation of invasive plant species as a result of proposed ground disturbing activities. Four factors were considered when assigning an overall risk rating to the proposed project. The four factors include susceptibility, threat, disturbance and exposure. Two of the factors (susceptibility and threat) have been combined into a composite factor titled "overall invasiveness rating". A more in depth discussion of the process as well as a description of each factor and guidance on scoring those factors are provided within Appendix D to this report located in the project record.

The information cited above was also utilized to conduct a semi-quantitative weed analysis. This analysis based the potential project impacts to noxious weeds on soil disturbance associated with project activities. These estimations are then paired with the existing infested acres in the treatment units and a long haul routes. These combined figures determined an estimation of weed treatment needs within the project area. A more detailed discussion on detrimental soil disturbance can be found within the Telegraph Soil Resource Back ground Report. A more in depth discussion of this process and the associated formulas is provided within Appendix F to this report located in the project record.

Methodology and Scientific Accuracy

The methodology used in this analysis includes the best available data from National Resource Manager (NRM) and other GIS datasets. Weeds data specific to the Telegraph Vegetation Project boundaries were intersected with proposed treatment units for the three action alternatives. GIS tools were used to combine various datasets and understand relationships and effects on weeds and other flora. Effects associated with various actions are based on literature, known weed infestations and personal experience.

The aforementioned information was used to complete an Invasive Plant Risk Evaluation. The intent of the invasive plant risk evaluation is to determine the level of risk of invasion and/or increased

infestation of invasive plant species as a result of proposed ground disturbing activities. Four factors were considered when assigning an overall risk rating to each alternative. The four factors include susceptibility, threat, disturbance and exposure. Two of the factors (susceptibility and threat) have been combined into a composite factor titled "overall invasiveness rating." Mantas (2003) provided susceptibility and threat ratings and probabilities of exposure which feed the risk evaluation. Results of the evaluation and a more in-depth discussion of the process as well as a description of each factor and guidance on scoring those factors are provided in appendix D of the Noxious Weeds Specialist Report.

This analysis is based on the best available science and acknowledges that there is incomplete and unavailable information. There is always uncertainty associated with scientific conclusions (Gleick et al. 2010). Uncertainty arises from factors such as complexity, natural variability, random variation, measurement error, and lack of knowledge. Elements of uncertainty are considered qualitatively. Policy measures designed to deal with uncertainty include public participation, interdisciplinary processes, and monitoring.

The mapped weed acres may be an over estimate due to how they are mapped and inventoried. If there is multiple species in an area, each species gets mapped and counted when there is an overlap.

Chemical weed treatments would be the primary treatment method in harvested and prescribed fire units and along roads as those areas are accessible to ground spraying equipment. Bio-control could be used in areas where the biological agents have optimal conditions for survival and expansion. In riparian areas, biological control would be emphasized where conditions for insect establishment are met. The effect of all weed treatment methods would be to control and contain existing and new infestations related to vegetation treatments.

Dispersal distances of noxious weed seeds will vary by species and other conditions (e.g., vector, vegetation stature, etc.). Sorensen (1984) found that wind dispersal was generally limited with wind-dispersed seeds often only traveling a few meters. Conversely dispersal distances from footwear and clothing can be quite far. Seeds can be dispersed over long distances when attached to clothing, with seed still present on soil in the tread of shoes at 5 km and attached to trouser material at 2.4 km (Mount and Pickering 2009). For the purposes of analysis a half mile buffer was considered to account for the expected average dispersal of noxious weed seeds.

Disturbance is widely recognized as a primary influence on plant community composition and is frequently implicated in the spread of invasive exotic plants (Hobbs and Humphries 1995). Parks et al. (2005) examined the patterns of invasive plant diversity in northwest mountain ecoregions and found an overwhelming importance of disturbance in facilitating the establishment of non-native plants. Disturbances can occur as a result natural events such as floods, wind events and animals disturbances. Disturbance can also result from human activities such as construction of roads and trails, livestock grazing, features common to logging activities such as skid-trails and landings, off-road use of ATV/UTVs, etc. Fire suppression efforts can also result in disturbances. Fire-line disturbances create suitable conditions for many non-native species to become established (Parks et al. 2005).

At local scales, nonnative invasive species richness and abundance are generally highest in and around disturbed patches, corridors, and edges such as riparian corridors, transportation corridors and fuel treatments (Benninger-Truax et al. 1992, Gelbard and Belnap 2003, Larson 2003). Buckley et al. (2003) found that features common in logged areas such as skid trails and haul roads are likely to support populations and propagules of nonnative plants. Their research also suggests that haul roads, skid trails and main forest routes serve as primary conduits for entry of introduced species into the

interior of managed stands. At regional or landscape scales, richness and abundance of nonnative invasive plants tend to be lower in protected or undeveloped areas than in human-dominated landscapes or landscapes fragmented by human use (Barton et al. 2003). Although natural disturbance can be a major contributor to increases in invasive species abundance, most of todays weed problems arise from past and present human activities (Hobbs and Humphries 1995).

With implementation of the required design features and recommended monitoring, the spread of weeds in the project area and weeds associated with project activities would be reduced. With repeated monitoring and continued treatment within the project area, new and existing have the potential to be controlled.

Resource Indicator Measure

The resource indicator used for analysis of potential environmental effects of the alternatives are as follows:

- Predicted acres of weed treatment in the project area.

This indicator measure is used because it represents existing infested areas as well as potential spread of infestations due to project activities thus, providing a relatively accurate measure to predict the potential effects of noxious weeds.

Spatial and Temporal Boundaries

The Telegraph Vegetation Project area is used as the spatial boundary for direct and indirect effects. Bounding for the analysis of cumulative effects of past, present, and foreseeable future actions is the “combined boundary” of 6th field Hydrologic Unit Codes (HUCs), elk herd unit, and lynx analysis areas that surround and overlay the project area. The Telegraph combined boundary encompasses the largest cumulative effects analysis area required for most resource effects. Activities beyond these boundaries would have diminishing effects that would not overlap with effects of project activities. Past actions are considered as part of the existing condition. On-going and reasonably foreseeable activities are also included in cumulative effects. See appendix B to this report located in the project record more detail on cumulative effects of noxious weeds. The analysis is bound in time by 10 years into the future, which allows for an adequate length of time to record vegetative changes. Effects associated with various actions are based on literature, known weed infestations and personal experience.

Noxious Weeds, Affected Environment

The Telegraph Vegetation Project area encompasses 23,669 acres, with 2,291 acres of noxious weeds mapped. The Telegraph Combined Boundary area includes approximately 3,872 acres of ground covered by noxious weeds. Weed infestations range from areas of 5 to 10 individual weed plants to linear patches along roads and trails (from less than 1 to 75 acres) to large patches of greater than 400 acres. Patch infestation levels range from light (1 percent canopy cover) to high (over 50 percent canopy cover). Various methods of weed control are used on known weed infestations across the Helena National Forest. Herbicide application is the most common form of control.

There are 10 State of Montana noxious weed species within the proposed project boundary: butter and eggs (*Linaria vulgare*), Canada thistle (*Cirsium arvense*), Dalmatian toadflax (*Linaria dalmatica*), houndstongue also known as gypsyflower (*Cynoglossum officinale*), hoary alyssum (*Berteroa incana*), meadow hawkweed (*Hieracium caespitosum*), orange hawkweed (*Hieracium aurantiacum*), oxeye daisy (*Leucanthemem vulgare*), spotted knapweed (*Centaurea stoebe)*, and St. Johnswort (*Hypericum perforatum*). Three additional Montana noxious weeds, diffuse knapweed

(*Centaurea diffusa*), leafy spurge (*Euphorbia esula*), and sulfur cinquefoil (*Potentilla recta*), do not occur in the project area but do occur in the combined boundary. Although not listed as noxious weeds in Montana, cheatgrass (*Bromus tectorum*), common mullein (*Verbascum thapsus*), and musk thistle (*Carduus nutans*) are non-native, invasive plants that are also present within the proposed project boundary. Therefore, a total of 16 invasive plants will be analyzed. The dominant weed species in the project area are Canada thistle, spotted knapweed, and gypsyflower.

This report analyzes the existing condition and the potential consequences of proposed actions and alternatives on noxious weeds. An underlying assumption for all alternatives is that the Forest noxious weed treatment program would continue to treat weeds within the project area annually, as funding permits, regardless of whether the proposed project is implemented. All areas of proposed activity, including timber harvest, thinning, prescribed fire, temporary and new road construction, and road reconstruction, are assumed to increase susceptibility to new or spreading infestations of noxious weeds. Areas where more intense ground disturbance and canopy reduction are considered to have greater susceptibility and risk of new weed infestation and expansion of existing populations

Analysis Area

The Telegraph Project area is located on the Helena Ranger District in the Little Blackfoot Watershed. This weeds analysis addresses weeds on two levels. Proposed activities are assessed within the project area to identify direct and indirect effects to noxious weeds. Cumulative effects are addressed at both the project level and within a larger area described as the combined boundary. The rationale for using the larger combined boundary area is that haul routes pass through this area and the potential for noxious weed spread may be higher due to increased vehicle traffic and haul route improvements and maintenance. The majority of the proposed treatment areas are lodgepole pine vegetation types, with lesser portions of cool moist forest and warm dry vegetation types. Lodgepole pine forested stands dominate the landscape, but trees are in the seedling and small tree size classes following the mountain pine beetle (MPB) outbreak. Engelmann spruce and subalpine firs are common shade-tolerant species present in the project area, and in some cases, dominate stands nearing climax, particularly in riparian areas. Douglas-fir is a dominant species in many lower elevation stands and a minor component of some higher elevation stands; all size classes are represented in Douglas-fir forests, with small and medium trees being most common. Ponderosa pine is a rare component in low-elevation stands, primarily on private land. Whitebark pine is a rare component at highest elevations. Some high-elevation stands contain a mixture of species, primarily lodgepole with components of Douglas-fir, subalpine fir, Engelmann spruce, and whitebark pine. There are aspen clones scattered across the landscape, generally in isolated pockets and in decline, and primarily at lower elevations on private land. Finally, the landscape is sprinkled with non-forested meadows, primarily along the rolling ridge tops that characterize the topography.

Weed species documented in the project area

Table 273 shows the approximate acres of infestation by species for both the project area and the combined boundary. Spotted knapweed and Canada thistle are the most abundant and widespread species in the project area, followed by musk thistle and gypsyflower. Sulfur cinquefoil and leafy spurge occur within the combined boundary, but not within the project area. See appendix C of the Noxious Weed specialist report for Montana’s most recent noxious weed list.

Table 273. Weed infestations in project area and combined boundary

Noxious weed species	Montana Noxious Weed Category	Acres infested in the Telegraph project area	Acres infested in the Telegraph Combined Boundary
Butter and eggs (*Linaria vulgare*)	Priority 2B	843	850
Canada thistle (*Cirsium arvense*)	Priority 2B	1,973	2,848
Cheatgrass (*Bromus tectorum*)	Priority 3 (not listed)	44	44
Common mullein (*Verbascum thapsus*)	Not listed	188	408
Dalmatian toadflax (*Linaria dalmatica*)	Priority 2B	57	57
Diffuse knapweed (*Centaurea diffusa*)	Priority 2B	0	0.2
Gypsyflower (*Cynoglossum officinale*)	Priority 2B	1,211	1,535
Hoary alyssum (*Berteroa incana*)	Priority 2B	0.4	0.4
Leafy spurge (*Euphorbia esula*)	Priority 2B	0	29
Meadow hawkweed (*Hieracium caespitosum*)	Priority 2A	59	59
Musk thistle (*Carduus nutans*)	Not listed	1,641	2,207
Orange hawkweed (*Hieracium aurantiacum*)	Priority 2A	164	164
Oxeye daisy (*Leucanthemum vulgare*)	Priority 2B	727	766
Spotted knapweed (*Centaurea stoebe*)	Priority 2B	1,958	2,879
St. Johnswort (*Hypericum perforatum*)	Priority 2B	227	227
Sulfur cinquefoil (*Potentilla recta*)	Priority 2B	0	1
Total Infested Acres[1]		2,291	3,872

[1]Many species overlap on the ground, so the actual area covered by weeds is smaller than the total of the species acres added together.

Species Description

Butter and eggs (*Linaria vulgare*), also known as yellow toadflax, is a perennial with a taproot and an extensive system of vertical and creeping lateral roots. The species reproduces mainly by buds on the lateral roots. Because of the extensive root system, the species is difficult to control with manual or mechanical methods or with herbicides. Biocontrol agents, however, can be very effective.

Canada thistle (*Cirsium arvense*) spreads primarily by adventitious root buds that may form new adventitious shoots along the root at any location (Zouhar 2001b). Canada thistle is present in much of the project area, generally associated with roadside or harvest disturbance.

Dalmatian toadflax (*Linaria dalmatica*) has been shown to readily establish on open and disturbed sites where competition from other plants is reduced (Zouhar 2003a). Dalmatian toadflax seeds may be dispersed by cattle, deer and other browsing animals, and the seeds can remain viable after passing through the gastrointestinal tracts of cattle and possibly deer. This species can also expand vegetatively by the formation of adventitious shoots from both the tap and lateral roots (Zouhar 2003a). There is serious risk of infestation from Dalmatian toadflax, even though current infestation levels are thought to be very low. Weeds are expected to increase in level of infestation and acres infested overall in the project area in spite of the efforts of herbicide application for control. Weed

seeds are stored in the upper soil layers, and will germinate over several years. Biocontrol agents usually provide the most effective treatment.

Diffuse knapweed (*Centaurea diffusa*) is a taprooted annual, biennial or short-lived perennial forb that reproduces by seed. Diffuse knapweed typically grows 6 to 24 inches (15-61 cm) tall and consists of a single main stem divided into numerous branches about halfway up the stem, giving it a ball-shaped appearance and tumbleweed mobility. Multiple applications of chemical treatments are required to control or eliminate the species and timing of application and stress to roots are critical (Beck 2008). Pulling or cutting several times a year followed by fall application of chemical treatments can be effective (Beck 2008), but treatments should be continued for several years.

Gypsyflower (*Cynoglossum officinale*), also known as houndstongue, is a taprooted biennial or short-lived perennial. It occupies a substantial acreage in both the combined boundary and the project area. This species is common along roads and in logged areas. Houndstongue is spread by large seeds that attach to animals and humans and may be dispersed by wind (Zouhar 2002). The species is relatively shade-tolerant, although it thrives in full sunlight. This species is difficult to map as it may occur in small, scattered patches. Plants may be treated by mowing, pulling or cutting before seed set or by herbicide application.

Hoary alyssum (*Berteroa incana*) is an exotic annual to short-lived perennial forb designated as a noxious weed in Montana since 2008. Toxicity to horses has been reported when green or dried forage is contaminated by more than 30 percent. It can proliferate in forage crops, pastures, and rangelands and rapidly fills in areas disturbed or overgrazed. Hoary alyssum is adapted to the temperate continental climate characterized by cold winters and hot, dry summers. Hoary alyssum thrives on dry and disturbed ground on limestone and calcareous substrata with poor fertility. It is commonly found growing along roads, and trails, gravelly stream and lake banks, in lawns, farmyards, and vacant lots.

Leafy spurge (*Euphorbia esula*) occurs outside the project area but in the combined boundary. The species generally grows in clumps, producing stems up to 3 feet tall from caudices, rhizomes, and roots. It has an extensive underground rhizome and root system that can penetrate into the soil as far as 15 to 30 feet. Leafy spurge can rapidly invade disturbed sites by establishing from seed and by sprouting from existing roots and root crowns. Once established, leafy spurge tends to expand and persist (Gucker 2010). Early, aggressive and repeated treatments are necessary to eliminate this species. Herbicide application is the most effective treatment.

Meadow hawkweed (*Hieracium caespitosum*) is indigenous to northern, central and eastern Europe and it occurs in abundance in the foothills of the Alps. It is believed to have been introduced into the United States in 1828 as an herbal remedy and an ornamental. It is currently found from Quebec to Ontario and southward to Georgia and extending to the Pacific Northwest.

Orange hawkweed (*Hieracium aurantiacum*) is the only species on the Montana 2A list in the project area (Stone 2010). List 2A species are required to be eradicated or contained where less abundant. Orange hawkweed forms a monoculture by establishing a dense mat of plants, lowers biodiversity and reduces the forage value of grasslands for grazing animals. This plant is a successful competitor, crowding out native, pasture and range species. Hawkweed species are allelopathic, meaning that they produce chemicals that suppress surrounding plants. The plant hybridizes freely with native and non-native hawkweeds (Rinella and Sheley 2002). Orange hawkweed spreads by runners, rhizomes and root buds. Herbicide application and use of integrated control measures are the most effective treatments.

Oxeye daisy (*Leucanthemum vulgare*, also known as *Chrysanthemum leucanthemum)* is found along numerous roads and trails although its mapped acreage is limited. Besides reproducing vegetatively along a rhizome, oxeye daisy is a prolific seed (achene) producer (Olson and Wallander 1999). Oxeye daisy reduces plant species diversity in infested areas. Grazing by cattle in infested areas intensifies its spread because they avoid the plant. Oxeye daisy has the potential of increasing soil erosion because bare soil is more prominent in areas where high densities occur. Cultivation destroys oxeye daisy's shallow root system (Mitich 2000). Herbicide application and use of integrated control measures are the most effective treatments.

Spotted knapweed (*Centaurea maculosa*) has by far the largest extent of infestation within both the combined boundary and the project area. The species occurs along roadsides and throughout south-facing areas of past harvest, as well as in natural grasslands. Spotted knapweed thrives in open areas, with forest canopies of less than 20 percent closure. Spotted knapweed spreads almost entirely by prolific seed production (Zouhar 2001a). This species has also been shown to have allelopathic properties, secreting toxins that suppress the growth of other plants, although resource competition is just as effective in its ability to dominate areas (Zouhar 2001a). The susceptibility of native grasslands, dry forests and shrublands, wetlands, and burned areas to spotted knapweed is high; the susceptibility of moist forest is moderate. This species has a large, perennial taproot and is likely to survive and sprout after fire if the root crown is not killed. It also produces large quantities of durable, heat-tolerant seed that can probably survive most grassland fires, although high severity fire may kill some spotted knapweed seeds (Zouhar 2001a). Herbicide efficacy may increase when applied post-burn. Persistent and careful hand-pulling can also control spotted knapweed. Entire plants must be removed before setting seeds. This method is feasible for small infestations or infestations along streams or in other sensitive areas.

St. Johnswort (*Hypericum perforatum*), also known as goatweed and Klamath weed, is an economically important pest in temperate regions worldwide. Although used as a possible natural antidepressant, St. Johnswort causes considerable ecological and economic losses. In addition to displacing desirable plants that are important for wildlife habitat and domestic livestock forage, St. Johnswort also poses risk of poisoning grazing animals. As a rhizomatous perennial, lateral roots grow two to three inches beneath the soil surface but may reach depths of three feet. The taproot may reach depths of four to five feet.

Sulfur cinquefoil (*Potentilla recta*) populations in North America are commonly associated with roadsides, vegetation disturbance, abandoned agricultural fields, and "waste areas." Sulfur cinquefoil can also invade native plant communities that are far from any apparent human disturbance and the species is now common in natural grasslands and shrubby areas (Zouhar 2003b). Sulfur cinquefoil has not been mapped in the project area, but a small occurrence is documented in the combined boundary. This species can be extremely aggressive; it has been known to outcompete knapweeds in some circumstances. Small infestations can be controlled by hand pulling. The species also responds to chemical treatment (Zouhar 2003b), but it is important to avoid spraying other forb species since most would also be killed by the herbicides used for sulfur cinquefoil treatment.

Noxious Weeds, Environmental Consequences

Effects Common to All Alternatives

Noxious weed infestations adversely affect native fauna and flora and present a large-scale threat to native ecosystems (D'Antonio et al. 2004, Lodge and Shrader-Frechette 2003, Lonsdale 1999, Mack et al. 2001, Pauchard et al. 2003). Noxious weeds can negatively alter community structure and ecosystem processes (Levine et al. 2003, Mack et al. 2000), including fire cycles (Brooks 2008). At

high infestation levels (canopy cover of ≥25 percent), weeds may cause a loss of native plant diversity (Ortega and Pearson 2005), reduction of wildlife habitat and forage (Thompson 1996), increases in erosion and depletion of soil moisture, soil biota and nutrient levels (Weidenhamer and Callaway 2010), and reduce the aesthetic value of the landscape and scientific values of wilderness areas (MTWMP 2008). These effects are common to all alternatives and would vary depending on the level of infestation. New weed introductions and spread of established populations would continue under all alternatives.

Weed Spread

Weeds are likely to spread under all alternatives, particularly along roadsides and areas of disturbance (Lonsdale 1999, Trombulak and Frissell 2000). The *HNF Weed Treatment Project FEIS* and *Record of Decision* (USDA Forest Service 2006 and 2007a) provide guidance and environmental requirements for weed control activities that would be applied to this area under any alternative. Roadsides would be treated on a scheduled basis, as they are a major vector for weed invasion.

Spotted knapweed, gypsyflower, nodding plumeless thistle, oxeye daisy, and Canada thistle may spread rapidly with ground disturbance and will spread at a slower rate without disturbance (Young et al. 1987, Zouhar 2001a, 2001b, 2003a). Dalmatian toadflax, butter and eggs, sulfur cinquefoil, and leafy spurge spread readily without ground disturbance and spread very rapidly with disturbance (Zouhar 2003a, 2003b, Gucker 2010).

Noxious weed infestations are introduced and spread through most ground disturbing activities (Young et al. 1987; Lonsdale 1999; Zouhar 2001a, 2002, 2003a). Road construction, mining and drilling operations, timber harvest on unfrozen ground and installation of underground facilities such as pipelines are primary activities that have the potential to spread existing infestations as well as introduce new infestations. Activities such as livestock grazing and recreational stock use also have the potential to spread noxious weed seeds, allowing new infestations to be introduced to areas that are away from roads or other disturbance areas. Vehicles that travel the National Forest road and trail system provide a source of weed seed along those corridors.

Road maintenance would occur under all alternatives. Roads have high weed infestations for several reasons: vehicles carry weed seeds, which are dispersed along travelways; roads are disturbed by maintenance activities on a regular basis, which provides a ready seedbed for weed seeds, both the seeds dispersed by vehicles and those that are carried on the wind or by animals and birds; human use is concentrated along roadsides which increases the exposure of these areas to noxious weed seed dispersal and ground disturbance (Lonsdale 1999, Ouren et al. 2007, Pauchard et al. 2003).

Public access for recreation, firewood collection, and private property access would continue along roadsides across the Forest. Snowmobile activities, along with other winter sports, would continue, depending on snow conditions throughout the winter. Forest users would be free to fully utilize all existing dispersed recreation sites and other open areas. The ground disturbance associated with these activities would likely increase weed infestations where bare soil is exposed. Other ongoing activities include those requiring special use permits such as utility structures, electronic sites, research sites, livestock grazing, one private camp and one recreational residence.

Effects to native plant diversity and ecosystem processes

The spread of noxious weeds is a threat to the health, sustainability, and productivity of many forests because weeds may negatively alter community structure and ecosystem processes (Birdsall et al. 2011). Invaders can reduce native plant diversity, alter soil biota and chemistry (Weidenhamer and Callaway 2010), affect native plant physiology (Kittelson et al. 2008), and even reduce the

reproductive success of native birds (Ortega et al. 2006). Noxious weed competition to native plants and plant communities can result in loss of species diversity and sensitive native plants (Mack et al. 2000, Olson and Wallander 1999). Increased abundance of noxious weeds may reduce the quality of native habitat by displacing native species, altering nutrient and fire cycles, degrading soil structure, and decreasing the quality and availability of forage for wildlife (Mack et al. 2000).

Noxious weeds may dominate plant communities and form monocultures that negatively influence native biological diversity. Weed competition with individual plants and plant communities can result in loss of species diversity and sensitive native plants. Native grasses used for domestic livestock and wild ungulates have been particularly susceptible to impacts from weeds (Sheley et al. 1999).

Studies of impacts to natural fire processes strongly support the expectation that invader impacts on disturbance regimes (ecosystem processes) can strongly and possibly irreversibly affect community structure (Levine et al. 2003). Dramatic alterations of fire frequency in historic shrublands that are now dominated by cheatgrass have been demonstrated (D'Antonio 2000; Ehrenfeld et al. 2001). Other cases of exotic grass and shrub impacts include increasing fuel resulting in greater flame lengths, higher temperatures and greater heat release. In each case, the mechanism through which impact develops depends on whether the invader can outcompete the natives for resources. In most cases, the specific eco-physiological reasons for greater biomass production have not been identified. The effects of cheatgrass strongly support the prediction that invaders affecting disturbance processes have the greatest potential to create large impacts on ecosystems (Vitousek 1990).

Allelopathy is a biological phenomenon by which one plant produces biochemicals that influence the growth, survival, and reproduction of other plants. Ridenour and Callaway (2001) showed that spotted knapweed had an adverse allelopathic effect on Idaho fescue (Festuca idahoensis) by reducing the fescue root growth by 50 percent.

Unanswered questions in the ecosystem-impacts literature include the degree to which documented impacts of noxious weeds result simply from the addition of new functional traits brought in by the invader, or alternatively by the reduction or elimination of native species (e.g., Mack et al. 2001).

Weed management and herbicide use

Weed management activities are part of the Helena National Forest weed program and would continue under all alternatives. Chemical weed treatments would be used in areas accessible to ground spraying equipment. Biocontrol would be used in areas where the biological agents have optimal conditions for survival and expansion. In riparian areas, biological control would be emphasized where conditions for insect establishment are met.

The use of herbicides may have positive or negative impacts on native plant diversity. Although most herbicide use may have side effects, removal of noxious weed species generally has beneficial effects to native plant communities. Rice et al. (1997) found in a detailed comparison of plant community composition over an eight year period that plots treated with herbicides were more similar to the potential natural communities than the no-spray controls (Mueggler and Stewart 1980). On the other hand, side effects of weed management can vary as a function of local site conditions (Crone et al. 2009, Karthikeyan et al. 2003, Shea et al. 2005). Potential side effects of weed management actions include reducing vigor or abundance of native or desirable species, inhibiting overall productivity or diversity, shifting community structure and function, and altering physical conditions (D'Antonio et al. 2004, Hulme 2006, Louda et al. 1997). Therefore, effective weed management requires weighing the success of control measures (e.g., impacts on target weeds and recovery of native species) against the side effects of management actions. This necessitates a

thorough understanding of how management tools interact with non-target system components as well as with target weeds.

The Helena National Forest Weed Treatment Project FEIS and Record of Decision (USDA Forest Service 2006 and 2007a) provide further analysis of effects, guidance and environmental requirements for weed control and treatment activities that would apply to this area under any alternative.

Treatment effectiveness

A single control treatment is rarely effective for eliminating large weed infestations. However, if new infestations are monitored and treated for several years after project implementation, there is a good chance they can be contained or eliminated. Emphasis on small and outlier infestations is an important principle of integrated weed management (IWM) (Sheley et al. 1999).

Project design features (see Noxious Weed Specialist Report and the Design Features section in chapter 2 of the FEIS) would contribute to minimizing new weed species establishment and expansion of existing noxious weed populations A list of native species that could be used for revegetation is included in appendix A of of the Noxious Weed Speicalist Report.

Climate change

The data on response of weeds and changes in weed ecology because of climate change are limited. Weeds are adaptable and if resources such as light, water, nutrients, or carbon dioxide change within the environment, it is more likely there may be an expansion of weeds. Drought can increase the susceptibility of ecosystems to invasion of nonnative species, especially under elevated CO_2 conditions (Chambers and Pellant 2008, Davis et al. 1999, Davis et al. 2001). However, prolonged drought or drought that occurs at the margin of a species range can result in mortality of nonnative invaders (Loeser et al. 2007), at least temporarily. Drought also can alter fire regimes but effects differ among ecoregions (Westerling et al. 2006, Ford et al. 2012). In most mountainous ecoregions, drought conditions in seasons prior to and including the fire season are associated with larger burn areas.

Effects Common to All Action Alternatives

New or expanded weed infestations would be most likely in the units with high levels of canopy removal and/or mechanical equipment use, and a long haul routes.

Proposed activities

Intermediate harvest

Intermediate harvest would involve activities that could predispose the forest to weed establishment and spread. Opening the forest canopy by the removal of larger trees would increase the amount of light to the forest floor, making the site more available for weed establishment. Jackpot burning which involves burning concentrations of fuels will tend to have areas of hotter burns which would be more likely to create openings for weed establishment. Mechanical equipment use would create more ground disturbance than hand treatments.

Precommercial thin

In most precommercial thin units, slash would be piled and burned. Piles of slash tend to burn hotter than scattered slash and are more likely to create openings for weed establishment (Korb et al. 2004).

Regeneration harvest

Slash treatment within the regeneration harvest type is usually a site prep burn (low-to-moderate intensity) which would be less likely than higher intensity burns to create openings for weed establishment. These harvest activities would reduce canopy cover, allowing more sunlight to reach the forest floor, and involve considerable ground disturbance from mechanical equipment. Increased light and disturbed soil would promote noxious weed spread or establishment.

Prescribed burn

Prescribed burns include necessary slash preparation work. Handlines would be constructed as needed. Burning hand piles, jackpot burns, or other high severity burns and the construction of handlines under this prescription would create openings for weed establishment.

Roads

Buckley et al. (2003) found that features common in logged areas such as skid trails and haul roads are likely to support populations and propagules of nonnative plants. Their research also suggests that haul roads, skid trails and main forest routes serve as primary conduits for entry of introduced species into the interior of managed stands. Not only do roads allow for efficient transport of noxious weed seeds, the soil disturbance and clearing of vegetation also provide excellent conditions for weeds. Thus, new temporary roads, new road construction, and road reconstruction activities provide higher risks for new weed infestations. Road maintenance activities may also contribute to some weed spread, but the risk is much lower.

The predicted soil disturbance within the treatment units was used to estimate the potential weed infestations associated with project activity. It is expected that without treatment of weed infestation new and exciting population will expand an annual rate 12 percent.

With the increased activities along road corridors and since most weeds in the project area are concentrated around road corridors, noxious weeds would be required to be treat before, during and after project implementation. This would reduce the potential for introduction and spread of noxious weeds.

Considering that disturbed areas are more susceptible to weed invasions, known weed infestation would be treated before activities causing disturbance takes place. Weed infestations within a half mile of units would be considered a threat and should be reduced to the extent possible. Treating a buffer around treatment units will reduce the probability of new invasions from population in the project area.

Prior to implementation, to prevent further expiation of weed infestation, weeds would be treated within treatment units, along haul routes and within a half mile of the treatment units.

With implementation of the required design features and recommended monitoring, the spread of weeds in the project area and weeds associated with project activities would be reduced. With repeated monitoring and continued treatment within the project area, new and existing have the potential to be controlled.

Alternative 1, No Action

By definition, direct and indirect effects (40 CFR 1508.8) result from the proposed action, and thus are not germane to the no-action alternative. When there are no direct and indirect effects, there are no cumulative effects.

This alternative is described to consider the conditions that would develop from not implementing the proposed action. Ground disturbance under this alternative would be limited to natural disturbances and existing uses. Under alternative 1 no vegetation treatments would occur and no new roads would be constructed. Weed management activities would continue to occur as analyzed within the HNF Weed Treatment Project FEIS (USDA Forest Service 2006). The specific level of management activates conducted would be subject to funding levels and workload priorities.

In the event of a wildfire, the heavy load of downed fuel could result in a high severity or intensity fire that could damage vegetation and soil and potentially further increase weed spread by exposing soil and reducing shading and competition. Canada thistle (Zouhar 2001b), spotted knapweed (Zouhar 2001a), Dalmatian toadflax (Jacobs and Sheley 2003), sulfur cinquefoil (Lesica and Martin 2003) and gypsyflower tend to survive fire and may spread in post-fire communities. Dalmatian toadflax in particular can rapidly expand from underground rhizomes. While native vegetation would return to the site, weeds that survive as underground parts or seeds may have an advantage under conditions of reduced canopy cover and competition and increased light and nutrients and may become established before native plant cover is abundant. Post-fire dominance is likely to vary with plant community, fire frequency, and fire severity.

Resource Indicator Measure

Predicted acres of weed treatment in the project area: 0 acres

No ground-disturbing activities are proposed with alternative 1. Weeds would be expected to continue to spread at a rate of 8 to 12 percent annually. Because HNF weed control treatments would continue to occur, subject to funding levels and Forest priorities, weed infestations may be held in check or would gradually diminish on the landscape. The rate of noxious weed spread could be higher if a high intensity wildfire were to burn through the area.

Irreversible and Irretrievable Commitments

None.

Alternative 2

There are about 6,754 acres of proposed activities and 518 acres of existing weed infestations in proposed treatment units. To a greater or lesser degree, all areas of proposed activity would allow disturbance that would create conditions suitable for new weed infestations. Table 274 shows the acres of weed species mapped in alternative 2 proposed treatment units.

Table 274. Acres of weeds in treatment units, alternative 2

Species	Montana Noxious Weed Category	Acres
Butter and eggs	Priority 2B	105
Canada thistle	Priority 2B	421
Cheatgrass	Priority 3 (not listed)	15
Common mullein	Not listed	30
Dalmatian toadflax	Priority 2B	15
Gypsyflower	Priority 2B	206
Hoary alyssum	Priority 2B	<1
Meadow hawkweed	Priority 2A	54
Musk thistle	Not listed	393
Orange hawkweed	Priority 2A	109
Oxeye daisy	Priority 2B	42
Spotted knapweed	Priority 2B	354
St. Johnswort	Priority 2B	85
Total area covered by weed infestations[1]		518

[1]Many species overlap on the ground, so the actual area covered by weeds is smaller than the total of the species acres added together.

Direct and Indirect Effects

Resource indicator measure

Predicted acres of weed treatment in the project area: 1,998 acres

Table 275 is the expected needs for weed treatment in alternative 2 broken down to before implementation, during implementation, and after implementation

Table 275. Expected noxious weed acres to be treated, alternative 2

Weed Treatment	Current Weed Infestation within Treatment Units	Estimate of Weed Infestation along Road Corridors	Known Weed Infestation within a Half Mile of Treatment Units	Potential Weed Infestation Related to Treatment Implementation	Total Acres for Single Application
Before Implementation	162	190	540	0	892
During Implementation	0	190	0	*	190
After Implementation	48	190	0	678	916
Total					**1,998**

* If new high risk weed infestations are detected during implementation, infestation would be treatment immediately.

Irreversible and Irretrievable Commitments

There would be no irreversible or irretrievable commitments under alternative 2. Although proposed activities would increase the susceptibility treatment areas to noxious weed introduction, the design features (see the Noxious Weed Specialist Report and the Design Features section in chapter 2 of the FEIS) for weed treatment before, during, and after project implementation would reduce the size and density of weed infestations.

Telegraph Vegetation Project Weed Infestations - Alternative 2

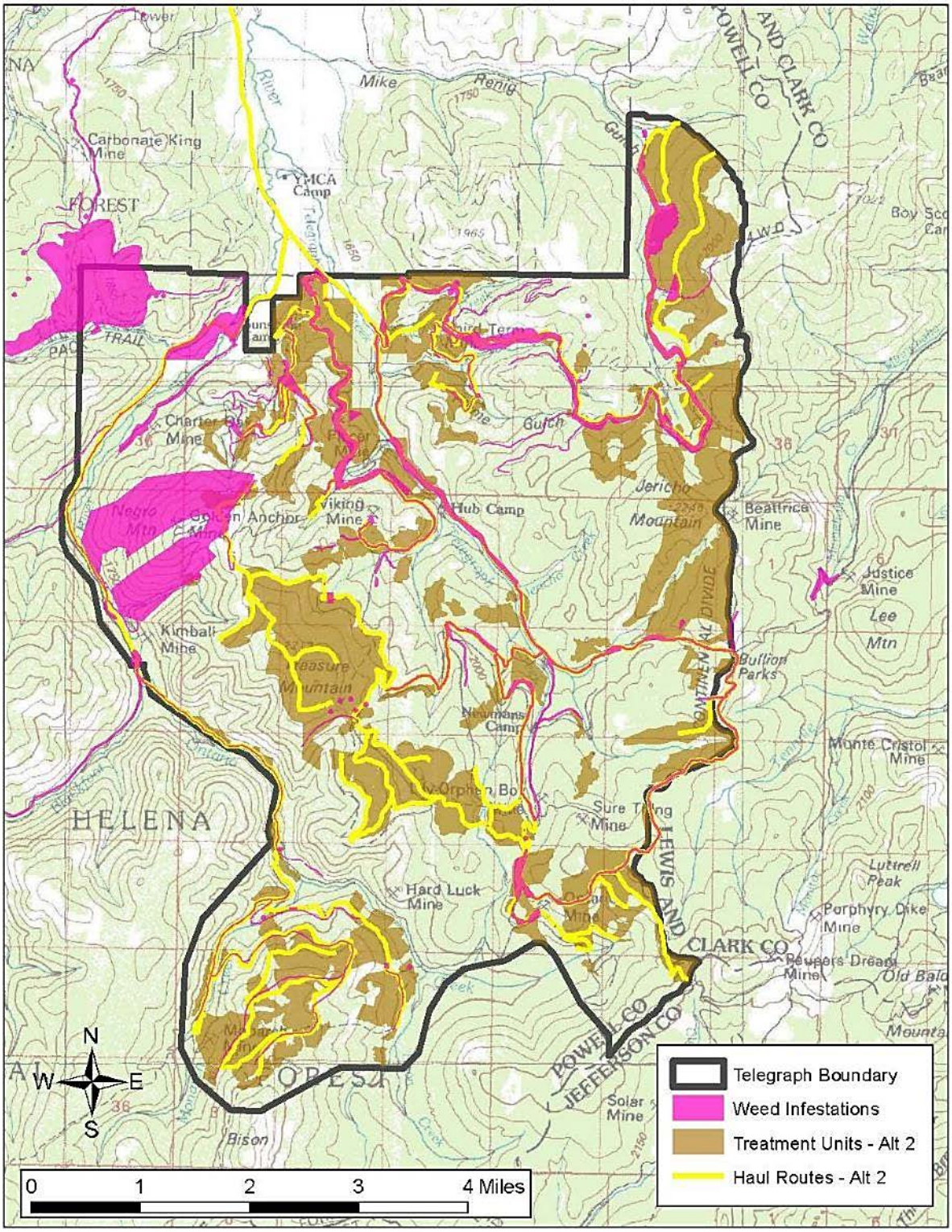

Figure 132. Alternative 2 proposed treatment units, haul routes, and weed infestations

Alternative 3

There are about 4,185 acres of proposed activities and 409 acres of existing weed infestations in alternative 3 treatment units. All areas of proposed activity, to a greater or lesser degree, would allow disturbance that would create conditions suitable for new weed infestations. Table 276 shows the acres of weed species mapped in alternative 3 proposed treatment units.

Table 276. Acres of weeds in treatment units, alternative 3

Species	Montana Noxious Weed Category	Acres
Butter and eggs	Priority 2B	72
Canada thistle	Priority 2B	318
Cheatgrass	Priority 3 (not listed)	15
Common mullein	Not listed	28
Dalmatian toadflax	Priority 2B	14
Gypsyflower	Priority 2B	153
Hoary alyssum	Priority 2B	<1
Meadow hawkweed	Priority 2A	47
Musk thistle	Not listed	325
Orange hawkweed	Priority 2A	90
Oxeye daisy	Priority 2B	12
Spotted knapweed	Priority 2B	290
St. Johnswort	Priority 2B	66
Total area covered by weed infestations[1]		409

[1] Many species overlap on the ground, so the actual area covered by weeds is smaller than the total of the species acres added together.

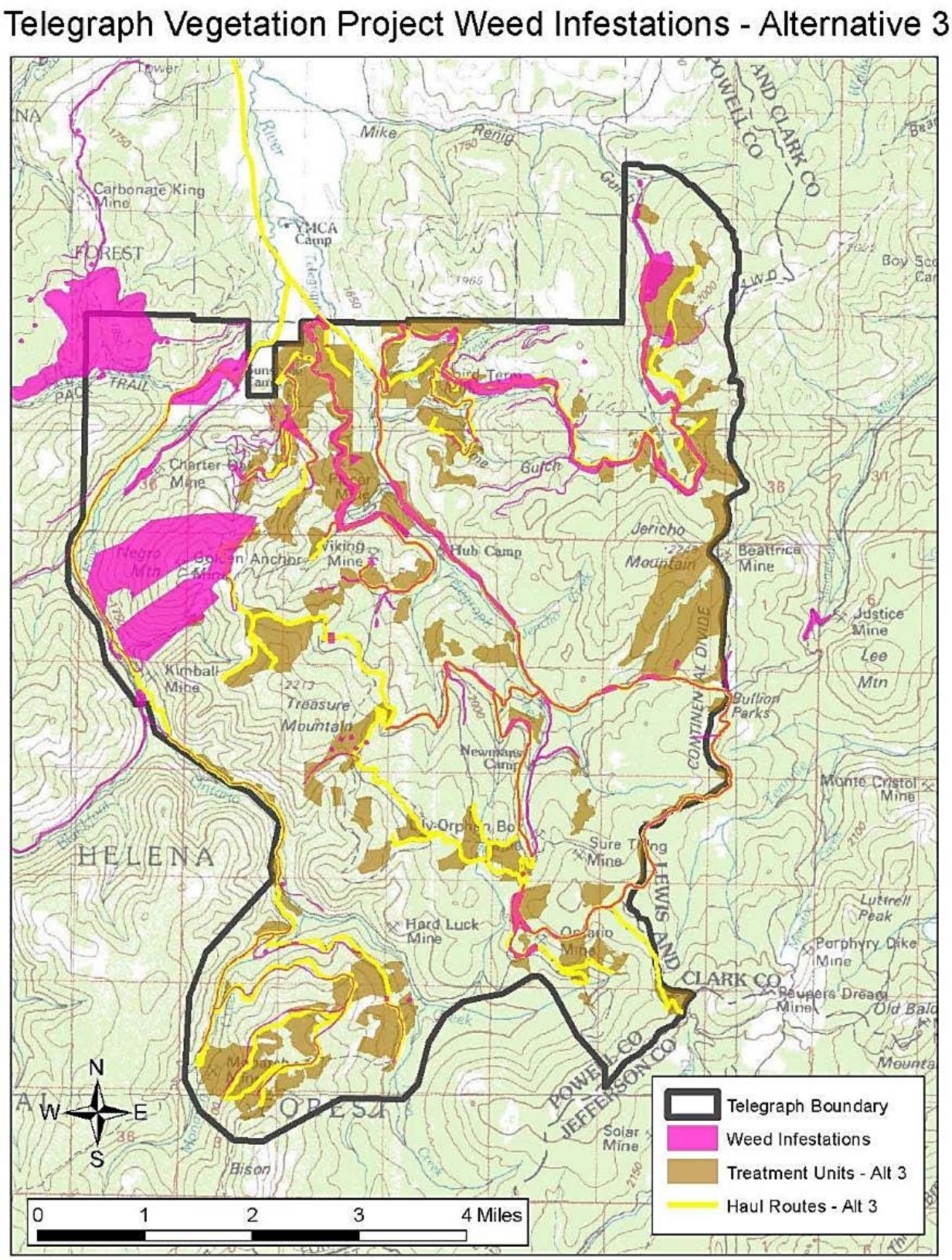

Figure 133. Alternative 3 proposed treatment units, haul routes, and weed infestations

Direct and Indirect Effects

Resource Indicator Measure

Predicted acres of weed treatment in the project area: 1,772 acres

Table 277 is the expected needs for weed treatment in alternative 3 broken down to before implementation, during implementation, and after implementation.

Table 277. Expected noxious weed acres to be treated, alternative 3

Weed Treatment	Current Weed Infestation within Treatment Units	Estimate of Weed Infestation along Road Corridors	Known Weed Infestation within a Half Mile of Treatment Units	Potential Weed Infestation Related to Treatment Implementation	Total Acres for Single Application
Before Implementation	151	168	559	0	878
During Implementation	0	168	0	*	168
After Implementation	45	168	0	513	726
Total					**1,772**

* If new high risk weed infestations are detected during implementation, infestation would be treatment immediately.

Irreversible and Irretrievable Commitments

There would be no irreversible or irretrievable commitments under alternative 3. Although proposed activities would increase the susceptibility treatment areas to noxious weed introduction the design features for weed treatment before, during and after project implementation would reduce the size and density of weed infestations.

Alternative 4

There are about 8,103 acres of proposed activities and 409 acres of existing weed infestations in alternative 4 treatment units. All areas of proposed activity, to a greater or lesser degree, would allow disturbance that would create conditions suitable for new weed infestations. Table 278 shows the acres of weed species mapped in alternative 4 proposed treatment units.

Table 278. Acres of weeds in treatment units, alternative 4

Species	Montana Noxious Weed Category	Acres
Butter and eggs	Priority 2B	211
Canada thistle	Priority 2B	581
Cheatgrass	Priority 3 (not listed)	38
Common mullein	Not listed	34
Dalmatian toadflax	Priority 2B	17
Gypsyflower	Priority 2B	328
Hoary alyssum	Priority 2B	<1
Meadow hawkweed	Priority 2A	54
Musk thistle	Not listed	521
Orange hawkweed	Priority 2A	106
Oxeye daisy	Priority 2B	151

Species	Montana Noxious Weed Category	Acres
Spotted knapweed	Priority 2B	571
St. Johnswort	Priority 2B	95
Total area covered by weed infestations[1]		694

[1] Many species overlap on the ground, so the actual area covered by weeds is smaller than the total of the species acres added together.

Direct and Indirect Effects

Resource Indicator Measure

Predicted acres of weed treatment in the project area: 2,439 acres

Table 279 is the expected needs for weed treatment in Alternative 4 broken down to pre-implementation, during implementation, and after implementation.

Table 279. Expected noxious weed acres to be treated, alternative 4

Weed Treatment	Current Weed Infestation within Treatment Units	Estimate of Weed Infestation along Road Corridors	Known Weed Infestation within a Half Mile of Treatment Units	Potential Weed Infestation Related to Treatment Implementation	Total Acres
Before Implementation	228	201	578	0	1,007
During Implementation	0	201	0	*	201
After Implementation	68	201	0	962	1,231
Total					**2,439**

* If new high risk weed infestations are detected during implementation, infestation would be treatment immediately.

Irreversible and Irretrievable Commitments

There would be no irreversible or irretrievable commitments under alternative 4. Although proposed activities would increase the susceptibility treatment areas to noxious weed introduction the design features for weed treatment before, during and after project implementation would reduce the size and density of weed infestations.

Cumulative Effects of Alternatives 2, 3, and 4

Direct and indirect effects of actions proposed under alternatives 2, 3, and 4 would be confined to proposed treatment units in the project area and haul routes in the combined boundary. Only impacts of other actions and events that overlap spatially and temporally with the direct and indirect effects of alternatives 2, 3, and 4 can be considered to be cumulative effects. Past activities' effects on noxious weeds are represented in the existing condition of the project. Ongoing and reasonably foreseeable projects could potentially contribute to cumulative effects for this project for those that overlap in space and time. However, weeds are treated as part of the Helena National Forest weed treatment program. Furthermore, design features are applied to projects to control the spread of noxious weeds in disturbed sites thus there would be minimal to no cumulative effects on noxious weeds. For detailed information regarding past, ongoing, and reasonably foreseeable cumulative effects of noxious weed, see appendix B of the Noxious Weed specialist report located in the project record.

Conclusions

Alternative 1 would have no short-term impact in terms of ground disturbance associated with vegetation treatment activities. Weeds would be expected to naturally expand approximately 8 to 12 percent per year. Weed control treatments would continue. Under this alternative, the project area would be at greatest risk of wildfire. If a severe wildfire were to occur, intensely burned portions of the project area would be susceptible to weed invasion or spread.

For all action alternatives, the level of risk associated with noxious weed spread is low, determined through a noxious weed risk evaluation (appendix D of the Noxious Weeds specialist report). The low level of risk is mainly due to the relatively low susceptibility of the affected habitat types. However, without treatment it is predicted that there will be an increase in the rate of spread of weeds under each action alternative due to predictions of soils disturbance for each treatment unit, and the roads activities. Utilizing expected soils disturbance and the Montana Noxious Weed List (MTDA 2015) to identify which invasive species to manage across the forest, as well as project specific invasive plant risk assessments/evaluations, high risk units were identified under each action alternative. Risk assessments/evaluations help identify threats to native vegetation as a result of project related ground disturbance and invasive species within or near the project area. Table Table 280 compares the estimated acres of weeds that need to be treated and compares the number of High Risk Units by alternative.

Table 280. Comparison of expected noxious weed acres to be treated

Alternative	Total Acres of Treatment
Alternative 2	1,998
Alternative 3	1,772
Alternative 4	2,439

Alternative 2, the Proposed Action, includes a total of 518 acres of noxious weed infestations within proposed treatment units. New or expanded weed infestations would be most likely in the 86 units with high levels of canopy removal and/or mechanical equipment use, and along road corridors. It is estimated that there would be 1,998 acre of weed treatment within the project area. This total acreage would be greater than Alternative 3, but less than Alternative 4.

Alternative 3, includes a total of 409 acres of noxious weed infestations within proposed treatment units. New or expanded weed infestations would be most likely in the 70 units with high levels of canopy removal and/or mechanical equipment use, and along road corridors. It is estimated that there would be 1,772 acre of weed treatment within the project area. This total acreage would be least amount of weed treatment when compared to Alternative 2 and Alternative 4.

Alternative 4, includes a total of 694 acres of noxious weed infestations within proposed treatment units. New or expanded weed infestations would be most likely in the 96 units with high levels of canopy removal and/or mechanical equipment use, and along road corridors. It is estimated that there would be 2,439 acre of weed treatment within the project area. The total acreage for this Alternative 4 would be greatest amount of weed treatment when compared to Alternative 2 and Alternative 3.

Prior to implementation, to prevent further expiation of weed infestation, weeds would be treated within treatment units, along haul routes and within a half mile of the treatment units.

With implementation of the required design features and recommended monitoring, the spread of weeds in the project area and weeds associated with project activities would be reduced. With repeated monitoring and continued treatment within the project area, new and existing have the potential to be controlled.

Forest Plan Consistency

The effects upon noxious weeds would remain within Forest Plan standards because it is consistent with management guidelines with the design features implemented. There are no specific management area standards for noxious weed management in the Forest Plan. This document incorporates the decision in the Noxious Weed EIS and ROD which prescribes specific guidance for noxious weed management on the HNF.The project is consistent with the “weed” portion of the Forest Plan forestwide management areas standards.

Soils

Introduction

This report discusses possible effects of proposed activities on the soils resource. Landtypes (soils) have been characterized for the Telegraph Project area in Soil Survey of Helena National Forest Area, Montana (USDA Forest Service and Natural Resources Conservation Service 2001). There are 42 soils mapped within the project area, 29 of which would be affected by proposed vegetation treatment activities. A summary of key soil characteristics for the 29 landtypes affected by the Telegraph Vegetation Project area is displayed in Table 281.

By including all design features and Resource Protection Measures specified in the action alternatives, proposed actions for the Telegraph Vegetation Project would comply with Region 1 Soil Quality Standards (R1 SQS) to limit detrimental soil disturbance (DSD).

Under Alternative 2, proposed treatment units listed in Table 284 are anticipated to comply with R1 SQS with implementation of additional design features; the remainder of the units not listed in Table 5 would comply with R1 SQS as proposed. Those design features are spelled out under the appropriate activities for this alternative. Under Alternative 3, proposed treatment units listed in Table 286 are anticipated to comply with R1 SQS with additional design features; the remainder of the units not listed in Table 286 would comply with R1 SQS as proposed. Those design features are spelled out under the appropriate activities for this alternative. Under Alternative 4, proposed treatment units listed in Table 289 are anticipated to comply with R1 SQS with additional design features; the remainder of the units not listed in Table 289 would comply with R1 SQS as proposed. Unit 093 is not expected to meet R1 SQS with the proposed treatment prescriptions regardless of design features for any of the alternatives. It is proposed in this report that the unit be divided into two units 093East and 093West and that the 093West unit be dropped. Unit 093East is anticipated to comply with R1 SQS. Those design features are spelled out under the appropriate activities for this alternative.

All detrimental soil disturbance resulting from project activities would be a short-term impact because there would be a long-term trend for soil recovery through reclamation measures and/or natural recovery processes (i.e., frost heaving, bio-perturbation, biomass input and nutrient cycling, etc.). Soils would likely take at least 50 years for recovery to pre-disturbance conditions where reclamation measures (scarification and seeding) would be implemented, such as on temporary roads, skid trails and log landings. Soils would likely take longer to recover to pre-disturbance conditions, perhaps at least 100 years, where only natural recovery processes would occur.

Nonetheless, all proposed actions for the Telegraph Vegetation Project have been designed to comply with R1 SQS to limit the area affected by detrimental soil disturbance through inclusion of Resource Protection Measures (RPMs) and design features in all action alternatives. A full listing of RPMs and design features which would be implemented with all action alternatives can be found in the Design Features section of this report located in the project record as well as in the Design Features section in chapter 2 of this FEIS.

Assumptions

Ground-based (Tractor) Harvest/Precommercial Thin (Ground Based)/Mechanical Re-arrangement of Fuels

Predictions of detrimental soil disturbance (DSD) are based on calculations of skid trail disturbance and have been validated by monitoring conducted on the HNF (USDA Forest Service 2013). It is assumed that the magnitude of soil disturbance on areas affected by primary skid trails would constitute detrimental soil disturbance. The average spacing between skid trails in tractor harvest units is estimated to be 100 feet except where they converge. With an average width of detrimental soil disturbance at 10 feet, main skid trails would affect about 9.1 percent of the activity area in a tractor harvest unit logged during "summer conditions." This is calculated using the following equation:

> % DSD = width of the skid trail in feet / [(width of skid trail in feet) + width of spacing between main skid trails in feet)] x 100
> 9.1% = 10 ft. / (10 ft+100 ft.) x 100

Monitoring conducted on the Helena National Forest in 2012 documented 7 percent detrimental soil disturbance on units that were logged with ground based equipment (tractor) during "summer conditions" (FY2012 Soil Monitoring Report). For logging under "frozen conditions," the amount of area impacted by log skidding is predicted to be between 3 to 4 percent of the activity area based on monitoring conducted on the Helena National Forest (USDA Forest Service 2013).

Log Landings Associated with Ground-based Harvest

The average size of log landings is estimated ¼ acre (0.25 acre) for tractor logging units. It is assumed that one-quarter of an acre log landing is needed for every 10 acres of harvested area. It is assumed that the magnitude of soil disturbance on area affected by log landings would constitute detrimental soil impacts. By calculating the detrimental disturbance with the following equation:

> % DSD = [(area of log landing in acres) ÷ (amount of harvested area per log landing in acres)] ×100
> 2.5% = [0.25÷10] ×100

The detrimental soil disturbance associated with log landings is 2.5 percent, which was validated by monitoring conducted on the HNF (USDA FS 2013).

Monitoring conducted on the HNF in 2012 documented 7 percent detrimental soil disturbance on units that were logged with ground-based equipment (tractor) during "summer conditions," which includes landings (USDA Forest Service 2013). For logging under "frozen conditions," the amount of area impacted by log skidding and landings is predicted to be between 3 to 4 percent of the activity area based on monitoring conducted on the HNF (USDA FS 2013).

Cable Yarding Harvest

Predictions of detrimental soil disturbance (DSD) are based on calculations of cable corridor disturbance. It is assumed that the magnitude of soil disturbance on area affected by cable yarding corridors would constitute detrimental soil disturbance. The average spacing between skid trails in tractor harvest units is estimated to be 100 feet except where they converge. With an average width of soil disturbance at 8 feet, main cable yarding corridors would affect about 7 percent of the activity area. This is calculated using the following equation:

> % DSD = width of the skid trail in feet ÷ [(width of skid trail in feet) + width of spacing between main skid trails in feet)] x 100
> 7.2% = 8 ft.÷ (10 ft+100 ft.) x 100

Soil monitoring in the Maudlow-Toston salvage sale area found that detrimental soil disturbance in cable yarding corridors affected approximately 4 to 5 percent of units when harvest occurred under summer conditions (USDA Forest Service 2003d).

Monitoring observations within cable units harvested under winter conditions documented that detrimental soil disturbance was negligible (i.e., not enough to be measurable) in the Maudlow-Toston Area. With this in mind, a 1 percent detrimental soil disturbance estimate is anticipated from this activity. Winter cable log-yarding methods have less impact to soils compared to tractor skidding over bare ground (USDA FS, 2013).

Log Landings Associated with Cable Yarding Harvest

With cable yarding systems, log landings would generally be located on the shoulder of the road used to access the harvest unit. Because the cable yarding equipment would be set-up and operating on the access road prism, there would not be soil impacts from heavy equipment on the log landing sites. Therefore, detrimental soil impacts would be negligible in the log landing sites for cable yarding units (USDA Forest Service 2011).

Prescribed Fire

There are several activities that have varying effects on soils in the prescribed fire category. For all of the burning prescriptions described below, it is assumed that the percent of severely burned soil equates to the percent detrimental soil disturbance (USDA Forest Service 2014).

Slashing is assumed to have no detrimental soil disturbance as a result of mechanical (chainsaw) cutting of small diameter trees by personnel on foot.

Pile burning focuses on a concentration of fuel accumulations in piles and high-severity fire would occur in these piles. Monitoring conducted on the Helena National Forest (USDA FS 2013) documented that pile burning within units resulted in 0 to 3 percent detrimental soil disturbance. Detrimental soil disturbance associated with pile burning could be as much as 5 percent depending on the concentration of the piles within the activity area. Therefore, the amount of detrimental soil disturbance associated with pile burning is predicted to be 5 percent.

Jackpot burning focuses on concentrations of natural fuel accumulations and/or slash after harvest or slashing. High-severity fire would occur in the heavy fuel concentration burning locations; however, this is predicted to affect no more than 5 percent of an activity area when considering the project design elements. Therefore, the detrimental soil disturbance associated with jackpot burning is predicted to be 5 percent.

Site prep burning follows harvest to reduce logging slash, and is intended to be a low- to moderate-severity fire. It is assumed that less than 2 percent of the area affected by a low-severity fire would be severely burned and less than 10 percent of the area affected by a moderate-severity fire would be severely burned (DeBano et al. 1998). As specified in the Design Features section of the Soils Specialis Report as well as in the Design Features section in chapter 2 of this FEIS, site prep burning should be designed to target the low end of fire severity to ensure compliance with the Soil Quality Standards.

Broadcast burning is designed to reduce hazardous fuels and includes areas of low-severity and mixed-severity burning. When estimating soil effects resulting from prescribed burning, specifically mixed-severity burning, occasionally burn plans will be designed to target the low end of mixed-severity fire to ensure adequate soil cover is retained to guard against erosion in excess of 2 tons per acre. Mixed-severity burning is designed to expose 5 to 25 percent bare soil. Targeting the low end of mixed-severity burning would be designed to expose 5 to 10 percent bare soil. It is assumed that less than 2 percent of the area affected by a low-severity fire would be severely burned and less than 10 percent of the area affected by a mixed-severity fire would be severely burned (DeBano et al. 1998). Therefore, a range of 2 to 10 percent detrimental soil disturbance is associated with broadcast burning (USDA FS, 2013, 2014b).

Under-burning is a low-severity fire covering a majority of an activity area. It is assumed that less than 2 percent of the area affected by a low-severity fire would be severely burned (DeBano et al. 1998). Therefore, the predicted detrimental soil disturbance following under-burning is 2 percent. Monitoring conducted on the Helena National Forest (USDA FS, 2013) documented that detrimental soil disturbance following under-burning averaged 4 percent.

All these estimates are based on monitoring of similar activities on similar landscapes, professional observation and experience in the field gained while evaluating forestry practices in other timber sale areas and prescribed fire projects.

Temporary Road Construction

For the purpose of calculating predicted area of detrimental soil disturbance resulting from temporary road construction and subsequent obliteration, estimates were made for average widths of disturbance on temporary or specified roads (25 feet), including the cut and fill slopes. With a width of 25 feet, 1 mile of temporary road construction would equal 3 acres of detrimental soil disturbance.

3 acres = [(1 mile x 5,280 feet/mile) x 25 feet] / 43,560 square feet per acre

Effectiveness of Best Management Practices

State of Montana BMP audits evaluate BMP implementation associated with timber harvest practices and are documented in the bi-annual report “Montana Forestry Best Management Practices Monitoring” (Montana Department of Natural Resources and Conservation [DNRC] 2000, 2002, 2004, 2006, 2008, 2010, 2012, and 2014). These State audits found that 100 percent of the timber sale areas on Federal land reviewed had implemented the following 10 BMPs in a manner that was effective in providing adequate protection of soil and water resources:

- IV.A.2, Logging suits topography (52 sites visited)
- IV.A.5, Skid Trail Design (51 sites visited)
- IV.A.6, Landing size and location (51 sites visited)
- IV.B.1a, Skid to minimize displacing soil (52 sites visited)

- IV.B.1b, Skid to minimize compacting soil (50 sites visited)
- IV.B.2, Avoid Equipment in Isolated Wetlands (19 sites visited)
- IV.B.4, Adequate drainage for landings (51 sites visited)
- IV.B.5, Adequate drainage for skid trails (51 sites visited)
- IV.C.5, Compaction and displacement minimized (52 sites visited)
- IV.C.6, Equipment operation on suitable slopes only (52 sites visited)

On the Helena National Forest, soil quality monitoring results have previously demonstrated that conservation of soil resources has improved during implementation of forestry activities since adoption of BMPs in 1988. Thus, BMPs are demonstrated to be effective in conserving soil resources on the Forest. This conclusion is documented in the Helena National Forest Annual Monitoring Report Fiscal Year 2004 which reported "that forestry practices have generally become more effective in limiting the amount of area affected by detrimental soil disturbance to comply with the Forest Plan measure of soil variability (i.e., 20%), since adoption of forestry Best Management Practices (BMPs) in 1988...Six of the monitoring plots assessed areas harvested prior to adoption of BMPs in 1988. The mean value for aerial extent of moderate to severe soil disturbance on these 6 plots was 19%, and ranged from 8% to 26%. The remaining 4 monitoring plots assessed areas harvested after 1988 and adoption of BMPs. The mean value for aerial extent of moderate to severe soil disturbance on these 4 plots was 13%, and ranged from 5% to 17%" (USDA FS 2007; page 80).

BMP monitoring has been conducted for harvest units in the Maudlow-Toston salvage sale area. The purpose of the monitoring was to determine if prescribed BMPs and mitigation measures had been adequately implemented and assess if those measures were effective in achieving soil and water conservation objectives. Results of this monitoring are documented in "Unit Log" reports, which describe BMP evaluations completed on January 8, and October 16 and 29, 2003 (USDA FS 2003). Key findings from BMP monitoring in Maudlow-Toston salvage sale area include:

- Adequate amounts of coarse woody material were retained in harvest units, as recommended by researchers (Graham et al. 1994).
- R1 SQS (USDA FS, 2014) for limiting detrimental soil disturbance, such as compaction and displacement, were met in helicopter, skyline cable (both summer and winter logging), and winter tractor logging units.
- Temporary roads and log landings have been successfully re-contoured, with adequate amounts of woody material scattered across reclaimed areas, and then seeded.

When feasible, changing the harvest season to winter has resulted in an approximate 6.7 percent decrease in detrimental soil disturbance per acre for units previously tractor yarded during dry conditions. This is based on previously stated monitoring results on the Helena National Forest.

In summary, results of State BMP audits by Montana DNRC and post-harvest soil quality monitoring on the Helena National Forest indicate that BMPs and mitigation measures have been effective in conserving soil and water resources during implementation of forestry practices with different land ownership or management agencies, and on a variety of ecosystem types. Thus, these same BMPs and design features can reasonably be expected to achieve soil and water conservation objectives with the Telegraph Vegetation Project.

Past monitoring on the Klamath National Forest showed that 69 percent of new skid trails reuse old skid trails (Laurent 2009). It was further estimated that main skid trails disturbed 10 percent of each

unit. Therefore, the estimation was made that 69 percent of the 10 percent (or 7 percent of each unit) would occur on pre-existing skid trails. Therefore, the assumption from this monitoring is that there would be 3 percent new detrimental soil disturbance added to the current amount from primary skid trails for units with existing skid trail networks.

Information Used

Information used in this analysis of soil resources is derived from a number of sources, which are described in detail where they are cited or used in this analysis. Only a summary of the primary sources of information used in this analysis is provided in this section. The reader will find more detail on information used in this analysis where it is cited in the body of this report.

The Region 1 Approach to Soils Analysis Regarding Detrimental Soil Disturbance in Forested Areas, A Technical Guide – April 2011. This document provides guidance to Northern Region (R1) soil scientists for project-level analysis of the soils resource in areas in forested areas. It provides information on data collection protocols, analysis methodologies, monitoring methodologies, and data management. In particular, this document offers additional guidance related to the Regional Soil Quality standards (FSM 2500 – Watershed and Air Management, R-1 Supplement No. 2500-99-1, here after referred to as R1 Supplement) for detrimental soil disturbance (DSD).

The “Soil Survey of Helena National Forest Area, Montana” (USDA FS, and Natural Resource Conservation Service 2001) provides information on distribution of mapped soil units, which are termed landtypes, within the project area. This published “Soil Survey” meets National Cooperative Soil Survey Standards, and includes descriptions of soil types and their characteristics relevant to management activities.

This analysis uses results of soil monitoring conducted in the Maudlow-Toston Salvage Sale Area and Cave Gulch Salvage Sale Areas (USDA FS 2003a, 2003b, and 2003c; Page-Dumroese et al. 2006), to evaluate implementation and effectiveness of BMPs. Other sources of information for evaluating effectiveness of BMPs are cited in this analysis.

Field work was conducted in 2009 and 2012 to document the existing detrimental soil disturbance in select units. Field work was prioritized in units where ground-based or cable-based harvest would occur, and those units with previous activities (determinations based on the FACTS database). A summary of that field work is located in the project record for the Soils Resource Report.

A variety of published scientific literature relating to soils and effects of timber harvest and prescribed fire were reviewed for supporting information in this analysis. Literature reviewed for this analysis is listed in a bibliography at the end of Soils Resource Report.

Methodology

The HNF uses the Forest Soil Disturbance Monitoring Protocol (Dumrose et al. 2009) to monitor forest sites before and after ground-disturbing management activities for physical attributes that could influence site resilience and long-term sustainability. The attributes describe surface conditions that affect site sustainability and hydrologic function. Monitoring the attributes of surface cover, ruts, compaction, and platy structure can also be used to generate best management practices that help maintain site productivity.

The HNF uses this protocol when evaluating physical soil disturbance in a forested setting to determine compliance with the Region 1 Soil Quality Standards (USDA Forest Service 1999) and the

Helena National Forest Plan (USDA Forest Service 1986). These soil guidelines are to be applied for design and evaluation of management activities.

The Water Erosion Prediction Project (WEPP; Elliot et al. 2000) erosion model is used to predict erosion resulting from prescribed fire activities. Technical documentation for WEPP states that the model values are plus or minus 50 percent of true erosion values, at best (Elliot et al. 2000). WEPP is used in this analysis to provide relative erosion values for comparison of harvest and prescribed fire effects by alternative, and for predicting management activity compliance with R1 SQS for soil loss. Detailed information regarding the model inputs and analysis results can be found in the Hydrology Specialist Report and accompanying project record. A subset of results has been included in the Soil Specialist project record.

Proposed treatment units with the same proposed activities (harvest and burning) were grouped together to determine detrimental soil disturbance because logging system design and resulting effects to the soil are the same for the same prescriptions. Detrimental disturbance resulting from temporary road construction was derived from prorating the disturbance associated with the road construction based on the size of the unit. This is consistent with the direction given by the Region 1 Approach to Soils Analysis Regarding Detrimental Soil Disturbance In Forested Areas, A Technical Guide – April 2011 (USDA 2011).

Soil Resource, Affected Environment

Analysis Area

In an effort to achieve legal mandates to sustain site productivity, the Forest Service has developed management policy to guide design and implementation of vegetation management practices (i.e., timber harvest, grazing, and prescribed burning) in ways that maintain or improve soil quality. Specifically, this management policy (known as the R1 SQS found in Forest Service Manual (FSM) 2500—Watershed and air management, USDA FS 1999), states that new vegetation management activities should not result in detrimental soil conditions on more than 15 percent of an activity area. When operations are planned in areas that do not meet soil quality standards resulting from prior activities, new vegetation management activities should be planned to meet current standards and designed to ameliorate past detrimental soil conditions, where feasible. For this project, R1 SQS will serve as the measurement indicator for determining compliance with legal mandates to sustain site productivity with implementation of management activities.

Intensively developed sites such as mines, recreation sites, administrative sites, powerline rights- of ways, and permanent roads and trails are areas dedicated for management uses other than vegetation production. Therefore, soil quality standards are not applied to these areas (USDA FS 1999). Permanent roads do affect soil hydrologic function; however, road evaluation is more appropriately conducted on a watershed basis. This analysis will focus on detrimental soil disturbance resulting from Forest Service vegetation management activities within proposed vegetation treatment units.

Soil quality standards are to be applied to “activity areas” (USDA FS 1999). The activity area is considered an appropriate geographic unit for assessing soil environmental effects, because soil productivity is a site-specific attribute of the land. Thus, the activity area will be used as the geographic unit to assess soil environmental effects for all action alternatives.

Soil quality standards are to be applied to “activity areas” (USDA FS 2014a). The activity area is considered an appropriate geographic unit for assessing soil environmental effects, because soil

productivity is a site-specific attribute of the land. Thus, the activity area is used as the geographic unit to assess soil environmental effects for all action alternatives.

All temporary roads, proposed units, skid trails and landings are considered to be part of an activity area. Specified transportation facilities, areas administered by special use permit and dedicated trails are excluded. These soil guidelines are to be applied for design and evaluation of vegetation management activities. The appropriate geographic area for soil cumulative effects analysis has been defined as the “land area affected by a management activity” (USDA FS 1999). This is because soil productivity is a site-specific attribute of the land. Forest Service Manual 2550.5 defines soil productivity as the inherent capacity of the soil resource to support appropriate site-specific biological resource management objectives, which includes the growth of specified plants, plant communities, or a sequence of plant communities to support multiple land uses. The productivity of one area of soil is not dependent on the productivity of an adjacent area of land. Similarly, if one acre of land receives soil impacts resulting from management activities and a second management activity that may affect soil is planned for that same site, then soil cumulative effects are possible on that site. Thus, cumulative effects to soil productivity are appropriately evaluated on a site-specific basis.

This site-specific productive function of soil is in contrast to the integrated hydrologic function of a watershed, which is dependent on the integrity of the whole system to maintain proper function

Temporal Scope

The temporal scope for assessment of soil resource environmental effects will include both short- and long-term impacts. For the purposes of this analysis, short-term effects are defined as those that occur approximately within 1 to 50 years following proposed management actions. Long-term effects are defined as those that occur approximately within 50 to 100 years, or more, following proposed management actions.

Landtypes in the Project Area

Landtypes (soils) have been characterized for the Telegraph Vegetation Project area in Soil Survey of Helena National Forest Area, Montana (USDA Forest Service and Natural Resources Conservation Service 2001). There are 42 soil units mapped within the project area, 29 of which would be affected by proposed vegetation treatment activities. A summary of key soil characteristics for the 42 landtypes affected by the Telegraph Vegetation Project area is displayed in table 281.

Of the 42 landtypes found in the Telegraph Vegetation Project area, 32 contain soil types considered “sensitive.” Sensitive soil types are those with greater vulnerability to, or at higher risk for, detrimental soil disturbance resulting from management activities, such as surface erosion, compaction or mass wasting. Many landtypes in the project area are sensitive because of their granitic parent material, which is at a high risk of surface erosion. Landtypes formed in ash-cap parent materials are also highly susceptible to rutting, compaction, and erosion. The majority of the land types within in the project boundary are wet soils due which are susceptible to rutting and compaction. There are several landtypes in the project boundary which are at risk for mass wasting or landslides due to wet soils being slump-prone. These landtypes are displayed in the table below.

Table 281. Characteristics of landtypes mapped within Telegraph Vegetation Project area

Landtype Number	Landform	Geology	Topsoil Texture	Slope Percent	Sensitive Soil characteristics	Acres
100	Flood plains and terraces	Mixed alluvium	———	0-10	Rutting and Compaction due to wet soils, flood-prone landform.	145
101	Flood plains and terraces	Alluvial deposits or glacial outwash	———	0-10	Rutting and Compaction due to wet soils, flood-prone landform.	540
110	Alluvial fans	Alluvial deposits	Very gravelly clay loam, very gravelly sandy loam	10-25	Flood-prone landform.	243
12C	Moraines	Glacial till from granitic rocks	Very cobbly sandy loam	15-40	Rutting and Compaction due to wet soils and erosion prone due to ash-cap and granitic parent materials.	585
12D	Moraines	Glacial till from granitic rocks	Very cobbly sandy loam	25-50	Rutting and Compaction due to wet soils.	590
136	Moraines	Glacial drift	———	0-10	Rutting and Compaction due to wet soils.	664
13A	Moraines or glaciated mountain ridges	Glacial till from basalt or metasedimentary rock	Very cobbly clay loam	10-25	Rutting and Compaction due to wet soils.	1,024
14B	Basins and toeslopes	Colluvial deposits from limestone, basalt and metasedimentary rock	Very cobbly silty clay loam	10-25	Rutting and Compaction due to wet soils. Mass wasting risk in slump-prone soils.	8
14C	Basins and toeslopes	Colluvial deposits from basalt and metasedimentary rocks	Very cobbly loam	10-40	Rutting and Compaction due to wet soils. Mass wasting risk in slump-prone soils.	925
15-	Landslides	Limestone, basalt and metasedimentary rock	Very gravelly silty clay loam	10-40	Rutting and Compaction due to wet soils. Mass wasting risk in landslide-prone soils.	28
36-	Rolling uplands	Granitic rock	Very gravelly sandy loam	25-40	Erosion prone soils due to granitic parent material.	540

Landtype Number	Landform	Geology	Topsoil Texture	Slope Percent	Sensitive Soil characteristics	Acres
36B	Mountain slopes	Granitic rock	Very gravelly sandy loam, gravelly sandy loam, loamy sand	10-40	Rutting and Compaction due to wet soils and erosion prone due to granitic parent materials.	277
39A	Mountain slopes	Argillites, siltites and quartzites	Bedrock, very cobbly loam	25-40	NA	147
46-	Mountain slopes and ridges	Granitic rock	Extremely bouldery sand	10-40	NA	181
47-	Mountain slopes	Basalts, tuffs, andesites and breccias	Extremely cobbly coarse sandy loam, extremely cobbly loam	25-40	NA	1,927
47B	Mountain slopes	Basalts, tuffs, andesites and breccias	Extremely cobbly loam	25-50	NA	3,024
470	Mountain slopes and ridges	Basalts, tuffs, andesites and breccias	Very stony loam, extremely stony loam	10-40	NA	151
56-	Mountain ridges	Granitic rock	Bedrock, very cobbly sandy loam	10-25	Rutting, compaction and erosion prone soils due to the ash-cap and granitic parent materials.	293
56A	Mountain slopes	Granitic rock	Extremely cobbly sandy loam	40-60	Erosion prone soils due to granitic parent material.	949
57-	Mountain ridges	Basalts, tuffs, andesites and breccias	Extremely cobbly loam	10-40	Rutting, compaction and erosion prone soils due to the ash-cap parent material.	62
57A	Mountain ridges	Basalts, tuffs, andesites and breccias	Extremely cobbly loam	10-40	Rutting, compaction and erosion prone soils due to the ash-cap parent material.	49
76-	Glaciated mountain slopes	Granitic rock	Very gravelly sandy loam	25-50	Rutting, compaction and erosion prone soils due to the ash-cap and granitic parent materials.	3,605

Landtype Number	Landform	Geology	Topsoil Texture	Slope Percent	Sensitive Soil characteristics	Acres
76A	Glaciated mountain ridges	Granitic rock	Very gravelly sandy loam	10-25	Rutting, compaction and erosion prone soils due to the ash-cap and granitic parent materials.	1,448
77-	Mountain ridges	Basalts, tuffs, andesites and breccias	Very cobbly loam, bedrock	10-25	Rutting, compaction and erosion prone soils due to the ash-cap parent material.	1,733
77A	Mountain ridges	Basalts, tuffs, andesites and breccias	Very cobbly loam, bedrock	10-25	NA	512
77B	Mountain slopes	Basalts, tuffs, andesites and breccias	Extremely cobbly loam	40-60	Rutting, compaction and erosion prone soils due to the ash-cap parent material.	1,336
790	Cirque basins	Glacial till from metasedimentary rock	Extremely channery loan very stony loan	25-40	Rutting compaction and erosion prone soils due to ash cap parent material	1,062
80-	Cirque headwalls and basins	Metasedimentary rock	Bedrock	40->60	NA	73
86-	Glacial trough walls	Granitic rock	Extremely gravelly sandy loam,	60-90	Erosion prone soils due to granitic parent material.	327
87-	Glacial trough walls	Metasedimentary rock and basalt	Extremely channery loam, bedrock	60-90	NA	947
90-	Glacial trough walls	Metasedimentary rock and basalt	Very cobbly loam	60-90	Rutting, compaction and erosion prone soils due to the ash-cap parent material.	227
97-	Structural breaklands	Argillites, siltites and quartzites	Extremely channery loam	60-90	NA	41
W-0 (Water Body)	———	———	———	———	———	4
Total						23,667

Field Evaluation of Existing Soil Conditions

As will be described in the following subsections, some of the soils within the Telegraph Vegetation Project area have been affected by past and ongoing management activities. Field evaluation was conducted in the Telegraph Vegetation Project area during summers of 2009 and 2012 by Helena National Forest soil science personnel. The purpose of this field evaluation was to validate existing soil conditions in areas affected by past and ongoing management actions. These management activities include the following actions: past timber harvest, grazing within the Tenmile Priest Pass Allotment, existing roads and trails, and off-highway vehicle use.

Past Silvicultural and Fuels Treatments

The FACTS database contains several records for past timber harvest activities in the Telegraph Vegetation Project Area. Harvest activities spanned several decades, primarily regeneration harvests in the 1960s, ‘70s, ‘80s, and ‘90s, which removed most of the overstory and resulted in a mosaic of regenerating patches. Sanitation cuts began in 2010 to remove the roadside hazard trees that were a result of the mountain pine bark beetle epidemic. Documentation of all past harvest units within the Telegraph Vegetation Project area can be found in the project record.

During the summers of 2009 and 2012, soil science personnel conducted field inventories of existing soil conditions within a selected sample of past harvest units. In 2009, the sampling strategy was purposive: Precommercial thin units using mechanical equipment for harvest which had previous entry based on the FACTS database and field verification. In 2012, several of the proposed units overlapped roadside hazard tree timber sale units. These units were evaluated as a top priority. The information will be used in this analysis as a basis for characterizing existing soil conditions in the project area, and for predicting soil cumulative effects where proposed vegetation treatments would be implemented in the same areas affected by prior timber harvest.

This field evaluation was conducted using the Forest Soil Disturbance Monitoring Protocol (Page-Dumroese et al. 2009) for assessing degree of soil disturbance resulting from management activities. Soil science personnel traversed selected past harvest units in a randomly oriented grid pattern with sample points at regularly spaced intervals across the entire unit. Units with up to 25 acres received a point spacing of 66 feet, resulting in approximately 10 points per acre. Units 25.01 to 150 acres received 132-foot spacing, resulting in approximately 2.5 points per acre. Units greater than 150 acres received a sample point spacing of 198 feet, resulting in approximately 0.63 point per acre. At each sample point, field personnel evaluated soil physical evidence indicating soil compaction, displacement, rutting, severe burning, surface erosion, mass wasting and ground cover (e.g., plants, plant litter or duff, woody material, bare ground). Based on the observations of soil physical evidence, a numerical rating from Forest Soil Disturbance Monitoring Protocol (Page-Dumroese et al. 2009) classification was assigned to characterize degree of soil disturbance at each sample point: class 0 representing undisturbed; class 1 representing slight to low disturbance; classes 2 and 3 representing detrimental soil disturbance according to the definitions of detrimental soil disturbance described in the Region 1 soil quality standards (USDA FS 2014).

The field evaluation found the amount of area affected by detrimental soil disturbance within each unit varied from 8 percent in a 1970s era clearcut to 0 percent with the average value of 2 percent of the area affected by detrimental soil disturbance in sampled clearcut harvest units. The amount of area affected by detrimental soil disturbance within each selectively cut harvest unit varied from 8 percent in a unit with a 1980s era seed-tree cut to 0 percent, with the average value of 2 percent of area affected by detrimental soil disturbance in sampled selective cut harvest units. A summary of results from this field evaluation is displayed in Table 282.

Table 282. Results of soil field evaluation in past harvest units, Telegraph Vegetation Project area

Unit ID	Plot #	Previous Harvest Method	Year Harvested	Total Number of Field Sample Points	Total # of Detrimental Points (Class 2 or 3)	Percent of Detrimental Field Sample Points
001		Liberation Cut and Clearcut	1968 and 1992	1,111	14	1%
002		Seed-tree Cut and Sanitation Cut	1986 and 2010	97	1	1%
004		Stand Clearcut	1973	49	0	0%
007		Stand Clearcut and Sanitation Cut	1968 - 1992 and 2010	210	2	1%
008		Stand Clearcut	1969	144	9	6%
009	09S2018	Clearcut	1992	80	0	0%
010		Sanitation Cut	2010	110	1	1%
011		Sanitation Cut	2010	292	7	2%
015	09S1040	Clearcut	1969	105	2	2%
017	09S2007	Clearcut	1969	207	10	5%
018		Stand Clearcut	1970	163	16	10%
020		Sanitation Cut	2010	245	8	3%
022		Stand Clearcut and Sanitation Cut	1992 and 2010	120	1	1%
023		Sanitation Cut	2010	220	9	4%
030	09S2009	Clearcut	1992	91	1	1%
049	09S2005	Clearcut	1983	227	4	2%
052		Stand Clearcut and Sanitation (salvage)	1974 and 1994 and 1989	173	12	7%
053	09S2004	Seed-tree Cut	1983	129	0	0%
069	09S2008	Clearcut	1985	81	0	0%
073	09S2010	Clearcut	1989	71	0	0%
077	09S2014	Clearcut	1989	247	0	0%
079	09S1044	Clearcut	1940	76	0	0%
081	09S1041	Clearcut	1986	86	0	0%
085	09S2012	Clearcut	1986	69	0	0%
087	09S2011	Clearcut	1988	103	0	0%
088	09S2026	Clearcut	1986	163	4	2%
089	09S1042	Clearcut	1986 - 1987	383	2	1%
091	09S2013	Clearcut	1989	216	0	0%
092		Stand Clearcut	1988	110	3	3%
101	09S2019	Clearcut	1975	155	2	1%

Unit ID	Plot #	Previous Harvest Method	Year Harvested	Total Number of Field Sample Points	Total # of Detrimental Points (Class 2 or 3)	Percent of Detrimental Field Sample Points
102		Stand Clearcut	1985	70	4	6%
103	09S2020	Clearcut	1985	87	1	1%
104	09S2027	Clearcut	1985	113	5	4%
106		Patch Clearcut	1991	252	1	0.4%
124	09S1036	Seed-tree Cut	1985	93	1	1%
126	09S1035	Clearcut	1972	259	1	0%
127	09S2001	Clearcut	1973	161	1	1%
128		Stand Clearcut	1973 and 1992	160	0	0%
130		Stand Clearcut	1973	12	1	8%
131		Stand Clearcut	1985	45	0	0%
132		Stand Clearcut	1985	47	1	2%
134		Stand Clearcut	1985	145	3	2%
145		Sanitation Cut	2010	156	0	0%
149	09S1038	Clearcut	1985	32	0	0%
151		Seed-tree Cut	1985	199	5	3%
152		Precommercial Thin, Commercial Thin, Sanitation Cut, Stand Clearcut.	1970 - 2010	235	2	1%
153	09S1039	Clearcut	1970	66	0	0%
154		Stand Clearcut and Sanitation Cut	1970 and 2010	218	3	1%
155	09S1037	Clearcut	1972	102	4	4%
157		Seed-tree Cut	1985	40	5	13%
159		Seed-tree Cut	1985	71	0	0%
163		Seed-tree Cut	1985	77	2	3%

Grazing Allotments

The Minnehaha pasture of the Tenmile Priest Pass Allotment overlaps the Telegraph Vegetation Project area in the northeastern corner of the project boundary. The majority of the area in this overlap is forested and relatively steep. The majority of the Telegraph Vegetation Project area does not overlap a grazing allotment and soil monitoring efforts did not report any detrimental disturbance from cattle, as livestock typically do not graze in forested areas.

Existing Roads / Trails and Off-highway Vehicle Use

Currently, there are approximately 125 miles of roads and 13 miles of trails designated for non-motorized use with 10 miles of roads and trail overlap recorded in GIS / INFRA roads database for

the Telegraph Vegetation Project area. For the roads, about 52 miles are closed year-round to wheeled, motorized vehicles (however, some are open to snowmobile use in the winter), while the remaining 72 miles are open to wheeled, motorized vehicles (however, some have various winter use restrictions to accommodate snowmobile and other seasonal uses). Of the 72 miles of road, about 1.5 miles are composed of known undetermined routes.

Under existing conditions, these roads affect approximately 375 acres of land, while non-motorized trails affect about 19 acres within the project boundary. Soils affected by existing roads and trails are being managed for transportation and access uses, and are not currently being managed for vegetation production, or productivity. This rule does not apply to non-system roads.

During the field work conducted in 2012, crews noted several non-system roads within the project area and within the treatment units. Non-system roads are accounted for in the existing detrimental soil disturbance for those units. The non-system roads ranged from obsolete, unused logging roads to well-used ATV routes. Documentation of non-system roads is contained in the Soil Specialist project record.

Soil Resource, Environmental Consequences

Effects Common to All Alternatives

There are no quantifiable effects common to all alternatives because soil impacts vary from no action (alternative 1) to changing prescriptions under each action alternative within each activity area.

Effects Common to All Action Alternatives

For all action alternatives, the same types of management activities are proposed (except as otherwise noted in the following analysis), with the differences among alternatives primarily reflected in the extent and location of affected areas. Similarly and within this context, the type and magnitude of soil effects associated with each action alternative would generally be the same, with the differences among alternatives reflected in the extent and location of affected areas. For this reason, the type and magnitude of soil effects predicted as a result of proposed management actions will be described in this section, while the extent and location of areas affected by proposed management actions will be described in the Effects by Alternative table specific for each alternative. Only the units with soils-specific design features will be discussed further under each alternative. Incorporating the design features would ensure all units would be in compliance with Region 1 Soil Quality Standards.criteria would ensure all units would be in compliance with Region 1 Soil Quality Standards.

Construction of Temporary Roads

Soil effects resulting from construction and use of temporary roads include removal of vegetative cover, compaction, degradation of soil structure, decreased infiltration and water holding capacity, reduction in organic material, accelerated surface erosion, and exacerbation of mass failure, such as landslides or slumps. In short, road construction and use results in impacts to soil productivity. Soil erosion is of special concern because eroded material can be transported to streams, and thus impair water quality aquatic habitat (see Hydrology report). Erosion tends to be least on roads with flat grades, and most severe on routes that have steeper gradients. Sediment delivery tends to be most problematic on roads located adjacent to or crossing streams.

In the short term, soils affected by temporary road construction would be detrimentally disturbed (i.e., compacted, displaced, rutted, eroded, etc.) during logging operations. For the purposes of this

analysis, soil impacts associated with temporary road construction are included when determining compliance with Region 1 soil quality guidelines for detrimental disturbance in tractor and cable harvest units, because temporary roads would be part of the activity area for those treatment units. Obliteration of temporary roads would be accomplished by recontouring areas of cut and fill construction, ripping compacted soils, and slashing and seeding areas of soil disturbance. Obliteration of temporary roads through soil scarification, seeding, placement of woody debris and recontouring would promote recovery of soils in the long-term. Thus, new temporary road construction would have short-term impact to soils, but obliteration would facilitate recovery of soil productivity over the long term. Recovery of soils to pre-disturbance conditions at these sites would likely take 50 years or longer.

Ground-based (Tractor) Harvest: Main Skid Trails and Log Landings

Research has documented that "log retrieval systems differ substantially in their immediate effect on soils," with tractor skidding over bare ground causing the greatest area of soil disturbance within harvest units. Winter tractor logging and suspended log yarding methods (cable yarding) have less impact to soils compared to tractor skidding over bare ground (USDA FS 2013).

Soil monitoring in the Maudlow-Toston salvage sale area found that detrimental soil disturbance from tractor yarding occurred on 3 to 4 percent of the unit within the winter tractor logged area, which did not include areas of disturbance associated with log landings or temporary and short-term specified roads (USDA FS, 2003d). Detrimental soil disturbance in skyline yarding cable corridors was found to affect approximately 4 to 5 percent of units when harvest occurred under summer conditions (again this does not include areas of disturbance associated with log landings and temporary and short-term specified roads).

Under all action alternatives, detrimental soil disturbance would occur with operation of ground-based heavy equipment for tree thinning and removal, primarily in areas where logging equipment traffic is concentrated, such as main skid trails, log landings, and temporary roads. Soil impacts resulting from temporary roads have been evaluated in a previous section. Detrimental soil disturbance on primary skid trails and log landings will be discussed in the following paragraphs.

For logging under summer conditions, main skid trails, which are designated or flagged on the ground prior to the start of logging operations, would typically be located in a parallel pattern in a harvest unit, at a spacing of about 100 feet apart (except where converging at the log landings). With an average width of soil disturbance of 10 feet, main skid trails would affect about 9 percent of the activity area in a tractor harvest unit logged during summer conditions. For logging under winter conditions, the amount of area impacted by log skidding is predicted to be about 3 to 4 percent of the activity area, consistent with findings from soil monitoring in the Maudlow-Toston Salvage Sale (USDA FS 2003b).

Detrimental soil disturbance would be a short-term impact because there would be a long-term trend for soil recovery through reclamation measures and/or natural recovery processes (frost heave bio-perturbation, biomass input, and nutrient cycling, etc.). Soils would likely take at least 50 years for recovery to pre-disturbance conditions where reclamation measures (scarification and seeding) would be implemented, such as on temporary roads, skid trails and log landings. Soils would likely take longer to recover to pre-disturbance conditions, perhaps at least 100 years, where only natural recovery processes would occur.

With ground-based log-retrieval systems, log landings would generally be located alongside the road that accesses the harvest unit. Typically, these log landings would be located on gentle terrain, where soil excavation would not be necessary.

In the short term, soils at log landing sites would be detrimentally disturbed during operation of heavy equipment for log processing. Upon completion of harvest activities, reclamation of log landings through soil scarification, seeding, placement of woody debris and recontouring (if needed), would promote recovery of soils in the long term. Recovery of soils to pre-disturbance conditions would likely take 50 years or longer.

Cable Yarding Tree Removal: Log Yarding Corridors and Log Landings

Under all action alternatives, detrimental soil disturbance would occur within cable yarding corridors, where the “butt-end” of logs contact the soil while being pulled up hill. In the short term, soil would be detrimentally disturbed by compaction, displacement, rutting and erosion in the areas affected by cable yarding. Over the long term, soils affected by detrimental disturbance in cable yarding corridors would recover through natural processes, such as frost heaving, bio-perturbation, and nutrient cycling. However, recovery of soils to pre-disturbance conditions would likely take 100 years or longer.

With cable yarding systems, log landings would generally be located on the shoulder of the road used to access the harvest unit. Because the cable yarding equipment would be set-up and operating on the access road prism, there would not be soil impacts from heavy equipment on the log landing sites. Therefore, detrimental soil impacts would be negligible in the log landing sites for cable yarding units.

Tree Thinning Using Hand Treatment Methods

Under all action alternatives, vegetation management prescriptions for hand treatment methods to thin small-diameter trees would be accomplished by crews using chainsaws or other hand tools. Access into the hand treatment units would be via crews walking into the area and hand-carrying tools to the site.

Because crews walking into treatment units and their use of chainsaws to thin trees would not create detrimental soil impacts, soil effects from hand thinning treatments will only be discussed in this section, and will not be discussed again under each action alternative.

Prescribed Fire: Soil Erosion and Severe Burning

Proposed fire prescriptions for vegetation treatments under all action alternatives have been grouped based on vegetation severity and subsequently assigned soil disturbance estimates based on bare soil amounts in the burn description.

With low-severity burning, soil heating would be low, with soil temperatures remaining below 50 degrees Celsius at a depth of 1 centimeter. The mineral soil would not be altered with low-severity burning. Typically, less than 2 percent of the area affected by a low-severity fire would be severely burned (DeBano et al. 1998, page 63). Low burn severity includes: underburn and low-severity broadcast burns. Severe soil burning would constitute detrimental soil disturbance within the prescribed fire treatment units.

With low-severity burning in forested ecosystems, surface litter would be charred or consumed, but the duff would be left intact. In shrubland / grassland ecosystems, plant leaves or stems may be consumed by low-severity fire; however, grass root crowns would typically remain viable below

ground, so that grasses would be able to re-sprout after the fire. Following low-severity burning, sufficient soil cover would be present to prevent detrimental soil erosion: duff would remain in forested ecosystems, while grasses would re-sprout in shrubland / grassland ecosystems.

For this analysis, soil erosion modeling was completed for each unit proposed for treatment with prescribed fire using WEPP software. Results of the erosion modeling are summarized for the Soils Resource Report, while the complete set of input data and output results for the WEPP modeling can be found in the project record.

With mixed or moderate severity burning, soil heating would be moderate, with soil temperatures reaching 100 to 200 degrees Celsius at a soil depth of 1 centimeter. However, the mineral soil would not be altered. Typically, less than 10 percent of the area affected by a moderate-severity fire would be severely burned (DeBano et al. 1998, page 63). Mixed burn severity includes: site prep burning and broadcast burning when prescriptions are designed moderate burn severity. Severe soil burning would constitute detrimental soil disturbance within the prescribed fire treatment units.

Burning slash piles would severely burn and sterilize soils in the localized areas coinciding with placement of the piles, because slash concentrated into a pile tends to generate very high heat output during burning. Based on a field review of post-treatment conditions in Clancy-Unionville Vegetation Project fuels reduction units where the same type of management activities were recently implemented, piling and burning would affect less than 5 percent of areas treated (USDA Forest Service 2005). High burn severity includes pile burning and jackpot burning. Severe burning would occur in the pile and jackpot burning locations; however, this is predicted to affect no more than 5 percent of the activity area.

For jackpot burning, it is predicted that soil effects would be comparable to those predicted for slash piling and burning, because discrete areas of fuel accumulation are targeted for ignition and burning. Specifically, severe burning would occur in the locations where fuel accumulations burned; however, this is predicted to affect no more than 5 percent of the activity area.

WEPP modeling was not used for predicting erosion following slash pile burning or jackpot burning for the Soils Specialist Report. It is predicted that erosion rates would be less than 1 to 2 tons per acre per year based on field review of post-treatment conditions in Clancy-Unionville Vegetation Project fuels reduction units where similar types of management activities were recently implemented (USDA FS 2005).

Tree Removal and Prescribed Fire: Biomass and Nutrient Cycling

Removal of biomass through timber harvest and prescribed burning can potentially leave insufficient organic material for future nutrient cycling. Researchers have recommended optimum amounts of coarse woody material to remain following vegetation management activities to sustain nutrient cycling and maintain long-term site productivity (Brown et al. 2003; Graham et al. 1994).

For all action alternatives, the Telegraph Vegetation Project has been designed to retain a minimum of 5 tons per acre of coarse woody material on the ground for warm, dry habitat types, and a minimum of 10 tons per acre of coarse woody material on the ground for all other habitat types. This design feature would be applied to all treatment prescriptions and treatment units, under all action alternatives. These amounts of coarse woody material are consistent with the amounts recommended by researchers to be retained and thus sustain nutrient cycling following management activities (Graham et al. 1994; Brown et al. 2003).

Additional woody biomass would be retained on many sites as snags, which would provide for future recruitment of coarse woody material on the ground as snags decay and fall. Graham and others (1994) note, "these recommendations are not designed to immediately replace the present forest floor and mineral soil organic matter, but to ensure their replacement over the next 100 years or more." Thus, retention of recommended amounts of coarse woody material would ensure sufficient biomass "is left after harvesting for the development and function of the next forest" (Graham et al. 1994).

Because this same design feature would be applied to all treatment prescriptions and treatment units under all action alternatives, recommendations for retaining minimum amounts of coarse woody material will only be discussed in this section, and will not be discussed again under each action alternative.

Mechanical Tree Thinning, Log Landings, Temporary Roads, and Prescribed Fire: Combined Soil Effects

Under each of the action alternatives, some of the proposed prescribed fire treatment units would be mechanically thinned prior to burning. Thus, there would be additive soil effects from prescribed burning combined with soil effects from either tractor, or cable yarding, plus log landings and temporary roads constructed to access those units. For the purposes of this analysis, these additive soil effects will be evaluated for the activity areas affected by the combinations of treatment activities for each action alternative, to determine compliance with R1 SQS for limiting detrimental soil disturbance to 15 percent or less of the area.

There would be 16 possible combinations of tree thinning activities and/or prescribed fire treatments. The 16 combinations, which will be analyzed separately for each of the action alternatives, would be:

1. Cable yarding tree removal with no burning and no temporary road construction.
2. Cable yarding tree removal with no burning and temporary road construction.
3. Cable yarding tree removal with site prep burn and no temporary road construction.
4. Cable yarding tree removal with site prep burning and temporary road construction.
5. Cable yarding tree removal with jackpot burning and no temporary road construction.
6. Ground-based tractor logging with no burning and no temporary road construction.
7. Ground-based tractor logging with no burning and temporary road construction.
8. Ground-based tractor logging with jackpot burning and no temporary road construction.
9. Ground-based tractor logging with jackpot burning and temporary road construction.
10. Ground-based tractor logging with site prep burn and no temporary road construction.
11. Ground-based tractor logging with site prep burn and temporary road construction.
12. Ground-based tractor logging with underburn and no temporary road construction.
13. Hand treat thinning, broadcast burn and no temporary road construction.
14. Hand treat thinning, burning piles and no temporary road construction.
15. Hand treat thinning, underburn and no temporary road construction.
16. Hand treat thinning, no burning and no temporary road construction.

Cumulative Effects Process

Since soil productivity is a site-specific attribute of the land, soil cumulative effects occur where impacts from past or reasonably foreseeable management activities overlap in space and time with effects of proposed actions. For this analysis, soil cumulative effects will be addressed on a site-specific basis where effects of past or reasonably foreseeable management activities overlap in space and time with effects of proposed vegetation treatments. Consequently, the proposed treatment units (i.e., activity areas as defined in Forest Service Manual 2500, Supplement No. 2500-2014-1) with Telegraph Vegetation Project serve as the geographic area for soil cumulative effects analysis. The past or reasonably foreseeable management activities within the project area with potential for soil cumulative effects in proposed treatment units include past timber harvest, livestock grazing, noxious weeds treatments, mining activities, and off-highway vehicle (OHV) use. The existing soil effects resulting from these past or ongoing uses are described in a previous section, and serve as the foundation for this soil cumulative effects evaluation.

Soil productivity is site-specific. It is not assessed or analyzed at the watershed scale (Page-Dumroese et al. 2000; Bulmer et al. 2008). Because productivity effects are spatially static and productivity in one location does not influence productivity in another location, it is appropriate to spatially limit the geographic boundary to the activity area. Activity areas may be stratified into smaller units to create reasonable analysis areas.

Under the action alternatives, there would be several proposed vegetation treatment units that have been affected by previous timber harvest, and where new vegetation treatments would occur. Because proposed vegetation treatments would be implemented in areas where soils have been affected by past harvest, there would be potential for soil cumulative effects. A list of the past harvest activities for these treatment units is displayed in appendix A to the Soils Resource Report located in the project record.

Of the units where proposed vegetation treatments overlap with areas of past harvest, many would be precommercially thinned using hand treatment methods, with retention of thinning slash for nutrient cycling. No burning treatments are scheduled for these areas. Because hand thinning treatments would not cause detrimental soil disturbance, there would be no new detrimental soil disturbance with proposed actions in these precommercial thin units. Thus, no adverse soil cumulative effects would occur in these units. Because slash from tree thinning would be scattered in these units, there would be a beneficial soil cumulative effect by providing additional organic material on the ground to increase soil nutrient cycling in the short term.

Areas within the Telegraph Project area have undergone past silvicultural, fuels management and/or site preparation activities as discussed in the Past Silvicultural and Fuels Treatments section above. The detrimental soil disturbance associated with past silvicultural activities was evaluated based on field examinations and diagnoses of the proposed units by the HNF Forest Silviculturist and the field soil disturbance results for selected proposed units monitored under direction of the HNF Forest Soil Scientist. Results of the monitoring of detrimental soil disturbance related to past silvicultural activities appear in Table 282. To minimize the likelihood of cumulative effects related to these units violating R1 SQS, mitigation measures are suggested in alternatives 2, 3, and 4.

The majority of the Telegraph Vegetation Project area does not overlap a grazing allotment and soil monitoring efforts in proposed units overlapping these areas did not report any detrimental disturbance from cattle, as livestock typically do not graze in forested areas. However, effects of grazing activities on soils are documented in the existing condition as detrimental soil disturbance. Mike Renig Gulch runs along the western edge of this part of the project area and is used by

livestock. These areas provide some transitory range, but do not count toward the total forage availability. A portion of Mike Renig Gulch runs through a narrow private parcel of about 30 acres. This private land is not fenced out of the allotment, but is also not part of the permitted grazing area. Little, if any, existing soil-related cumulative effects are related to current livestock grazing.

Livestock grazing would be reasonably foreseeable in areas where tree thinning and prescribed burning would be completed. Thus, adverse soil cumulative effects of livestock grazing, mechanical thinning, and prescribed burning may be of concern. Potential cumulative effects of livestock grazing in proposed treatment units would be mitigated by deferring grazing for at least one growing season following vegetation treatments. This would minimize possible cumulative effects of grazing and vegetation treatments. Soil conditions would need to be evaluated following all proposed activities, but before grazing activities resume.

Noxious weeds tend to invade sites with soil disturbance, such as areas affected by road construction, timber harvest, and prescribed burning. Proliferation of noxious weeds decreases biological diversity. Non-native plants use a number of strategies to establish a presence on new sites, regardless of management-related disturbance. Such strategies include wind pollination, adaptability to high and low moisture and nutrient sites, and varying life histories. Some non-native weeds are perfectly adept at invading sites in the absence of soil disturbance (Neary et al. 2002). The extent and likelihood of noxious weed invasions in areas affected by proposed vegetation management activities are analyzed and disclosed in the Noxious Weeds Report for this project.

Past mining activities on National Forest System lands are common throughout the Telegraph Vegetation Project Area. Effects of mining activities on soils are documented in the existing condition as detrimental soil disturbance. Future mineral proposal activities are expected in this area especially in the Monarch Mine area toward the southwestern corner of the project area.

Soil cumulative effects where proposed units overlap with past harvest would generally be the same for all action alternatives, because the same units would be treated under all action alternatives. Similarly, it is predicted that potential soil cumulative effects resulting from livestock grazing, OHV use, and minerals impacts would be the same for all action alternatives. Thus, soil cumulative effects will only be discussed in this section, and will not be discussed again under each action alternative.

Alternative 1, No Action

Direct and Indirect Effects

Under alternative 1, no new management actions are proposed. With no new actions proposed, no new soil effects would occur. The abundance and extent of downed fuels may result in high-severity surface fire effects in the event of a wildfire. These fire effects could slow vegetation recovery following fire, result in erosion or sediment delivery to streams if duff and litter layers are consumed, or result in loss of certain vegetation types due to lack of a seed source. See Fuels Specialist Report for more information.

Irreversible and Irretrievable Commitments

An irreversible commitment represents a total loss of a resource, which cannot be replaced. An irretrievable commitment represents a temporary loss of a resource, which can be replaced over time. Large areas of severely burned soils, likely resulting in accelerated erosion, top soil/organic matter loss, impaired water quality, decreased site productivity, etc. would take decades to centuries to replace therefore representing an irretrievable commitment. There are no known irreversible commitments.

Cumulative Effects

Because no new management activities are proposed with alternative 1, no new soil cumulative effects would be predicted. However, past, ongoing, and reasonably foreseeable management activities, such as previous timber harvest, livestock grazing, roads, OHV use, and minerals activity would continue to affect soil resources similar to impacts described for the affected environment assessment in this analysis.

Alternative 2

Direct and Indirect Effects

A summary list of landtypes and acres treated by vegetation treatment activities proposed for alternative 2 are listed in table 283. More detailed information disclosing the specific landtypes treated within each proposed vegetation treatment unit are located on a spreadsheet in the project record.

Table 283. Landtypes and acres treated by proposed vegetation treatments for alternative 2

Alternative 2	Prescribed Fire	Intermediate Harvest	Intermediate Harvest	Regeneration Harvest	Regeneration Harvest	Precommercial Thinning	Precommercial Thinning	Grand Total (acres)
Landtypes	**Hand Treat (acres)**	**Cable Yarding (acres)**	**Ground-based (Tractor) Yarding (acres)**	**Cable Yarding (acres)**	**Ground-based (Tractor) Yarding (acres)**	**Ground-based (Tractor) Yarding (acres)**	**Hand Treat (acres)**	
100			11.7	5.7	1.6	4.3		23.3
101					0.9		25.7	26.6
110		0.5	24.5			0.3		25.3
12C					112.2	14.0	100.4	226.6
12D	1.1				18.3		65.5	84.9
136	4.4		1.7		76.0	8.0	6.7	96.8
13A		6.8	116.8	98.3	11.4	18.4	53.7	305.4
14C	231.5			3.4	154.3		77.5	466.7
15-			10.8					10.8
36			64.2		121.5	49.6	9.9	245.2
36B					6.8		17.7	24.5
39A			7.7			14.2		21.9
46-	134.5							134.5
47-	8.0	0.0	92.9	17.2	48.1	111.9	73.8	352.0
470					79.2		7.8	87.0
47B	99.1	28.2	2.7	13.5	279.1	49.9	208.6	681.1
56-				2.2	152.0		44.6	198.8
56A				149.0	262.5	4.8	83.9	500.1
57A					22.2			22.2
76-	143.7	8.7	56.5	33.5	267.8	21.2	197.8	729.2
76A	109.1				349.3	32.3	145.3	636.0
77-	175.1			66.7	701.7	9.0	100.4	1053.0
77A	17.0				37.1	17.8		71.9
77B					134.5	0.3	66.2	201.1
790				21.0	147.7	31.9	80.2	280.7
80-	20.8						3.8	24.6
86-	70.5				29.2	6.4	1.6	107.8
87-	34.3			13.5	46.3		19.5	113.6
90-					0.3		0.6	0.9

Under alternative 2, 8.5 miles of temporary road construction would have short-term impact on approximately 25.5 acres of soil. For the purposes of this analysis, soil effects from temporary roads

would be included with the area of detrimental soil disturbance associated with timber harvest units, because the temporary roads would be constructed for logging equipment to access these units. However, reclamation by full obliteration of temporary roads upon conclusion of proposed vegetation treatments would facilitate long-term recovery of soil productivity on these 25.5 acres.

Soil Disturbance Treatment Scenarios

Detrimental soil disturbance is estimated for the following scenarios which represent the range and various combinations of treatments that could result in soil disturbance under this alternative in addition to field-verified existing soil condition. Only the units requiring additional design features to comply with R1 SQS will be outlined below. All other units meet R1 SQS as proposed (details are in the project record). Units at or below the 15 percent DSD threshold will not be addressed.

Table 284. Acres of new detrimental soil disturbance based on proposed vegetation treatments and activity area acres, alternative 2
Bold font indicates greater than 15 percent detrimental soil disturbance

Unit ID	Activity Area (acres)	Cumulative DSD without Rehabilitation* (%)		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features		
		Low	High		Low	High	Winter Logging + Proposed Burning	Summer Logging + Deferred Burning	Winter logging + deferred burning
001	143.5	**18.8%**	--	0.0%	**18.8%**	--	13.7%	13.8%	
002	33.7	**18.6%**	--	0.0%	**18.6%**	--	13.5%	13.6%	
007	84.6	**17.6%**	--	0.0%	**17.6%**	--	12.5%	12.6%	
008	60.8	**17.6%**	--	2.6%	15.0%	--	9.9%	15.0%	
011	72.3	11.2%	**19.2%**	0.0%	11.2%	**19.2%**			
017	22.0	**16.6%**	--	0.0%	**16.6%**	--	11.5%	16.6%	
018	68.9	**15.5%**	--	0.0%	**15.5%**	--	10.4%		
019	46.6	**20.2%**	--	0.0%	**20.2%**	--	**15.1%**	**15.2%**	
020	20.9	**19.6%**	--	0.0%	**19.6%**	--	14.5%	14.6%	
023	22.2	**18.1%**	--	0.0%	**18.1%**	--	13.0%	13.1%	
027	36.8	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
052	19.9	**23.6%**	--	0.0%	**23.6%**	--	**18.5%**	**18.6%**	
056	70.9	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
059	95.2	**15.8%**	**23.8%**	0.0%	**15.8%**	**23.8%**			
060	63.4	**20.4%**	--	0.0%	**20.4%**	--	**15.3%**	**15.4%**	
063	126.2	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
066	78.3	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
069	9.8	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
074	5.4	9.2%	**17.2%**	0.0%	9.2%	**17.2%**			
075	19.5	9.8%	**17.8%**	0.0%	9.8%	**17.8%**			
076	21.7	9.8%	**17.8%**	0.0%	9.8%	**17.8%**			

Unit ID	Activity Area (acres)	Cumulative DSD without Rehabilitation* (%)		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features		
		Low	High		Low	High	Winter Logging + Proposed Burning	Summer Logging + Deferred Burning	Winter logging + deferred burning
077	105.6	**17.2%**	--	0.0%	**17.2%**	--	12.1%	12.2%	
080	21.1	9.8%	**17.8%**	0.0%	9.8%	**17.8%**			
084	53.6	14.2%	**22.2%**	0.0%	14.2%	**22.2%**			
085	31.7	14.2%	**22.2%**	0.0%	14.2%	**22.2%**			
087	41.6	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
088	66.9	11.2%	**19.2%**	0.0%	11.2%	**19.2%**			
089	141.1	14.6%	**22.6%**	0.0%	14.6%	**22.6%**			
091	94.0	**16.6%**	--	0.0%	**16.6%**	--	11.5%	11.6%	
101	78.2	14.6%	**22.6%**	0.0%	14.6%	**22.6%**			
102	7.5	**17.6%**	--	4.5%	13.1%	--			
103	30.7	14.6%	**22.6%**	0.0%	14.6%	**22.6%**			
104	47.0	**17.6%**	**25.6%**	0.5%	**17.1%**	**25.1%**		**15.1%**	
105	62.3	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
106	95.3	14.5%	**22.5%**	0.0%	14.5%	**22.5%**			
109	39.5	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
110	7.3	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
111	22.1	**15.6%**	**23.6%**	0.0%	**15.6%**	**23.6%**			
112	17.1	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
113	50.1	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
114	11.9	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
116	76.3	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
117	94.7	14.4%	**22.4%**	0.0%	14.4%	**22.4%**			
121	9.9	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
130	1.1	**19.6%**	--	0.0%	**19.6%**	--	**8%		
143	69.6	**15.9%**	**23.9%**	0.0%	**15.9%**	**23.9%**	10.8%	13.9%	
145	67.0	**16.8%**	**24.8%**	0.0%	**16.8%**	**24.8%**	11.7%	14.8%	
152	115.4	**19.0%**	--	0.0%	**19.0%**	--	13.9%	14.0%	
154	73.6	**17.6%**	--	0.0%	**17.6%**	--	12.5%	12.6%	
155	39.6	**15.6%**	--	0.0%	**15.6%**	--	10.5%	**15.6%**	
157	6.3	**24.6%**	--	0.0%	**24.6%**	--	**13%		
160	89.0	**16.6%**	--	0.0%	**16.6%**	--	11.5%	11.6%	
165	126.6	**16.6%**	--	0.0%	**16.6%**	--	11.5%	11.6%	
167	254.3	**17.9%**	--	0.0%	**17.9%**	--	12.8%	12.9%	
011s	40.8	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			

Unit ID	Activity Area (acres)	Cumulative DSD without Rehabilitation* (%)		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features		
		Low	High		Low	High	Winter Logging + Proposed Burning	Summer Logging + Deferred Burning	Winter logging + deferred burning
093East	20.0	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
093West	40.0	**31.1%**	**39.1%**	0.0%	**31.1%**	**39.1%**	**26.0%**	**29.1%**	

* Includes existing DSD, DSD from logging system, landings, burning, temp roads

** Unit 130 and 157 proposed design feature is to hand treat the units.

Table 285. Unit-specific design features for alternative 2

Prescription	Summer logging + Deferred burning	Winter logging + Proposed burning	Winter logging + Deferred burning	Low-severity burn
Improvement Cut (GB), Slashing, Jackpot Burn	001, 002, 007, 023 and 154	-	-	-
Improvement Cut (Cable), Slashing, Jackpot Burn	-	-	-	-
Precommercial Thin (GB)	-	017, *130, 155 and *157	-	-
Precommercial Thin (Hand)	-	-	-	-
Precommercial Thin (Hand) Underburn	-	-	-	-
Clearcut with Leave Trees (GB)	-	-	-	-
Clearcut with Leave Trees (Cable)	-	-	-	-
Clearcut with Leave Trees (GB), Jackpot Burn	020, 077, 091, 152, 160, 165 and 167	-	*52	-
Clearcut with Leave Trees (Cable), Jackpot Burn	-	-	-	-
Clearcut with Leave Trees (GB), Site Prep Burn	-	104, 143 and 145	-	063, 066, 069, 084, 085, 087, 089, 101, 103, 105, 106, 109, 110, 111, 112, 113, 114, 116, 117 and 121
Clearcut with Leave Trees (Cable), Site Prep Burn	-	-	-	075, 076, 080 and 088
2-aged Seedtree with Reserves (GB)	-	-	-	-

Prescription	Summer logging + Deferred burning	Winter logging + Proposed burning	Winter logging + Deferred burning	Low-severity burn
2-aged Seedtree with Reserves (GB), Site Prep Burn	-	-	-	056 and 059
2-aged Shelterwood with Reserves (GB), Site Prep Burn	-	-	-	011s and 027
2-aged Shelterwood with Reserves (Cable), Site Prep Burn	-	-	-	011 and 074
Slashing, Handpiling, Burning Piles (Prescribed Fire)	-	-	-	-

* Units with High Existing DSD – Specific Design Features applied. See section below, Units with High Existing Detrimental Soil Disturbance.

Units with High Existing Detrimental Soil Disturbance:

Precommercial Thin (Ground-based)

Unit 130 has 8 percent existing detrimental soil disturbance due to past harvest impacts; it is recommended that the unit be treated by hand rather than ground-based to ensure that the detrimental soil disturbance complies with R1 SQS. Unit 157 has 13 percent existing detrimental soil disturbance due to past harvest impacts; it is recommended that the unit be treated by hand rather than ground-based to ensure that the detrimental soil disturbance complies with R1 SQS.

Clearcut with Leave Trees (Ground-based), Jackpot Burn

Unit 52 has 7 percent existing detrimental soil disturbance due to impacts from the roadside hazard tree removal project. To meet R1 SQS, it is recommended that both winter logging and deferred burning be implemented, and, in the portion of the unit that overlaps the roadside hazard tree removal, that skid trails and landings be reused to the extent practicable.

Clearcut with Leave Trees (Ground-based), Site prep burn

Unit 93 has 18 percent existing detrimental soil disturbance due to historic mining activity throughout the unit. The eastern portion of the unit east of 1801-A1 is not impacted by mining. If the unit were to be divided into two smaller units based on that dividing line of east and west, the detrimental soil disturbance associated with mining can be limited to Unit 93West. It is recommended that Unit 93West be dropped or the prescription be changed to hand treatment so that the net detrimental soil disturbance does not increase above the existing levels. The amount of restoration required to reduce the detrimental soil disturbance to levels below existing would be expensive due to the nature of the disturbance, which includes open shafts, surface tailings piles, and total topsoil removal from years of erosion.

Irreversible and Irretrievable Commitments

Detrimental soil disturbance associated with the Telegraph Vegetation Project would be an irretrievable commitment of soil resource; soils would recover over the long-term following detrimental disturbance from proposed vegetation management actions. The decrease in soil productivity during this recovery time would represent the irretrievable impact of implementing

vegetation treatment activities with Telegraph Vegetation Project. There are no known irreversible commitments under this alternative.

Cumulative Effects

Soil cumulative effects where proposed units overlap with past harvest would generally be the same for all action alternatives. Similarly, it is predicted that potential soil cumulative effects resulting from livestock grazing, OHV use, and minerals impacts would be the same for all action alternatives.

Alternative 3

Direct and Indirect Effects

A summary list of landtypes and acres treated by vegetation treatment activities proposed for alternative 3 are listed on Table 286. More detailed information disclosing the specific landtypes treated within each proposed vegetation treatment unit are located on a spreadsheet in the project record.

Table 286. Landtypes and acres treated by proposed vegetation treatments for alternative 3

Landtypes	Prescribed Fire	Intermediate Harvest		Precommercial thinning		Regeneration Harvest		Grand Total
	Hand treat	Cable Yarding	Ground-based (tractor yarding)	Ground-based (tractor yarding)	Hand treat	Cable	Ground-based (tractor yarding)	
100			11.7	4.3		5.7	1.6	23.3
101					25.7		0.9	26.6
110		0.5	24.5	0.3				25.3
12C				14.0	0.9		28.9	43.9
12D	1.1				39.0		18.3	58.3
136	4.4		1.7	8.0	4.5		39.8	58.5
13A		6.8	116.8	18.4	44.3	81.1	11.4	278.9
14C	99.4				28.5		64.8	192.6
15-			10.8					10.8
36-			64.2	49.6	9.9		115.9	239.6
36B					17.7		1.8	19.5
39A			7.7	14.2				21.9
46-	106.8							106.8
47-	8.0	0.0	92.9	111.9	68.4		23.0	304.3
470					7.8		31.5	39.3
47B	28.1	28.2	2.7	49.9	166.3		182.0	457.2
56-					44.6	0.0	126.5	171.1
56A					62.1	62.4	190.2	314.7
57A							22.2	22.2
76-	120.7	8.7	56.5	21.2	106.0	33.5	200.2	546.9
76A	58.0			26.0	118.7		160.8	363.5
77-	119.4			9.0	60.1		140.6	329.2

Landtypes	Prescribed Fire	Intermediate Harvest		Precommercial thinning		Regeneration Harvest		Grand Total
	Hand treat	Cable Yarding	Ground-based (tractor yarding)	Ground-based (tractor yarding)	Hand treat	Cable	Ground-based (tractor yarding)	
77A	15.3			17.8			14.7	47.7
77B				0.3	46.8		124.6	171.8
790				7.2	60.0	9.8	109.5	186.5
80-	19.5				3.8			23.3
86-	0.4				1.6		29.2	31.3
87-	24.1				19.5		23.9	67.5
90-					0.6		0.3	0.9

Under alternative 3, 3.4 miles of temporary road construction would have short-term impact on approximately 10.2 acres of soil. For the purposes of this analysis, soil effects from temporary roads would be included with the area of detrimental soil disturbance associated with harvest units, because the temporary roads would be constructed for logging equipment to access these units. However, reclamation by full obliteration of temporary roads upon conclusion of proposed vegetation treatments would facilitate long-term recovery of soil productivity on these 10.2 acres.

Soil Disturbance Treatment Scenarios

Detrimental soil disturbance is estimated for the following scenarios, which represent the range and various combinations of treatments that could result in soil disturbance under this alternative in addition to field verified existing soil condition. Only the units requiring additional mitigation to comply with R1 SQS will be specifically outlined below. All other units meet R1 SQS as proposed. Units within the acceptable disturbance level will not be addressed, because it is assumed the prescribed BMPs associated with each treatment scenario do not need to be repeated.

Table 287. Percent of new detrimental soil disturbance based on proposed vegetation treatments and activity area acres, alternative 3

Bold font indicates greater than 15 percent detrimental soil disturbance

Unit ID	Activity Area (acres)	Cumulative DSD without Rehabilitation* (%)		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features		
		Low	High		Low	High	Winter Logging + Proposed Burning	Summer Logging + Deferred Burning	Winter logging + deferred burning
001	143.5	**18.6%**	--	0.2%	**18.4%**	--	13.3%	13.4%	
002	33.7	**18.3%**	--	0.9%	**17.5%**	--	12.4%	12.5%	
007	84.6	**17.6%**	--	0.0%	**17.6%**	--	12.5%	12.6%	
008	60.8	**17.6%**	--	2.6%	15.0%	--	9.9%	15.0%	
011	72.3	11.2%	**19.2%**	0.0%	11.2%	**19.2%**			
011s	40.8	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
017	22.0	**16.6%**	--	0.0%	**16.6%**	--	11.5%		
018	68.9	**15.5%**	--	0.0%	**15.5%**	--	10.4%		
019a	16.0	**22.3%**	--	0.0%	**22.3%**	--	**17.2%**	**17.3%**	12.2%
020	20.9	**19.6%**	--	0.0%	**19.6%**	--	14.5%	14.6%	
023	22.2	**18.1%**	--	0.0%	**18.1%**	--	13.0%	13.1%	
027a	13.1	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
052	19.9	**23.6%**	--	0.0%	**23.6%**	--	**18.5%**	**18.6%**	13.5%
059a	28.7	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
063a	70.2	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
066a	62.9	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
069	9.8	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
074	5.4	9.2%	**17.2%**	0.0%	9.2%	**17.2%**			
077	105.6	**16.6%**	--	0.0%	**16.6%**	--	11.5%	11.6%	
084a	6.2	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
085a	6.8	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
087	41.6	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
088	66.9	11.2%	**19.2%**	0.0%	11.2%	**19.2%**			
089a	59.8	14.6%	**22.6%**	0.0%	14.6%	**22.6%**			
089b	13.3	14.6%	**22.6%**	0.0%	14.6%	**22.6%**			
089c	42.5	14.6%	**22.6%**	0.0%	14.6%	**22.6%**			
091	94.0	**16.6%**	--	0.0%	**16.6%**	--	11.5%	11.6%	
093East	20.0	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
093West	40.0	**31.1%**	**39.1%**	0.0%	**31.1%**	**39.1%**	**26.0%**	**29.1%**	
101a	70.7	14.6%	**22.6%**	0.0%	14.6%	**22.6%**			
102	7.5	**17.6%**	--	4.5%	13.1%	--	8.0%	13.1%	

Unit ID	Activity Area (acres)	Cumulative DSD without Rehabilitation* (%)		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features		
		Low	High		Low	High	Winter Logging + Proposed Burning	Summer Logging + Deferred Burning	Winter logging + deferred burning
103a	13.1	14.6%	**22.6%**	0.0%	14.6%	**22.6%**			
105	62.3	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
106a	35.5	14.0%	**22.0%**	0.0%	14.0%	**22.0%**			
109	39.5	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
113a	32.6	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
114	11.9	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
116a	23.8	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
117a	6.0	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
121	9.9	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			
130	1.1	**19.6%**	--	0.0%	**19.6%**	--	**8%		
143a	45.0	14.7%	**22.7%**	0.0%	14.7%	**22.7%**			
145a	54.5	14.3%	**22.3%**	0.0%	14.3%	**22.3%**			
152	115.4	**19.0%**	--	0.0%	**19.0%**	--	13.9%	14.0%	
154	73.6	**17.6%**	--	0.0%	**17.6%**	--	12.5%	12.6%	
155	39.6	**15.6%**	--	0.0%	**15.6%**	--	10.5%	**15.6%**	
160	89.0	**16.6%**	--	0.0%	**16.6%**	--	11.5%	11.6%	
165a	38.1	**16.6%**	--	0.0%	**16.6%**	--	11.5%	11.6%	

* Includes existing DSD, DSD from logging system, landings, burning, temp roads

** The Unit 130 proposed design feature is to hand treat the unit, not winter logging.

Table 288. Unit-specific design features for alternative 3

Prescription	Summer logging + Deferred burning	Winter logging + Proposed burning	Winter logging + Deferred burning	Low Severity burn
Improvement Cut (GB), Slashing, Jackpot Burn	001, 002, 007, 023 and 154	-	-	-
Improvement Cut (Cable), Slashing, Jackpot Burn	-	-	-	-
Pre Commercial Thin (GB)	017, 018, 102	130* and 155	-	-
Pre Commercial Thin (Hand)	-	-	-	-
Pre Commercial Thin (Hand) Underburn	-	-	-	-

Prescription	Summer logging + Deferred burning	Winter logging + Proposed burning	Winter logging + Deferred burning	Low Severity burn
Clearcut with Leave Trees (GB)	-	-	-	-
Clearcut with Leave Trees (Cable)	-	-	-	-
Clearcut with Leave Trees (GB), Jackpot Burn	020, 077, 091, 152, 160 and 165a,	-	052 and 019a	-
Clearcut with Leave Trees (Cable), Jackpot Burn	-	-	-	-
Clearcut with Leave Trees (GB), Site Prep Burn	-	-	-	063a, 066a, 069, 085a, 087, 089a, 89b, 89c, 93East, 101a, 103a, 105, 106a, 109, 111, 112, 113a, 114, 116a, 117a, 121 and145a
Clearcut with Leave Trees (Cable), Site Prep Burn	-	-	-	088
Clearcut with Reserves(GB), Site Prep Burn	-	-	-	084a
2-Aged Seedtree with Reserves (GB)	-	-	-	-
2-Aged Seedtree with Reserves (GB), Site Prep Burn	-	-	-	059a
2-Aged Shelterwood with Reserves (GB), Site Prep Burn	-	-	-	011s and 027a
2-Aged Shelterwood with Reserves (Cable), Site Prep Burn	-	-	-	011 and 074
Slashing, Handpiling, Burning Piles (Prescribed Fire)	-	-	-	-

* Units with High Existing DSD – Specific Design Features applied. See section below, Units with High Existing DSD.

Units with High Existing Detrimental Soil Disturbance:

Precommercial Thin (Ground-based)

Unit 018 has 10 percent existing detrimental soil disturbance due to the presence of old jammer roads and skid trails. Reuse of old skid trails and jammer roads would decrease the amount of new soil disturbance and the cumulative soil disturbance in the unit is predicted to comply with R1 SQS. Additionally, logging under winter conditions in this unit would further reduce the anticipated detrimental soil disturbance to below the Region 1 SQS. Unit 130 has 8 percent existing detrimental

soil disturbance due to past harvest impacts, it is recommended that the unit be treated by hand rather than ground-based to ensure that the detrimental soil disturbance complies with R1 SQS.

Clearcut with Leave Trees (Ground-based), Jackpot Burn

Unit 52 has 7 percent existing detrimental soil disturbance due to impacts from the roadside hazard tree removal project. To meet R1 SQS, it is recommended that both winter logging and deferred burning be implemented. And, in the portion of the unit that overlaps the roadside hazard tree removal, it is recommended that skid trails and landings be reused to the extent practicable.

Clearcut with Leave Trees (Ground-based), Site Prep Burn

Units 093 would require design features to ensure compliance with Region 1 guidelines. Unit 93 has an 18 percent existing detrimental soil disturbance due to historic mining activity throughout the unit. The eastern portion of the unit east of 1801-A1 is not impacted by mining. If the unit were to be divided into two smaller units based on that dividing line of east and west, the detrimental soil disturbance associated with mining can be limited to Unit 93West. It is recommended that Unit 93West be dropped or the prescription be changed to hand treatment so that the net detrimental soil disturbance does not increase above the existing levels. The amount of restoration that would be required to reduce the detrimental soil disturbance to levels below the existing would be expensive due to the nature of the disturbance, which includes open shafts, surface tailings piles, and total topsoil removal from years of erosion.

Irreversible and Irretrievable Commitments

An irreversible commitment represents a total loss of a resource, which cannot be replaced. An irretrievable commitment represents a temporary loss of a resource, which can be replaced over time. Detrimental soil disturbance associated with the Telegraph Vegetation Project would be an irretrievable commitment of soil resource; soils would recover over the long-term following detrimental disturbance from proposed vegetation management actions. The decrease in soil productivity during this recovery time would represent the irretrievable impact of implementing vegetation treatment activities with Telegraph Vegetation Project. Under Alternative 3, a permanent road ~0.7 miles in length will be constructed to replace multiple segments of road (~1.36 miles total) that run across or within a section of the Little Blackfoot River floodplain. This will equate to approximately 1.6 acres of land being removed from the productive land base, this would represent an irreversible commitment. However, 1.36 miles of road will be decommissioned, restoring 3.3 acres back into the productive land base. This will reduce the long term risk of sediment delivery into the watershed, and help to restore floodplain processes. Please see Hydrologist and Transportation reports for details.

Cumulative Effects

Soil cumulative effects where proposed units overlap with past harvest would generally be the same for all action alternatives. Similarly, it is predicted that potential soil cumulative effects resulting from livestock grazing, OHV use, and minerals impacts would be the same for all action alternatives.

Alternative 4

Direct and Indirect Effects

A summary list of landtypes and acres treated by vegetation treatment activities proposed for alternative 4 are listed in Table 289. More detailed information disclosing the specific landtypes treated within each proposed vegetation treatment unit are located on a spreadsheet in the project record.

Table 289. Landtypes and acres treated by proposed vegetation treatments for alternative 4

	Prescribed Fire		Intermediate Harvest		Precommercial thinning		Regeneration Harvest		WB Pine Release	Grand Total
Landtypes	Rearrange-ment of Fuels	Hand Treat	Cable Yarding	Ground-based (tractor yarding)	Ground-based (tractor yarding)	Hand Treat	Cable	Ground-based (tractor yarding)	Hand Treat	
100				11.69	4.30		5.70	1.55		23.3
101						25.72	7.45	0.91		34.1
110			0.51	24.48	0.28					25.3
12C		6.20			14.02	100.39		212.92		333.5
12D		1.69				40.65		35.06		77.4
136	10.05	16.75			4.76	5.28		111.37		148.2
13A		44.37	6.76	116.82	18.44	51.58	98.28	73.42		409.7
14C	141.79	12.39				69.40	3.40	298.07		525.0
15-				10.77						10.8
36-		16.31			45.19	9.90		208.55		279.9
36B						2.60		25.73		28.3
39A		96.92			14.22			7.65		118.8
46-	104.77							30.58		135.4
47-		127.20	0.04	92.92	111.91	73.77	17.22	48.11		471.2
470		50.07				7.78		79.21		137.1
47B	29.58	44.30	28.22	2.70	49.85	182.61	45.76	462.80		845.8
56-		5.71					2.23	155.54	44.56	208.0
56A		89.69					113.33	246.01	56.85	505.9
57A								22.21		22.2
76-	111.74	35.41	8.75	56.49	21.20	137.48	33.47	469.28		873.8
76A	71.87	51.90			32.35	93.34		348.84		598.3
77-	31.06	66.04			9.03	97.04	91.44	847.26		1141.0
77A		173.71			17.76			54.11		245.6
77B		22.38			0.33	45.18		262.70	7.35	337.9
790	24.67	23.76			7.19	5.22	13.48	113.04	47.91	235.3
80-		20.77				3.78				24.6
86-	70.54	93.43						29.22	1.62	194.8
87-		14.19				1.29	13.52	80.57		109.6
90-						0.64		0.25		0.9
Total										8,102.0

Under alternative 4, 3.4 miles of temporary road construction would have short-term impact on approximately 10.2 acres of soil. For the purposes of this analysis, soil effects from temporary roads would be included with the area of detrimental soil disturbance associated with harvest units, because the temporary roads would be constructed for logging equipment to access these units.

However, reclamation by full obliteration of temporary roads upon conclusion of proposed vegetation treatments would facilitate long-term recovery of soil productivity on these 10.2 acres.

Soil Disturbance Treatment Scenarios

Detrimental soil disturbance is estimated for the following scenarios which represent the range and various combinations of treatments that could result in soil disturbance under this alternative in addition to field verified existing soil condition (Table 290). Only the units requiring additional mitigation to comply with R1 SQS will be specifically outlined below. All other units meet R1 SQS as proposed. Units within the acceptable disturbance level will not be addressed, because it is assumed the prescribed BMP's associated with each treatment scenario does not need to be repeated.

Table 290. Percent of new detrimental soil disturbance based on proposed vegetation treatments and activity area acres, alternative 4
Bold font indicates greater than 15 percent detrimental soil disturbance

Unit ID	Activity Area (acres)	Cumulative DSD without Rehabilitation* (%)		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features		
		Low	High		Low	High	Winter Logging + Proposed Burning	Summer Logging + Deferred Burning	Winter logging + deferred burning
001	143.5	**15.9%**	--	0.0%	**15.9%**	--			
007	84.6	**15.1%**	--	0.0%	**15.1%**	--			
008	60.8	**20.1%**	--	0.0%	15.0%	--		**15.1%**	
011	72.3	9.0%	**17.0%**	0.0%	9.0%	**17.0%**			
011s	40.8	11.0%	**19.1%**	0.0%	11.0%	**19.1%**			
015	12.3	**16.1%**	--	0.0%	**16.1%**	--			
017	22.0	**19.1%**	--	0.0%	**19.1%**	--			
018	68.9	**24.1%**	--	0.0%	**24.1%**	--	**19.0%**	**19.1%**	
020	20.9	**17.1%**	--	0.0%	**17.1%**	--			
023	22.2	**18.1%**	--	0.0%	**18.1%**	--			
027	36.8	11.1%	**19.1%**	0.0%	11.1%	**19.1%**			
030	10.2	**15.1%**	--	0.0%	**15.1%**	--			
035D	58.0	11.1%	**19.1%**	0.0%	11.1%	**19.1%**			
052	19.9	**21.1%**	--	0.0%	**21.1%**	--	**16.0%**	**16.1%**	
056	70.9	11.0%	**19.1%**	0.1%	11.0%	**19.0%**			
059	95.2	11.1%	**19.0%**	0.3%	10.8%	**18.9%**			
066	78.3	11.1%	**19.1%**	0.0%	11.1%	**19.1%**			
084	53.6	11.4%	**19.2%**	1.0%	10.4%	**18.2%**			
085	31.7	10.9%	**18.8%**	1.4%	9.5%	**17.4%**			
088	66.9	13.9%	**21.5%**	0.0%	13.9%	**21.5%**			
089	141.1	**15.1%**	--	0.0%	**15.1%**	--			
093E	20.0	13.6%	**21.6%**	0.0%	13.6%	**21.6%**			

Unit ID	Activity Area (acres)	Cumulative DSD without Rehabilitation* (%)		Reduced DSD from Rehabilitation (%)	Total Post Activity DSD (%)		Total Post Activity DSD (%) with Design Features		
		Low	High		Low	High	Winter Logging + Proposed Burning	Summer Logging + Deferred Burning	Winter logging + deferred burning
093W	40.0	**31.1%**	**39.1%**	0.0%	**31.1%**	**39.1%**	**26.0%**	**29.1%**	**24.0%**
101	78.2	12.0%	**20.0%**	0.6%	11.4%	**19.4%**			
102	7.5	**20.1%**	--	0.0%	**20.1%**	--		**15.1%**	
103a	13.1	12.1%	**20.1%**	0.0%	12.1%	**20.1%**			
104	47.0	11.1%	**19.1%**	0.0%	11.1%	**19.1%**			
106	94.3	11.4%	**19.3%**	0.0%	11.4%	**19.3%**			
109	39.5	11.1%	**19.1%**	0.0%	11.1%	**19.1%**			
111	22.1	11.1%	**19.1%**	0.0%	11.1%	**19.1%**			
112	17.1	11.1%	**19.1%**	0.0%	11.1%	**19.1%**			
113	50.1	11.1%	**19.1%**	0.0%	11.1%	**19.1%**			
114	11.9	11.1%	**19.1%**	0.0%	11.1%	**19.1%**			
116	76.3	11.1%	**19.1%**	0.0%	11.1%	**19.1%**			
121	9.9	11.1%	**19.1%**	0.0%	11.1%	**19.1%**			
127	16.0	**15.1%**	--	0.0%	**15.1%**	--			
130	1.1	**22.1%**	--	0.0%	**22.1%**	--	**17.0%**	**17.1%**	
132	3.1	**16.1%**	--	0.0%	**16.1%**	--			
134	15.8	**16.1%**	--	0.0%	**16.1%**	--			
143	69.6	11.3%	**19.2%**	0.8%	10.5%	**18.4%**			
145	67.0	11.1%	**19.0%**	0.6%	10.5%	**18.4%**			
151	24.9	**17.1%**	--	0.0%	**17.1%**	--			
154	73.6	**15.1%**	--	0.0%	**15.1%**	--			
155	39.6	**18.1%**	--	0.0%	**18.1%**	--			
163	9.9	**17.1%**	--	0.0%	**17.1%**	--			

* Includes existing DSD, DSD from logging system, landings, burning, temp roads

Table 291. Unit-specific design features for alternative 4

Prescription	Summer logging + Deferred burning	Winter logging + Proposed burning	Winter logging + Deferred burning	Low-severity burn
Improvement Cut (GB), Slashing, Jackpot Burn	001, 007 and 023	-	-	-
Improvement Cut (Cable), Slashing, Jackpot Burn	-	-	-	-
Precommercial Thin (GB)	015, 017, 127, 132, 134, 151, 155 and 163	008 and 102	018 and 130	-
Precommercial Thin (Hand)	-	-	-	-
Precommercial Thin (Hand) Underburn	-	-	-	-
White Pine Release (Hand)				
Clearcut with Leave Trees (GB)	30	-	-	-
Clearcut with Leave Trees (Cable)	-	-	-	-
Clearcut with Leave Trees (GB), Jackpot Burn	020 and 154	-	052	-
Clearcut with Leave Trees (Cable), Jackpot Burn	-	-	-	-
Clearcut with Leave Trees (GB), Site Prep Burn	89		-	066, 084, 085, 101, 103a, 104, 106, 109, 111, 112, 113, 114, 116, 121, 143, and 145
Clearcut with Leave Trees (Cable), Site Prep Burn	-	-	-	088
2-aged Seedtree with Reserves (GB)	-	-	-	-
2-aged Seedtree with Reserves (GB), Site Prep Burn	-	-	-	056 and 059
2-aged Shelterwood with Reserves (GB), Site Prep Burn	-	-	-	011s, 27 and 35d
2-aged Shelterwood with Reserves (Cable), Site Prep Burn	-	-	-	011
Mechanical Rearrangement of Fuels (Prescribed Fire)	-	-	-	-

Units with High Existing DSD:

Precommercial Thin (Ground-based)

Unit 018 has 10 percent existing detrimental soil disturbance due to the presence of old jammer roads and skid trails. Reuse of old skid trails and jammer roads would decrease the amount of new soil disturbance and the cumulative soil disturbance in the unit is predicted to comply with R1 SQS. Unit 008 has 6 percent existing detrimental soil disturbance due to past harvest impacts. It is recommended that the unit be treated by hand rather than ground-based to ensure that the detrimental soil disturbance complies with R1 SQS.

Clearcut with Leave Trees (Ground-based), Jackpot Burn

Unit 052 has 7 percent existing detrimental soil disturbance due to impacts from the roadside hazard tree removal project. To meet R1 SQS, it is recommended that both winter logging and deferred burning be implemented. And, in the portion of the unit that overlaps the roadside hazard tree removal, it is recommended that skid trails and landings be reused to the extent practicable.

Clearcut with Leave Trees (Ground-based), Site Prep Burn

Unit 093 has 18 percent existing detrimental soil disturbance due to historic mining activity throughout the unit. The eastern portion of the unit east of 1801-A1 is not impacted by mining. If the unit were to be divided into two smaller units based on that dividing line of east and west, the detrimental soil disturbance associated with mining can be limited to Unit 93West. It is recommended that Unit 93West be dropped or the prescription be changed to hand treatment so that the net detrimental soil disturbance does not increase above the existing levels. The amount of restoration required to reduce the detrimental soil disturbance to levels below the existing would be expensive due to the nature of the disturbance, which includes open shafts, surface tailings piles, and total topsoil removal from years of erosion.

Irreversible and Irretrievable Commitments

An irreversible commitment represents a total loss of a resource, which cannot be replaced. An irretrievable commitment represents a temporary loss of a resource, which can be replaced over time. Detrimental soil disturbance associated with the Telegraph Vegetation Project would be an irretrievable commitment of soil resource; soils would recover over the long term following detrimental disturbance from proposed vegetation management actions. The decrease in soil productivity during this recovery time would represent the irretrievable impact of implementing vegetation treatment activities with Telegraph Vegetation Project. Under Alternative 4, a permanent road ~0.7 miles in length will be constructed to replace multiple segments of road (~1.36 miles total) that run across or within the Little Blackfoot River floodplain. This will equate to approximately 1.6 acres of land being removed from the productive land base, this would represent an irreversible commitment. However, 1.36 miles of road will be decommissioned, restoring 3.3 acres back into the productive land base. This will reduce the long term risk of sediment delivery into the watershed, and help to restore floodplain processes. Please see Hydrologist and Transportation reports for details.

Cumulative Effects

Soil cumulative effects where proposed units overlap with past harvest would generally be the same for all action alternatives. Similarly, it is predicted that potential soil cumulative effects resulting from livestock grazing, OHV use, and minerals impacts would be the same for all action alternatives.

Conclusions

By including all resource protection measures described in this section, proposed actions for the Telegraph Vegetation Project would comply with Region 1 soil quality guidelines to limit detrimental soil disturbance and preserve soil productivity for future vegetative growth and soil health. Additionally, no cumulative effects are projected to occur as a result of design features and included mitigation.

Nonetheless, detrimental soil disturbance would occur in the short term, within the 15 percent of the activity area limits as defined by R1 SQS. If all resource protection measures were applied as described in this report, there would be a maximum of 563 acres of DSD under alternative 2 (table available in the project record), while 430 acres of DSD would occur with alternative 3 (table available in the project record), and 870 acres of DSD would occur with alternative 4 (table available in the project record). Areas affected by detrimental soil disturbance would include main skid trails, log landings and temporary roads for tractor harvest units, cable yarding corridors, and areas of severe burning in units treated with prescribed fire.

Detrimental soil disturbance would be a short-term impact because there would be a long-term trend for soil recovery through reclamation measures and/or natural recovery processes (i.e., frost heave bio-perturbation, biomass input and nutrient cycling, etc.). Soils would likely take at least 50 years for recovery to pre-disturbance conditions where reclamation measures would be implemented, such as on temporary roads and log landings. Soils would likely take longer to recover to pre-disturbance conditions, perhaps at least 100 years, where only natural recovery processes would occur such as on main skid trails and cable yarding corridors.

Irreversible/Irretrievable Commitments

Detrimental soil disturbance associated with the Telegraph Vegetation Project would be an irretrievable commitment of soil resource; soils would recover over the long term following detrimental disturbance from proposed vegetation management actions. The decrease in soil productivity during this recovery time would represent the irretrievable impact of implementing vegetation treatment activities with Telegraph Vegetation Project. Alternatives 3 and 4 have a segment of permanent road construction, this construction is described in more detail under the Alternatives 3 and 4 Irreversible/Irretrievable Commitments section. This road segment is considered to be an irreversible commitment.

Cumulative Effects

Soil cumulative effects where proposed units overlap with past harvest would generally be the same for all action alternatives, because the same units would be treated under all action alternatives (with the exception of units not treated under Alternative 3). Similarly, it is predicted that potential soil cumulative effects resulting from livestock grazing, OHV use, implementation of Divide Travel Plan, and mineral activity impacts would be the same for all action alternatives

Forest Plan Consistency

With the implementation of design features and additional resource protection measures with the proposed treatments, all proposed actions for the Telegraph Vegetation Project would comply with Region 1 soil quality guidelines to limit detrimental soil disturbance, as well as meet Helena Forest Plan and NFMA requirements to conserve site productivity. This determination is based on previous BMP audits documenting that soil and water best management practices are effective when implemented successfully (Montana Department of Natural Resources and Conservation 2000 and 2002; USDA Forest Service 2003).

Hydrology

Introduction

The Telegraph Vegetation Project (Telegraph Project) on the Helena National Forest (HNF) proposes vegetation and watershed improvement treatments in the headwaters of the Little Blackfoot River. The Hydrology Specialist Report addresses potential project-related and cumulative impacts on water resources, specifically water quality and quantity in the streams within and downstream of the project area, as well as riparian area and wetland condition and function within the project area.

The project boundary encompasses portions of four 6th-order hydrologic unit code (6th-HUC) sub-watersheds: Ontario Creek, Telegraph Creek, Mike Renig Gulch, and Little Blackfoot River-Hat Creek. There are impaired stream reaches as identified on the State of Montana Clean Water Act section 303(d) list within and immediately downstream of the project are.

Measurement Indicators

Four measurement indicators were used to evaluate the effects of each alternative:

- Sediment from roads (average tons per year)
- Sediment from treatment units (tons per year and probability of sedimentation)
- Water yield increase over current conditions (percent)
- Roads decommissioned (miles within 150 feet of a stream)

Sediment from roads and treatment units are selected as measurement indicators because sediment is the most likely water quality impairment to be generated by activities related to this project. Water yield is a measurement indicator because increased water yield can be associated with forest management practices. Removing living trees can decrease the amount of water that is removed from the watershed by canopy interception, evapotranspiration, and sublimation. This can result in more water in the stream in base flow and in lower-magnitude peak flow events, as well as potentially altering the timing of snowmelt-associated peak flows. The fourth measurement indicator – road miles decommissioned within 150 feet of a stream – was selected because roads located within that buffer pose a greater risk of sediment delivery to the stream.

Other important water resource issues in the project area include road/stream crossings, undersized culverts, wetlands, and riparian areas. Road/stream crossings and undersized culverts are discussed in detail in the Fisheries Biological Evaluation and Specialist Report. Harvest management prescriptions within riparian habitat conservation areas (RHCAs) and wetland buffers have been established in consultation with the silvicultural and fisheries specialists to ensure that activities meet riparian management objectives to be consistent with the HNF Land and Resource Management Plan (Forest Plan). Therefore, measurable impacts to wetlands and riparian areas are not anticipated, and they are not included as a measurement indicator.

The results of the analyses related to the four measurement indicators are as follows:

- The probability that proposed treatment units will deliver any amount of sediment to a stream in the first year following treatment is predicted to be 18 percent under alternatives 2 or 3, or 26 percent under alternative 4, according to Water Erosion Prediction Project (WEPP) modeling. There is 90 percent likelihood that total annual sediment delivery to project area streams would be below 0.5, 0.3, or 1.2 tons in alternatives 2, 3, and 4 respectively.

- Project road improvements are predicted to result in an annual average decrease in sediment delivery to streams of approximately 9.9 tons.
- Water yield has likely been affected by insect mortality. The equivalent clearcut area (ECA) analysis estimated that insect mortality, wildfires, and previous forest management actions have increased water yield by roughly 8 to 11 percent in project area sub-watersheds under existing conditions. The proposed action alternatives are predicted to further increase water yield by no more than 1 to 2 percentage points, an increase which remains within the guidelines set forth by the Montana Department of Environmental Quality.
- Road decommissioning proposed under alternatives 3 and 4 would remove 6.6 miles of road within 150 feet of stream channels, reducing the long-term risk of sediment delivery to project area streams.

Alternative 1 (no action) would not directly add to cumulative watershed effects in the analysis area. Potential negative impacts associated with alternatives 2, 3, and 4 would be short-term and have been determined in this analysis to be negligible. Project watershed improvements include replacement of six to twenty-four stream crossings that are currently undersized or damaged. These culverts contain large volumes of sediment that would be at risk of entrainment in the event of catastrophic failure, and in some cases are barriers to aquatic organism passage. Along with the road decommissioning planned under the action alternatives, these improvements would have a positive impact on watershed conditions in the analysis area.

The analyses completed for this report and activities proposed under alternatives 2, 3, and 4 comply with all applicable Forest Plan standards related to water resources, including forest-wide standards and standards for all pertinent management areas. Documentation of compliance with applicable Forest Plan standards is provided in appendix A of the Hydrology Specialist Report.

Assumptions

Water Quality

Activities proposed under all three action alternatives would meet State water quality standards for streams if all reasonable land, soil, and water conservation practices are implemented and those practices “protect present and reasonably anticipated beneficial uses” (ARM 17.30.602). Of the beneficial uses designated for project area streams, the proposed activities would be most likely to affect salmonid habitat through increased sediment delivery to streams. Project design features are planned to mitigate sediment delivery to waterbodies. Other beneficial uses for project area streams are unlikely to be affected by the proposed activities.

The effects of each alternative, summarized in the Environmental Consequences section of this report, are based on the following assumptions related to water quality:

- The potential for sediment delivery from treatment units is highest in the first year following disturbance and generally recovers to pre-disturbance conditions within five years, based on HNF soils monitoring.
- Existing roads that would be reconstructed that do not currently have sediment delivery points would not develop sediment delivery points during project implementation.
- The project would be constructed and managed in accordance with the watershed and soil design features listed below and those described in the Telegraph Project Soils Specialist

Report and chapter 2 of the FEIS to mitigate adverse effects to water quality, minimize soil compaction, prevent erosion, protect wetlands, and minimize severe soil burning.

Water Yield

Water yield from a watershed is typically defined as the total volume of water leaving the basin via surface flow over a specified length of time. Annual water yield fluctuates based on climatic variability and changes in land use patterns. For example, timber harvest and road construction may increase water yield by removing living trees from treated areas, thus reducing the amount of water lost to transpiration and canopy interception, evaporation, and sublimation. Increased water yield can be of concern because it may result in accelerated stream bank erosion resulting in habitat degradation and additional sedimentation. Conversely, increased water yield can have positive effects to physical habitat conditions during periods of low flow.

Widespread tree mortality from natural causes, such as insects, disease, or fire may similarly increase water yield (MacDonald and Stednick 2003). Removal of trees has a greater effect on the water balance than removal of smaller plants such as grasses, forbs, and shrubs, because large trees are generally more deeply rooted and thus have access to soil and groundwater for a longer period. Trees also transpire much more water per unit area of ground coverage than smaller plants. The effects of tree mortality or removal on water yield depend on many factors, the most important of which is the percentage of the watershed area affected. A statistically significant increase in stream flow is generally not measurable until at least 20 to 30 percent of a watershed's forest cover is removed (MacDonald and Stednick 2003). Additionally, annual precipitation must generally exceed 18 to 20 inches in order for a measurable yield increase to occur (Bosch and Hewlett 1982; MacDonald 1987).

Due to recent insect mortality, many of the trees to be removed under the action alternatives are already dead. Dead trees do not transpire and thus do not remove groundwater or soil water from the watershed. After needle loss, dead trees intercept only a small fraction of the precipitation that would be intercepted by an intact canopy and subsequently lost to sublimation and evaporation. Therefore, removing dead trees has a negligible effect on the water balance in a watershed. The ECA evaluates cumulative water yield increases due to insect mortality, wildfires, and previous forest management actions. Water yield increases presented for alternative 1 (no action) represent the current conditions, including the current bug kill mortality, and are relative to an undisturbed forest state.

Riparian and Wetland Areas

The project would allow removal of some dead trees within riparian and other wetland habitats. However, Montana's SMZ law and prescription restrictions within RHCAs would limit equipment use in these areas, and soil best management practices (BMPs) would be implemented to protect wetlands (see the Fisheries Biological Evaluation and Soils specialist reports for more information). This analysis assumes that by adhering to the design features described in the Hydrology Specialist Report and other specialists' reports as well as the Design Features section in chapter 2 of this FEIS, treatment activities would not impair hydrologic function of wetlands or riparian areas.

Culverts

The following assumptions apply to the culvert analysis:

- Crossing failure is assumed to remove most of the valley fill volume when discussing consequences of sediment entrainment.
- For determination of culvert capacity, a headwater/diameter (HW/D) ratio of 1.0 was used.

Mitigation Measures

Several elements of the project would address some of the known sediment delivery locations as well as flow and fish passage concerns in the project area. Predicted reductions in sediment delivery and other water resource-related benefits from these projects are discussed in this section.

Stream Crossing Improvements

There are 6 to 24 stream crossings planned for improvement in this project, depending on alternative. In accordance with current Forest Service practices, replacement culverts would have a 1 percent probability (100-year) flood capacity and a lower risk of failure (and potential sediment entrainment) than existing undersized culverts.

Road Improvements

The project will include road improvement and maintenance work on haul routes within the project area to address many existing road drainage concerns and reduce the number of sediment delivery points. The Transportation Specialist Report details the road maintenance projects in the project area. The effects analysis below details predicted effects of the proposed road work.

In addition to the road work planned under both action alternatives, alternative 3 includes a proposal to re-route National Forest System Road (Road) 123, which currently crosses the Little Blackfoot River at a wide point in the floodplain and provides access to the Ontario Creek drainage. This road acts as a dam on the floodplain, with two culverts and one bridge allowing streamflow to pass. The stream is depositional in this reach which, combined with the broad floodplain, results in avulsion and channel migration in years of high spring runoff. The three crossing structures have proven unsuitable to accommodate the shifting river channels. This has resulted in frequent emergency maintenance measures to avoid road damage, and has resulted in sediment entrainment from the road fill. The re-route would involve the construction of the Golden Anchor bridge at the site of a current ford of the Little Blackfoot, roughly 0.5 mile downstream of the current road alignment. This bridge is specified in all action alternatives of the draft Divide Travel Plan, and is planned for construction in the fall of 2015. The road would then connect to the section of Road 123 west of Ontario Creek, allowing for the removal of the road segment crossing the Little Blackfoot floodplain, including two culverts and a bridge.

Information Used

Roads Sediment Survey

A sediment source survey was done on project area roads. Sites with observed evidence of sediment transport to stream channels were evaluated to use the WEPP: Road model to predict differences in sediment transport between existing and improved conditions.

Culvert Survey

A culvert survey was completed for the project analysis. Culverts within the area were surveyed in detail by Forest Service personnel, in accordance with the guidelines contained in the National Inventory and Assessment Procedure for Identifying Barriers to Aquatic Organism Passage at Road-Stream Crossings (Clarkin et al. 2005).

Water Quality Data

Water quality monitoring data were not available for the project area. Information in the water quality section is based on the Montana 303(d) list (Montana DEQ 2012) and the Little Blackfoot TMDL report (Montana DEQ 2011).

GIS Data

Numerous geographic information system (GIS) layers were used for spatial analysis including proposed vegetation treatment units, proposed and existing roads, 6th-HUC watershed boundaries, streams from the National Hydrography Dataset, HNF land types, stream buffers, and various intersections of these layers with the HNF soil survey. This information was used in various analyses.

HNF Soil Survey

The HNF Soil Survey (USDA Forest Service 2001) provided data on soil types and characteristics for the study area. This information was used in modeling erosion and sedimentation.

Helena National Forest Wetland Data

HNF wetland survey crews searched for wetlands as defined by the United States Army Corps of Engineers (USACE 1987) within the project area. The survey focused on areas identified by a GIS terrain model as likely to have wetlands. Wetlands identified within those areas were described in detail and mapped. These survey data are not comprehensive and do not include all wetlands in the project area, and the identified wetlands were not distinguished by type (fens, wet meadows, etc.). Data from the wetland survey are included in the project record.

Helena National Forest Riparian Survey Data

HNF field crews conducted a riparian survey along streams located in grazing allotments in 2009. Data collected are available in the project record, and include the functional rating for surveyed riparian areas: properly functioning condition (PFC), functioning-at-risk (FAR), or non-functioning (NF). The survey also included an assessment of trend in riparian condition, whether functional impairments could be controlled, and the key factors in determining the functional rating.

Methodology and Scientific Accuracy

Scale of Analysis

The spatial scale of analysis for direct and indirect impacts is at the 6th-order hydrologic unit code (6th-HUC) sub-watershed. This scale was selected because the types of watershed impacts that are associated with forest management practices (increased sediment delivery and water yield) are discernible at the 6th-HUC scale. Additionally, a smaller scale of analysis would require significantly more data and effort without a commensurate increase in accuracy, given the tools available for analysis of watershed impacts. Finally, the 6th-HUC scale provides meaningful data in light of the regulatory framework. Typically, only a limited number of 6th-HUC streams are listed as impaired under Section 303(d) of the CWA, so the 6th-HUC scale allows a determination of the relative impacts or improvements to more sensitive streams.

The temporal scale of the analysis for direct and indirect effects ranges from one to five years. The potential for short-term increases in erosion and sediment delivery associated with road decommissioning would last as long as soil is disturbed or exposed. Once vegetation and groundcover have stabilized disturbed ground surfaces, decommissioning-related sediment delivery would not be expected to persist. For management activities on treatment units, the potential for sediment delivery is highest in the first year following disturbance and generally recovers to pre-disturbance levels within five years. Therefore, potential direct and indirect effects related to treatment units will be evaluated on a temporal scale of five years.

The cumulative effects analysis area includes all the 6th-HUC sub-watersheds where project activities would occur, which is approximately 45,900 acres in size. Analysis will be presented at the scale of the individual 6th-HUC sub-watershed. The project boundary encompasses portions of four 6th-HUC sub-watersheds: Ontario Creek, Telegraph Creek, Mike Renig Gulch, and Little Blackfoot River-Hat Creek. The temporal scale for the cumulative effects analysis is greater than five years.

Methodologies

The WEPP:Road model (Elliott et al. 2000) was used to predict sediment transport from roads to stream channels. Input data used to run this model were collected in the field in the aforementioned sediment surveys. The Disturbed WEPP model (Elliott 2004) was used to predict erosion and sediment transport from treatment areas to stream channels. Input data required for the Disturbed WEPP interface include slope and length of treated hillslopes and buffers, soil type and rock content, and vegetative cover.

Both WEPP models incorporate climate data tailored to the individual site using Parameter-elevation Regressions on Independent Slopes Model (PRISM) data (Daly et al. 2000) and simulate daily events for a number of years specified by the user (50 years in this analysis) to determine the probability of sediment leaving the unit or road. The model incorporates individual precipitation event characteristics and antecedent conditions as well as site characteristics into its prediction of average annual runoff, erosion, and sediment yield values.

The physical basis and performance of the WEPP models is discussed in the model documentation (Elliott et al. 2000) as well as several peer-reviewed papers (Elliot 2004; Laflen et al. 2004; Larsen and MacDonald 2007). In general, erosion prediction models have difficulty predicting sediment output with precision from a road, hillslope, or watershed at time scales useful to land managers. This is due mainly to a high degree of variability in site characteristics and climate. An average erosion/sediment delivery rate prediction can encompass this variability to some degree, but becomes much more useful when combined with a predicted probability that erosion will occur. These probabilities are included in this report.

The culvert risk analysis was based on field measurements of the culverts within the project area and flood frequency regression curves developed for the state of Montana (Parrett and Johnson 2004). The basis and accuracy of the regression curves are documented in the cited publication.

The ECA method was used to estimate the impact of past, ongoing, and proposed project activities on water yield in the four 6th-HUC sub-watersheds in the project area. The ECA method has been in use for several decades in the northern Rockies and provides a reasonable estimation of the impacts of vegetation removal on water yield (Belt 1980). The ECA method predicts water yield increases by assigning coefficients to various types of disturbances. Information used in the analysis includes the timber stand database and various GIS layers. Basal area reduction coefficients and mortality factors used in the ECA analysis were provided by the HNF silviculturist. Watershed mean annual precipitation was determined from PRISM data (Daly et al. 2000).

Changes in water yield are difficult to predict at the landscape scale due to the complexity of water movement in mountainous forested environments. Even with exhaustive site data available only in experimental settings (i.e., transpiration rates, soil moisture and porosity, precipitation, stream flow, groundwater level and flow), water yield estimates are approximate at best. The ECA model results are useful for comparisons between existing conditions and action alternatives, but should not be interpreted as a precise prediction of individual flow events.

Physical riparian habitat was assessed as part of the sediment source survey described above, using standard PFC guidelines (Prichard et al. 1998). Overall watershed function was also assessed under the 2011 USFS Watershed Condition Framework, which considers overall geomorphic, hydrologic, and biotic integrity relative to natural potential conditions (USDA 2011a; USDA 2011b).

Hydrology, Affected Environment

Introduction

This section describes the water resources within the project area. Information included in this section is from field investigation by HNF watershed crews, published reports and data from the Montana Department of Environmental Quality and the US Forest Service, and various GIS layers.

Analysis Area

The analysis area for direct and indirect effects includes the Ontario Creek, Telegraph Creek, Mike Renig Gulch, and Little Blackfoot River-Hat Creek sub-watersheds. The size of these sub-watersheds ranges from 7,332 acres for Mike Renig Gulch to 13,522 acres for Little Blackfoot River–Hat Creek..

Ontario Creek

The Ontario Creek sub-watershed is approximately 12,801 acres in size. Approximately 51 percent (6,483 acres) is in the project area. The watershed is characterized by steep mountainous terrain. The Ontario Creek sub-watershed is underlain by Tertiary and Cretaceous rhyolites and Cretaceous granitics. Valley bottoms are generally covered by Pleistocene glacial till. Average annual precipitation is approximately 26 inches. There are no public drinking water supplies in this watershed (DEQ 2016). The overall watershed condition was rated as Functionally Impaired by the 2011 USFS Watershed Condition Framework.

Ontario Creek (headwaters to mouth at Little Blackfoot River) is listed as water quality limited by Montana DEQ (Figure 134). The beneficial use of aquatic life is listed as not fully supporting due to impairments including aluminum, cadmium, copper, lead, and zinc. Sources are identified as impacts from inactive abandoned mine lands.

Monarch Creek, located in the Ontario Creek sub-watershed, is listed as water quality limited by Montana DEQ (Figure 134). The beneficial uses of aquatic life, cold water fishery, and primary contact recreation are listed as partially supporting, due to impairments including arsenic, copper, lead, mercury, pH, and selenium. Sources are identified as mill tailings, mine tailings, and subsurface (hard rock) mining.

An un-named creek located at T8N, R6W, S27 in this watershed is also listed as impaired from its headwaters to Ontario Creek, due to impairments including aluminum, arsenic, cadmium, copper, iron, lead, mercury, zinc, and pH (Figure 134). Sources are identified as inactive abandoned mine lands

Telegraph Creek

The Telegraph Creek sub-watershed is approximately 12,227 acres in size. Approximately 91 percent (11,120 acres) of this watershed is in the project area. The watershed is characterized by steep mountainous terrain, with a broad valley bottom in the lower reach. Telegraph Creek flows into the Little Blackfoot River near the northern boundary of the project area. The Telegraph Creek sub-watershed is underlain by Cretaceous granitics and rhyolite. Valley bottoms are generally covered by

Pleistocene glacial till and Quaternary alluvial deposits. Annual average precipitation for the watershed is about 23 inches. The overall watershed condition was rated as Functionally Impaired by the 2011 USFS Watershed Condition Framework.

There is one public drinking water supply in this watershed, located at Camp Child downstream of the project area. The source water type is classified as groundwater not under the influence of surface water, with no sources from surface water or from groundwater under the influence of surface water (DEQ 2016).

Telegraph Creek (headwaters to Hahn Creek) is listed as water quality limited by Montana DEQ (Figure 134). The beneficial uses of aquatic life, cold water fishery, and drinking water are listed as not fully supporting, due to impairments including aluminum, arsenic, beryllium, cadmium, copper, lead, zinc, sedimentation/siltation, and alteration in stream-side or littoral vegetative covers. Sources are identified as forest roads, mine tailings, and impacts from inactive abandoned mine lands.

Telegraph Creek (Hahn Creek to the mouth at Little Blackfoot River) is listed as water quality limited by Montana DEQ (Figure 134). The beneficial uses of aquatic life and drinking water are listed as not fully supporting, due to impairments including aluminum, cadmium, copper, lead, mercury, and zinc. Inactive abandoned mine lands are identified as the source of contamination.

Sally Ann Creek (headwaters to mouth at O'Keefe Creek) and O'Keefe Creek (headwaters to mouth at Telegraph Creek) are listed as water quality limited by Montana DEQ (Figure 134). The beneficial use of aquatic life is listed as not fully supporting for either stream, due to impairments including cadmium, copper, and zinc. Sources of contamination for O'Keefe Creek are identified as impacts from inactive abandoned mine lands; sources for Sally Ann Creek are inactive abandoned mine lands and mine tailings.

Mike Renig Gulch

The Mike Renig Gulch sub-watershed is approximately 7,332 acres in size. Approximately 29 percent (2,155 acres) of this watershed is in the project area. The Mike Renig Gulch watershed is underlain by Cretaceous rhyolite and granodiorite. Valley bottoms are generally covered by Pleistocene glacial till and Quaternary alluvial deposits. The sub-watershed is characterized by steep mountainous terrain, with a broad valley bottom in the lower reach. Annual average precipitation for the watershed is about 21 inches. There are no public drinking water supplies in this watershed (DEQ 2016). The overall watershed condition was rated as Functioning At Risk by the 2011 USFS Watershed Condition Framework.

The watershed assessment for the Little Blackfoot River conducted by the HNF found that historically the main stem reach of Mike Renig Gulch was heavily influenced by beaver activity for about 3.5 miles upstream from its confluence with the Little Blackfoot River. A substantial portion of the reach on private land is intensively grazed and the influence of beaver has been reduced in terms of the amount of adjacent land affected by elevated water tables. Additionally, the stream is partially diverted for livestock watering. Near the Forest boundary, conditions are improved with substantial portions of the immediate stream bottom having relatively high water tables and extensive willow communities. No streams in this sub-watershed are listed as water quality limited by the Montana DEQ (Figure 134).

Little Blackfoot River-Hat Creek

The Little Blackfoot River is a direct tributary to the Clark Fork River within the Columbia River Basin. The Little Blackfoot River-Hat Creek sub-watershed extends from the headwaters of the Little

Blackfoot River, near the continental divide, to Dog Creek (downstream of the project area). Approximately 10 stream miles are located in the project area, from the confluence of Ontario Creek to the confluence of Telegraph Creek. The Little Blackfoot River-Hat Creek sub-watershed is approximately 13,522 acres in size. Approximately 28 percent (3,779 acres) of this watershed is in the project area. There are no public drinking water supplies in this watershed (DEQ 2016). The overall watershed condition was rated as Functionally Impaired by the 2011 USFS Watershed Condition Framework.

The Little Blackfoot River-Hat Creek sub-watershed is underlain by Cretaceous volcanic and sedimentary rocks. Valley bottoms are generally covered by Pleistocene glacial till and Quaternary alluvial deposits. The watershed is characterized by steep mountainous terrain, with a broad valley bottom in the lower reach. Annual average precipitation for the watershed is about 26 inches.

Two segments of the Little Blackfoot River (headwaters to Dog Creek and Dog Creek to the mouth at Clark Fork River) are listed by the Montana DEQ as water quality limited (Figure 134). The beneficial uses of aquatic life and cold water fishery are listed as partially supporting, due to impairments including arsenic, cyanide, alteration in streamside vegetative cover, and sedimentation/siltation. Sources are identified as abandoned mines and roads.

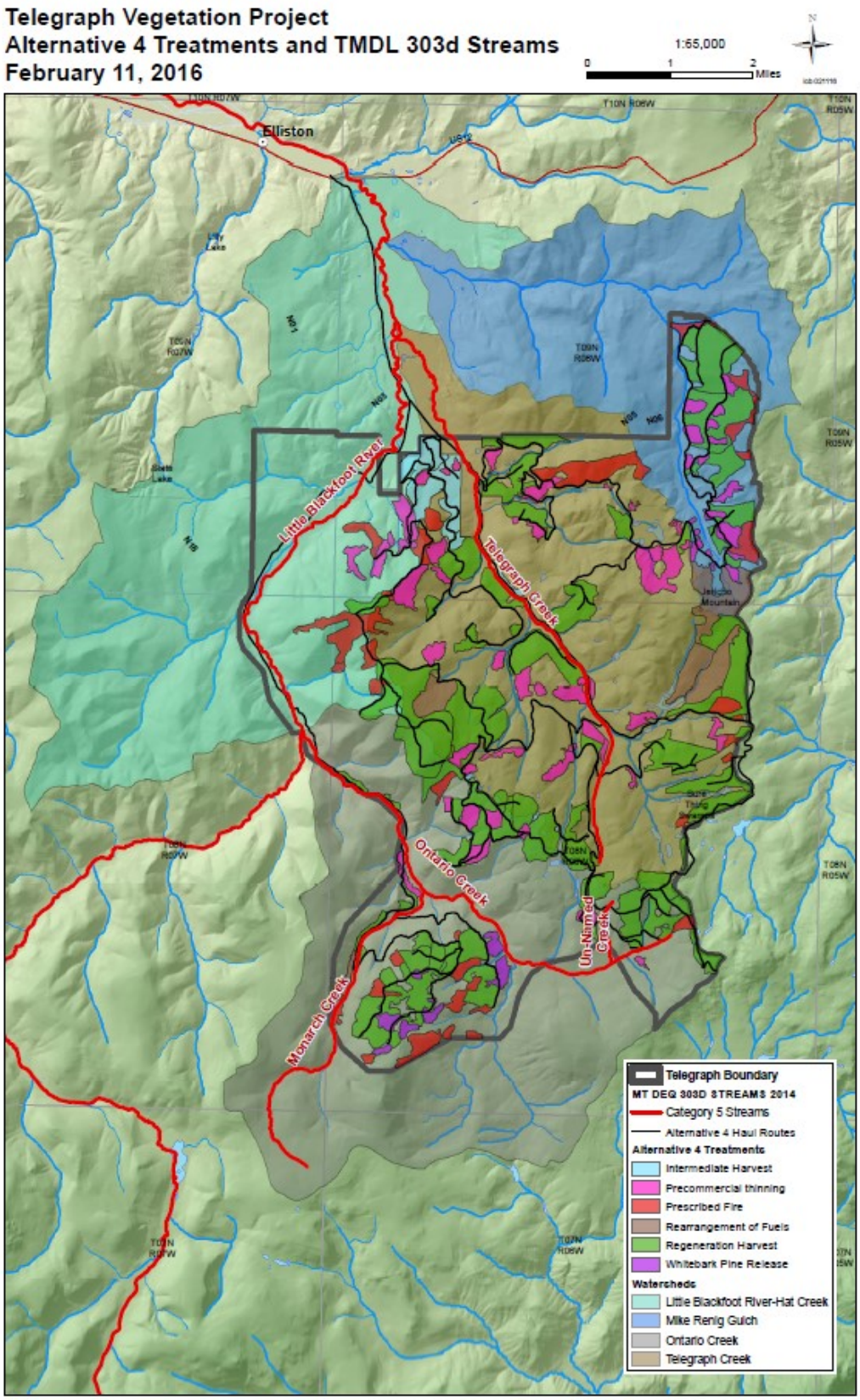

Figure 134. Streams listed by the Montana Department of Environmental Quality as water-quality-limited (DEQ 2016)

Water Quality

Sediment

Sediment from Roads

HNF hydrology staff conducted a road sediment survey for the Forest Service-managed portions of the 6th-HUC sub-watersheds in the project area. The survey identified existing road segments that are hydraulically linked to stream channels and that increase the risk of sediment delivery during runoff events. Information collected included input parameters required for WEPP:Road modeling: road design (insloped, outsloped, rutted, unrutted); surface (native or gravel); road and buffer dimensions; and road and buffer gradient.

The survey only included roads on the HNF portions of these watersheds. Some Forest Service spurs were not surveyed, due to lack of access. Unsurveyed spurs are generally in upland locations and/or overgrown and are less likely to be chronic sources of sediment to streams.

Using the road sediment survey data, the WEPP:Road model was used to predict sediment transport from existing roads to stream channels. Table 292 summarizes the results of the modeling.

Table 292. Estimated average annual sediment delivery from roads to stream channels—existing conditions

Drainage	Average sediment delivery (tons/year)
Little Blackfoot River-Hat Creek	4.3
Mike Renig Gulch	0.7
Ontario Creek	2.6
Telegraph Creek	3.5

The existing road network has several road/stream crossings. A culvert analysis was completed for all culverts in the project area that were surveyed by HNF hydrology staff. Of the 53 culverts in the project area (28 in the Telegraph Creek sub-watershed, 13 in the Ontario Creek sub-watershed, 6 in the Little Blackfoot River-Hat Creek sub-watershed, and 6 in the Mike Renig Gulch sub-watershed), 19 had inadequate capacity to convey runoff from the 25-year design event (a flow event with a 4 percent chance of occurrence in any given year), and 35 of the culverts had inadequate capacity for the 100-year design event (a flow event with a 1 percent chance of occurrence in any given year). These culverts have greater than a 65 percent probability of failure over a design life of 25 years (Potyondy 1981). Some of these culverts also present unnatural barriers to fish passage (see Fisheries Biological Evaluation and Specialist Report). These culvert crossings contain more than 32,000 cubic yards of road-fill sediment in total, which would be at risk of entrainment in the event of catastrophic culvert failure

Sediment from Other Sources

Although roads are the dominant source of anthropogenic sediment in project area watersheds, there are additional natural and human-caused sources. Other activities have occurred on Federal lands throughout the project area watersheds. Human-caused impacts include livestock grazing, mining (both placer and hard rock), timber management, special uses of various types, recreation, trail construction, trail maintenance, firewood cutting, fire suppression, prescribed fire, weed control, and utility corridors (USDA 2000).

Non-sediment

In three of the four project area sub-watersheds, streams are listed as impaired due to high concentrations of metals—see the above descriptions of impairments and beneficial uses for each watershed. Within the Ontario Creek sub-watershed, Monarch Creek and the un-named creek are also listed as impaired for low pH.

No project-area streams are listed as impaired due to stream temperature. However, several project-area stream segments are listed as impaired due to alterations in streamside vegetative covers, which may result in localized areas of elevated stream temperature. Alterations in streamside vegetative covers along Telegraph Creek from its headwaters to Hahn Creek are attributed to construction and use of forest roads and impacts from abandoned mine lands. Alterations in streamside or littoral vegetative covers along the Little Blackfoot River from Dog Creek to the mouth are due to agriculture, channelization, and rangeland grazing. From its headwaters to Dog Creek, alterations in streamside or littoral vegetative covers along the Little Blackfoot River are attributed to highway bridge runoff and impacts from abandoned mine lands.

Water Yield

In a mountainous forested landscape, roughly 20 to 30 percent of the watershed must be treated in order to attain a statistically significant increase in streamflow (MacDonald & Stednick, 2003). Research has suggested that remaining trees tend to make use of most additional water made available through the reduction in transpiration brought about by tree removal (MacDonald, 1987). The Montana Department of Environmental Quality considers changes in average water yield up to 15 percent above or below baseline to be “nonsignificant” (ARM 17.30.715).

Water yield increase was estimated using the equivalent clearcut area (ECA) method for existing conditions in the project-area watersheds. The ECA analysis estimated water yield increases due to insect mortality, roads, wildfires, and previous forest management actions, as compared to an undisturbed forest state. The analysis also evaluated the potential for water yield increases associated with the action alternatives evaluated for this report.

The ECA acres under existing conditions, and the associated percent water yield increase, are depicted in Table 293. The predicted water yield increase in the Mainstem Little Blackfoot River watershed under current conditions is about 10 percent above baseline, which is within the 15 percent guideline set by the Montana DEQ (ARM 17.30.715).

Table 293. Estimated equivalent clearcut acres (ECA) and water yield increase under existing conditions

Sub-watershed	Sub-watershed area (acres)	Total ECA (acres)	Beetle-kill ECA (acres)	Water yield increase (%)
Little Blackfoot River-Hat Creek	13,522	3,220	2,913	8
Mike Renig Gulch	7,332	1,971	1,612	8
Ontario Creek	12,801	4,085	3,440	10
Telegraph Creek	12,227	4,579	2,650	11
Mainstem Little Blackfoot River	45,906	13,855	10,614	10

This analysis suggests that under the current condition, water yield in the mainstem Little Blackfoot River downstream of the analysis area is roughly 10 percent higher than if no trees in the watershed had been killed or removed in the past 60 years. The increased yield is due primarily to extensive

insect-caused tree mortality in recent years, accounting for over 80 percent of the equivalent clearcut area under existing conditions

Riparian and Wetland Areas

Physical riparian habitat and bank alteration conditions were recorded for riparian areas in grazing allotments in the project area in 2008–2009. Riparian conditions are described in greater detail in the Fisheries Biological Evaluation and Specialist Report. Not every riparian reach in the project area was surveyed—efforts were focused in grazing allotments where impacts to riparian areas are typically greatest.

The results of the survey of riparian areas (in grazing allotments only) are summarized in table 294. None of the reaches observed were rated PFC. Of the riparian reaches surveyed, 11 were rated as NF. Seven of these reaches were in the Little Blackfoot River-Hat Creek sub-watershed, three were in the Ontario Creek sub-watershed, and one was in the Mike Renig Gulch sub-watershed. Field observations indicated that the major impacts to surveyed riparian areas were from livestock use.

Table 294. Riparian condition data for Telegraph Project sub-watersheds

Sub-watershed	Riparian Condition PFC (# reaches)	Riparian Condition FAR (# reaches)	Riparian Condition NF (# reaches)	Exceed Bank Alteration Standards (# reaches)	Allotment(s)
Little Blackfoot River-Hat Creek	0	3	7	6	Hat Creek, Slate Lake
Mike Renig Gulch	0	0	1	2	Tenmile-Priest Pass
Ontario Creek	0	1	3	N/A	Telegraph
Telegraph Creek	0	2	0	N/A	Telegraph

PFC = Properly Functioning Condition; FAR = Functioning At Risk; NF = Non-Functioning

No formal survey data are available for riparian areas outside of grazing allotments. As noted in the previous section, segments of Telegraph Creek and the Little Blackfoot River are listed as impaired due to alterations in streamside or littoral vegetative covers. Probable sources of alterations are listed as construction and use of forest roads, impacts from abandoned mine lands, agriculture, channelization, highway bridge runoff, and rangeland grazing (see previous section for details on sources in each impaired stream segment). An additional source of impairments in riparian areas along streams throughout the project area are impacts from unauthorized travel along streams, commonly referred to as dispersed recreation. Many of these dispersed sites include eroding banks, compacted and bare soils, and disturbed vegetation. The Divide Travel Plan addressed these dispersed sites.

HNF wetland survey crews searched for wetlands (as defined by USACE (1987)) within the project area. Non-riparian wetlands were generally observed to be in good condition. A total of 61.5 acres of wetlands were identified in proposed treatment units as part of this survey. Data from the wetland survey are included in the project record.

Hydrology, Environmental Consequences

Four measurement indicators were used to evaluate the effects of each alternative considered as part of the Telegraph Project:

- Sediment from roads (average tons per year)
- Sediment from treatment units (tons per year and probability of sedimentation)
- Water yield increase over current conditions (percent)
- Road decommissioning (decommissioned miles within 150 feet of a stream)

Sediment from roads and treatment units are selected as measurement indicators because sediment is the most likely water quality impairment to be generated by activities related to this project.

Water yield is a measurement indicator because increased water yield can be associated with forest management practices. Removing large numbers of living trees can decrease the amount of water that is removed from the watershed by transpiration and canopy interception, evaporation, and sublimation. This can result in more water in the stream in base flow and in lower-magnitude peak flow events, as well as potentially altering the timing of snowmelt-associated peak flows.

Other important water resource issues in the project area include road density, road/stream crossings, non-riparian wetlands, and riparian areas.

Effects Common to All Alternatives

There are no effects common to all alternatives.

Effects Common to All Action Alternatives

Project road maintenance and reconstruction are similar under all action alternatives—the Transportation Specialist Report outlines details of this work. Six undersized culverts would be upgraded to accommodate the 100-year return-interval flow event under all action alternatives (an additional three culverts would be upgraded in alternative 3, and an additional 14 would be upgraded in alternative 4).

Alternative 1 – No Action

Direct and Indirect Effects

Under alternative 1, no new management actions are proposed; therefore no additional water resource impacts would occur and no additions to watershed-scale cumulative effects are predicted. Past and ongoing management activities, such as road use, OHV use, mining, and livestock grazing would continue to affect water resources. Because the project area lies within a fire-prone landscape, wildfires and associated watershed effects are likely under any of the alternatives. However, the analysis and modeling of existing conditions presented in the Fire and Fuels Specialist Report suggest that current and continued fuel accumulation in the absence of treatment could result in increased fire intensity and residence time (see Fire and Fuels specialist report for more details).

Numerous studies have documented post-wildfire increases in erosion and stream sediment levels (e.g., Wagenbrenner et al. 2006; Spigel and Robichaud 2007; Robichaud et al. 2008; Moody and Martin 2009). While it is difficult to anticipate the exact pattern of burn severity to soils from either a prescribed fire or a wildfire in the project area, some general conclusions can be made from the fire-effects literature as well as monitoring of prescribed fire on the Helena NF (for details of HNF monitoring, see the Soils Specialist Report). Whereas a wildfire typically burns through a landscape when conditions are hot and dry, prescribed fires are usually implemented when soil, duff, and coarse woody debris moisture levels are relatively high (i.e., in the spring and late fall). Burning that occurs during conditions of higher soil moisture generally results in lower impacts to soils (Hartford and Frandsen 1992; Stephan et al. 2012; Stoof et al. 2013). Stephan et al. (2012) found that wildfire-

burned watersheds exhibited higher severity effects than watersheds burned in springtime prescribed fires, and produced substantially greater impacts to water quality. Furthermore, Rhoades et al. (2011) found that post-fire impacts to water quality in and around the Denver municipal watershed were closely correlated to burn severity and extent—the larger the area with high-severity burn effects, the greater the impact to stream water quality during the five-year analysis period following the Hayman Fire in 2002.

Irreversible and Irretrievable Commitments

An irretrievable commitment represents a temporary loss of a resource that can be replaced over time. An irreversible commitment represents a total loss of a resource that cannot be replaced. Any water quality impacts due to the attendant watershed effects associated with increased wildfire risk in alternative 1 would be irretrievable commitments, in that soil and water quality would recover from the potential wildfire effects over a period of years. There are no irreversible commitments due to alternative 1 because any potential impacts to water resources would be temporary in nature.

Cumulative Effects

The project area lies within a fire-prone landscape. Wildfires and associated watershed effects are likely under any of the alternatives. However, the Telegraph Project Fire and Fuels Specialist Report suggests that there would be an increased risk of wildfire absent the management actions proposed under the action alternatives. Watershed effects from a wildfire could include loss of canopy cover and associated impacts to riparian function, water quality impacts including sediment delivery to stream channels and increased stream temperature, increased water yield, short-term hydrophobicity, and long-term streamflow increases.

Water yield increases were estimated using the ECA method (Ager and Clifton, 2005) to account for all natural and human-caused loss of forest canopy, including tree mortality from the recent beetle epidemic. Under existing conditions, the combined effects of beetle-kill, past harvest, and wildfire have resulted in a percent water yield increase from 8 to 11 percent (Table 293). This analysis suggests that under the current condition, water yield in Little Blackfoot River immediately downstream of the project area is 10 percent higher than if no vegetation in the basin was killed or removed in the past 60 years. Recent insect mortality accounts for over 80 percent of this estimated water yield increase. These increases likely would not be detectable at the 6th-HUC level.

No new management activities are proposed under alternative 1, so aside from the potential increased risk of wildfire-related watershed effects, there are no additional cumulative effects related to alternative 1. Other past, present, and reasonably foreseeable activities that will continue to affect water quality, water yield, and riparian health and vigor in the cumulative effects analysis area are discussed in the alternative 2 cumulative effects section.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Water Quality

Sediment from Roads

Alternative 2 proposes to construct 16 temporary road segments totaling about 8.5 miles. Proposed temporary road locations were reviewed in the field by watershed staff. The review found that proposed temporary road locations are generally in upland areas that would not pose a risk of sediment delivery to streams. One proposed temporary road (N01) crosses a small intermittent

channel in the Telegraph Creek sub-watershed. Another proposed temporary road (N15) crosses the upper reach of a headwater drainage to the Little Blackfoot River, but the proposed crossing location was found to be dry with no evidence of surface runoff.

The channel that would be crossed by temporary road N01 flows to an impoundment on private land below the National Forest boundary. Outflow from this impoundment does not form a channel, nor does any surface flow reach the road which separates this drainage from Telegraph Creek. Any sediment carried by this stream is not transported beyond the impoundment, and therefore does not affect water quality in Telegraph Creek. Nonetheless, the crossing would be implemented in a manner that would minimize disturbance and erosion. The crossing would occur at a dry site in the valley bottom where the riparian area consists of a narrow strip on either side of the approximately one-foot-wide channel. This crossing would require approval from the State of Montana with a SPA 124 permit and most likely from the US Army Corps of Engineers with a CWA 404 permit.

Alternative 2 includes roughly 32.6 miles of road reconstruction and 42.1 miles of road maintenance. Details of what each of these categories of road improvement would entail are described in the Transportation Report. Road improvements would be done in accordance with the design features described above in this report to improve drainage and reduce or eliminate sites that allow sediment delivery to a stream or wetland. The potential effects of the proposed road improvements were estimated using the WEPP:Road model. Table 295 summarizes the predicted reduction in sediment delivery to stream channels from project improvements to roads. Such improvements should be expected to last from three to seven or more years following treatment. This temporal variability is dependent on factors that affect sedimentation from roads and are difficult to predict, such as road use patterns, continued maintenance, and weather.

Table 295. Predicted average annual sediment delivery from roads to streams in the project area

Sub-watershed	Average sediment delivery (tons/year)				Reduction in sediment delivery from Existing Condition		
	Existing	Alt 2	Alt 3	Alt 4	Alt 2	Alt 3	Alt 4
Little Blackfoot River-Hat Creek	4.3	0.1	0.1	0.1	98%	98%	98%
Mike Renig Gulch	0.7	0.1	0.1	0.1	89%	89%	89%
Ontario Creek	2.6	0.4	0.4	0.4	85%	85%	85%
Telegraph Creek	3.5	0.6	0.6	0.6	84%	84%	84%

Sediment from Treatment Units

It is unlikely that alternative 2 would lead to increased streambank erosion, as equipment would not operate in the SMZ (see the design features section in chapter 2 of this FEIS), and hand crews would not cut trees along stream banks. Hand crew work within the SMZ is not likely to result in a level of ground disturbance that would lead to any soil erosion or sediment transport.

Project activities are most likely to impact non-road sediment delivery to streams through burning in treatment units, and to a lesser extent, operation of equipment on hillslopes. To minimize sediment delivery from treatment units to streams, no-ignition buffers would be implemented. Buffer width was informed through WEPP erosion modeling. The regeneration treatment was modeled as “low severity burn” for treatment units with site preparation or broadcast burning. For units where jackpot burning or no burning was proposed, the treatment was modeled as 5-year forest, to reflect the more limited amount of burn disturbance (see the Forested Vegetation Specialist Report for more information). No-ignition and no-mechanical treatment buffers of 50 feet above streams are

predicted to result in a negligible probability of sediment delivery to streams from all treatment units in the project area. Table 296 summarizes probability of sediment delivery from treatment units by sub-watershed as predicted by the Disturbed WEPP model for the first year following treatment. With a 50-foot no-ignition or mechanical treatment buffer, probability of sedimentation is slight, with the model predicting a 12 to 26 percent probability of sediment delivery from any treatment unit. However, the predicted amount of sediment produced would be low (less than 0.03 ton per acre). The model estimated a probability of 74 to 82 percent that no eroded sediment would be delivered to a stream channel in the first year following treatment under any of the alternatives. Erosion and sediment delivery probability are expected to recover to pre-treatment rates within three to five years following implementation.

Table 296. Predicted treatment unit sediment delivery probability and rate for the action alternatives

Sub-watershed	Alternative 2		Alternative 3		Alternative 4	
	Probability of occurrence 1st year	Sediment delivery* (tons)	Probability of occurrence 1st year	Sediment delivery* (tons)	Probability of occurrence 1st year	Sediment delivery* (tons)
Little Blackfoot River-Hat Creek	16%	0.01	16%	0.01	12%	0.12
Mike Renig Gulch	18%	0.10	18%	0.06	2%	<0.01
Ontario Creek	13%	0.13	13%	0.04	26%	0.43
Telegraph Creek	12%	0.23	12%	0.16	18%	0.63

*Total sediment delivery for all units, 10% occurrence probability in first year following treatment.

Non-sediment

Alternative 2 has the potential to influence stream temperature by removing streamside trees. Although the shade provided by dead, defoliated trees is substantially less than that provided by a living canopy, such trees still provide some shade to adjacent streams (Amaranthus et al. 1989). However, understory vegetation (including small trees) is generally unaffected by insect mortality. This vegetation would be preserved under alternative 2, and most trees within the riparian habitat conservation area (RHCA) would not be cut (see Fisheries Biological Evaluation and Specialist Report for details on RHCA treatments). Thus, this alternative would be unlikely to result in measureable increases in stream temperature.

Road/Stream Crossings

Alternative 2 includes upgrading of six culverts along haul routes. Four of the culverts to be replaced currently lack capacity for the 25-year flow event. The other culverts are partial barriers to aquatic organism passage (AOP). Replacement culverts will be sized to pass the 100-year flood and provide full AOP. This work would reduce the risk of culvert failure and resulting entrainment of road-fill sediment into the stream system. Details on stream crossing improvements are listed in the Transportation Report. The benefits of this measure were not quantified for the project, but would restore floodplain and riparian habitat connectivity, as well as remove a chronic source of sediment and maintenance effort.

Water Yield

The project-related and cumulative equivalent clearcut acres and estimated percent water yield increase that would result from work proposed under this alternative are listed in table 297.

Although most timber volume to be cut in the project area is dead, some green trees would be removed, particularly in the precommercial thin units. The project-related and cumulative equivalent clearcut acres and estimated percent water yield increase that would result from work proposed under this alternative are listed in table 297. Water yield in the project area sub-watersheds is predicted to increase by an additional less than 1 to 2 percentage points over existing conditions if alternative 2 is implemented. Under existing conditions, water yield is estimated to be 8 to 11 percent higher than what would be expected in undisturbed forest, as a result of recent insect mortality. Cumulative water yield increase was estimated to be about 11 percent in the Mainstem Little Blackfoot River below the project area, or 1 percent above existing conditions. The estimated water yield increases for each 6th-HUC and the mainstem of the Little Blackfoot River are below the 15 percent significance threshold stipulated in ARM 17.30.715. Therefore, the small incremental potential increase posed by this project would likely not measurably change conditions. However, if a water yield increase were detectable, it would almost certainly be within acceptable limits for TMDL streams.

Table 297. Estimated equivalent clearcut acres (ECA) and water yield increase under alternative 2

Sub-watershed	Alternative 2 ECA	Cumulative ECA	Project water yield increase	Cumulative water yield increase
Little Blackfoot River-Hat Creek	58	3,220	<1%	8%
Mike Renig Gulch	206	1,971	1%	9%
Ontario Creek	283	4,085	1%	11%
Telegraph Creek	601	4,579	2%	13%
Mainstem Little Blackfoot	1,148	13,855	1%	11%

Riparian and Wetland Areas

A total of 61.5 acres of wetland identified during the HNF survey in 2009 lie within alternative 2 treatment units. The design features to protect wetlands, described in the Design Critera section of chapter 2 of this FEIS and in the Soils Specialist Report, would be applied to protect wetlands in or near treatment units.

Alternative 2 would not substantially impact the hydrologic function of riparian areas in that no mechanical equipment would operate in riparian areas, and hand-falling in the SMZ would be minimized. All project activities would be performed in accordance with State regulations, including Montana's SMZ law and RHCA restrictions described in the Fisheries Biological Evaluation and Specialist Report.

Irreversible and Irretrievable Commitments

Any water quality impacts due to increased sediment delivery resulting from alternative 2 would be irretrievable commitments, in that the stream would recover from the influx of additional sediment over a period of years. There are no irreversible commitments due to alternative 2 because any potential impacts to water resources stemming from project activities would be temporary in nature and counterbalanced by watershed improvements as discussed in this section.

Cumulative Effects

Several past and present Federal and non-Federal activities have affected and continue to affect water quality, water yield, and riparian conditions in the cumulative effects analysis area. Appendix B of

the Hydrology Specialist Report includes tables of past, present, and future activities that could contribute to water-resources potential cumulative effects.

Federal and private roads and culverts constructed at road/stream crossings in the project area have impacted streams and riparian areas. There are several sediment delivery points on existing roads as described previously, and culverts represent a permanent grade control in the stream channels where they have been constructed. Culverts directly interact with channels and can affect channel morphology and channel migration patterns, and also local hydraulics that may impact the stream channel. Culvert upgrades in recent years would likely have caused short-term impacts to water quality while in-stream work was ongoing, with long-term benefits from the reduction in risk of culvert failure and potential sediment entrainment.

The Divide Travel Plan, signed in 2016, designates existing roads as either open to motorized or non-motorized access, or closed seasonally or year-round. Specific road construction or decommissioning is not proposed, and therefore, no direct effects to water resources in the analysis area are expected. However, roads designated as closed may be selected for future decommissioning, which would indirectly benefit water resources through long-term reductions in sediment delivery to streams.

Grazing in riparian areas and cattle trailing along streams within grazing allotments and on private land would likely continue to contribute elevated sediment levels to streams in the project area. In the absence of other reductions to sediment delivery, streams in several of the watersheds where treatment is planned would continue to receive elevated levels of sediment due to impacts from cattle grazing. Alternative 2 would have no effect on livestock management activities and related impacts.

There are no large-scale active mines in the project area, but past mining activities have contributed metals and sediment to stream channels, and some sites continue to impact water quality. The Affected Environment section includes details on which streams are impaired due to metals concentrations. Abandoned mines can pose chronic or episodic water quality problems to forest streams. For example, a sealed adit in the Little Blackfoot watershed failed catastrophically in late 2008, delivering sediment and metals-laden water to Telegraph Creek. The Helena-Lewis and Clark National Forest continues to pursue mine reclamation opportunities in the project area, including an upcoming reclamation project at the Lily/Orphan Boy mine with a tentative implementation date of 2016–2017, which is expected to lead to long-term reductions in metals loading to streams. The Telegraph Vegetation Project would not disturb mining deposits (e.g., waste rock and tailings), and therefore, is not expected to contribute to cumulative effects on metals concentrations in streams.

In the Telegraph project area watersheds, water yield has been and most likely will continue to be affected by large-scale tree mortality due to insect infestations. Large-scale loss of live trees reduces the volume of water removed from a watershed by transpiration. The ECA analysis presented above also takes into account past harvest and burn activities on the landscape. Activities proposed under alternative 2 are not predicted to have a measureable cumulative effect on water yield, as the majority of trees to be removed are already dead (Table 297).

Extensive tree mortality could also impact stream temperature in streams that cross the affected stands. However, understory vegetation, generally unaffected by insect mortality, will continue to provide shade. Furthermore, understory and riparian vegetation exposed to increased levels of sunlight and moisture (due to overstory mortality or tree removal) can expand and provide additional shade (Gravelle and Link 2007). While an increase in incoming short-wave (solar) radiation is generally considered to be the dominant driver of stream temperature increase, numerous factors influence the extent to which a stream exposed to additional direct sunlight will have an increase in water temperature (Johnson 2004). Thus, the extent of water temperature changes resulting from

overstory mortality is difficult to predict. Alternative 2 would be unlikely to contribute to any meaningful stream temperature increase, given the minimal removal of vegetation in SMZs and RHCAs.

Other timber harvest operations have the potential to result in increased sediment loading to project area streams. Recent and ongoing timber harvest includes work on private inholdings within the upper Little Blackfoot watershed as well as recent roadside hazard tree removal work on National Forest System roads. Analysis presented above suggests that the proposed project would include improvements and mitigations that would lead to a net reduction in anthropogenic sediment loading to project-area streams.

Alternative 3

Key differences between alternatives 2 and 3 include the following:

- Alternative 3 would treat fewer units and fewer acres.
- Alternative 3 would require construction of fewer miles of temporary roads.
- Alternative 3 would include the improvement of three additional stream crossings.
- Alternative 3 would include the decommissioning of roughly 33 miles of existing roads.
- Alternative 3 would include the re-routing of the part of Road 123 that forms a partial dam across the Little Blackfoot floodplain, and the decommissioning of that road segment.

Direct and Indirect Effects

Discussion of direct and indirect effects of alternative 3 is abbreviated to avoid duplication—for additional details, see discussion in the appropriate section of alternative 2 above.

Water Quality

Sediment from Roads

Alternative 3 proposes construction of roughly 3.4 miles of temporary road segments, including the proposed segment N01 that crosses an intermittent stream. The same issues pertaining to this segment that were discussed under the alternative 2 discussion apply to this site in alternative 3.

Predicted sediment delivery reductions from roads due to maintenance and reconstruction efforts will be similar for all action alternatives (table 292).

Sediment from Treatment Units

As with alternative 2, erosion and sediment transport from treatment units is predicted to be negligible assuming that 50-foot no-ignition buffers and other standard soil and water BMPs are appropriately implemented (Table 296).

Non-Sediment

For the same reasons that are outlined in the discussion of alternative 2, project activities proposed in alternative 3 would be unlikely to result in measurable increases in stream temperature.

Road Decommissioning

Alternative 3 would include the decommissioning of 32.8 miles of road. Approximately 6.6 miles of this total are within 150 feet of a stream channel, and thus, have a higher probability of being a chronic source of sediment. Roads would be treated to decompact surfaces, re-establish natural

hillslope contours, remove culverts and restore natural stream channels, and discourage unauthorized use by motorized vehicles. This work would restore soil productivity and reduce potential erosion on roughly 80 acres of land in the project area. Although sediment delivery to streams was not quantified for this analysis, the decommissioning would likely reduce the amount of anthropogenic sediment load to project-area streams.

Road/Stream Crossings

Alternative 3 includes improvement of nine stream crossings along haul routes. Four of the culverts to be replaced currently lack capacity for the 25-year flow event. The other culverts are partial barriers to AOP. Replacement culverts will be sized to pass the 100-year flood and provide full AOP. This work would reduce the risk of culvert failure and resulting entrainment of road-fill sediment into the stream system. Details on culverts are in the Transportation Specialist Report. This alternative would also allow the decommissioning of the segment of Road 123 that crosses the Little Blackfoot River and Ontario Creek. The benefits of this measure were not quantified for the project, but would restore floodplain and riparian habitat connectivity, as well as remove a chronic source of sediment and maintenance effort.

Water Yield

Although most timber volume to be cut in the project area is dead, some green trees would be removed, particularly in the precommercial thin units. The project-related and cumulative equivalent clearcut acres and estimated percent water yield increase that would result from work proposed under this alternative are listed in Table 298. Estimated ECA water yield increases per 6th-HUC sub-watershed range from 0.1 to 1.1 percentage points above existing conditions under alternative 3. Estimated existing water yield increase above what would be expected in undisturbed forest canopy as a result of recent insect mortality ranges from 8 to 11 percent. Cumulative water yield increase was estimated to be about 10 percent at the Mainstem Little Blackfoot River below the project area or less than 1 percentage point above existing conditions. The estimated water yield increases for each 6th-HUC and the mainstem of the Little Blackfoot River are below the 15 percent threshold stipulated in ARM 17.30.715. Therefore, the small incremental potential increase posed by this project would likely not measurably change conditions. However, if a water yield increase were detectable, it would almost certainly be within acceptable limits for TMDL streams.

Table 298. Estimated equivalent clearcut acres (ECA) and water yield increase under alternative 3

Sub-watershed	Alternative 3 ECA	Cumulative ECA	Project water yield increase	Cumulative water yield increase
Little Blackfoot River-Hat Creek	46	3,208	<1%	8%
Mike Renig Gulch	112	1,877	1%	9%
Ontario Creek	179	3,981	<1%	11%
Telegraph Creek	390	4,368	1%	13%
Mainstem Little Blackfoot	727	13,434	1%	10%

Riparian and Wetland Areas

A total of 29.9 acres of wetland identified during the HNF survey in 2009 lie within alternative 3 treatment units, fewer than in alternative 2. The design features to protect wetlands, described in the Design Features section of chapter 2 on this FEIS and in the Soils Specialist Report, would be applied to protect wetlands where they are in or near treatment units.

Alternative 3 would not substantially impact the hydrologic function of riparian areas in that no mechanized equipment would operate in riparian areas, and hand-felling in the SMZ would be minimized (see Design Features section in chapter 2 of this FEIS). All project activities would be performed in accordance with State regulations, including Montana's SMZ law and the RHCA restrictions described in the Fisheries Biological Evaluation and Specialist Report.

Irreversible and Irretrievable Commitments

Any water quality impacts due to increased sediment delivery resulting from alternative 3 would be irretrievable commitments, in that the stream would recover from the influx of additional sediment over a period of years. There are no irreversible commitments due to alternative 3 because any potential impacts to water resources stemming from project activities would be temporary in nature and counterbalanced by watershed improvements as discussed in this report.

Cumulative Effects

The cumulative effects related to ongoing grazing, beetle epidemic, existing roads, culverts, abandoned mines, and federal and private forest management activities described under alternative 2 would also apply to alternative 3 (see alternative 2 cumulative effects section above for a complete discussion of past and ongoing activities).

Alternatives 2 and 3 would not likely add to cumulative effects to water resources in the project area for the following reasons:

- Both alternatives would include road maintenance and decommissioning that would result in a net reduction in sediment delivery to project area streams.
- Both alternatives would include replacement of several undersized culverts. Five of these culverts currently lack capacity for the 25-year flow event.
- Replacement culverts would be sized to pass the 100-year flood in accordance with INFISH Standards.
- Both alternatives would have no measurable effect on grazing activities and related impacts.
- Mining deposits (e.g., waste rock and tailings) would not be disturbed during project operations.
- Activities proposed under both alternatives would have no measurable effect on water yield.
- Both alternatives would be unlikely to meaningfully contribute to any stream temperature increase given the minimal removal of vegetation in SMZs and RHCAs.

Alternative 4

Key differences between alternative 4 versus alternatives 2 and 3 include the following:

- Alternative 4 would treat the most units and the most acres.
- Alternative 4 would require construction of more miles of temporary roads.
- Alternative 4 would require reconstruction of more road miles.
- Alternative 4 would include the most stream crossing improvements and upgrades

Alternative 4 retains the following proposed actions described under alternative 3:

- Alternative 4 would include the decommissioning of roughly 33 miles of existing roads.

- Alternative 4 would include the re-routing of the part of Road 123 that forms a partial dam across the Little Blackfoot floodplain, and the decommissioning of that road segment.

Direct and Indirect Effects

Discussion of direct and indirect effects of alternative 4 is abbreviated to avoid duplication—for additional details, see discussion in the appropriate section of alternatives 2 and 3 above.

Water Quality

Sediment from Roads

Alternative 4 proposes construction of roughly 9.7 miles of temporary road segments, including the proposed segment N01 that crosses an intermittent stream. The same issues pertaining to this segment that were discussed under the alternative 2 discussion apply to this site in alternative 4.

Alternative 4 also includes a temporary bridge across Telegraph Creek to provide access to the temporary road segments in treatment unit 172A. There are still existing abutments in place at this location from a past bridge that has since been removed. The presence of existing abutments negates the need for additional in-channel work. Installation and removal of the temporary bridge would be done in a manner that would minimize disturbance and erosion, by implementing erosion control measures (e.g., silt fencing, wattles, weed-free straw bales). Prior to implementation, this crossing would require approval from the State of Montana with an SPA 124 permit and from the U.S. Army Corps of Engineers with a CWA 404 permit.

Predicted sediment delivery reductions from roads due to maintenance and reconstruction efforts will be similar for all action alternatives (Table 295).

Sediment from Treatment Units

As with alternatives 2 and 3, erosion and sediment transport from treatment units is predicted to be negligible assuming that 50-foot no-ignition buffers and other standard soil and water BMPs are appropriately implemented (Table 296).

Non-Sediment

For the same reasons that are outlined in the discussion of alternative 2, project activities proposed in alternative 4 would be unlikely to result in measurable increases in stream temperature.

Road Decommissioning

Alternative 4 would include the decommissioning of 32.8 miles of road. Approximately 6.6 miles of this total are within 150 feet of a stream channel, and thus, have a higher probability of being a chronic source of sediment. Roads would be treated to decompact surfaces, re-establish natural hillslope contours, remove culverts and restore natural stream channels, and discourage unauthorized use by motorized vehicles. This work would restore soil productivity and reduce potential erosion on roughly 80 acres of land in the project area. Although sediment delivery to streams was not quantified for this analysis, the decommissioning would likely reduce the amount of anthropogenic sediment load to project-area streams.

Decommissioning of unauthorized routes in the vicinity of the confluence of Ontario Creek and the Little Blackfoot River would include several dispersed sites in streamside and other riparian and floodplain areas. Following guidance in the Divide Travel Plan record of decision, similar impaired streamside and riparian areas throughout the project area would be restored, and barriers (e.g.

boulders, jack-rail fencing) installed to help guide motorized users to remain on authorized routes and avoid further degradation of these sensitive areas.

Road/Stream Crossings

Alternative 4 includes replacement of 24 stream crossing structures in the project area. Fifteen of the culverts to be replaced are currently damaged and/or lack capacity for the 25-year flow event. The other culverts are partial barriers to AOP. Replacement culverts will be sized to pass the 100-year flood and provide full AOP. This work would reduce the risk of culvert failure and resulting entrainment of road-fill sediment into the stream system. Details on culverts are in the Transportation Specialist Report. This alternative would also allow the decommissioning of the segment of Road 123 that crosses the Little Blackfoot River and Ontario Creek, as well as the improvement of four additional fords crossing Ontario Creek and its tributaries along Roads 123-001 and 495-D1. The benefits of these measures were not quantified for the project, but would restore floodplain and riparian habitat connectivity, as well as remove several chronic sources of sediment to Ontario Creek and the Little Blackfoot River.

Water Yield

Although most timber volume to be cut in the project area is dead, some green trees would be removed, particularly in the precommercial thin units. The project-related and cumulative equivalent clearcut acres and estimated percent water yield increase that would result from work proposed under this alternative are listed in Table 299. Estimated ECA water yield increases from existing conditions in the project area sub-watersheds range from 0.3 to 1.9 percentage points under Alternative 4. Existing water yield is estimated to be 8 to 11 percent higher than what would be expected in undisturbed forest canopy as a result of recent insect mortality. Cumulative water yield increase was estimated to be about 11 percent at the Mainstem Little Blackfoot River below the project area, or 1 percentage point above undisturbed conditions. The estimated water yield increases for each 6th-HUC and the mainstem of the Little Blackfoot River are below the 15 percent threshold stipulated in ARM 17.30.715. Therefore, the small incremental potential increase posed by this project would likely not measurably change conditions. However, if a water yield increase were detectable, it would almost certainly be within acceptable limits for TMDL streams.

Table 299. Estimated equivalent clearcut acres (ECA) and water yield increase under alternative 4

Sub-watershed	Alt 4 ECA	Cumulative ECA	Project water yield increase	Cumulative water yield increase
Little Blackfoot River-Hat Creek	127	3,289	<1%	9%
Mike Renig Gulch	196	1,960	1%	9%
Ontario Creek	322	4,124	1%	11%
Telegraph Creek	566	4,544	2%	13%
Mainstem Little Blackfoot	1,212	13,917	1%	11%

Riparian and Wetland Areas

Under alternative 4, a total of 55.9 acres of wetland identified during the HNF survey in 2009 lie within treatment units, more than in alternative 2, but fewer than in alternative 3. The design features to protect wetlands, described in chapter 2 of this FEIS and in the Soils Specialist Report, would be applied to protect wetlands where they are in or near treatment units.

Alternative 4 would not substantially impact the hydrologic function of riparian areas in that no mechanized equipment would operate in riparian areas, and hand-felling in the SMZ would be minimized (see design features section in chapter 2 of this FEIS). All project activities would be performed in accordance with State regulations, including Montana's SMZ law and the RHCA restrictions described in the Fisheries Biological Evaluation and Specialist Report.

Additionally, restoration of several dispersed sites impacted by motorized vehicles in streamside and other riparian and floodplain areas throughout the project area would result in improvements to riparian and floodplain form and function.

Irreversible and Irretrievable Commitments

Any water quality impacts due to increased sediment delivery resulting from alternative 4 would be irretrievable commitments, in that the stream would recover from the influx of additional sediment over a period of years. There are no irreversible commitments due to alternative 4 because any potential impacts to water resources stemming from project activities would be temporary in nature and counterbalanced by watershed improvements as discussed in this report.

Cumulative Effects

The cumulative effects related to ongoing grazing, beetle epidemic, existing roads, culverts, abandoned mines, and Federal and private forest management activities described under alternatives 2 and 3 would also apply to alternative 4 (see alternative 2 cumulative effects section above for a complete discussion of past and ongoing activities).

Alternatives 2, 3, and 4 would not likely add to cumulative effects to water resources in the project area for the following reasons:

- All alternatives would include road maintenance and decommissioning that would result in a net reduction in sediment delivery to project-area streams.
- All alternatives would include replacement of damaged and undersized culverts. Replacement culverts would be sized to pass the 100-year flood in accordance with INFISH Standards.
- All alternatives would have no measurable effect on grazing activities and related impacts.
- Mining deposits (e.g., waste rock and tailings) would not be disturbed during project operations.
- Activities proposed under all alternatives would have no measurable effect on water yield.
- All alternatives would be unlikely to meaningfully contribute to any stream temperature increase given the minimal removal of vegetation in SMZs and RHCAs.

Conclusions

The proposed project would treat approximately 6,754 acres (alternative 2), 4,185 acres (alternative 3), or 8,103 acres (alternative 4) with a combination of regeneration, intermediate treatment, intermediate harvest, and prescribed burning (see Forested Vegetation Specialist Report). Table 300 summarizes the effects of each alternative on water-related resources using four measurement indicators.

Table 300. Comparison of water resource measurement Indicators by alternative

Measurement Indicator	Alternative 1 No Action (Existing Condition)	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Water quantity cumulative effects (percent water yield increase over undisturbed forest)				
Little Blackfoot – Hat Creek	8%	8%	8%	9%
Mike Renig Gulch	8%	9%	9%	9%
Ontario Creek	10%	11%	11%	11%
Telegraph Creek	11%	13%	13%	13%
Sedimentation from treatment units (tons, probability of sedimentation in the first year after treatment)				
Little Blackfoot – Hat Creek	N/A	0.01 (16%)	0.01 (16%)	0.12 (12%)
Mike Renig Gulch	N/A	0.10 (18%)	0.06 (18%)	<0.01 (2%)
Ontario Creek	N/A	0.13 (13%)	0.04 (13%)	0.43 (26%)
Telegraph Creek	N/A	0.23 (12%)	0.16 (12%)	0.63 (18%)
Sedimentation from roads (average tons/year)				
Little Blackfoot – Hat Creek	4.3	0.1	0.1	0.1
Mike Renig Gulch	0.7	0.1	0.1	0.1
Ontario Creek	2.6	0.4	0.4	0.4
Telegraph Creek	3.5	0.6	0.6	0.6
Roads decommissioned (miles within 150 feet of stream)				
Little Blackfoot – Hat Creek	0	0	1.1	1.1
Mike Renig Gulch	0	0	0.8	0.8
Ontario Creek	0	0	0.6	0.6
Telegraph Creek	0	0	4.1	4.1

Alternative 1 – No Action

Currently, several of the streams in the project area watersheds are listed on Montana's CWA 303(d) list as being impaired, primarily due to sediment/siltation from a variety of sources. In most of these impaired streams, beneficial uses are compromised due at least in part to land use activities on private land, which is outside the control of the HNF. Under alternative 1 (no action), full attainment of all beneficial uses would still not be met in these watersheds. Existing activities (e.g., forest roads) on the HNF portions of these watersheds might in some cases not meet the State requirement that "all reasonable land, soil and water conservation practices have been applied" to minimize pollution (ARM 17.30.602), although effects of forest roads and other management practices in place before April 1993 are exempt from this standard (MCA 75-5-317).

The project area is a fire-prone landscape. Therefore wildfire and attendant watershed effects are likely under any of the alternatives. However, the Fire and Fuels Specialist Report suggests that there would be an increased risk of wildfire absent the management actions proposed under alternatives 2, 3, or 4. Watershed effects from a wildfire could include increased water yield, sediment delivery to stream channels, streambank erosion and damage to riparian health and vigor, short-term hydrophobicity, and long-term streamflow increases and sedimentation.

Since there are no activities proposed under alternative 1, there are no cumulative effects related to alternative 1.

Alternative 2 – Proposed Action

Alternative 2 would be consistent with applicable State and Federal laws and regulations, if proposed activities are done in accordance with reasonable land, soil, and water conservation practices as summarized in the design features section of this FEIS and applicable design features from the Fisheries Biological Evaluation and Specialist Report and the Soils Specialist Report, in addition to the Design Features section in the FEIS.

Proposed activities under alternative 2 are predicted to result in a net decrease in sediment delivery to streams over the next 3 to 7 years, based on a low probability of delivery from treatment units and reductions in chronic sediment load from project road improvements. Furthermore, culvert upgrades would reduce the likelihood of failure and sediment entrainment during flood events, as well as improve aquatic organism passage for the affected streams. Over the long term, improved road surfaces would likely revert to current conditions with associated sediment delivery unless improvements are maintained.

Rigorous application of existing road maintenance, construction, decommissioning, hauling, and timber harvest BMPs would meet the State requirement that “all reasonable land, soil and water conservation practices have been applied” to minimize pollution in the watersheds covered by the alternative 2 (ARM 17.30.602).

Proposed activities under alternative 2 would comply with the Montana SMZ law and RHCA guidelines by adhering to applicable design features. The project and analysis complies with applicable Forest Plan standards, as documented in the HNF Forest Plan (USDA 1986). Existing impairments to waterbodies due to ongoing grazing allotments, timber harvest activities on private land, and past Federal actions would be unaffected by activities proposed under alternative 2. The analysis of environmental consequences and conclusions documented in this report assume that the design features and mitigation measures described in chapter 2 of this FEIS would be applied effectively in all project activities. Refer to the Soils Specialist Report and the Fisheries Biological Evaluation and Specialist Report for additional design features and mitigation measures.

Implementation of alternative 2 would have a net benefit to project area water resources over the next 3 to 7 years, based primarily on the improvements planned to roads in the project area, the low probability of sedimentation from treatment units, and the avoidance of disturbance in wetlands and riparian areas. Proposed culvert upgrades would have a long-term (beyond 7 years) benefit to water resource values. A less tangible potential benefit would be the reduction in probability of a widespread wildfire with high-severity watershed effects, and the reduction in probability of fire spread from the Telegraph Creek watershed to the adjacent Upper Tenmile Creek watershed (the source of Helena’s municipal water supply).

Alternative 3

All of the conclusions drawn for alternative 2 apply to alternative 3. Additionally, alternative 3 would include the upgrade of nine culverts (versus six in alternative 2), and the decommissioning of 32.8 miles of road, of which 6.6 miles are within 150 feet of a stream. Thus, the water resource benefits of this alternative, including reduction in sediment sources and improvement of stream crossings, are greater than those of alternative 2. The potential impacts to water resources of alternative 3 are slightly lower than those of alternative 2, in that the model predicted somewhat lower sediment delivery to streams from treatment units assuming effective implementation of design features such as no-ignition buffers.

Alternative 4

All of the conclusions drawn for alternatives 2 and 3 apply to alternative 4. Alternative 4 would also include the upgrade or improvement of 24 stream crossings (versus 6 in alternative 2, and 9 in alternative 3), and the decommissioning of 32.8 miles of road, 6.6 of which are within 150 feet of a stream. Also, this alternative would include restoration of several dispersed sites impacted by motorized vehicles in streamside and other riparian and floodplain areas throughout the project area, and would result in improvements to riparian and floodplain form and function, and reduced fine sediment delivery to project-area streams. Thus, the water resource benefits from long-term reduction in sediment sources and improvement of stream crossings are greater than those of alternatives 2 and 3. The short-term potential impacts to water resources of alternative 4 are slightly higher than those of alternatives 2 and 3, in that the model predicted somewhat higher sediment delivery to streams from the additional treatment units. However, the additional acreage treated can be expected to further reduce the probability of widespread high-severity wildfire into the adjacent Tenmile Creek Helena municipal watershed.

Monitoring

To ensure compliance with local, State, and Federal water quality standards, the HNF Forest Plan requires annual monitoring of “10 percent of timber sales or other projects that create soil disturbance” (USDA, 1986, p IV/15). If the Telegraph Vegetation project is implemented, areas within the project area would be monitored to determine the effectiveness of treatment-unit and road BMPs. Monitoring of BMPs, during and after project work, would be critical in determining whether applied measures are effective in minimizing sediment delivery to streams. The road improvement contracting officer's representative and timber sale administrator would monitor BMPs for proper implementation and effectiveness, and watershed staff would evaluate their effectiveness. Monitoring that would likely occur includes review of harvest and burn units adjacent to waterbodies to ensure any SMZ law and RHCA prescription guidelines were followed, and to identify any erosion and sediment delivery to streams. Additional monitoring could include assessment of road conditions to determine effectiveness of road BMPs in reducing sediment delivery to streams. Where BMPs are shown to be inadequate in protecting water quality, they would be modified or project activities would be discontinued.

Forest Plan Consistency

All alternatives would be consistent with the general watershed provisions in the HNF Forest Plan (USDA Forest Service 1986). Specifically,

- The project is consistent with management area standards and guidelines (USDA Forest Service 1986 p II/24),
- Pertinent soil and water best management practices (BMPs) or resource protection measures listed in the Forest Service National Core BMP Technical Guide (USDA Forest Service 2012) would be implemented (USDA Forest Service 1986 p II/25),
- Project implementation and post-implementation effects would be monitored to ensure that BMPs are implemented properly and are effective (USDA Forest Service 1986 p II/25).

Appendix A of the Fisheries Biological Evaluation and Specialist Report summarizes the Forest-wide and regional standards that are applicable to water resources, and explains how each standard is being met by the project and by the analyses in this section of the FEIS.

Fish and Aquatic Species

Introduction

This section documents existing condition and environmental consequences to aquatic resources from the proposed Telegraph Vegetation Project. The report also discusses the potential effects to Forest Service sensitive and management indicator species (MIS), and Endangered Species Act (ESA) listed aquatic species. These species include westslope cutthroat trout (*Oncorhynchus clarki lewisi*), bull trout (*Salvelinus confluentus*), and western pearlshell mussel *(Margaritifera falcata).*

Treatment areas in all action alternatives would encompass portions of four sub-watersheds in the Little Blackfoot River including Telegraph Creek, Mike Renig Gulch, Ontario Creek, and Little Blackfoot River-Hat Creek. Native trout species within this project area include the westslope cutthroat trout (WCT). WCT are on the USFS Region 1 sensitive species list and are a species of concern throughout Montana. Potential threats to WCT within the project area include competition and predation with non-native fish, and habitat loss or degradation.

The Columbia River (CR) bull trout is the native char species within the project area and part of the Upper Clark Fork River Recovery Unit (UCFR). Bull trout are federally listed as “threatened” under the Endangered Species Act. The presence of this species has been documented in the project area in very low numbers. The decline of bull trout in the Little Blackfoot River basin and greater Upper Clark Fork Core Area is attributed to hybridization, competition, predation, as well as habitat alterations downstream of this project area such as water diversion and anthropogenic sediment sources. In October 2010, the USFWS revised its 2005 designation of critical habitat for bull trout. The Little Blackfoot River was removed as critical habitat due to downstream impairments and the population declining to levels at or near extirpation.

Table 301. Analysis area species and summary of effects

Species	Species Status	Present In Action Area: Habitat or Detections	Effects Determination	Rationale for Determination
Fishes				
westslope cutthroat trout (*Oncorhynchus clarki lewsi*)	USFS Sensitive	Yes, occupied habitat	May impact, not likely to result in trend toward Federal listing	Short-term adverse sediment effects with proposed culvert removal and road decommissioning efforts.
bull trout (Salvelinus confluentus)	ESA Threatened	Yes, occupied habitat	Likely to Adversely Affect (LAA)	Adverse sediment effects with proposed culvert removals, culvert replacements, and road decommissioning efforts. Also, ongoing mine reclamation and degraded baseline conditions.
Invertebrates				
western pearlshell mussel *(Margaritifera falcata)*	USFS Sensitive	No, habitat present but, not detected in 2010 survey	No impact	Not present in project area

Resource Indicators and Measures

Six measurement indicators were used to evaluate the effects of each alternative. These indicators are a combination of INFISH Riparian Management Objectives and habitat parameters adopted from the Matrix of Diagnostic/Pathways and Indicators from Making Endangered Species Act Determinations of Effects for Individual or Grouped Actions at the Watershed Scale, (USDI Fish and Wildlife Service, 1998).

- Stream Temperature
- Large wood distribution and potential recruitment
- Pool frequency/quality as it relates to large wood inputs and percent fines
- Percent fines as it relates to spawning habitat
- Road density and location within riparian areas
- Stream connectivity (culvert barriers), and floodplain connectivity

Assumptions

The three major components of the Telegraph Project are commercial harvest (primarily ground-based, cable and hand-thinning) with associated landing and road development, and subsequent road decommissioning efforts. Proposed restoration efforts would also include culvert removal and culvert replacement. Each of these activities carries potential to affect some component of aquatic habitat and the ability of the watershed and riparian areas to act as a buffer to harvest activity and its connected actions and are considered in this analysis. Pool frequency and quality, large woody debris (LWD), percent fines, and water temperature are habitat components or indicators that are potentially affected by timber activities and proposed road improvements and considered in this analysis. The hydrology report addresses water yield and sediment delivery to streams in detail; the fisheries analysis references some of this information to further address effects to aquatic habitat. Some of these habitat parameters below are specifically addressed as INFISH riparian management objectives

(RMOs) (referencing Section 7 Fish Habitat Monitoring Protocol for the Upper Columbia River Basin, USDA Forest Service 1994), and are summarized in Table 302. These objectives are part of determining the complexity of habitat available for fish within the analysis area.

Table 302. Aquatic habitat components considered in the Telegraph Project effects analysis

Habitat Component	INFISH RMO	Habitat Could Potentially be Affected by:		
		Timber Harvest	Road and Landing Construction	Road Improvements/ Decom and Culvert Replacements
Water quality				
Temperature	X	X	X	
Large woody debris	X	X	X	
Stream Channel conditions				
Substrate		X	X	X
Pool frequency/quality (tied to sediment inputs)	X	X	X	X
Floodplain and Stream connectivity			X	X
RHCA Condition				
Road density and location	Not a habitat parameter. Included because it could affect habitat quality.			

Table 303. INFISH riparian management objectives pertinent to the Telegraph Project

Habitat Feature	RMOs
Pool Frequency[1]	Wetted width (ft) 10 15 20 25 35 55 100 Number pools/mile 60 48 39 23 18 9 4
Water Temperature	Compliance with Water Quality standard or maximum Temp. <59 ºF for migration and rearing and <48°F for spawning.
Large Woody Debris	> 20 pieces/mile, >12 inch diameter, >35 ft. length

[1] Local adaptation from Making Endangered Species Act Determinations of Effects for Individual or Grouped Actions at the Watershed scale, USDI Fish and Wildlife Service 1998.

Refer to the hydrology report for assumptions concerning water quality and quantity. Habitat and fish population assumptions are outlined below.

- Under the Section 7 Habitat Monitoring Protocol for the Upper Columbia River Basin (USDA 1994), INFISH RMOs (Table 303) are intended to apply to Rosgen (1996) C-type channels. For example, monitoring protocol for determining pool frequency requires count of only pools greater than 1 meter (approximately 3 feet) in low gradient (1 to 2 percent) stream channels. Few stream reaches in the analysis area fit these criteria and the majority of stream reaches within these sub-watersheds are of mid-elevation and of moderate gradient.
- McNeil core sampling of streambed substrate provides a baseline measure of percent fine sediment and represents a measure of fish habitat condition as a function of past and ongoing land-use practices and natural background processes.

- Research demonstrates an inverse relationship exists between the amount of fine sediments (less than 6.4 millimeters) in spawning and rearing habitats and fish embryo survival and fry emergence.
- The relative response of trout populations to increased inputs of fine sediment in spawning and rearing habitat as depicted in laboratory studies approximates the response under natural conditions.
- Data collected within critical stream reaches or core sampling reaches is extrapolated to estimate aquatic habitat condition through the entire stream reach.
- Bull trout eDNA detection samples were taken in stream reaches during active spawning period (August-October). Bull trout distribution was expanded to the headwaters if a stream reach was sampled once with a negative detection but, there is connectivity with a downstream reach or tributary that had a positive detection. Often times this distribution overlapped current WCT distribution.
- The analysis quantified both open and closed roads or trails and the proposed maintenance and reconstruction within INFISH buffers, which are assumed to be hydrologically connected (i.e., have the potential to deliver sediment). Beyond 300 feet, any sediment that might be produced was assumed immobilized by vegetation and other ground barriers, before reaching surface water.

Information Used

Data were collected on two major elements of the fisheries resource: (1) fish populations inhabiting the area, and (2) existing stream habitat conditions. The existing fish habitat condition within the various 6th-field HUCs included within the project area was gathered from the Little Blackfoot Bull Trout Section 7 Watershed Baseline (USDA Forest Service 2000) and in the Divide Landscape Analysis (USDA 1996).

Fish populations throughout most of the streams in the Telegraph project area have been inventoried. Data collected about fish populations in the planning area help to define the existing status (baseline) about each population from which to evaluate effects of the action alternatives. Past surveys were primarily completed to determine fish presence or absence, species composition, upstream limits of fish distribution, and to identify migration barriers. Additionally, genetic sampling was completed on some of the WCT populations to determine the degree of hybridization between rainbow and/or Yellowstone cutthroat trout. Any streams supporting WCT that have not been tested would be treated the same as pure WCT until future testing shows otherwise. Fisheries surveys to determine fish species composition and upstream distribution were accomplished by electrofishing crews to sample 200- to 300-foot sample reaches to determine presence of fish and species composition. Sampling has been conducted at various times by Forest Service and Montana Fish, Wildlife and Parks (MFWP) fishery personnel. Upstream limits of fish distribution for most of the fishery streams were determined by spot electrofishing upstream until fish could no longer be found.

Information pertaining to fish habitat conditions was collected to help assess baseline conditions from which to make projections of any changes in habitat due to activities associated with various vegetation treatment activities proposed under the action alternatives. To characterize the quality of stream gravels for salmonid egg survival, the amount of fine sediment less than 6.4 millimeters (¼-inch) diameter present in spawning habitat was measured. The sediment levels obtained (fines) are also used as a means to monitor fines for cumulative watershed effects analysis. McNeil core samplers were used to sample spawning substrates in various reaches to characterize existing conditions using procedures outlined in Bundt and Abt (2001). Wet sediment samples were

transported from the stream for laboratory analysis of dry weights to estimate the quality of gravel habitat for salmonid reproduction. Various roads throughout the project area pose varying levels of risk for sediment delivery. At a broad level, the risk that various roads pose to fish in relation to sediment delivery has been assessed as part of a Forest Roads Analysis (USDA 2004). A road sediment source inventory was completed throughout the entire planning area to gain knowledge about road segments that contribute anthropogenic sediment to stream channels beyond natural background levels to assess potential effects on fish habitat. Forest roads also frequently cross streams using culverts under-designed to pass flood flows and provide for fish passage. Culvert crossings can cause both chronic sedimentation impacts during typical water years and catastrophic effects when floods trigger crossing failure (USDA Forest Service 1998c, p. 2). Therefore, aquatics crews also completed an inventory and assessment of culverts throughout the planning area in need of increased capacity and upgrading aquatic organism passage.

Qualitative walk-through surveys or riparian disturbance surveys have been used to assess streamside riparian conditions, streambank disturbance, and relative condition of streamside vegetation serving as cover for fish. Much of those efforts were performed prior to or as part of documenting baseline conditions detailed in the Blackfoot Watershed Baseline (USDA 2000, updated 2007). More recently, riparian evaluations have occurred under the direction of the forest ecologist using the Proper Functioning Condition (PFC) assessment (Prichard et al. 1998) and that information is available in hydrology project files.

There are six PACFISH INFISH Biological Opinion (PIBO) sites that are located within the project area or in near the project boundary, and located on reaches of the Little Blackfoot and Ontario Creeks. PIBO effectiveness monitoring began in 2001, on a 5-year sampling rotation with the main objectives to determine if key biologic and physical components of aquatic and riparian communities are improved, degraded, or restored within the range of bull trout given past and ongoing land management practices. This analysis also references a 2001–2006 PIBO summary report of the effectiveness monitoring program (EMP).

Methodology and Scientific Accuracy

Analysis Scale

The fisheries analysis will use the subwatershed scale (6th field HUC) to analyze direct, indirect, and cumulative effects. This scale of analysis was selected because effects from the proposed actions and cumulative effects would not necessarily be distinguishable at a larger scale.

The temporal bounding of the analysis for direct and indirect effects ranges from one to five years. Increases in sediment delivery associated with construction and obliteration activities would be short-term associated with instream activity and disturbed or exposed soils within the project area. Once the immediate project area has been stabilized with aggregate or vegetation has re-established, construction-related impacts would not be expected to persist beyond a few months to one year. For management activities on treatment units, the potential for sediment delivery is highest in the first year following disturbance, and generally recovers to pre-disturbance conditions within five years. Some cumulative effects are expected to be ongoing, so the effects analysis is greater than five years.

Methodologies

For this section, the environmental baseline discussion and discussion of effects use Forest Service habitat stream survey data. Stream surveys follow a modified Region 1 and Region 4 stream survey protocol. Stream substrate sampling follows the McNeil core sampling protocol (2002, Version 1.3).

Other survey efforts include USFS eDNA sampling, Forest Service and Montana Fish Wildlife and Parks (MTFWP) fish survey protocol, PACFISH/INFISH Biological Opinion (PIBO) habitat monitoring, as well as GIS analysis. Water temperature data are referenced from the Helena-Lewis and Clark (HLCNF) National Forest monitoring records. The seven-day moving maximum and average summer time water temperatures are measured. The bull trout eDNA sampling efforts sampled many first and second order stream channels during adult spawning periods August through October; refer to McKelvery et al. (2016) most recent paper for full methodology and sampling techniques.

This section ties closely to the watershed analysis in the hydrology specialist report and relies on the same models used for predicting sediment delivery from roads and proposed treatment units that can affect fish habitat. For detailed information on sediment analysis, refer to the hydrology specialist report. Integration of the watershed analysis sediment yield to streams and its effect on salmonid spawning habitat is required to determine the relative risk to fisheries resources. A qualitative method was utilized to assess this if projected sediment delivery indicated increases from current levels.

Critical reaches most representative of spawning habitat and responsive to changing sediment yields were selected for sampling using the McNeil Core sampling procedures described by Platt et al. (1983) and Bunte and Abt (2001, pp 203-205). Core sampling of streambed substrate provides a measure or baseline of percent fine sediment less than 6.4 millimeters in diameter (¼-inch) in spawning habitat and represents a measure of fish habitat condition as a function of past and ongoing land-use practices (cumulative effects) and natural background processes above a critical reach in a watershed.

Stream crossings were evaluated in the project area to determine adequacy for aquatic organism passage (AOP) and flow capacity. The hydrology report discusses how culverts were evaluated for flow capacity and flood analysis. The crossings were evaluated for AOP by physical inspection (e.g., perched outlet) and velocity calculations at various flows. Culverts with physical constraints on passage (e.g., velocity or elevation change) for relevant species and life stages were identified as partial or complete barriers to passage, and targeted for improvement.

As mentioned above, PIBO Effectiveness Monitoring Project data (2001–2015) were utilized to speak to baseline habitat condition. PIBO Effectiveness Monitoring sites were used to determine the direction and rate of change in riparian and aquatic habitats over time as a function of management practices, and to determine whether riparian and aquatic habitat conditions at managed (integrator) sites reflect conditions throughout the watershed and reference reaches. In addition, PIBO sites determine whether specific key management practices for livestock grazing are effective in maintaining or restoring riparian structure and function. Sites are on a 5-year sampling cycle and approximately 20 percent of these sites are in reference sub-watersheds with the remaining in managed sub-watersheds. Sites are either integrator sites or are the most downstream stream segment randomly selected with a 3 percent gradient, sentinel sites are sampled annually or designated monitoring areas (DMA), which were identified by local field unit personnel as locations utilized for livestock grazing implementation monitoring. Average reference condition for PIBO effectiveness monitoring sites was determined given controlling factors of stream size, geology, landuse and gradient. Habitat parameters used from each PIBO site reflect the measurement indicators highlighted for this analysis, refer to Table 306.

Fish Species, Affected Environment

This section presents existing conditions and trends for aquatic resources within the Telegraph Vegetation Project planning area. After the analysis area is described, information is organized under

two major subsections: fish populations and fish habitat. The first discusses the status and distribution of fish populations inhabiting the planning area including discussions about non-native and native fish populations. The second subsection provides an overview of fish habitat including land-use activities that influence trends in stream habitat conditions.

Analysis Area

The fisheries analysis area lies within the Upper Little Blackfoot watershed and consists of Telegraph Creek, Ontario Creek, Mike Renig Creek, and Little Blackfoot River – Hat Creek sub-watersheds (6th field HUC). Refer to the hydrology report for a more detailed discussion of the analysis area.

Fish Populations in the Analysis Area

Historically, most project area perennial streams suitable to support a fishery were occupied by native fishes to their headwaters unless a natural barrier to fish movement existed. With introductions of non-native salmonids including brook, brown and rainbow trout within portions of the Little Blackfoot River drainage, the current native salmonid fish species composition and distribution have changed (table 304). Salmonid fish distribution and their upper limits in the watersheds are depicted on fish distribution maps included in the map at the end of this section.

Telegraph Creek Watershed (6th field HUC #170102030503)

Salmonid fishes present within the Telegraph Creek watershed include westslope cutthroat trout (*Oncorhynchus clarki lewisi*), brown trout (*Salmo trutta*), and brook trout (*Salvelinus fontinalis*). Other fish species present include sculpins (*Cottus sp*.). More recent eDNA surveys for bull trout (*Salvelinus confluentus*) did not detect bull trout within the Telegraph Creek sub-watershed, refer to the eDNA map in appendix A of the aquatics species specialist report.

Ontario Creek Watershed (6th field HUC #170102030501)

Bull trout were found in Ontario Creek in a 1999 electrofishing survey and more recently were detected using eDNA methods, refer to the eDNA map in appendix A of the fisheries specialist report. The mainstem of the Little Blackfoot River and Ontario Creek are believed to be the primary contributors to the localized resident bull trout population in the Little Blackfoot River (USDA 2009e). Westslope cutthroat trout are found in Ontario Creek and its tributaries (Table 304) (USDA 2009e). Westslope cutthroat trout have been tested to be genetically pure in Ontario Creek, Monarch Creek, and Bison Creek, and are assumed to be genetically pure where found in the other streams in this watershed. Brook trout are found in Ontario Creek, Mary Ann Creek, Monarch Creek, Bison Creek, and an unnamed tributary. Mountain whitefish are also found in Ontario Creek.

Mike Renig Gulch Watershed (6th field HUC #170102030504)

Reports from anglers indicate that bull trout were present at one time in Mike Renig Gulch 30 to 40 years ago prior to the establishment of brook trout (USDA 2006). Based on past sampling efforts, no bull trout have been found in Mike Renig Gulch, and current eDNA sampling have not detected bull trout (refer to appendix A of the fisheries specialist report).

Genetically pure WCT are found in the mainstem of Mike Renig Gulch. Westslope cutthroat trout are also found in unnamed tributaries 1 and 2 and are assumed to be genetically pure (Table 304). Brook trout are found in the mainstem of Mike Renig Gulch, and unnamed tributaries 1 and 2.

Table 304. Current known fish species in streams within the Telegraph Project Area

6th Field HUC Sub-watershed	Stream	Salmonid Fish Species Present (based on sampling*)	WCT Genetic Status	Comments
Telegraph Creek	Telegraph Creek	EB and WCT	Tested genetically pure	Bull trout are assumed absent in Telegraph Creek based on most recent intensive surveys and eDNA sampling efforts.
	Flume Gulch, Little Flume	EB and WCT	Assumed pure	
	Hahn Creek	EB and WCT	Assumed pure	
	Moose Creek	EB and WCT	Assumed pure	
	Booth Gulch	EB and WCT	Assumed pure	
	Jericho Creek	EB and WCT	Assumed pure	
	Clemmer Gulch	EB and WCT	Assumed pure	
	O'Keefe Creek	EB and WCT	Assumed pure	
	Sally Ann Creek	EB and WCT	Assumed pure	
	Bryan Creek	EB and WCT	Assumed pure	
	Unnamed tributary to Bryan Creek	EB and WCT	Assumed pure	
Ontario Creek	Ontario Creek	EB, WCT, BT, WF, S	Tested Genetically pure	2015 eDNA documented Bull trout throughout much of Ontario Creek. Assumed to be present in Monarch creek given limited eDNA sampling efforts.
	Mary Ann Creek	EB and WCT	Assumed pure	
	Monarch Creek	EB, BT, WCT	Tested genetically pure	
	Bison Creek	EB, BT, WCT	Tested genetically pure	
	Unnamed tributary 1	EB and WCT	Assumed pure	
	Unnamed tributary 2	WCT	Assumed pure	
Mike Renig Gulch	Mike Renig Gulch	EB and WCT	Tested genetically pure	Bull trout assumed present in Mike Renig Gulch, but latest electrofishing surveys suggest absent; probability of presence is low
	Unnamed tributary 1	EB and WCT	Assumed pure	
	Unnamed tributary 2	EB and WCT	Assumed pure	
Little Blackfoot River-Hat Creek	Little Blackfoot River	WCT, LL, EB, WF, BT, S	Tested genetically pure	2015 eDNA sampling documented bull trout present. Throughout the upper reaches of the Little Blackfoot River.
	Slate Creek	EB and WCT	Assumed pure	
	Hat Creek	EB and WCT	Tested genetically pure	

*Fish Species: WCT - westslope cutthroat trout, EB - eastern brook trout, LL - brown trout, BT - bull trout, WF - mountain whitefish, S - sculpin

Source: USDA 2006; USDA 2009a; USDA 2009e, 2015eDNA

Little Blackfoot-Hat Creek Watershed (#170102010507)

Very little is known about the dynamics of the bull trout population in the Little Blackfoot River. With recent eDNA sampling efforts, it is known that bull trout are most likely a small resident population within the upper Little Blackfoot River with the lower stream reaches below the Forest

boundary providing little rearing or spawning habitat (2015 eDNA sampling, appendix A in fisheries specialist report). Electrofishing and angling within the Forest have yielded few fish over the last 15 years. Angling efforts in the early 1990s documented bull trout distribution upstream to Blackfoot Meadows, although abundance was very low. Intensive electrofishing efforts on the mainstem Little Blackfoot River 1 mile upstream from Kading Campground in the mid-1990s failed to document any bull trout in the 1,500-foot section of stream sampled. Sampling in 2008 by the Montana Department of Fish, Wildlife, and Parks (MFWP) also failed to find bull trout in the mainstem Little Blackfoot River in the vicinity of Larabee Gulch upstream to Kading Campground. In 2009, a single bull trout was documented in the Little Blackfoot River just upstream from the confluence of Ontario Creek (USDA 2009a).

As mentioned above, recent eDNA sampling has detected bull trout within the Little Blackfoot River. With the intensive sampling and recent eDNA results, it seems unlikely that bull trout are present in Slate Creek or in Hat Creek. Slate Creek is a very small stream and current findings in the literature suggest that bull trout use of very small tributaries is limited, although sometimes small bull trout use the lower reaches of very small tributaries. In addition, diversion of Slate Creek for irrigation on private land reduces water flow reaching the Little Blackfoot River during times when bull trout might have been historically moving into tributary streams for spawning. There is some possibility that bull trout are using Hat Creek for a short distance upstream from its confluence with the Little Blackfoot River. A partial culvert barrier reduces the potential for bull trout to migrate upstream in Hat Creek from the Little Blackfoot River.

Westslope cutthroat trout have been documented as being present in the Little Blackfoot River and Hat Creek. Intensive electrofishing efforts in 1999 yielded cutthroat trout in Slate Creek. Brook trout are found in the mainstem of the Little Blackfoot River, Slate Creek, and Hat Creek. In addition, eastern brown trout and mountain whitefish are found in the Little Blackfoot River (Table 304).

Bull Trout Status Overview and Habitat Requirements

Bull trout within the project area are part of the Blackfoot Core Area. The Little Blackfoot River population is believed to be close to extirpation based on previous sampling efforts by MTFWP and Forest Service fisheries crews from 2007 to 2010. The 2015 eDNA sampling efforts detected bull trout within the Little Blackfoot drainage, Figure 135, but are assumed to be in very low numbers (less than 50 spawning adults) and therefore, was not previously identified as a local population. The 2010 final rule on bull trout designated critical habitat and removed the Little Blackfoot as bull trout critical habitat; therefore, its relative importance to the core area was assessed as Low.

Declines of bull trout in the Little Blackfoot drainage have been attributed largely to non-native species interactions. Bull trout have suffered from hybridization and competition with brook trout in the headwater reaches and tributaries of the Little Blackfoot (hybrids have been documented) and from brown trout competition and predation in the middle and lower reaches of the river. Additionally, multiple water diversions below the Forest contribute to low flows and increased water temperatures that inhibit fish movements and production capabilities in the river. Habitat alterations from highway and railroad locations in conjunction with sediment delivery from roads and agricultural development below the Forest have affected stream morphology and reduced fish habitat quality. There is a general lack of connectivity from the river below the Forest to upper reaches of most tributaries during bull trout migration to traditional spawning areas.

The following discussion of bull trout habitat requirements in Montana is taken from Montana Bull Trout Scientific Group (MBTSG) 1998. The majority of migratory bull trout spawning in Montana occurs in a small percentage of the total stream habitat available. Spawning occurs between late

August and early November, principally in third and fourth order streams. Spawning adults use low gradient areas (less than 2 percent) of gravel/cobble substrate with water depths between 0.1 and 0.6-meters and velocities from 0.1 to 0.6-meters per second. Proximity of cover for the adult fish before and during spawning is an important habitat component. Spawning tends to be concentrated in reaches influenced by groundwater where temperature and flow conditions tend to be more stable. The relationship between groundwater exchange and migratory bull trout spawning requires more investigation. Spawning habitat requirements of resident bull trout are poorly documented.

Successful incubation of bull trout embryos requires water temperatures below 8 °C, spawning gravels with less than 35 to 40 percent of sediments smaller than 6.35 millimeters in diameter, and high gravel permeability. Eggs are deposited as deep as 25.0 centimeters below the streambed surface and the incubation period varies, depending on water temperature. Spawning adults alter streambed characteristics during redd construction to improve survival of embryos, but conditions in redds often degrade during the incubation period. Mortality of eggs or fry can be caused by scouring during high flows, freezing during low flows, super-imposition of redds, or deposition of fine sediments or organic materials during the incubation period. A significant inverse relationship exists between the percentage of fine sediment in the incubation environment and bull trout survival to emergence. Embryo/fry entombment appeared to be the largest mortality factor in incubation studies in the Flathead drainage. Groundwater influence plays a large role in embryo development and survival by mitigating mortality factors.

Rearing habitat requirements for juvenile bull trout include cold summer water temperatures (15 °C) provided by sufficient surface and groundwater flows. Warmer temperatures are associated with lower bull trout densities and can increase the risk of invasion by non-native species that could displace, compete with, or prey on juvenile bull trout. Juvenile bull trout are generally benthic foragers, rarely straying from cover, and they prefer complex forms of cover. High sediment levels and embeddedness can result in decreased rearing densities. Unembedded cobble/rubble substrate is preferred for cover and feeding and also provides for higher invertebrate production. Highly variable streamflow, reduced large woody debris, increased bedload movement, and other forms of channel instability can limit the distribution and abundance of juvenile bull trout. Habitat characteristics that are important for juvenile bull trout of migratory (fluvial) populations are also important for stream resident sub-adults and adults. However, stream resident adults are more strongly associated with deep pool habitats than are migratory juveniles.

Both migratory and stream-resident bull trout move in response to developmental and seasonal habitat requirements. Migratory individuals can move great distances (up to 250 kilometers) among lakes, rivers, and tributary streams in response to spawning, rearing, and adult habitat needs. Stream-resident bull trout migrate within tributary stream networks for spawning purposes, as well as in response to changes in seasonal habitat requirements and conditions. Open migratory corridors, both within and among tributary streams, larger rivers, and lake systems are critical for maintaining bull trout populations.

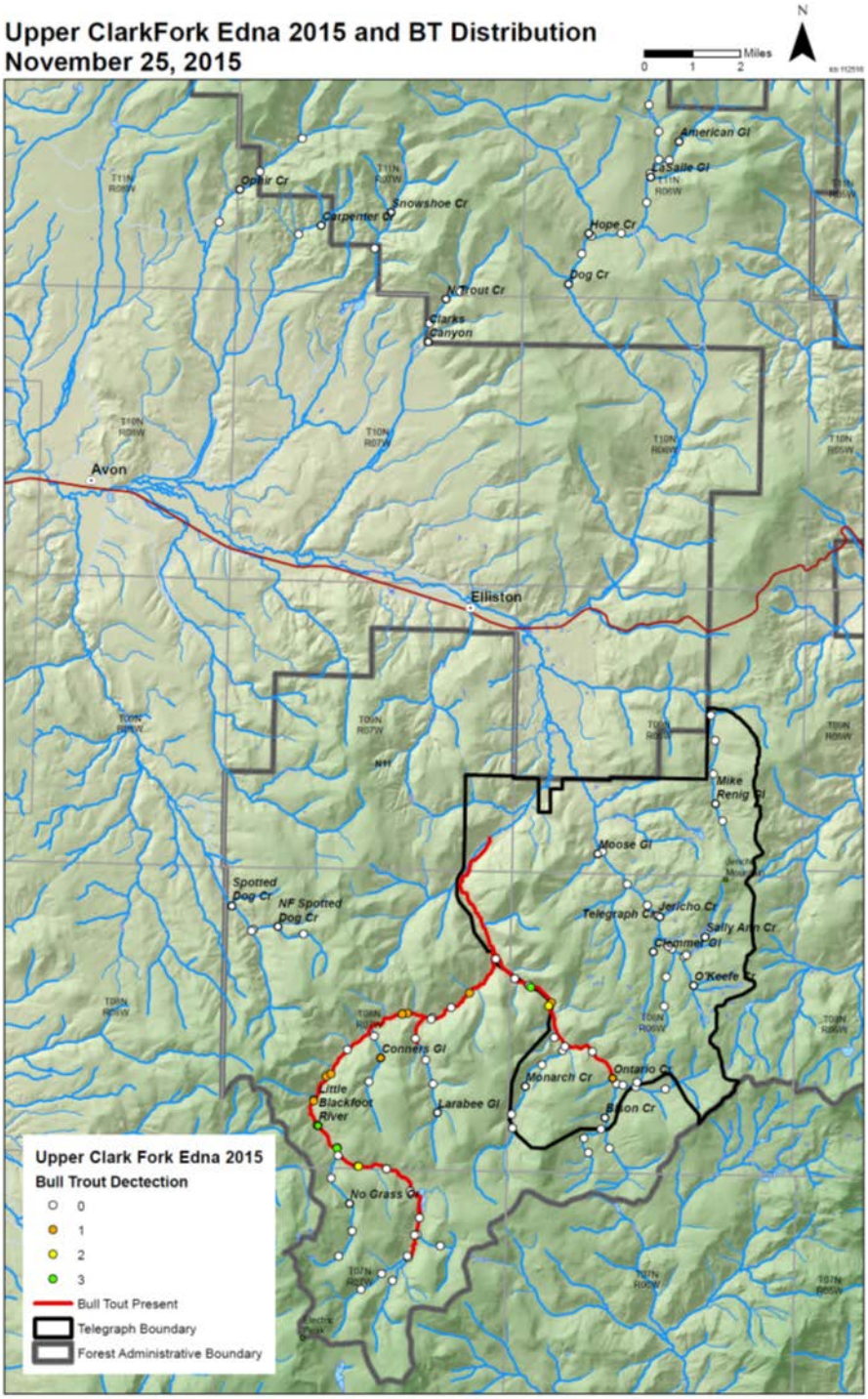

Figure 135. Upper Clark Fork eDNA 2015 Bull Trout Detection Map

Westslope Cutthroat Trout Status Overview and Habitat Requirements

The distribution and abundance of westslope cutthroat trout (WCT) have declined from historical levels over part or all of their historical range (Shepard et al. 2003). According to the Status of Westslope Cutthroat Trout (Oncorhynchus clarki lewisi) in the United States Shepard et al. 2002, there were 1,645 miles that were historically occupied. Currently, there are approximately 446 miles of habitat that are occupied with 37 conservation populations in the Upper Clark Fork watershed. Approximately 92% of these conservation populations are considered potentially genetically altered or potentially hybridized with stocked non-native cutthroat and rainbow trout. Westslope cutthroat trout are distributed throughout the project area and the upper Little Blackfoot watershed, these resident populations are considered healthy and thrive within many of these headwater streams. These populations have tested genetically pure or are assumed genetically pure. WCT have many of the same habitat requirements as bull trout but, are slightly more tolerant of warmer water temperatures. WCT densities are strongly correlated with increased pool frequencies and quality of pool habitat. Threats to WCT within the project area include, habitat fragmentation from downstream diversions and increased water temperatures, habitat degradation from road infrastructure and past mining practices, and competitive interactions with non-native fish species such as brook trout and brown and rainbow trout in lower mainstem Little Blackfoot River.

Western Pearlshell Mussel Status Overview and Habitat Requirements

Western pearlshell mussels (*Margaritifera falcata*) may be one of the longest living freshwater invertebrates and animals. Specimens have been aged at over 90 years (Vannote and Minshall 1982). The western pearlshell mussel has an elongate shell, typically 2.5 to 4 inches long with a concave ventral edge. The interior shell has a purple to pink hue as the outside shell is dark brown to black. These mussels are found in cool, stable running, generally low to moderate gradient streams and rivers. Swift stream velocities can limit where mussels can occur in streams. They are most commonly found in stable gravel and pebble benthic substrate, but can occur in sand or gravel among cobble and boulders in moderate to higher gradient larger rivers. They usually occupy reaches of stream where the riparian zone is dominated by willows or alders.

The larval stage of this mussel (glochidia) briefly parasitizes a host fish, westslope cutthroat trout, by attaching to the gills. They fall off the host as a juvenile mussel. The larval parasitism on fish enables upstream transport to habitats otherwise difficult to reach by relatively immobile adult mussels. Western pearlshell glochidia are considered highly host-specific (Bauer 1987) as they are typically restricted to salmonid fishes.

The western pearlshell mussel continues to experience substantial range reductions over the last 100 years. The primary cause of stream habitat deterioration in Montana is high fine sediment load, related to agricultural practices, which is one of the most serious pollutants of stream systems. Excess fine sediment can degrade mussel habitats by decreasing substrate permeability. This has a smothering effect on juvenile mussels and limits successful recruitment (Stagliano 2010, 2015).

The Montana Natural Heritage database contains no records for this species in the project area, and surveys of the Little Blackfoot have not located any western pearlshell mussels (Stagliano 2015). The Little Blackfoot River has not been designated to be predicted pearlshell habitat on Forest Service-administered lands (Stagliano 2015).

Fish Habitat in the Analysis Area

Background

Fish habitat in the project area is the product of interactions among underlying geologies, soils, topography, vegetation, climate, and hydrology unique to the watershed (Meehan and Bjornn 1991; Swanston 1991). More details about elements influencing Telegraph Creek, Ontario Creek, Mike Renig Gulch, and Little Blackfoot-Hat Creek Watersheds are discussed under the “Affected Environment” sections in the Telegraph Project soil and hydrology reports. In their natural context, processes like fire, floods, insect infestations, and beaver activity operate on the stream system to produce improved habitat quality and productivity in the long term (Swanston 1991). Human land-use activities can disrupt the balance of these interactions producing persistent changes in habitat that can impact natural fish production and population viability (Meehan and Bjornn 1991; Waters 1995). The Telegraph project area has traditionally been managed for non-fishery resources: primarily timber harvest, livestock grazing, mining, and transportation. Cumulatively, these activities may impair stream structure and function to varying degrees by increasing erosion and sedimentation, impacting water quality, altering flows, reducing vegetation cover, and destabilizing or degrading channels. Ongoing temperature monitoring, past sediment sampling efforts, GIS analysis, and the Little Blackfoot River baseline condition report (2000) with updates are the basis for the existing condition summary below.

Table 305. Summary of existing condition by subwatershed

	Telegraph Creek	Ontario Creek	Mike Renig Gulch	Little Blackfoot-Hat Creek
Watershed Condition				
Road density[2] (mi/mi^2)	3.30 FUR Many valley bottom roads.	2.0 FAR[1] Many bottom roads.	1.97 FAR many valley roads.	2.5 FAR, valley roads
Water Quality				
Temperature [3] (bull trout spawning/ rearing)	Average maximum temps 15-18 °C, FUR for rearing and spawning	Average maximum temps 13-16 °C, rearing FAR, and spawning, FUR.	Assumed FAR, (LBR baseline condition 2000).	Average maximum temperatures 15-20 C, FUR for rearing and spawning.
Habitat access	FAR, manmade barriers do not allow for fish passage at base flows. A list of current barriers and proposed improvements in Table 308.	FAR-partial manmade barriers on Monarch and Ontario creeks. Current barriers and crossing improvements in Table 308.	FUR, diversion structures on private lands do not allow for fish passage at varying flows. Current barriers and improvements (Table 308)	FAR-several partial barriers on the mainstem LBR and Hat creek. Barriers and proposed improvements are listed in Table 308.
Pool Quantity/ Quality	FAR- pool quantity/quality do not meet INFISH RMOs. High levels of sediment likely reduce pool volume and lack of beaver activity affect pool habitat and frequency in reaches.	FAR-pool quantity/quality do not meet INFISH RMO for pool frequency or quality. Pool reduction is due to increased sedimentation from road/trail systems and past livestock practices, and lack of beaver activity.	FAR, beaver influence on some reaches, livestock impacts reducing pool quality on some stream reaches. Pool frequency negatively affected by increased sedimentation.	FAR-pool quantity/quality do not meet INFISH RMO for pool frequency or quality. Pool reduction is due to increased sedimentation from road/trail systems and past livestock practices, and lack of beaver activity.

	Telegraph Creek	Ontario Creek	Mike Renig Gulch	Little Blackfoot-Hat Creek
Large Woody Debris	FAR- There is equally conifer and shrub dominated communities along Telegraph Creek. LWD levels are below minimum levels desired for FA given INFISH RMO's due to extensive clearing on private lands, and past mining activity and harvest within RHCA (LBR Watershed Analysis 2000 and 2002 (5-12)), however, many of these reaches are shrub dominated and there is potential for future recruitment in the upper stream reaches on NFS lands given the extensive MPB epidemic. Refer to project record for site specific riparian condition. Road encroachment and private homesite development could limit future LWD recruitment in some lower reaches of Telegraph Creek.	FAR, LWD levels are below desired levels for FA given INFISH RMO's (LBR Watershed Analysis 2000 and 2002 (5-12)), however, there is potential for future LWD recruitment in most of the stream reaches due to pervasive MPB; stream reaches in Ontario creek are tree dominated with a lesser shrub component. Refer to project record for site specific riparian condition. Road encroachment in some stream reaches could restrict future LWD recruitment.	FA, LWD are at levels near natural condition. Many miles of stream within the Mike Renig subwatershed are dominated by continuous willow communities with healthy beaver activity. Although past grazing impacts there has been little past harvest activity given the shrub dominated riparian vegetation. Future LWD recruitment is predicted in the upper reaches given MPB epidemic.	FAR, Tree dominated riparian communities are dominant throughout the upper Blackfoot, however, due to road construction and private land development LWD levels in the lower reaches of the upper Blackfoot do not meet wood frequency desired for FA given INFISH RMO's (LBR watershed analysis 2000 and 2002 (Table 5-12)), however, there is potential for future LWD recruitment in most of the stream reaches due to pervasive MPB. Refer to project record for site specific riparian condition. Road encroachment in some stream reaches could restrict future LWD recruitment.
Off-Channel Habitat/Refugia	FAR-due to the reduced influence of beaver, existing road systems (FS 495), and private development below Forest boundary and mining impacts in the headwaters of Telegraph Creek.	FAR-Overall floodplain connectivity in portions of Ontario Creek have been disrupted by existing road systems paralleling the creek.	FAR, Loss of Off Channel refugia due to beaver declines and existing road systems.	FAR, Overall floodplain connectivity in reaches of this section of the LBR have been disrupted by existing road systems paralleling the creek.

1. FA=High habitat condition Functioning Appropriately, FAR=Moderate Habitat condition Functioning at Risk, FUR=Low habitat condition Functioning at Unacceptable Risk (Matrix of Pathways and Indicators of Watershed Condition USFWS 1998).

2. Refer to hydrology report for water yield, ECA analysis and sediment yield accounts for Forest Service, private, and state roads.

3. Winter temperatures were not collected, so temperature does not speak to incubation. Rearing and spawning for high functioning watersheds is 4-12 °C and 4-9 °C (respectively), moderate functioning is <4 or 13-15 °C and <4 or 10 °C, low functioning watersheds >15 °C and <4 or >10 °C.

Table 306. PIBO monitoring data (2000–2014) on stream reaches within the Telegraph project area

Stream	Site Type	Habitat Index Score[1]	Pool Frequency #/Km	Percent Pool (%)	Percent Pool fines <6mm (%)[2]	LW frequency #/Km
Ontario	Integrator	71	33	75		60
Ontario	Integrator	71	33	75	6	60
Little Blackfoot River	Integrator	56	25	32	18	166
Little Blackfoot River	Integrator	43	16	22	3	138
Little Blackfoot River	Integrator	54	27	36	8	90
Little Blackfoot River	Reference	81	101	67	16	360

[1].Numeric score of Index of physical habitat integrity 0 (worst) to 100 (best).

[2]. Quantified using a 0.38m x 0.38m grid with 50 intersections. The grid is placed at 3 locations along each pool tail. The percentage of particles <6mm is calculated for each grid and averaged for each pool and then all pools within a reach.

Table 306 summarizes 2001 to 2014 effectiveness monitoring data within the analysis area and includes both managed (integrator) and reference sites condition however, does not include other reference sites within the ecoregion or compare to reference site condition across the entire Columbia and upper Missouri river basins. Multiple reference reaches across ecoregion and at a larger basin scale is necessary to obtain an adequate sample size when comparing managed and reference site condition over a large temporal scale. The more recent PIBO Stream Habitat Condition Report for the Helena-Lewis and Clark National Forest (2016) synthesized stream habitat condition status and trend across the Forest and by subbasin by using site data, reflected above. Although it may first appear that some of these managed sites within the project area are not functioning at reference condition Table 306, when comparing to other reference sites both locally and by ecoregion, managed sites may be very similar to reference condition and an improving or declining trend in habitat condition across a landscape may be detected. The PIBO report (2016) indicates, measured habitat parameters at many of the managed sites were similar to reference reach condition when compared across the Forest. Managed sites were compared to local reference reaches, ecoregion and all reference sites across the Columbian River and Missouri River basins. Although sites were similar to evaluated reference condition, the overall change in habitat condition or trend (2000 to 2015) is not statistically significant among many of the habitat parameters except for an improving trend in percent undercut banks and an initial negative change in percent pool habitat. When evaluating at the subbasin scale for the Upper Clark Fork, habitat conditions at managed sites were also very similar to reference reach condition. Statistically significant trends in habitat metrics within the upper Clark Fork were difficult to detect. Upon evaluation, sites in the Upper Clark Fork only indicated a statistically significant increase in percent bank angle (negative trend) and a decrease in percent of bank with undercuts (negative trend). Refer to the project file for a complete list of effective monitoring sites and habitat metrics and the 2016 PIBO Stream Habitat Condition report. It is important to remember that streams are dynamic systems and the data in Table 306 suggest that even streams close in proximity within the same watershed, and under similar management practices can have very different stream responses as measured by these habitat attributes.

Substrate

Excessive sediment beyond natural background levels has been identified as a principal limiting factor and dominant effect to fisheries habitat from forest management activities, whether the sediment results from roads, timber management, and mining or livestock grazing. Although activities themselves may differ widely, the effects of increased sedimentation on fish habitat could be the same (Meehan 1991, pp 5 and 6). Since the streambed is generally accepted as the integrator of processes and land use practices occurring upstream, the collective effects of the past and ongoing activities in the planning area are best measured in the streambed of critical reaches that receive sediment generated by natural processes and human disturbance. While recent data are not available, fine particle levels within spawning gravel have been sampled in streams from all the sub-watersheds within the planning area (Table 307). These values can provide an important baseline and identify relative differences between watersheds.

Average sediment levels from the project area are compared with those taken from the Lake Helena Watershed Planning Area which were 32.5 percent ± 10 percent (USEPA 2004, pp 225-231). This was based on limited sampling from unmanaged drainages or portions of undisturbed drainages on the Helena NF, and provides a plausible mean reference value for fisheries management goals while taking into account an approximate 10 percent natural variation. Based on available core sampling data, mean fine sediment in spawning habitat for three of the four sub-watersheds are within the accepted range of variation but exceeds the upper range of variation for fish habitat management goals in the Mike Renig Gulch sub-watershed (Table 307).

Table 307. Summary of mean percent fines in spawning habitat of select streams

6th Field HUC sub-watershed (name)	Stream(s) sampled for sediment analysis	Mean % fines in spawning habitat	USEPA reference Standard (%)	Roadless Area reference (%)
Little Blackfoot River-Hat Creek	Little Blackfoot River-Hat Creek	37.8	32.5	31.9
Mike Renig Gulch	Mike Renig Gulch	50.5	32.5	31.9
Ontario Creek	Ontario Creek Bison Creek Monarch Creek HUC Mean	36.9 36.9 37.7 37.2	32.5	31.9
Telegraph Creek	Telegraph Creek Booth Gulch Sally Ann Creek HUC Mean	38.2 35.1 43.1 38.8	32.5	31.9

Temperature

High temperatures on Telegraph and Ontario Creeks and the Little Blackfoot River could be considered a limiting factor for some fish distribution during the summer months with rearing and spawning potential greatly decreased. Given current bull trout and WCT distribution, temperatures on the mainstem Little Blackfoot River and Ontario Creek are marginal for bull trout rearing and spawning but appear to have areas of cold water refugia. These streams are assumed to have adequate temperatures to support overwintering habitat for bull trout. There would be no canopy removal that would affect shade and stream temperature, refer to project design criteria.

Riparian Habitat Conservation Areas

Approximately 704 acres of past harvest and fuels activities have occurred within RHCAs of the analysis area. There was very little activity within the Mike Renig Gulch sub-watershed; the majority of past harvest and prescribed fire activity occurred within Telegraph Creek (468 acres). Comparatively little past harvest and fire activity occurred in the Little Blackfoot-Hat Creek (101 acres) and Ontario Creek (104 acres) given the size of their sub-watershed.

Estimated annual sediment delivery from roads to stream channels under existing conditions, before project improvement work, ranges from 0.7 ton per year (Mike Renig Gulch) to 4.3 tons per year Little Blackfoot River-Hat Creek. Road. Road densities are relatively high throughout most of the sub-watersheds within the analysis area with many valley bottom roads (Table 307). Density of roads within riparian areas is greatest in Ontario Creek (3.7 miles per square mile) followed by Mike Renig Gulch (2.2 miles per square mile) and Telegraph (1.9 miles per square mile), and lastly, Little Blackfoot River (1.3 miles per square mile). There is continued watershed degradation that stems from the NFS Road 227, adjacent to the Little Blackfoot River; the NFS Road 495 that runs adjacent to Telegraph Creek, and NFS Road 123 that parallels portions of Ontario Creek. There is ongoing road maintenance and reconditioning work on these roads and all major haul routes.

There is currently light cattle use within the project area; Ten Mile allotment (15,675 acres) is the only allotment within the project area and only 7 percent (1,730 acres) of it is located within the project area. Grazing is on pasture rotation with 200 cow/calf pairs; this would primarily affect the Mike Renig watershed. Refer to the range and hydrology reports, which address current range condition and riparian condition within the grazing allotments. Only a small portion of Hat Creek and Slate Lake allotments are within the analysis area outside of the project boundary, and both are under deferred grazing system.

It is estimated that over 60 inventoried historic and abandoned mine sites exist in the upper Little Blackfoot Watershed. Several abandoned mine sites located in neighboring watersheds near the project area may require haul of select materials or mine waste through the Little Blackfoot drainages in support of reclamation actions. The primary waste disposal location utilized for many past, ongoing or foreseeable mine reclamation projects is the Luttrell Regional Mine Waste Repository located at the head of the upper Tenmile Watershed. Montana DEQ has designated 14 abandoned mine sites located in the upper Little Blackfoot as high priority. As of the date of the fisheries specialist report, there are no approved plans of operation which authorize mining activity within the project area. These past mining activities and abandoned mine operations on State, Federal, and private lands have greatly impacted or have the potential to impact water resources and fish habitat throughout the watershed. Elevated levels of metal concentrations in both mined material, tailings and instream sources remain a concern and are assumed to have ongoing adverse effects to aquatic resources; refer to the hydrology report for specifics on total maximum daily loads and water quality issues. Inventory, assessment, and monitoring of these mine sites is an ongoing project for the Helena-Lewis and Clark National Forest. The Forest Service has, and will continue, to pursue mine reclamation actions in an effort to improve overall watershed quality and meet State and Federal water quality rules and regulations. This responsibility obligates the Forest Service to participate in the total maximum daily loads process and responsibilities include water quality management plans. Forest water quality management plans rely on current laws, management plans, and best management practices (USDA 2012) to provide the basis for improving water quality in the forested landscape.

Environmental Consequences

This section analyzes the direct, indirect, and cumulative effects of the proposed actions on native and ESA listed fish species and their habitats. Direct effects are immediate impacts, both adverse and beneficial, from project-related actions. Indirect effects are caused by, or result from, the proposed action and may occur later in time or space. Cumulative effects considers past, ongoing, and any foreseeable actions on National Forest System lands, see appendix C of this FEIS.

Alternative 1, No Action

Direct and Indirect Effects

Under alternative 1 of the Telegraph Project, the Forest Service would not change management in the project area; there would be no proposed harvest, thinning, prescribed burning activities or road maintenance or improvements or road decommissioning. Therefore, there would be no mechanism for direct effects to Endangered Species Act listed fish species and their critical habitat or Forest Service Region 1 sensitive fish and aquatic invertebrates and their habitat. Alternatively, there would be little reduction in sediment delivery to nearby streams and no improved fish passage without the proposed road improvements and maintenance. There may be indirect effects to riparian areas under the no-action alternative with no treatment or reduction of existing fuel loads. High-severity fires could increase with no fuels treatments, considering the natural fire regime of frequent low-severity fires and past suppression efforts, see the fuels report for further analysis on historic fire regimes in the Upper Blackfoot watershed.

Irreversible and Irretrievable Commitments

There would be no irreversible commitments in the selection or implementation of alternative 1 related to aquatic species. There would be no permanent alteration of habitat quality or projected loss of fish populations. Opportunity costs associated with not performing the road improvement work proposed under the action alternatives are reversible, but the delay in improving habitat conditions would result in an irretrievable commitment of an unknown duration. Failure of high-risk culverts could lead to long-term degradation of aquatic habitat and reduced aquatic productivity.

Cumulative Effects

Under alternative 1 of the Telegraph Project, the Forest Service would not change management in the project area; therefore, this alternative would not incrementally add to past, present, or reasonably foreseeable future activities to cause cumulative effects to Endangered Species Act listed fish species and Region 1 sensitive fish and aquatic invertebrate species and their habitat.

Effects Common to All Action Alternatives (2, 3, and 4)

The Telegraph Project proposes commercial harvest activities. Harvest and any prescribed burning activities are closely managed; thereby limiting the potential for impacts to native fish and their critical habitat. This is due primarily (but not exclusively) to best management practices (BMPs) and project-specific design features applied uniformly across the project area. (See the Fisheries Biological Evaluation and Specialist Report as well as the Design Features section in chapter 2 of this FEIS for details.)

Summary of design features used to minimize or eliminate effects to fisheries and stream habitat include:

- Retention of INFISH buffers adjacent to streams and wetlands that would maintain shade, future instream and riparian wood inputs, and streambank stability, refer to specific project design criteria.
- No timber harvest or road building would occur on field verified landslides prone areas, which would minimize potential management-related mass failures and subsequent sediment delivery to streams.
- No mechanized equipment within RHCAs. Equipment would not be serviced in riparian areas. This would eliminate potential toxic chemical introductions into streams.
- Hazard trees in RHCAs along haul routes would be felled and left in place in order to maintain large woody material in RHCAs. Exceptions would be the removal of hazard trees within the RHCA but, above existing roads. Given the road, these trees would not be potential contributors to future LWD recruitment of stream channel form and function, thus INFISH standard RA-2 would be met.
- Temporary roads construction and stream crossing would be limited and implemented on existing road prisms within RHCAs and there would be no new landing construction within RHCAs.
- There would be no ignition within RHCAs within prescribed burn units. Fire would be allowed to back into riparian buffers.
- Erosion control measures near waterways and stream crossings would be implemented during road reconstruction and decommissioning.
- Snowplowing would be allowed on the Little Blackfoot and Lower Ontario Creek roads under all action alternatives with specific design features. Drainage features would be flagged prior to plowing so side cast material does not plug the outlet of the drainage feature or stream crossing, adversely affecting aquatic resources or fish passage. This design measure is less of a concern under alternatives 3 and 4, given the proposed reroute, which would avoid the need for these specific design features.

Direct Effects

Direct effects to aquatic resources would be limited to the proposed road improvement projects such as culvert replacements. Direct effects to aquatic resources from changes in magnitude, timing, or duration of sediment transport from proposed instream activities would be expected, but minimized with erosion control measures and additional conservation measures through Endangered Species Act Section 7 consultation with US Fish and Wildlife Service. Past turbidity monitoring on the Nez-Perce Clearwater NF (Connor 2014) has shown that with BMP's properly employed work adjacent to stream channels rarely exceed state water quality standards. Work in stream channels that are not dewatered may exceed the instantaneous standard for turbidity. This is also seen in dewatered channels when the channel is first dewatered and the channel is rewatered. Approximately 80% of the time the turbidity exceedance lasts less than 2 hours and is close to baseline within a 24 hour period. Most often, this turbidity is exceeded during rainstorm events or log culverts removal or when a culvert has previously failed. To address these concerns, and to show that BMP's are properly employed, work would be halted until turbidity is below 50 NTU's. Other BMP's would include using non-erodible diversions, employing sump pumps for seepage issues, wetting substrate before rewatering, repeatedly washing substrate, rewatering channels slowly if diverted for AOP replacement, and using sediment trapping. With BMP's properly employed and design measures in place and with instream work during low flow periods and at a time that salmonids are not spawning (July 15 to August 15), no direct mortality to adult salmonids and/or larval from proposed actions is

foreseeable or predicted to occur. Culvert replacements and road decommissioning would ultimately have long-term fisheries benefits with improved stream connectivity and fish passage.

Table 308. Proposed stream crossing Improvements within the project area and effects to fish

Road	Stream	Alt. 2	Alt. 3	Alt. 4	Effects to Fish
NFSR 123	Mary Ann Creek	Yes	Yes	Yes	Short term downstream sediment effects to WCT with culvert replacement.
NFSR 123	Little Blackfoot River Tributary	Yes	Yes	Yes	Effects would be minimal given mitigation measures and the work is not instream.
NFSR 1856	Mike Renig Gulch Trib 1	Yes	Yes	Yes	Possible downstream effects to WCT with removal of the culvert and placement of Rock Ford. There would be no ongoing adverse effects to WCT with removal of the culvert because the 1856 is currently closed to all motorized vehicles and open to only over snow travel. This route is proposed for year round non-motorized use under the Divide Travel Plan.
NFSR 1856	Mike Renig Trib 2	Yes	Yes	Yes	See comment above
NFSR 1801	Monarch Creek	No	Yes	Yes	Short term adverse effects (sediment and fish salvage) to both WCT and bull trout with culvert removal and replacement with AOP.
NFSR 495	Clemmer Gulch	Yes	Yes	Yes	Adverse effects (sediment and fish handling) to WCT with culvert replacement.
NFSR 459	Clemmer Gulch (upper crossing)	Yes	Yes	Yes	Short term adverse sediment effects to WCT with culvert replacement.
NFSR 4100	LBR	No	Yes	Yes	Adverse effects to both WCT and bull trout given road relocation, road decommissioning efforts and bridge replacement.
NFSR 4104	Monarch Creek	No	Yes	Yes	Adverse effects to WCT and bull trout with the removal of the culvert and replacement with AOP.
NFSR 1856	Mike Renig Gulch tributaries x 5	No	No	Yes	Culvert upgrades are primarily for hydrologic purposes with road improvements. Upgrades are on tributaries that are intermittent/swales and non-fish bearing. Any downstream adverse effects would be immeasurable with design features, duration and timing of instream work.
NFSR 4104	Monarch Creek tributary	No	No	Yes	Refer to comment above
NFSR 4104	Ontario Creek tributary	No	No	Yes	Refer to comment above
NFSR 1856	Telegraph Creek tributaries x 2	No	No	Yes	Refer to comment above
NFSR 1856-D1	Flume Gulch and tributary	No	No	Yes	Culvert replacements would have short term adverse effects to WCT but, would be minimized with design features, duration and timing of instream work.
MT123-001	Ontario Creek	No	No	Yes	Improve crossing following field evaluation and consultation with MT FWP and USFWS to ensure continued aquatic organism passage. Instream work would have short term sediment effects to WCT and bull trout and direct effects through fish salvage.
MT 123-001	Ontario Creek tributary x2	No	No	Yes	Upgrade to a hardened rock ford; work is not on a fish bearing stream and given design features, timing and duration of work there would be no measurable downstream adverse effects to fisheries in Ontario Creek.
NFSR 495-D1	Ontario Creek tributary	No	No	Yes	Improve crossing following field evaluation and consultation with MT FWP and USFWS to ensure continued aquatic organism passage. Instream work would have short term sediment effects to WCT and bull trout and direct effects through possible fish salvage.

Indirect Effects

Temperature

Water temperature is one of the most important variables affecting salmonids and other stream biota. Temperature influences timing of migration and spawning, egg maturation, growth, intra and interspecific competitive ability and resistance to parasites and disease. There is temporal variability in stream temperature and variation can occur by channel type and within the water column. Cold water is key for salmonids especially bull trout; bull trout are most common in streams that rarely exceed 55 degrees Fahrenheit (13 degrees Celsius) (Isaak 2014). Bull trout typically spawn in water temperatures below 48 degrees Fahrenheit (9 degrees Celsius). Westslope cutthroat are most common in streams that rarely exceed 59 degrees Fahrenheit (15 degrees Celsius). Temperature data indicate (project record) that with the exception of reaches in the LBR below the project boundary, many of these streams do not exceed 59 degrees Fahrenheit and support healthy genetically pure populations of WCT, refer to Table 4. Temperatures in lower Telegraph near the upper limit for spawning adult WCT. Removal of shade providing trees and riparian shrubs can reduce quantity and vigor of plants that shade streams and maintain water temperatures (Tait et al. 1994; Lamberti et al. 1994; Kreutzweiser et al. 2008 and Ebersole et al. 2001). Current temperature data suggests that water temperatures are near the upper limit for salmonids within all sub-watersheds and possibly a thermal barrier in many parts for bull trout.

In the Telegraph Project, the INFISH buffers and project-specific design features (see chapter 2 Design Features section) would be observed across the project area. The project proposes thinning and prescribed fire treatments in riparian areas to improve vegetative community heterogeneity and colonization of understory species that would occur under natural disturbances, ultimately producing an increase in shade-bearing trees in some of the smaller order stream reaches. Commercial harvest within RHCAs would only salvage dead or dying trees above existing roads that do not contribute to stream shade. Temperature monitoring will continue throughout the Little Blackfoot watershed. Any reduction of shade providing riparian vegetation would be minor and ultimately, insignificant in affecting stream temperature in all action alternatives.

The hydrology report specifically speaks to the natural hydrologic cycle of the area and wetland features and addresses changes to percent annual water yield given vegetative cover and proposed treatments. Discharge, which alters magnitude and timing of stream flow, regulates stream temperature during these summer months, often more so, than shade from riparian vegetation (Janisch et al. 2012; Chamberlin et al. 1991). Although change in water yield, calculated by equivalent clearcut acres (ECA), cannot predict changes to instream flow, these changes would not be significant and an increase in discharge from treatment units is not expected. Increases in water-yield from proposed project activities range from less than 1 percent to 2 percent (hydrology report table 6). These small and immeasurable changes would likely have no effect on stream temperature, thus, no indirect effects to aquatic resources.

Substrate

The project area has moderate to high road densities with many valley bottom roads, (Table 305); these existing roads (private and public) adjacent to streams within the project area continue to impact streams and riparian areas by displacing riparian habitat and acting as vectors for fine sediment to enter stream channels. Road improvements with culvert replacements, and road and landing construction associated with harvest and fuel activities under all action alternatives have the potential to increase sediment delivery to stream reaches. These additional sediment loads can affect the formation and maintenance of pools and thus, influence pool frequency in streams; pool size and

location may change if sediment loads increase due to forest management activities. Proposed road maintenance, project-specific design features and appropriate logging system design would greatly minimize potential sediment delivery and effects to aquatic resources.

The hydrology report indicates that there would be overall reduction in sediment delivery to nearby streams with the proposed road reconstruction, maintenance and stream crossing improvements (table 4, hydrology report). Sediment reductions would range from 84 to 98 percent, depending on alternative, and there would not be significant sediment increases above existing condition, common to all action alternatives (table 4, hydrology report). Predicted annual sediment delivery by year from proposed activities only range from 0.1 to 1.1 tons per year above existing condition. Table 309 below, summarizes this type of road work proposed within RHCAs.

Table 309. Miles of road work within RHCAs under all action alternatives

Subwatershed (6th field HUC)	Proposed Road Work	Alt. 2	Alt. 3	Alt. 4
Little Blackfoot-Hat Creek	Maintenance	2.66	2.29	2.29
	New Construction	0.0	0.02	0.02
	Reconstruction	0.07	0.44	0.44
	Temp Road/Obliteration	0.01	0.01	0.01
Mike Renig Gulch	Reconstruction	1.69	0.78	1.69
Ontario Creek	Maintenance	2.24	2.08	2.08
	New Construction	0.0	0.19	0.19
	Reconstruction	3.05	2.97	2.37
Telegraph Creek	Maintenance	8.22	8.22	8.22
	Reconstruction	0.79	0.79	1.83
	Temp Road/Obliteration	0.0	0.0	0.18

It is difficult to quantify suspended sediments from harvest units; however, the hydrology reports show that proposed activities would not substantially increase sediment delivery by treatment unit between alternatives (hydrology report table 9). Logging system design (ground, cable yarding or hand thinning) and specific soil design features would minimize soil erosion within harvest units. Design features include, retention of fines and course woody material along with winter logging so detrimental soil disturbance is not exceeded within certain units, and limiting operations during wet conditions. Additional project design features include riparian buffers of 150 to 300 feet along perennial and intermittent fish-bearing streams, which are effective sediment filters eliminating additional habitat degradation due to sediment transport (Clinton 2011; Groom et al. 2011; and Lakel III et al. 2011).The hydrology report indicates that there would be no significant change in annual water yield from treatment units, thus, it can be inferred that there would be no significant changes in timing or magnitude of small or large-runoff events from proposed actions under all action alternatives (hydrology report, table 9). Given this information, with intact riparian buffers and no mechanized equipment within RHCAs there would be no impacts to streambank stability or significant changes to instream channel structure or sediment storage. With road improvements and culvert upgrades, percent mean fines within spawning habitat should decrease or stay within the accepted range of variation, (Table 307).

Proposed harvest activities will not substantially change the magnitude, timing or duration of sediment transport. Proposed road improvements and maintenance will have short-term increases in sediment delivery but, with long-term reduction in sediment delivery and improved habitat quality.

The greatest downstream sediment effects to fisheries and aquatic habitat would be the stem from the proposed instream channel work including the seven proposed culvert/bridge replacements and culvert removals. Sediment delivery and deposition would be short-term, limited duration and in isolated locations directly below project sites. Erosion control measures and Endangered Species Act Section 7 conservation measures would limit adverse sediment impacts to aquatic resources.

Large Woody Debris

There are well recognized relationships between large woody debris, habitat complexity and increases in biological productivity. Large woody debris is an important source of habitat specifically pool formation and cover for fish and provides suitable habitat over a wide range of flow and climatic conditions. Response to increased large woody debris in studies with different fish assemblages has produced variable results (Sweka et al 2010; Schmetterling 2000; Sestrich et al 2011). These large wood complexes are essential for habitat cover for bull trout that are within the project area (USFWS 2014). Sources of large woody debris are affected by the species composition, age class, and stand types found in both riparian and upslope areas. Recruitment is affected by bank and hillslope topography and the physical processes which deliver wood to the channel. Stream reach morphology is an important factor in large woody debris placement with accumulations more common in unconstrained deposition reaches. Previous Little Blackfoot Watershed Analyses (2000 and 2002) indicate large wood is not meeting minimal riparian management objectives standards in many reaches due to past land management practices (Table 5) with the exception of drainages in the Mike Renig subwatershed, which, is dominated by a strong riparian willow/shrub component. However, due to pervasive beetle kill, future recruitment within many of these stream reaches dominated by conifer overstory is inevitable, refer to the project record for site specific riparian condition. There is no mechanism to alter large wood recruitment given intact riparian buffers within regeneration and intermediate harvest units and mechanical fuel units. Exceptions would be the removal of hazard trees within the RHCA above existing roads. Given the existing road, these trees would not be potential contributors to future LWD recruitment of stream channel form and function, thus INFISH standard RA-2 would be met. In most cases the existing road, confines the channel and does not allow for stream and floodplain interaction where large wood material can effectively contribute to stream structure or instream habitat.

Large dense stream-adjacent stands in mixed pined ecosystems can be an unintended artifact of past forest management practices (Agee 1993) such as fire suppression and past commercial harvest practices. Telegraph proposes pre-commercial thinning and prescribed fire treatments in riparian areas are to improve community heterogeneity and colonization of understory species that would occur under natural disturbances (Swanson et al. 2010; Dodson and Peterson 2010) and eventually leading to recruitment of large wood material delivered to nearby stream channels, meeting INFISH standard WR-1. Thinning would be of small diameter material that is not currently contributing to overstory canopy and no thinning would occur within 50 feet of the ordinary high water mark, a greater distance than one tree length away from the stream channel. Given the riparian buffer and the fact that no mechanized equipment would be used, proposed activities would not destabilize streambanks, compromise stream shade and would ensure that future large woody debris objectives are met, clearly meeting INFISH standards and guidelines, FW-1 and FW-2. Any hazard trees would be felled and left on site and there would be no storage or refueling of fuel and other toxicants within the RHCA, meeting INFISH standards and guidelines RA-2 and RA-4.

Floodplain and Stream Connectivity

The Watershed Condition Baseline for the Little Blackfoot Drainage (2000) implies that many of the drainages currently have compromised floodplain connectivity due to incised stream channels in part

from past livestock grazing practices, reduction in beaver activity throughout the watershed, and development of the road network. There is no mechanism to alter floodplain connectivity given proposed harvest units under all action alternatives with project specific design features and no indirect effects to aquatic habitat. There is minimal temporary road construction within RHCAs (Table 309) and new roads and landings would be obliterated immediately after use. Proposed road improvements and culvert replacements under all action alternatives would improve fish passage and accessibility to over 4.5 miles of stream habitat.

Irreversible and Irretrievable Commitments

There would be no irreversible or irretrievable commitments in selecting and implementing action alternatives 2, 3, and 4.

Cumulative Effects Common to All Action Alternatives

Only the activities that may affect native fish population and their habitat and sensitive aquatic invertebrates are discussed in this cumulative effects analysis. Appendix C of the FEIS has a complete discussion of the past, current, and future activities in the project area. Past vegetation treatments have been conducted over the majority of the project area. Most of this harvest occurred over 20 years ago with opportunities of revegetation; approximately 3,170 acres were treated between 1960 and 2000. Prior harvest activity includes regeneration and intermediate harvest with prescribed burning activities.

Potential effects of harvest activities have been previously summarized. Approximately 704 acres of past harvest and prescribed fire activity have occurred within RHCAs; this treated area constitutes less than 16 percent of the project area and only 1.5 percent within the analysis area (combined 6th field HUC). Riparian treatments were largely implemented from 1960 to 1974 with the majority of these activities located in the Telegraph drainage. More recently, (2000 to 2015) approximately 600 acres have been treated within the project area, the majority of this harvest was associated with the Roadside Hazard Tree Removal Project. Only 8 acres of harvest and prescribed burning activity occurred within riparian areas from 2000 to 2015. There is no temporal or spatial overlap with other Forest Service vegetation treatments or proposed treatments within the Telegraph Project area. Given that few acres were treated within the past decade and little to no treatment recently within riparian areas, impacts to aquatic habitat from past vegetation treatments and connected actions would be negligible and offer little opportunity for measurable cumulative effects with proposed activities under all action alternatives. Several hundred acres of harvest has occurred within the analysis area on private and non-Federal lands in the last decade, harvest methods are assumed ground-based. Timing, duration and percent of past harvest within riparian areas is not known so, it is assumed that there could be potential measurable cumulative effects associated with past and ongoing harvest activity on private lands with possible measurable cumulative effects to aquatic resources. Personal Use Firewood and Post and Pole permits would also be ongoing activities. Given Forest Plan standards and guidelines as amended by INFISH (1995), these activities have to meet riparian management activities, thus, there would be no direct effect to fisheries, and no measurable indirect or cumulative effects to aquatic habitat.

Only a very small percentage (30 acres) of past prescribed burning efforts occurred within riparian areas. These underburns were of low intensity within past harvest units. These burns did not meet the objectives of large broadcast burns and were not used as restoration techniques. Past wildfire activity has been minimal; the only recorded wildfire was approximately 10 acres in size.

There have been many road improvements and stream crossing upgrades within the project area, and road maintenance would be ongoing. As mentioned previously, these activities have the potential to

have short- term direct adverse effects to fisheries and aquatic resources with long-term watershed benefits and improved fish passage. The majority of road work was implemented between 2009 and 2011, with the help of the American Restoration and Recovery Act and included road recondition/reconstruction with installation of new drainage features and several culvert upgrades that accommodated organism passage and 100-year flow events. These include upgrades on NFS Road 527, NFS Roads 495 and 1856 on Hahns Creek and NFS Road 227 on the Little Blackfoot River. Adverse direct effects to fisheries from these road improvements were of short duration and in isolated locations. Many road treatments were implemented more than 5 years ago, so there would be no long-term direct or indirect effects that temporally overlap with road treatments and proposed activities under all action alternatives thus, there are no measurable adverse cumulative effects to aquatic resource from these past road improvements. However, past road improvements such as culvert upgrades and some road reconstruction have many long-term benefits to fish passage and habitat and floodplain connectivity, so there would be beneficial cumulative effects from these past road improvements and road-related activities proposed under all action alternatives.

The Divide Travel Plan identified high risk roads or roads within riparian corridors in the Telegraph project area that would continue to have detrimental impacts to fisheries and aquatic resources. Effects to aquatic resources from ongoing road maintenance, and routine use of and maintenance of National Forest System trails are more difficult to quantify, but there should be minimal measurable cumulative effects given design features (see Design features section in chapter 2 of the FEIS) under the Forest's best management practices (USDA 2012) and Helena National Forest LRMP standards and guidelines as amended by INFISH. Trail improvements could only have long-term benefits to aquatic resources, in addition, there are overall reductions in sediment delivery with ongoing road maintenance (hydrology report, table 4). The Treasure Mountain snowmobile trail reroute uses existing National Forest System roads. This reroute project, along with routine use and maintenance of over-snow travel uses existing system roads with no measurable direct or indirect effects to aquatic resources. There would be no measureable cumulative effects given design features and Helena National Forest LRMP standards and guidelines as amended by INFISH. The Divide Travel Plan with an estimated implementation of 2016 provides transportation direction for a variety of motorized and non-motorized recreational opportunities. The travel plan proposes changes only to existing roads and trail systems on NFS lands; there is no proposed road construction or decommissioning proposed under this decision.

In general, commercial road use and recreational special use permitting is limited in scope and scale and do not overlap spatially or temporally with proposed activities under all action alternatives. There would be no direct or indirect effects to aquatic resources thus, these uses were not considered in the cumulative effects section. Private road use permits are only issued to private landowners with seasonal restrictions for resource protection. Given these design features and restrictions to the general public and Helena National Forest LRMP standards and guidelines, there would be no foreseeable cumulative effects to aquatic resources with this ongoing action.

Although there are no active mining operations within the project area, there are ongoing water quality issues and potential adverse effects to aquatic resources and riparian habitat from past mining activities and abandoned mine sites within the analysis area. For example, there are 26 features (adits, shaft, etc.) within the project boundary with some level of documented discharge and 16 sites that are undergoing active reclamation. The Lily/Orphan Boy mine is one of these reclamation projects and involves removal of mine waste and haul to an off-site repository. Removal of tailings and mine waste would involve work within the floodplain and is stream adjacent to Telegraph Creek. Even with project-specific design features, there would likely be adverse impacts to fisheries, specifically WCT within Telegraph project area, but with long-term habitat improvements. This

project is in partnership with Trout Unlimited and MT DEQ with possible implementation 2016 to 2017. This is a foreseeable action within the project area and, dependent upon implementation, there could be cumulative effects, short-term adverse and long-term beneficial with the proposed road improvements within the Telegraph Project. Although past mining impacts continue to have ongoing impacts to water quality within the project area, the Forest Service has, and will continue to pursue mine reclamation actions in an effort to improve overall watershed quality and meet State and Federal water quality rules and regulations. This responsibility obligates the Forest Service to participate in the TMDL process and responsibilities include water quality management plans. Forest water quality management plans rely on current laws, management plans, and best management practices (USDA 2012) to provide the basis for improving water quality on the Forest.

Ongoing grazing and range improvements on the Ten Mile, Hat Creek, and Slate Lake Allotments occur within the analysis area; see the range report for detailed analysis of historical grazing use in these allotments. Implementation monitoring has focused on utilization and residual stubble height monitoring on both upland and riparian habitats. Implementation monitoring within riparian areas is conducted at designated monitoring areas along streams in each pasture; refer to Table 306 and table 3 of the Hydrology report. Currently, range activities are closely managed with fencing, upland water developments, pasture rotation, salting and riding used as adaptive management tools, thereby limiting the potential for impacts to native fish species and their critical habitat. Grazing impacts are also mitigated by using appropriate best management practices (USDA 2012) and project- specific design features applied uniformly across the project area. Although not all riparian conditions are at Properly Functioning Condition, current monitoring data shows an improving trend (refer to range report) and habitat condition at PIBO-managed sites largely reflect reference reach condition (PIBO Report 2016) across the Forest, and there are adaptive management practices within allotments in place to address adverse effects to riparian and aquatic habitat. Sedimentation issues and riparian impacts from current range management activities on the Forest are unlikely to further degrade stream habitat or reduce the viability of TES fish species. Given standards and guidelines of the Helena National Forest LRMP as amended by INFISH, project-specific design features and ESA Sec. 7 consultation, the potential effects to riparian areas and water quality from all action alternatives would not incrementally add to past, present, or reasonably foreseeable future activities to cause cumulative effects to native fish populations including ESA listed fish species and their habitat.

There would be ongoing grazing on private lands primarily north of the project area. The grazing practices and water diversions along the lower Little Blackfoot would continue to have adverse impacts to aquatic habitat. The proposed instream work under all action alternatives would be short in duration, with project design features in place to minimize the magnitude of effects at isolated locations, and thus, would not add incrementally to sediment delivery and habitat degradation within these lower reaches of the Little Blackfoot below the Forest boundary. Improved passage would increase available habitat for both spawning and rearing for WCT and bull trout, and provide additional refugia that is difficult to find in stream reaches on private lands. There would be ongoing noxious weed treatment throughout the analysis area. Herbicide applications will follow guidance from the 2005 Helena National Forest Herbicide FEIS ROD regarding limits of Tordon applied within any specific 6th code hydrologic unit such that, the projected levels of herbicide that may reach surface waters will remain below 0.07 parts per million. There would be no anticipated direct, indirect, or cumulative effects to aquatic resources concerning herbicide treatments

Effects Unique to Alternative 2

Direct Effects

No road decommissioning or the re-route of NFS Road 123 (4100-A1 new) would be proposed under alternative 2. In addition, culverts on NFS Roads 1801, 4100, 4104, 495 D-1 and 1856-D1 would not be implemented under this alternative, nor would the five culvert upgrades on NFS Road 1856 and two hardened crossings on MT 123-001. Direct effects from sediment delivery and increased turbidity to aquatic resources from proposed culvert replacements and road decommissioning would therefore be reduced under alternative 2; however, there would be compromised fish passage and access to additional spawning and rearing habitat for both WCT and bull trout on Monarch and the Little Blackfoot River if these passage projects were not implemented. Under alternative 2, there would be two culvert removals on NFS Road 1856 with no subsequent road decommissioning. The NFS Road 1856 is currently closed to all wheeled motorized traffic and the Divide Travel Plan proposes to close this road to all motorized traffic including over-snow vehicles. So, removal of these culverts would directly improve fish passage with only isolated increases in turbidity with the culvert removal. Since the road is closed to all motorized traffic, there would be no direct or indirect effects with motorized vehicles at stream crossings or downstream sediment increases from this action.

Indirect Effects

Objectives of road decommissioning are to reduce erosion from road surfaces and slopes and related sedimentation into streams and restore the natural surface and subsurface of drainage patterns and site productivity. Dependent on road proximity to stream channels, decommissioning can restore road crossings, improve aquatic organism passage, and if stream adjacent, improve channel stability. With no proposed road decommissioning or obliteration of a section of NFS Road 123, and many culvert upgrades, there would not be the short-term pulse of sediment to downstream habitat associated with these activities, but these high risk roads within the riparian area would be a chronic source of sediment to aquatic resources and continue to compromise floodplain connectivity on the Little Blackfoot and Ontario Creek. There would likely be ongoing sediment impacts to aquatic habitat within the Telegraph drainage, given that approximately 6.6 miles of high risk roads (150 feet of the stream channel) are proposed for decommissioning under alternatives 3 and 4.

Effects Unique to Alternative 3

Direct Effects

Alternative 3 proposes approximately 33 stream miles of road decommissioning and nine stream crossing improvements including the culvert/bridge upgrades on NFS Roads 1801, 4100 and 4104. This alternative also proposes the 4100 new road construction or reroute that connects to NFS Road 123 and subsequent obliteration of NFS Roads 123, 123-017, and 018. Eliminating this section of road would require the construction of a crossing on a small, unnamed tributary to the Little Blackfoot River as well as roughly 2,000 feet of new road along the edge of the Little Blackfoot River and Ontario Creek. Proposed decommissioning would obliterate 6.6 miles of system roads within RHCAs and the road obliteration of the 123 road system would eliminate three stream-crossing structures. Short-term turbidity increases and adverse effects to aquatic resources would most likely be greater under this action alternative given the road decommissioning activities within the RHCAs; however, with the obliteration of the extensive riparian road system, there would likely be an overall reduction in direct sediment delivery to nearby streams and long-term improved watershed condition and aquatic habitat. The culvert upgrade on the Little Blackfoot River would improve passage up through Ontario Creek, and culvert upgrades on the 1801 and 4101 would

improve aquatic organism passage on approximately 3 miles of Monarch Creek. Project-specific design features (see the Design Features section of chapter 2 of the FEIS) and conservation measures through the Section 7 consultation would minimize some of these short-term adverse impacts to fisheries and their habitat.

Indirect Effects

As mentioned previously, road decommissioning objectives are to reduce erosion from road surfaces and slopes and related sedimentation into streams and restore natural surface and subsurface of drainage patterns and site productivity. With the proximity of these roads to stream channels, indirect effects include measurable downstream sediment delivery to aquatic habitat in the short term, with long term improved channel stability and reduction of chronic sediment delivery to nearby waterways. This would likely improve the quality of pool habitat for rearing and/or overwintering salmonids and overall water quality. Alternatives 3 and 4 involve the obliteration of a section of route 123 that crosses the Little Blackfoot River floodplain. This segment of road acts as a dam on a wide section of floodplain and complex stream channel, and is a chronic source of sediment to the Little Blackfoot River. The long-term indirect benefits of this road relocation to aquatic resources would include restoring floodplain and channel connectivity and processes at a wide, active, and complex reach of the Little Blackfoot River. Eliminating three stream crossing structures on the Little Blackfoot River and one on Ontario Creek would remove a chronic source of fine sediment from a sediment-impaired stream.

Effects Unique to Alternative 4

Direct and indirect effects under alternative 4 would be very similar to alternative 3 except for direct effects associated with additional culvert upgrades and two hardened fords on MT 123-001. There is also an increase in regeneration harvest units; however, the project water yield increases only range from less than 1 to 2 percent with no significant cumulative water yield increases or water quality effects (Hydrology Report, table 7). Sedimentation from treatment units increases slightly within Mike Renig Gulch and Ontario subwatersheds, but there are decreases in sedimentation in both Telegraph and Little Blackfoot-Hat Creek subwatersheds (Hydrology Report, table 9). With this modeling data and project design features (see Design Features section in chapter 2), there are no additional direct or indirect effects to fisheries with the additional proposed harvest units under alternative 4.

Cumulative Effects

There would be no cumulative effects that are completely unique to alternatives 3 and 4. Refer to the cumulative effects section for all action alternatives.

Determination of Effects

Alternative 1

As the no-action alternative, there would be no proposed timber harvest, prescribed fire activities, road decommissioning and improvements. Therefore, there is no mechanism for direct or indirect effects, and no contribution to cumulative effects on Endangered Species Act listed fish species and their designated critical habitat and Forest Service Region 1 sensitive fish, aquatic invertebrates and their habitat. Therefore, there would be no effect to proposed, endangered, and threatened fish species and Deisgnated Critical Habitat and no impact to sensitive fish and aquatic invertebrate species and their habitat.

Columbia River Bull Trout and Designated Critical Habitat

All Action Alternatives (2, 3, and 4)

The action alternatives do not differ substantially in sedimentation effects from proposed harvest units or cumulative water yield increases and due to project design features and best management practices, there would be no mechanism to negatively impact riparian management objectives. The reduction of sediment delivery to streams from road improvements is similar under all alternatives with significant reductions compared to existing conditions. The reduction in sediment delivery from road treatments with ongoing road maintenance and decommissioning efforts of high risk roads within riparian areas would have long-term improvements to water quality, instream habitat, and floodplain function. Although project mitigation measures would lessen impacts to bull trout, there would be short-term, isolated increases in sediment delivery with road decommissioning efforts that are adjacent to stream channels and instream work, refer to turbidity effects and monitoring in the Direct Effects analysis. This would include culvert replacements on Monarch Creek (NFS Roads 4100 and 4104, 1801), Ontario Creek (MT 123-001, and NFS Road 495-D1) and the bridge replacement on the Little Blackfoot (NFS Road 4100, lower crossing on MT 123-001) along with the reconstruction of NFS Road 4100, reroute to NFS Road 123 and subsequent obliteration of NFS Roads 123, 123-017, and 018. Although short-term adverse effects would occur, there would be long-term watershed benefits with improved passage for bull trout and an increase in spawning and rearing habitat within this section of the Little Blackfoot River, and Ontario and Monarch Creeks. Although there are long-term watershed benefits with road improvements, passage upgrades and ongoing and proposed mine reclamation activities within the analysis area, for the reasons stated above, and considering the cumulative effects with mine reclamation and degraded baseline conditions in some drainages, the implementation of the Telegraph Project under the proposed action alternatives **'May Affect, and Likely to Adversely Affect'** Columbia River bull trout The project is consistent with the Forest Plan as amended by INFISH; the proposed project activity will not further affect viability of the Blackfoot River Core Population, on the Helena-Lewis and Clark National Forest.

The final rule for the revised designation of bull trout critical habitat (USFWS 2010) removed all of the Little Blackfoot River drainage as bull trout critical habitat. Because there is no bull trout critical habitat in the Little Blackfoot River drainage, bull trout critical habitat would not be affected by the project. Therefore, the call is **No Effect** for bull trout critical habitat.

Westslope Cutthroat Trout

All Action Alternatives (2, 3, and 4)

Proposed actions such as road decommissioning, and culvert upgrades could have measurable short-term increases of sediment and direct adverse effects to WCT, refer to turbidity effects and monitoring under the Direct Effects Analysis. This work would include culvert replacements on tributaries to Mike Renig (NFS Road 1856), Mary Ann Creek (NFS Road 123), Monarch Creek (NFS Roads 1801 and 4104) Clemmer Gulch (NFS Road 495) and Ontario Creek (MT 123-001, NFSR 195-D1). The bridge replacement on the Little Blackfoot River (NFS Road 4100) with the associated reconstruction of NFS Road 4100, reroute to NFS Road 123 and subsequent obliteration of NFS Roads 123, 123-017 and 018 would also have adverse isolated impacts on WCT. As stated earlier, these activities, along with additional road decommissioning proposed within riparian areas (Table 309) would have long-term watershed and aquatic habitat benefits, with improved passage and stream connectivity. Although project design features and mitigations would lessen impacts to WCT and have long-term watershed improvements, considering the proposed instream work and

cumulative effects of ongoing mine reclamation, the proposed action alternatives **May Impact Individuals and habitat but, is not likely to result in a trend toward Federal listing, and continued viability** is expected on the Helena-Lewis and Clark National Forests.

Western Pearl Mussel

All Action Alternatives (2, 3, and 4)

The more recent survey efforts by the Montana Natural Heritage Program (Stagliano 2015) did not detect western pearlshell mussel in the Little Blackfoot River of the analysis area. The closest detection was in Elliston Creek downstream of the project area, and past survey efforts have observed western pearlshell mussel in the lower reaches of the Little Blackfoot River well below the analysis area. Reasons for their decline and shrinking distribution include stream habitat degradation, and habitat fragmentation from water diversions and stream channelization. A decline in host fish species such as the WCT, and water quality issues (point and nonpoint pollution) also play a role. Due to project design features, the distance of occupied habitat from the actual project area, and limited effects to stream channels within the project area, the implementation of the project would have **No Impacts** to western pearlshell mussel or its habitat.

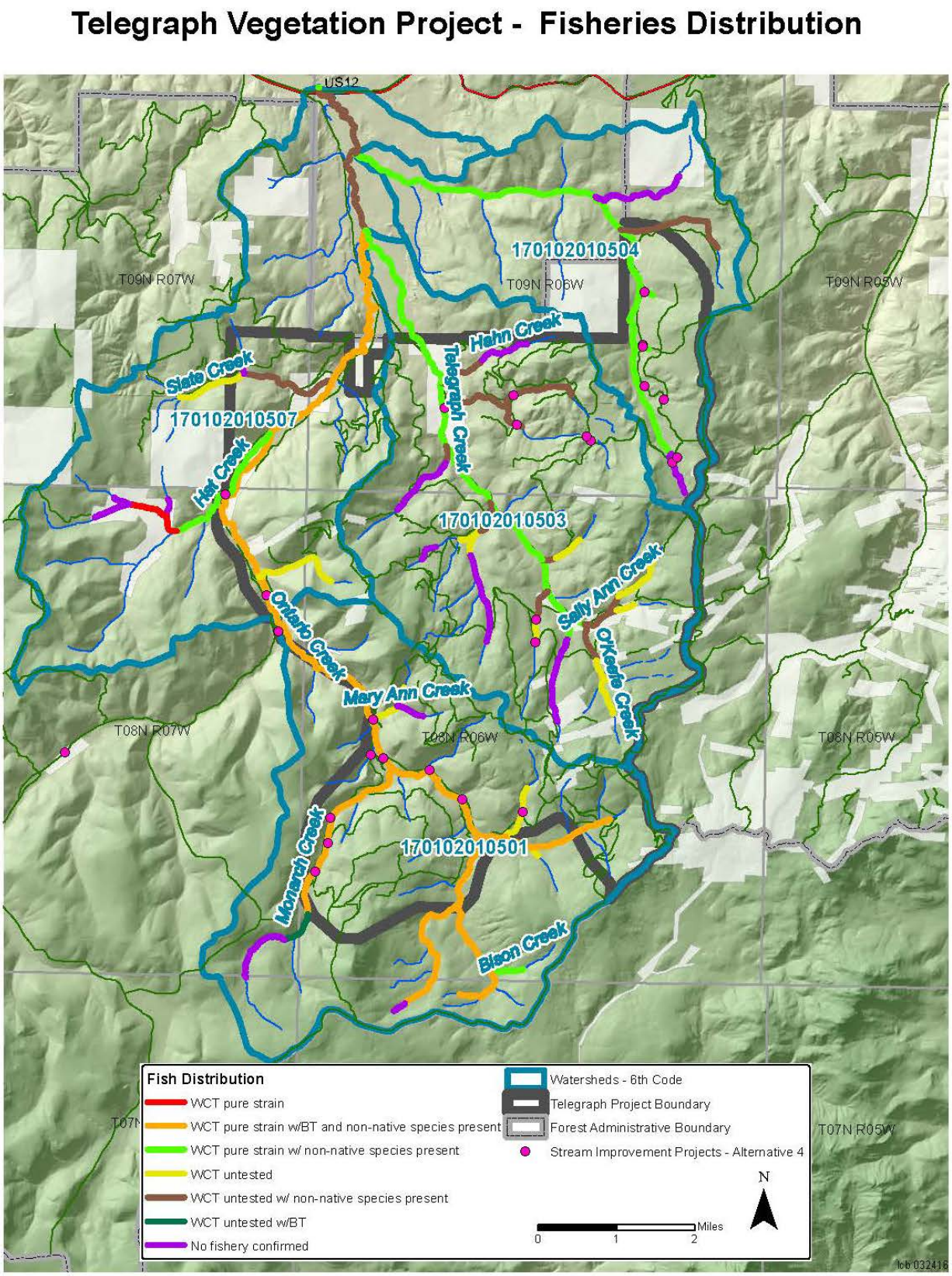

Figure 136. Telegraph Vegetation Project fisheries distribution

Transportation

Introduction

This section summarizes the analysis and effects to the transportation resources within the project area boundary, as well as access corridors that provide connection to Montana Highway 12.

The measurement indicators for this resource are: miles of road that would be used as haul roads, miles of road reconstruction, miles of specified road construction, miles of road maintenance, miles of new temporary road construction, and a summary of stream crossing improvements.

Assumptions

Detailed road condition surveys have not been conducted recently, so identified work associated with using roads for haul is based on a preliminary site visit by the transportation specialist in 2012.

The road network is analyzed beginning with the intersection at Montana Highway 12.

Information Used

The available forest transportation atlas, including spatial GIS and tabular Infra infrastructure data, has been used for summarization and analysis of the transportation system.

A roads sediment survey was performed for the project analysis. Roads within the area were surveyed in detail; sites where sediment was being transported to stream channels were evaluated and located with GPS (Global Positioning System) units. Parameters measured at the sites were those required by the Water Erosion Prediction Project (WEPP): Road model. Data included road design, dimensions, gradient, surface material, buffer dimensions, and overall disturbance width and length. The survey focused on Forest Service-owned roads in the watersheds. Not all Forest Service roads were surveyed.

A culvert survey was completed for the project analysis. Culverts within the area were surveyed in detail by Forest Service personnel, in accordance with the guidelines contained in the *National Inventory and Assessment Procedure-For Identifying Barriers to Aquatic Organism Passage at Road-Stream Crossings* (Clarkin et al. 2005).

A field review was conducted by the transportation specialist in July 2012. Field notes and photographs were gathered. This information was used to categorize necessary work (reconstruction or maintenance) on existing haul routes.

Methodology and Scientific Accuracy

The transportation system was analyzed using transportation data from the sources listed above. This data was used to evaluate the effects of each alternative (alternatives 1, 2, 3, and 4). The alternatives and their effects were analyzed using the following measurement indicators:

- miles of road that would be maintained or reconstructed,
- miles of roads used as haul roads,
- miles of new temporary road construction,
- qualitative discussion of stream crossing improvements.

These mileage calculations were completed using the forest transportation atlas, including linked available GIS spatial and Infra tabular data.

Transportation, Affected Environment

Introduction

This section describes the transportation system within the project area. Information included in this section is from the 2009 field investigation performed by the HNF, as well as the 2012 transportation specialist field visit.

Analysis Area

The forest transportation system is a site-specific feature on the land and effects to this resource are localized. As a result, the project area is used as the geographic boundary for direct, indirect and cumulative effects to the transportation resource. In addition, haul roads that extend outside the project boundary are included in the analysis. Figure 136 shows the existing forest transportation system within the Project area.

Temporally, the Project implementation is expected to last up to 10 years. Therefore, 0 to 10 years is considered “short term” in this analysis, and 10+ years is considered “long term”.

Existing Forest Transportation System

In the project area, the transportation system has traditionally been used to provide access for utilization of public and private lands, including mining, timber management, fuels treatment, and recreation.

There are approximately 123.6 miles of existing roads located in the project area. Most of these are under the jurisdiction of the Forest Service (112.3 miles), and there are also roads under private jurisdiction (7.2 miles) as well as county jurisdiction (4.1 miles). A majority of roads under Forest Service jurisdiction (110.7 miles) are managed as National Forest System (NFS) roads, while the others are considered unauthorized routes. A summary of NFS roads within the project area is provided in Table 310.

Table 310. National Forest System Roads within the project area

Operational Maintenance Level	Miles
4 – Moderate Degree of User Comfort	2.9
3 – Suitable for Passenger Cars	34.4
2 – High Clearance Vehicles	30.3
1 – Basic Custodial Care (Closed)	43.1
TOTAL	110.7

Another 7.3 miles of road are located outside the project boundary yet provide access to the area from Montana Highway 12. These roads will also be included in the analysis when associated with the action alternatives. The majority of these access roads are county (4.5 miles), and the remainder are NFS roads (2.8 miles).

Forest Road 227 serves as the primary access route to the project area. This road begins at Montana Highway 12, and is paved to the intersection with Forest Road 495. South of this intersection the road is surfaced with crushed rock. There are several residences located on this road, north of the

proposed vegetation treatments. This road is under Powell County jurisdiction to the boundary of NFS land. South of this boundary, the road is primarily under Forest Service jurisdiction, and continues on to provide access to the west portion of the Telegraph Vegetation Project. Associated with two segments where the road crosses private land inholdings, the road is under county jurisdiction.

Forest Road 495 intersects FR 227 and provides the access to the central and eastern portions of the project area. This road is also surfaced with crushed rock. There are residences located on this road adjacent to the northern project area boundary. Forest Road 495 is under Powell County jurisdiction to the intersection with NFS Road 1857-B2. South of this point the road is managed by the Forest Service as NFS Road 495.

The majority of additional roads providing access to the project area are lower standard NFS roads, with the exception of two segments of Forest Road 1857-B1 that cross private land. These segments are under county jurisdiction. There are also several segments of road under private jurisdiction within the project area, also associated with private inholdings.

National Forest System roads have been maintained over time as time and funding allowed. Past timber management provided for road improvements and maintenance to support timber product removal. In addition, other supplemental funding programs (including FS Legacy Roads and Trails, American Recovery and Reinvestment Act) were utilized in the last 5 years to improve roads in the Hahn Creek, Telegraph Creek, and Little Blackfoot River watersheds. Drainage and crossing improvements were completed on NFS Roads 277, 495, 527, 1856, and 1857.

In addition to the above-mentioned Regulatory Framework, the Helena National Forest Roads Analysis (USDA 2004) also provides direction for management of the forest transportation system. Implementation of the recommendations in this report has led to the existing travel management direction.

Figure 136 shows location of existing roads existing condition.

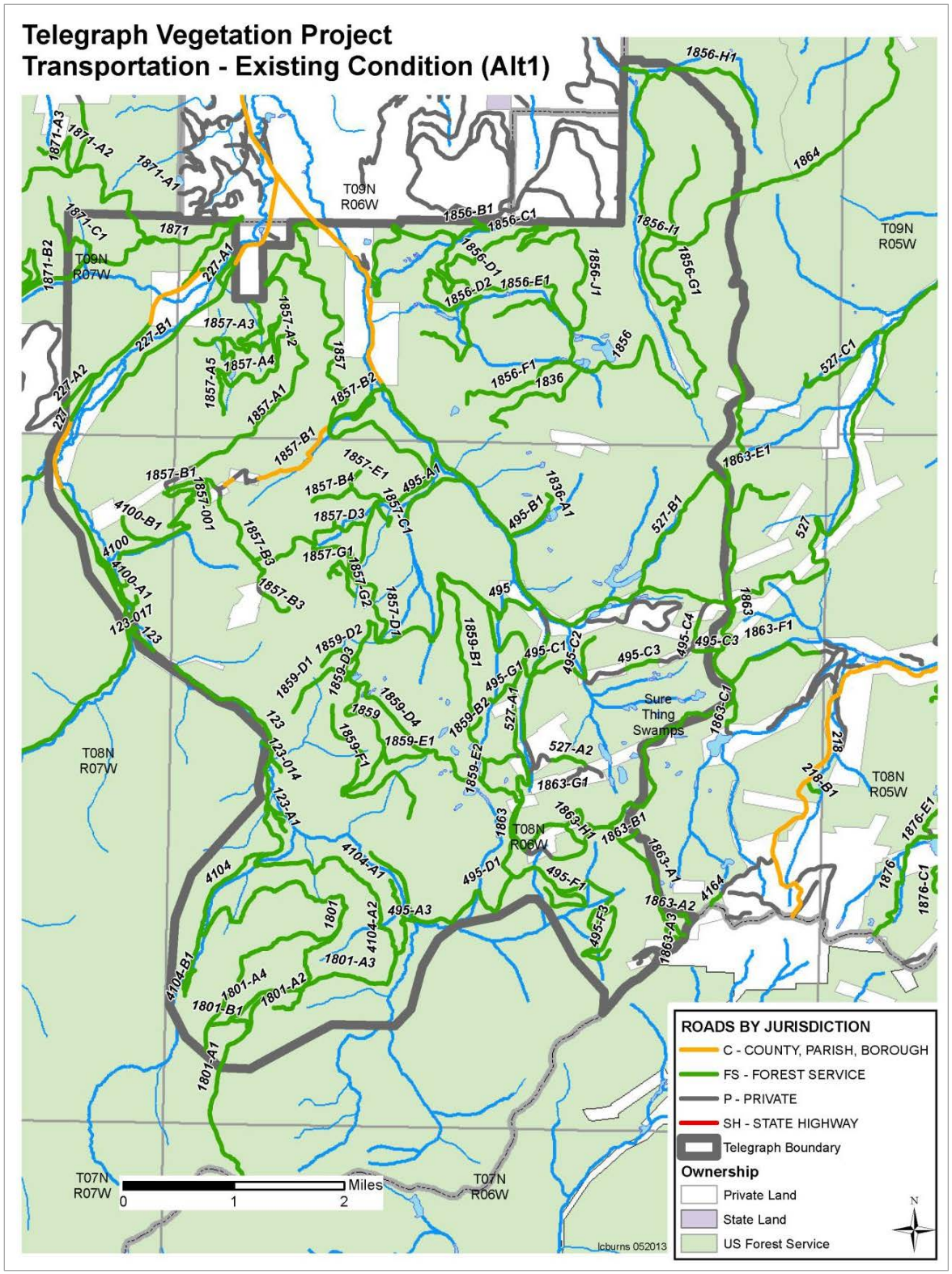

Figure 137. Existing roads in the Telegraph Project Area

Road Network Infrastructure

The existing road network has several road/stream crossings. A culvert analysis was completed for all culverts in the project area that were surveyed by HNF hydrology staff. Of the 53 culverts in the project area, 19 had inadequate capacity to convey runoff from the 25-year design storm event (a rainfall event with a 4 percent chance of occurrence in any given year), and 35 had inadequate capacity for the 100-year design storm event (a rainfall event with a 1 percent chance of occurrence in any given year). Some of these culverts also present unnatural barriers to fish passage (see *Telegraph Fisheries Resource Report*). Four of the undersized culverts in the Telegraph Creek watershed and one of the undersized culverts in the Ontario Creek watershed were replaced as part of recent road maintenance projects. These culvert crossings contain more than 32,300 cubic yards of sediment that would be at risk of entrainment in the event of catastrophic culvert failure. Additional culverts were replaced as part of HNF maintenance projects, but survey data was not available so they were not analyzed for capacity.

Other infrastructure associated with the road system includes drainage ditches, culvert inlet and outlet headwalls, cattle guards, and gates on closed roads.

Transportation, Environmental Consequences

Effects Common to All Alternatives

Higher standard roads such as FR 495 and FR 227 would continue to receive annual maintenance as time and funding allows.

Effects Common to All Action Alternatives

Truck traffic would increase during the project period, which would have a minor adverse effect on public usage. Truck traffic effects would include temporary delays on the road and temporary road closures. The increase in heavy truck traffic on roads would have a minor effect on use of the area by the public while heavy truck traffic is present due to short delays. Further effects are discussed in the Telegraph Recreation Resource Report.

Increases in sedimentation caused by erosion and dust on haul routes would be short term (0 to 10 years), and maintenance and improvements to the road system would provide long-term (10+ years) benefits to the transportation system.

Haul roads for product removal from proposed vegetation units are identified for the action alternatives. Where applicable, necessary road work for each haul road is identified, and categorized as maintenance or reconstruction

Road maintenance is used to keep the road at an acceptable level that meets BMP standards and allows for safe timber haul. Typical road maintenance activities would include surface blading, vegetation removal, minor slump repair, and drainage structure cleaning and/or installation. Road maintenance would occur prior to, during, or after haul.

Road reconstruction is used to bring the road up to an acceptable level, in order to meet BMP standards and allow for safe timber haul. In addition to basic maintenance activities (listed above), reconstruction would also involve more significant roadway improvements, realignment, curve widening, or subgrade boulder or cobble excavation and removal. Reconstruction would occur prior to haul.

Site-specific tasks for each haul road will be determined during implementation, within the general scope of activities identified above.

In addition to existing roads, temporary roads are also proposed for each action alternative. These roads will be improved or constructed to a minimal standard in order to provide access for harvesting equipment and log trucks. These roads are improved to a minimal standard for short-term project use, and then closed and rehabilitated (decommissioned) following harvest activities. Telegraph Vegetation Project temporary roads will be decommissioned by obliteration, including: re-contouring (returning the prism to natural contour), removing culverts, replacing topsoil, placing woody debris upon the disturbed area to provide stability, and seeding the disturbed area.

Alternative 1 – No Action

If alternative 1 is chosen, no vegetation treatments would occur, there would be no road improvements or regular road maintenance, and no new temporary roads would be constructed.

Direct and Indirect Effects

There is no proposed road work associated with this alternative. The mileage of road would continue to be the same and no new temporary roads would be constructed. Higher standard roads such as FR 495 and FR 227 would continue to receive annual maintenance as time and funding allows.

Road management would not change as part of the no action alternative. Ongoing closures would remain the same and no new road closures would be implemented.

Irreversible and Irretrievable Commitments

There are no irreversible and irretrievable commitments associated with this alternative.

Cumulative Effects

Cumulative effects are the effects of past activities added with the effects of proposed actions. Since there are no activities proposed under alternative 1, there are no cumulative effects related to alternative 1. Present, ongoing, and foreseeable activities would continue to affect road conditions

Alternative 2 – Proposed Action

Approximately 6,754 acres of vegetation treatments are proposed under alternative 2. Haul roads and temporary roads would be used to provide access to vegetation treatment units and facilitate the removal of logs.

Direct and Indirect Effects

Haul Roads

There are approximately 84.2 miles of haul roads identified for implementing vegetation treatments proposed in Alternative 2. Of these routes, approximately 43 miles are identified for maintenance, and another 32.6 miles are identified for reconstruction. Another 8.5 miles of temporary roads are also proposed under this alternative.

Roads identified for use as haul roads that are not under Forest Service jurisdiction would require coordination with the landowner prior to work taking place on the ground, as well as prior to haul. Roads under county jurisdiction would continue be maintained by the County

Roadside hazard trees would be mitigated as necessary to provide for safe timber haul.

Stream crossing structures, including bridges with posted load-restrictions where NFS Road 495 crosses Jericho Creek and NFS Road 123 crosses Ontario Creek, would be evaluated by the Forest Engineer prior to hauling 40-ton loads across. Necessary mitigation measures would be in place prior to overloading.

Table 311 summarizes the mileage of roads identified as haul roads in alternative 2.

Table 311. Haul road work summary - alternative 2

Type of Work	Miles
Maintenance	43.1
Reconstruction	32.6
Temporary Road Construction	8.5
HAUL ROAD TOTAL	84.1

* Due to rounding, the rounded numbers in table do not add up exactly to 84.1

Stream Crossing Improvements

To improve watershed conditions, reduce sedimentation, increase sizing to accommodate 100-year flow events, and/or provide for aquatic organism passage, a number of road stream crossings would be improved in the project area (Table 312). These sites would be improved as time and funding permits, and those required prior to implementation of the vegetation treatments and log haul are listed below.

Table 312. Alternative 2 stream crossing improvements

Road	Stream	Existing Structure	Summary of Work	Required Per BMP
NFSR 123	Mary Ann Creek	1.8-foot X 2.5-foot metal pipe arch (28-foot length)	Replace culvert. Surface roadway above structure.	Yes
NFSR 123	Little Blackfoot River tributary	4-foot circular metal culvert (41-foot length)	Armor roadway with riprap along upstream fill slope between culvert and Little Blackfoot River bridge. Armor inlet and outlet w/ riprap.	No
NFSR 1856	Mike Rennig Gulch tributary	1.5-foot circular metal pipe (23-foot length)	Remove damaged culvert; replace with rock ford.	Yes
NFSR 1856	Mike Rennig Gulch tributary	1.5-foot circular metal pipe (25-foot length)	Remove non-functional culvert; replace with rock ford.	Yes
NFSR 495	Clemmer Gulch (lower crossing)	1.5-foot circular metal culvert (25-foot length)	Replace culvert.	Yes
NFSR 495	Clemmer Gulch (upper crossing)	2-foot circular metal culvert (41-foot length)	Replace culvert.	Yes

Figure 137 shows location of the haul roads and proposed road work for alternative 2.

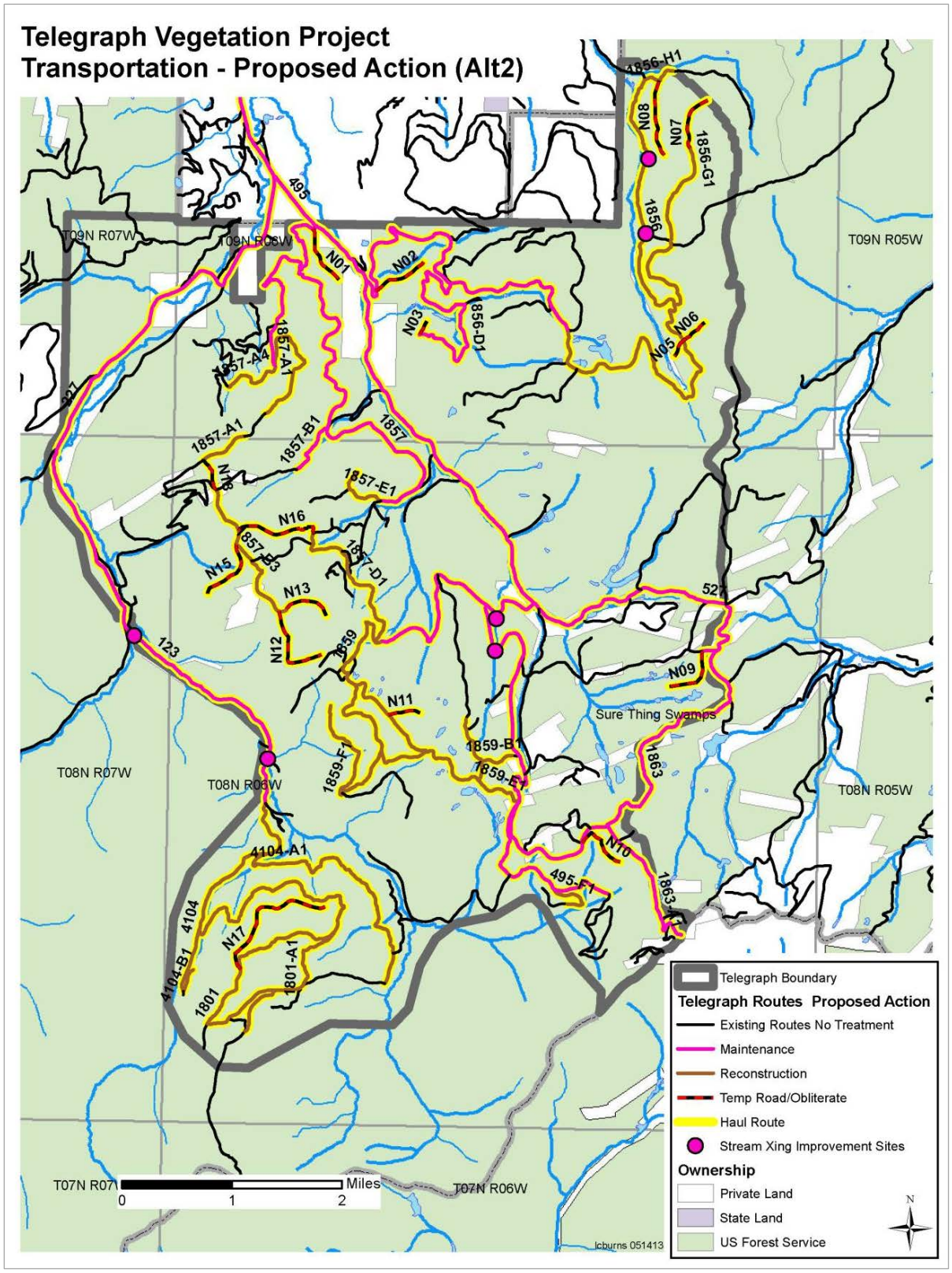

Figure 138. Haul roads and proposed road work, alternative 2

Irreversible and Irretrievable Commitments

There are no irreversible and irretrievable commitments associated with transportation under this alternative.

Cumulative Effects

Under alternative 2, maintenance and improvements to the road system occurring as part of the Telegraph Vegetation Project, when coupled with reasonably foreseeable road maintenance and improvement activities, would result in long-term beneficial cumulative effects such as reduced road surface erosion, improved functionality of the roads, and extended road life. Roads would also be safer for use, since roadside hazard trees would be mitigated. Telegraph Vegetation Project alternatives would not change roads open to public use, though changes to the forest transportation system could occur under the North Divide Travel Planning effort. Past, ongoing, and reasonably foreseeable projects have been described and considered in appendix A of the Transortation Specialist Report.

Alternative 3

Alternative 3 was developed based on internal and external resource issues that were identified through scoping. Transportation-related key issues that drove the development of this alternative included minimizing temporary road construction.

Approximately 4,185 acres of vegetation treatments are proposed under alternative 3. These treatments would generate logs and would have haul roads provide for access and product removal.

Direct and Indirect Effects

Haul Roads

There are approximately 74.6 miles of haul roads identified for implementing vegetation treatments proposed in Alternative 3. Of these routes, just under 43 miles are identified for maintenance, and another 28.3 miles are identified for reconstruction. Approximately 3.4 miles of temporary roads are also proposed under this alternative.

Roadside hazard trees would be mitigated as necessary to provide for safe timber haul.

Roads identified for use as haul roads that are not under Forest Service jurisdiction would require coordination with the landowner or County prior to work taking place on the ground, as well as prior to haul.

Stream crossing structures, including bridges with posted load-restrictions where NFS Road 495 crosses Jericho Creek and NFS Road 123 crosses Ontario Creek, would be evaluated by the Forest Engineer prior to hauling 40-ton loads across. Necessary mitigation measures would be in place prior to overloading.

Table 313 summarizes the mileage of roads identified as haul roads in alternative 3.

Table 313. Haul road work summary - alternative 3

Type of Work	Miles
Maintenance	41.8
Reconstruction	28.7
Temporary Road Construction	3.4
HAUL ROAD TOTAL	74.6

Stream Crossing Improvements

To improve watershed conditions, reduce sedimentation, increase sizing to accommodate 100-year flow events, and/or provide for aquatic organism passage, a number of road stream crossings would be improved in the project area (Table 314). Some sites would be improved as time and funding permits, and those required prior to implementation of the vegetation treatments and log haul are listed below.

Associated with replacing individual crossing structures, more substantial road reconstruction would also occur near the west end of NFSR 123. An existing ford located where NFSR 4100 crosses the Little Blackfoot River would be replaced with a bridge, and then NFSR 123 would be relocated to use this crossing and follow a newly constructed roadway along the east side of the Little Blackfoot River and Ontario Creek, rejoining the current alignment east of the existing Ontario Creek crossing. From the intersection with NFSR 227, the first 0.6 mile of NFSR 123 would be decommissioned – including crossing removal and roadway rehabilitation.

Table 314. Alternative 3 stream crossing improvements

Road	Stream	Existing Structure	Summary of Work	Required Per BMP
NFSR 123	Mary Ann Creek	1.8-foot X 2.5-foot metal pipe arch (28-foot length)	Replace culvert. Surface roadway above structure.	yes
NFSR 123	Little Blackfoot River tributary	4-foot circular metal culvert (41-foot length)	Road will be relocated (see NFSR 4100 below). Decommission the westernmost 0.6 miles of NFSR 123, including removal and rehabilitating the Little Blackfoot River tributary crossing, as well as removing the Ontario Creek bridge.	no
NFSR 1801	Monarch Creek	6-foot X 4.7-foot metal pipe arch	Replace culvert with new structure to accommodate aquatic organism passage.	no
NFSR 1856	Mike Rennig Gulch tributary (southern site)	1.5-foot circular metal pipe (23-foot length)	Remove damaged culvert; replace with rock ford.	yes
NFSR 1856	Mike Rennig Gulch tributary (northern site)	1.5-foot circular metal pipe (25-foot length)	Remove non-functional culvert; replace with rock ford.	yes
NFSR 4100	Little Blackfoot River	Ford	Upgrade crossing to bridge. Relocate a segment of NFSR 123 to utilize this improved crossing, and reconnect with the existing NFSR 123 alignment east of the existing Ontario Creek bridge.	no

Road	Stream	Existing Structure	Summary of Work	Required Per BMP
NFSR 4104	Monarch Creek	4-foot X 5.5-foot metal pipe arch	Replace culvert with new structure to accommodate aquatic organism passage.	no
NFSR 495	Clemmer Gulch (lower crossing)	1.5-foot circular metal culvert (25-foot length)	Replace culvert.	yes
NFSR 495	Clemmer Gulch (upper crossing)	2-foot circular metal culvert (41-foot length)	Replace culvert.	yes

Figure 138 and Figure 139 show the location of the haul roads and proposed road work for alternative 3.

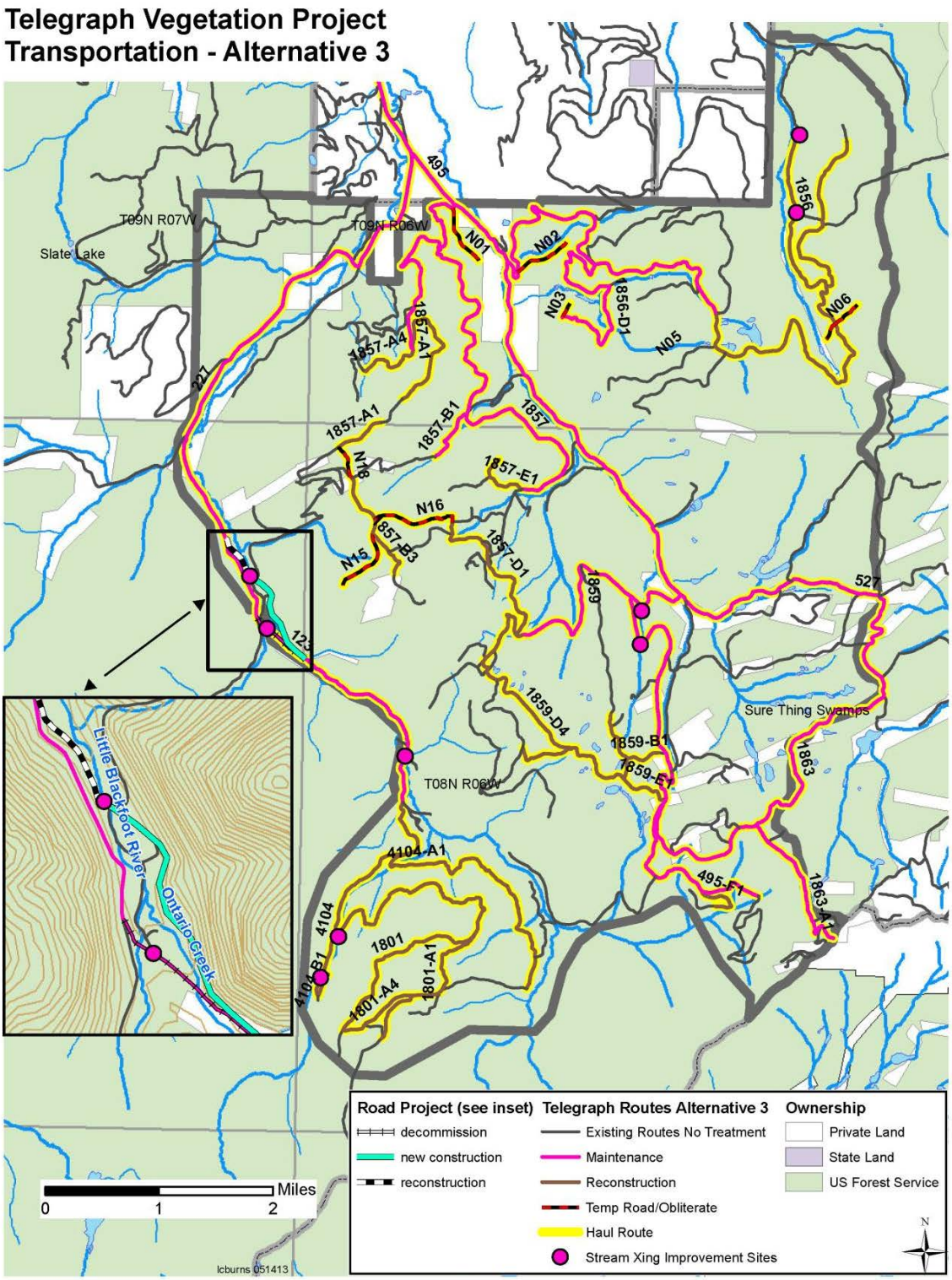

Figure 139. Haul roads and proposed road work, alternative 3

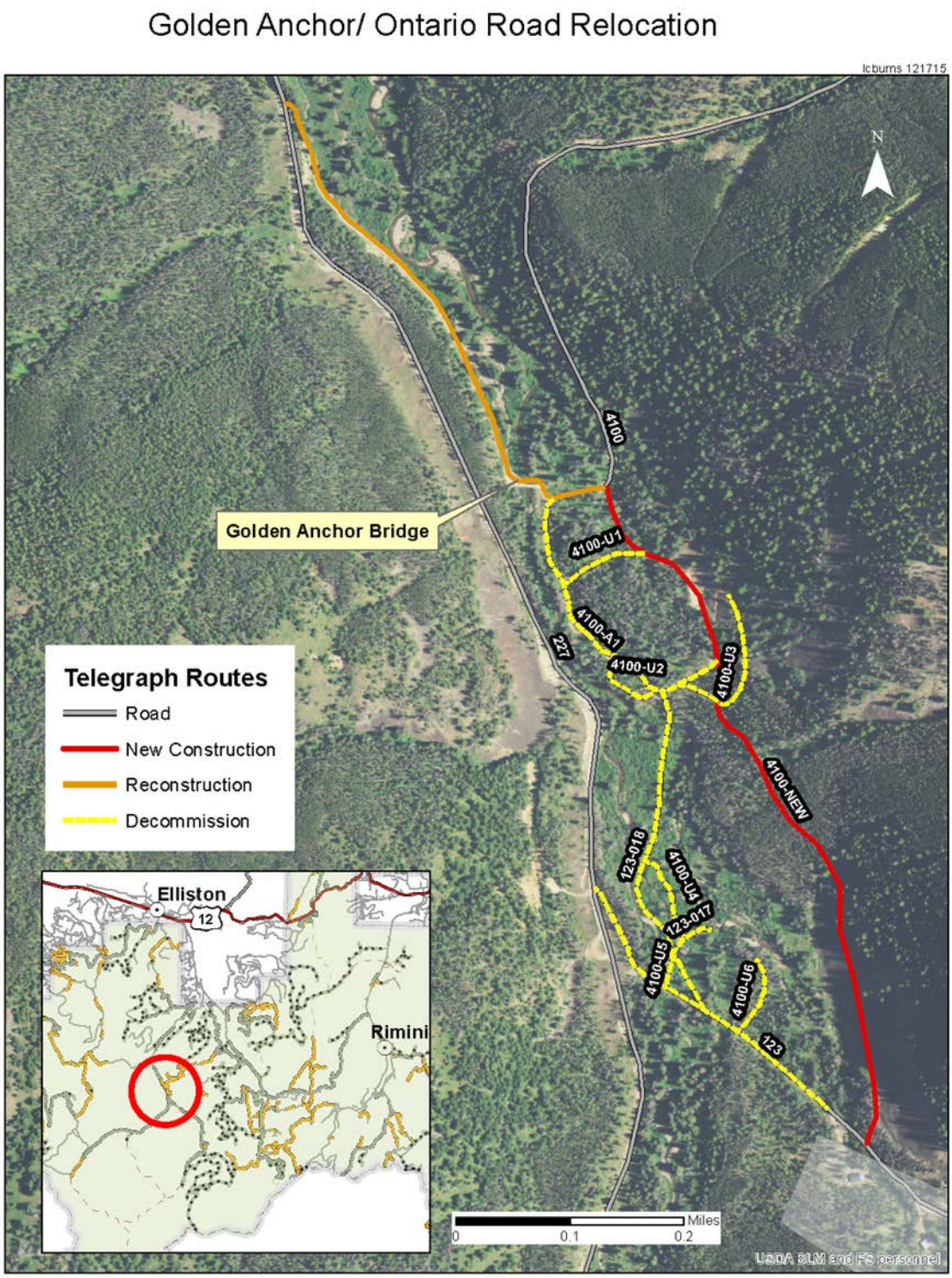

Figure 140. Golden Anchor Road relocation map

Irreversible and Irretrievable Commitments

There are no irreversible and irretrievable commitments associated with this alternative.

Cumulative Effects

Under alternative 3, maintenance and improvements to the road system occurring as part of the Telegraph Vegetation Project, when coupled with reasonably foreseeable road maintenance and improvement activities, would result in long-term beneficial cumulative effects such as reduced road surface erosion, improved functionality of the roads, and extended road life. Roads would also be safer for use, since roadside hazard trees would be mitigated. Besides the relocation of NFS Road 123, Telegraph Vegetation Project alternatives would not change roads open to public use. The North Divide Travel Plan could result in changes to the transportation system.

Alternative 4

Alternative 4 was developed based on public comments and cooperation during the DEIS comment period, and further ground truthing by specialists.

Approximately 8,103 acres of vegetation treatments are proposed under alternative 4. These treatments would generate logs and would have haul roads provide for access and product removal.

Direct and Indirect Effects

Haul Roads

There are approximately 89.3 miles of haul roads identified for implementing vegetation treatments proposed in alternative 4. Of these routes, just over 43 miles are identified for maintenance, and another 35.8 miles are identified for reconstruction. Approximately 9.7 miles of temporary roads are also proposed under this alternative. Temporary road N23 would have a temporary bridge installed for haul, and then removed post-haul, providing access to Unit 172A. Another 0.7 mile of specified road construction would also be included.

Roadside hazard trees would be mitigated as necessary to provide for safe timber haul.

Roads identified for use as haul roads that are not under Forest Service jurisdiction would require coordination with the landowner or County prior to work taking place on the ground, as well as prior to haul.

Stream crossing structures, including bridges with posted load-restrictions where NFS Road 495 crosses Jericho Creek and NFS Road 123 crosses Ontario Creek, would be evaluated by the Forest Engineer prior to hauling 40-ton loads across. Necessary mitigation measures would be in place prior to overloading.

Table 315 summarizes the mileage of roads identified as haul roads in alternative 4.

Table 315. Haul road work summary, alternative 4

Type of Work	Miles
Maintenance	43.1
Reconstruction	35.8
Temporary Road Construction	9.7
Specified Road Construction	0.7
HAUL ROAD TOTAL	89.3

Stream Crossing Improvements

To improve watershed conditions, reduce sedimentation, increase sizing to accommodate 100-year flow events, and/or provide for aquatic organism passage, a number of road stream crossings would be improved in the project area (Table 316). Some sites would be improved as time and funding permits, and those required prior to implementation of the vegetation treatments and log haul are listed below.

Associated with replacing individual crossing structures, more substantial road reconstruction would also occur near the west end of NFSR 123. An existing ford located where NFSR 4100 crosses the Little Blackfoot River would be replaced with a bridge, and then NFSR 123 would be relocated to use this crossing and follow a newly constructed roadway along the east side of the Little Blackfoot River and Ontario Creek, rejoining the current alignment east of the existing Ontario Creek crossing. From the intersection with NFSR 227, the first 0.6 mile of NFSR 123 would be decommissioned – including crossing removal and roadway rehabilitation.

Table 316. Alternative 4 stream crossing improvements

Road	Stream	Existing Structure	Summary of Work	Required per BMP
NFSR 123	Mary Ann Creek	1.8-foot X 2.5-foot metal pipe arch (28-foot length)	Replace culvert. Surface roadway above structure.	yes
NFSR 123	Little Blackfoot River tributary	4-foot circular metal culvert (41-foot length)	Road will be relocated (see NSFR 4100 below). Decommission the westernmost 0.6 miles of NSFR 123, including removal and rehabilitating the Little Blackfoot River tributary crossing.	no
NFSR 495	Clemmer Gulch (lower crossing)	1.5-foot circular metal culvert (25-foot length)	Replace culvert.	yes
NFSR 495	Clemmer Gulch (upper crossing)	2-foot circular metal culvert (41-foot length)	Replace culvert.	yes
NFSR 1801	Monarch Creek	6-foot X 4.7-foot metal pipe arch	Replace culvert with new structure to accommodate aquatic organism passage.	no
NFSR 1856	Mike Renig Gulch tributary (southern site)	1.5-foot circular metal pipe (23-foot length)	Remove damaged culvert; replace with rock ford.	yes
NFSR 1856	Mike Renig Gulch tributary (northern site)	1.5-foot circular metal pipe (25-foot length)	Remove non-functional culvert; replace with rock ford.	yes

Road	Stream	Existing Structure	Summary of Work	Required per BMP
NFSR 4100	Little Blackfoot River	Ford	Upgrade crossing to bridge. Relocate a segment of NFSR 123 to utilize this improved crossing, and reconnect with the existing NFSR 123 alignment east of the existing Ontario Creek bridge.	No
NFSR 4104	Monarch Creek	4-foot X 5.5-foot metal pipe arch	Replace culvert with new structure to accommodate aquatic organism passage.	No
NFSR 1856	Mike Renig Gulch	1.5-foot circular metal pipe (36.5-foot length)	Replace culvert.	Yes
NFSR 1856	Mike Renig Gulch tributary	1.5-foot circular metal pipe (23-foot length)	Replace culvert.	Yes
NFSR 1856	Mike Renig Gulch tributary	1.5-foot circular metal pipe (28-foot length)	Replace culvert.	Yes
NFSR 1856	Mike Renig Gulch tributary	1.5-foot circular metal pipe (24-foot length)	Replace culvert.	Yes
NFSR 1856	Mike Renig Gulch tributary	1.5-foot circular metal pipe (23-foot length)	Replace culvert.	Yes
NFSR 4104	Monarch Creek tributary	1.5-foot circular metal pipe (16-foot length)	Replace culvert.	Yes
NFSR 4104	Ontario Creek tributary	1.5-foot circular metal pipe (15.5-foot length)	Replace culvert.	Yes
NFSR 1856	Telegraph Creek tributary	1.5-foot circular metal pipe (45-foot length)	Replace culvert.	Yes
NFSR 1856	Telegraph Creek tributary	2-foot circular metal pipe (50-foot length)	Replace culvert.	Yes
NFSR 1856-D1	Flume Gulch tributary	2-foot circular metal pipe (30-foot length)	Replace culvert with pipe arch.	Yes
NFSR 1856-D1	Flume Gulch	1.5-foot circular metal pipe (45-foot length)	Replace culvert with pipe arch.	Yes
MT 123-001	Ontario Creek	Ford	Improve crossing following field evaluation and consultation with MT FWP and USFWS to ensure continued aquatic organism passage.	No
MT 123-001	Ontario Creek tributary	Ford	Upgrade to hardened rock ford.	No
MT 123-001	Ontario Creek tributary	Ford	Upgrade to hardened rock ford.	No
NFSR 495-D1	Ontario Creek tributary	Ford	Improve crossing following field evaluation and consultation with MT FWP and USFWS to ensure continued aquatic organism passage.	No

Figure 139 and Figure 140 show the location of the haul roads and proposed road work for alternative 4.

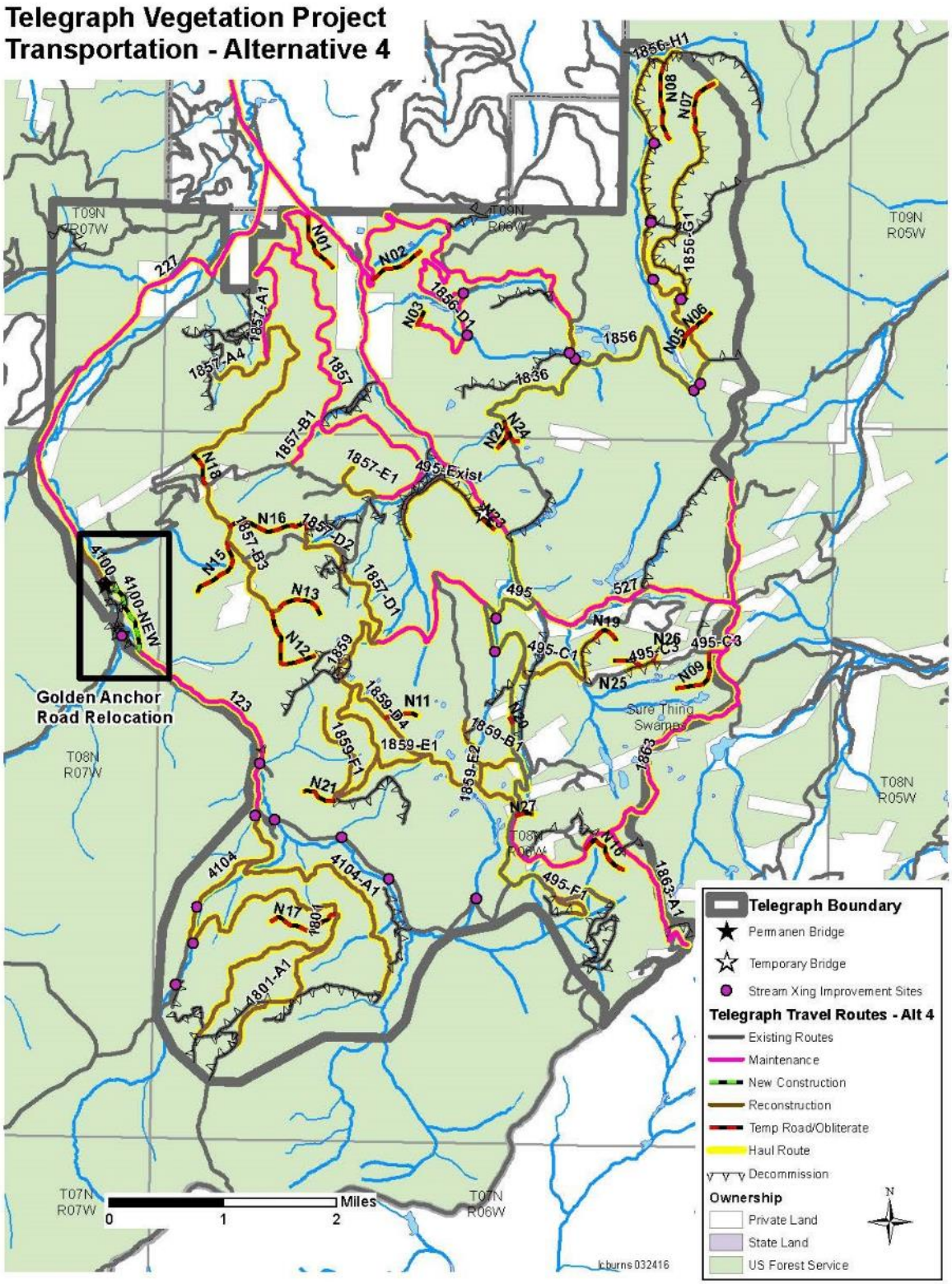

Figure 141. Haul roads and proposed road work, alternative 4

Irreversible and Irretrievable Commitments

There are no irreversible and irretrievable commitments associated with transportation under this alternative.

Cumulative Effects

Under alternative 4, maintenance and improvements to the road system occurring as part of the Telegraph Vegetation Project, when coupled with reasonably foreseeable road maintenance and improvement activities, would result in long-term beneficial cumulative effects such as reduced road surface erosion, improved functionality of the roads, and extended road life. Roads would also be safer for use, since roadside hazard trees would be mitigated. Besides the relocation of NFS Road 123, Telegraph Vegetation Project alternatives would not change roads open to public use. Later changes to the forest transportation system could still occur under the North Divide Travel Planning effort.

Conclusions

A summary of the alternatives and the associated road network, maintenance, and road management is included in table 317.

Table 317. Alternative summary table

Resource/Issue	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4
Haul Roads (miles)	0	84.2	74.6	89.3
Maintenance (miles)	0	43.1	41.8	43.1
Reconstruction (miles)	0	32.6	28.7	35.8
Specified Road Construction	0	0	0	0.7
Temporary Road (miles)	0	8.5	3.4	9.7
Stream Crossing Improvements	0	6	9	24

Under Alternative 1, roads would continue to provide access for forest users and private property. Alternative 1 is consistent with the Forest Plan because it meets the Forest-wide road management standards as shown in the Transportation Specialist Report, Appendix A: Forest Plan Consistency Tables.

Alternative 2 proposes vegetative treatments for 6,754 acres. To access treatment units with product removal, approximately 32.6 miles of road would be reconstructed, 43.1 miles of road would be maintained, and approximately 8.5 miles of temporary road would be built. Temporary roads would be closed and rehabilitated following the project. Six stream crossing structures would be improved. Compliance with the Forest-wide road and road management standards would generally ensure that Alternative 2 is consistent with the Forest Plan as shown in the Transportation Specialist Report, Appendix A: Forest Plan Consistency Tables.

Alternative 3 proposes vegetative treatments for 4,185 acres. To access treatment units with product removal, approximately 28.7 miles of road would be reconstructed, 41.8 miles of road would be maintained, and approximately 3.4 miles of temporary road would be built. Temporary roads would be closed and rehabilitated following the project. Nine stream crossing structures would be improved. Compliance with the Forest-wide road and road management standards would generally ensure that Alternative 3 is consistent with the Forest Plan as shown in the Transportation Specialist Report, Appendix A: Forest Plan Consistency Tables.

Alternative 4 proposes vegetative treatments for 8,103 acres. To access treatment units with product removal, approximately 35.8 miles of road would be reconstructed, 43.1 miles of road would be maintained, and approximately 9.7 miles of temporary road would be built. Another 0.7 mile of specified road would be constructed. Temporary roads would be closed and rehabilitated following the project. Twenty-four stream crossing structures would be improved. Compliance with the Forest-wide road and road management standards would generally ensure that Alternative 4 is consistent with the Forest Plan as shown in the Transportation Specialist Report, Appendix A: Forest Plan Consistency Tables.

Recreation

Introduction

The USDA Forest Service Helena National Forest (HNF) is proposing the Telegraph Vegetation Project (Project), within a 23,669-acre analysis area. The project is approximately 15 miles southwest of Helena, and 5 miles from Elliston, Montana, in the Little Blackfoot River drainage.

Assumptions

An assumption of this recreation analysis is that recreation use of the project area would likely continue or increase as the Helena area population increases. The population trends in this area indicate an increase in population amongst a middle-aged demographic, which is the segment of the population most likely to participate in outdoor recreation activities (State of Montana, Census and Economic Information Center, Montana Commerce Department). Furthermore, the Forest Plan projects increases in all categories of recreation use on the Forest over the next several planning decades, although capacity is still expected to exceed demand (USDA 1986, Chapter 2)

Information Used

Helena National Forest GIS data, aerial and ground photos, and local resource-specific knowledge of the Telegraph project area were used in this analysis.

Methodology and Scientific Accuracy

The purpose of this analysis is to disclose potential effects of the Telegraph Project on the recreation resource. The methods used in this analysis were GIS mapping of existing recreation elements, including Recreation Opportunity Spectrum classes; Management Areas; National Forest System roads and non-motorized trails; groomed and not groomed winter recreation routes, and developed recreation sites. Actions proposed in the various alternatives were then mapped with these base recreation elements. Using this information, the activities' effect on the existing recreation condition was examined using qualitative measurement indicators.

The recreation analysis area is spatially defined as an area within a half-mile of the project boundary in all directions. Further clarification is contained in the 'Analysis Area' section. For the temporal bounds of the recreation analysis, short-term as well as long-term effects are considered. Short-term refers to those effects that last from the point of implementation up to 15 years. Short-term effects also include immediate effects, where the impact would occur during implementation, but would not endure beyond the end of implementation. Thus, short-term effects include disturbances associated with implementation of the proposed activities as well as immediate impacts that would endure beyond implementation, up to 15 years. Long-term refers to those effects lasting more than 15 years.

Recreation Resource Indicators

Indicators of direct and indirect effects include:

- **Temporary loss of recreation opportunity**: displacement of users, or a change in recreation experience due to vegetation treatments/prescribed fire activities (i.e., temporary closure of areas or visitors avoiding the area during the vegetation treatments or prescribed fire).

Measure: Effects lasting up to 15 years in duration

- **Long term loss of recreation opportunity**: chronic displacement of users, or permanent changes in recreation experience due to changes in scenery following the vegetation treatments or prescribed fire that affect the recreation setting, long-term closures, loss of trail opportunities from impacts of prescribed fire (increased maintenance shortfalls, erosion, downed trees) or other actions related to the project.

Measure: Effects lasting more than 15 years in duration

Recreation Affected Environment

Introduction

The Telegraph Project area provides access to a variety of recreation opportunities. Most recreation use is related to and adjacent to National Forest System roads and/or the Continental Divide National Scenic Trail (CDNST). The existing condition of recreation settings and opportunities in the project area is discussed below.

Analysis Area

The spatial boundary for the recreation analysis is an area a half-mile outside the project boundary in all directions. The project area plus a half-mile zone outside the project area is an appropriate spatial boundary for this recreation analysis because it accommodates the possibility of project activities impacting recreating visitors that may be just outside the project area itself. For example, a vegetation management unit may be located on or near the project boundary and a non-motorized trail may be located a quarter mile away from that unit, across the project boundary line. Those recreationists hiking or biking that trail may feel the effects of that cutting unit in terms of noise or views of vegetation management activities.

Telegraph Area Recreation Activities

Statistics from the Forest's National Visitor Use Monitoring (NVUM) survey indicate that there are approximately 322,000 visits to the HNF annually. NVUM data further indicate that the majority of those visitors identify themselves as being from Lewis and Clark County. This indicates that the HNF is primarily a local destination. Seventy-one percent of visits come from people who live within 50 miles of the Forest.

NVUM data indicate that hunting is the most common primary recreation activity for visitors to the HNF. District managers confirm that hunting is also one of the most common recreational uses of the Telegraph project area in particular. Forestwide, 20.5 percent of visitors to the Forest report hunting as their main activity on the Forest. Forest-wide, visitors also report other recreation activities to be their main activity on the Forest, at the following rates:

- Hiking/Walking (15.2 percent)
- Viewing Natural Features (13.2 percent)
- Cross-country skiing (6.5 percent)
- As far as motorized activities, 3.8 percent reported "motorized trail activity" as their main activity on the Forest. A small percentage of individuals reported snowmobiling and OHV use as being activities they engaged in, but both of these activities did not rank out above 1 percent of the main activities people engaged in on the Forest.

These activities also take place in the Telegraph project area. In addition to the primary purpose of visit activities reported, the NVUM report for the Forest also describes the activities visitors

participate in, regardless of whether it is their main reason for visiting. These general Forest recreation activities include Hiking/Walking (49 percent), Viewing Natural Features (30.8 percent), and Viewing Wildlife (24 percent)

The recreation environment potentially affected by the Telegraph Project consists primarily of dispersed recreation opportunities, including camping, hunting, fishing, and motorized and non-motorized trail recreation. Dispersed recreation uses, such as hunting and camping are the most common recreation activities in the area. Many of the project area's roads are used to access hunting and fishing grounds and camping spots. Hunting opportunities in the project area are primarily big and small game. A popular place for camping is in the floodplain and benches above the Little Blackfoot River, accessed directly off the Little Blackfoot River Road, FR227. These camping areas are dispersed, undeveloped sites, which are not designated or signed by the Forest Service.

There are also approximately 13 miles of non-motorized trails in the project area. The most well-known trail in the area is the Continental Divide National Scenic Trail (CDNST). The Continental Divide Trail is a National Scenic Trail that extends 3,100 miles from Canada to Mexico along the Continental Divide. It was established in 1978, and is managed by various Federal land management agencies through interagency agreement. The Telegraph section of the trail, however, generally receives light use, as it primarily runs along roads in this section. In addition to the CDNST, the trailhead for the Monarch Creek trail starts in the southwest corner of the project area and extends southwest into the Electric Peak Inventoried Roadless Area (IRA). This trailhead can be accessed from the south end of Monarch Creek Road, #4104.

Figure 142. Continental Divide National Scenic Trail sign in project area

Several area roads are groomed by a local snowmobile club, the Helena Snowdrifters, for snowmobile use in the winter months, and are popular winter recreation opportunities. Popular groomed snowmobile routes in the project area include Forest Road (FR) 427, Minnehaha Road and

FR 495, Telegraph Creek Road. There is a total of 27.9 miles of winter use groomed routes and 8.1 miles of winter motorized routes that are not groomed in the project area. Summer motorized use is limited to area roads, as there are no designated motorized trails in the Telegraph area.

Figure 143. Summer view of project area groomed snowmobile route, FR 4104-A1

There are also three designated recreation facilities in the project area: the Charter Oak Historic and Interpretive Mining site, the Lion's Sunshine Camp site, and the Little Blackfoot Snowpark. These sites are located on the western edge of the project area, accessed from the Little Blackfoot Rd, FR 227. The Lion's site provides developed campground facilities, operated under a special use permit. The Charter Oak mine site is a WWII-era historic lode mine and mill site that is listed in the National Register of Historic Places. Forest Service interpretation of the site is provided, with the assistance of local students. There are no Wilderness Areas or Wild and Scenic Rivers in the project area. Finally, there are two popular developed recreation sites in the general vicinity of this project, but which are not located in the recreation analysis area. The Kading cabin and Kading campground are located 3.5 miles to the west of the project boundary, off FR 227, and Moose Creek Campground is located 2.3 miles to the east of the project boundary, off Rimini Road, FR 695. Neither of these sites is close enough to the project area to be impacted by its activities.

Existing Condition, Recreation Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) is used by the HNF to classify and manage types of recreation. The ROS is a system of classifications based on a range of recreation settings and probable activities that contribute toward the goal of providing a variety of outdoor recreation opportunities. An ROS setting is defined as the combination of physical, biological, social, and managerial conditions that give value to a place. By combining variations in these conditions, it is

possible to provide a diversity of recreational settings for visitors to enjoy. The potential range of the spectrum is from urban to primitive opportunity settings. The ROS settings found in the project area, however, are semi-primitive non-motorized, semi-primitive motorized, and roaded natural. The large majority of the project area is in a roaded natural setting, with small areas adjacent to the Jericho Mountain IRA in semi-primitive motorized and semi-primitive non-motorized settings. The descriptions of these ROS categories follow:

Roaded Natural:

Area is characterized by predominantly natural-appearing environments with moderate evidences of the sights and sounds of man. Such evidence usually harmonizes with the natural environment. Interaction between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities.

The user's experience in this setting is expected to include:

About equal probability to experience affiliation with other user groups and for isolation from sights and sounds of other humans. Opportunity to have a high degree of interaction with the natural environment. Challenge and risk opportunities associated with more primitive types of recreation are not very important. Practice and testing of outdoor skills might be important. Opportunities for both motorized and non-motorized forms of recreation are possible. (USDA FS 1983, ROS)

Furthermore, roaded natural areas are within a half-mile of better than primitive roads, and the environment is expected to be modified by humans, although these modifications should be largely unnoticeable from sensitive travel routes. A moderate to high frequency of contact with other recreationists is expected on roads, and a low to moderate contact frequency is expected on trails and off routes.

Semi-primitive Non-motorized:

Area is characterized by a predominantly natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present but are subtle. Motorized uses are not permitted.

The user's experience in this setting is expected to be:

High, but not extremely high probability of experiencing isolation from the sights and sounds of humans; independence, closeness to nature, tranquility, and self-reliance through the application of woodsman and outdoor skills in an environment that offers challenge and risk.

Semi-primitive Motorized:

Area is characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is permitted.

The user's experience in this setting is expected to be:

> Moderate probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of

woodsman and outdoor skills in an environment that offers challenge and risk. Opportunity to have a high degree of interaction with the natural environment. Opportunity to use motorized equipment while in the area.

Environmental Consequences

The purpose of the Telegraph Vegetation Project is to be responsive to the mountain pine beetle outbreak in the area. This includes: recover economic value of the dead and dying trees, promote desirable regeneration, improve conditions for fire suppression effectiveness as well as firefighter and public safety in the area in the event of a wildfire, and maintain diverse wildlife habitats. The project also seeks to maintain or improve watershed values. The project area is 23,669 acres in size, of which alternative 2 proposes to treat approximately 6,754 acres, alternative 3 proposes to treat 4,185 acres, and alternative 4 proposes to treat 8,103 acres. The project is located in the Helena Ranger District, approximately 10 miles southwest of Helena, Montana.

The underlying need for the Telegraph Project is to respond to the epidemic-level mountain pine beetle outbreak in the Telegraph project area. An additional objective of the project is to create more diverse and sustainable forest stands in the area, establishing a greater diversity of species, age class, and density that would help the forested landscape be more resilient. Economic value would also be recovered from mountain pine beetle-affected stands in the Telegraph Project.

This section describes the environmental consequences for the recreation resource including recreation settings and opportunities of implementing the three action alternatives presented in the Telegraph Project.

Effects Common to All Alternatives

Minor effects to the recreation resource would occur in all alternatives. These would be more pronounced in the no-action alternative because there would be no treatment of mountain pine beetle-affected areas. Due to the extent of the mountain pine beetle infestation in the project area, some degree of loss of scenic quality would be expected in any alternative. This loss of scenic quality would impact the value of some recreation opportunities, such as hiking, or driving the forest roads for pleasure. In addition, as significant numbers of trees fall due to heavy mountain pine beetle mortality, the accessibility off-trail recreation opportunities would be impacted. Hunting, in particular, would be affected in certain areas, as walking through and bringing game through deadfall areas would become difficult.

Alternative 1, No Action

Direct and Indirect Effects

Alternative 1 is the no-action alternative. The direct and indirect effects of the no-action alternative on the recreation resource would be caused by continuation of the mountain pine beetle outbreak in the area. If alternative 1 is chosen, no vegetation treatments would occur. Consequently, fuel loading would continue to increase over the project area, as mountain pine beetle-killed trees would continue to fall. This would create an increased fire risk under alternative 1. As described in the effects common to all section above, the continuation of the mountain pine beetle epidemic would cause a loss in scenic quality that would impact some recreation opportunities in the area, such as hiking or scenic driving on forest roads. Other potential impacts to recreation could include closures for safety, lost opportunities due to destruction of recreation facilities by fire, and changes to access due to hazards such as snags, brush, and fallen trees. This alternative has the greatest potential to negatively impact recreation in the long term.

No roads would be decommissioned under this alternative, however, the motorized recreation opportunities would remain the same since roads proposed for decommission in alternatives 3 and 4 were closed through the Divide Travel Plan and are not available for motorized travel.

There would be no stream crossing improvements, associated road reconstruction, or bridge placement under this alternative. Visitors would not experience any delays that could be associated with this type of improvement. However, over time there could be restrictions or changes to travel due to deteriorating conditions in a few site-specific areas.

Compared with the action alternatives, however, this alternative would provide the least amount of short-term disruption to recreation activities. Direct effects such as displacement of recreation uses to other areas during project implementation would not occur under this alternative. There would not be delays in driving forest road caused by logging operations. Hunters or other recreationists would not have to find other places to recreate when, for example, side roads that might access dispersed camping or hunting areas are temporarily unavailable due to cutting and burning activities.

Irreversible and Irretrievable Commitments

There would be no irreversible or irretrievable commitments with alternative 1. However, effects of large wildfires caused by increased fuel loading could change the recreation experience profoundly over time.

Cumulative Effects

Analysis of cumulative effects on recreation considers the effects of past, present, and reasonably foreseeable future activities on the recreation resource. The spatial boundary for the actions considered in cumulative effects is the project boundary. For recreation, only activities within the project area could be expected to add to the impact of the project's activities. Temporally, actions considered date back to pre-1960 actions that are known, and date forward to all reasonably foreseeable planned future activities. A list of these actions considered is provided in appendix B. They include timber harvesting, prescribed burning, road and trail reconstruction, recreational use, mining, and private land development.

Past timber harvesting and road construction contributed to the existing condition of the recreation landscape, creating an area where human activity is evident, and the recreation setting is primarily that of a working landscape. In addition, roads constructed for those past harvest activities have made positive contributions to the accessibility of recreation activities in the area, such as access to hunting grounds, dispersed campsites, and snowmobile routes. Trails improved over the past several years include sections of the CDNST and the Monarch Creek Trail and Trailhead. These past activities have contributed positively to the existing condition of recreation facilities in the project area.

Cumulative effects of alternative 1 are expected to be limited to those areas where closures for safety or subsequent fires could cause changes to recreation patterns. Without treating the mountain pine beetle outbreak, the subsequent fuel loading that colonizes the fire area could cause long-term changes in how visitors distribute themselves across the landscape.

Effects Common to Alternatives 2, 3, and 4

Direct and Indirect Effects

Although the action alternatives differ in the acres treated, size of units, and number of units, their impact on recreation settings and opportunities would be similar. Alternative 3 was developed to

minimize disruptions to elk and lynx habitat. Alternative 3 drops 34 of the units treated in alternative 2, and treats 2,033 fewer acres than in alternative 2. Alternative 4 was developed in response to public comments and proposes more prescribed fire and regeneration harvest. Table 318 summarizes the major differences between action alternatives. Because impacts to recreation are mostly similar, the alternatives are analyzed together.

Table 318. Summary of activities proposed in the action alternatives

	Alternative 2	Alternative 3	Alternative 4
Temporary road construction miles	8.5 miles	3.4 miles	9.7 miles
Intermediate Harvest	434 acres	434 acres	360 acres
Precommercial thinning	1,786 acres	1,289 acres	1,304 acres
Prescribed Fire	1,050 acres	606 acres	1,013 acres
Regeneration Harvest	3,484 acres	1,856 acres	4,671 acres
Rearrangement of Fuels	0 acres	0 acres	596 acres
Whitebark Pine Release	0 acres	0 acres	158 acres
Total Vegetation Treatment	6,754 acres	4,185 acres	8,103 acres

Based on response to comments received on the DEIS and resource issues identified during site visits, during implementation of this project opportunities would be sought to improve and when necessary re-align and stabilize trails located on roads to be decommissioned or used for haul to address resource concerns and re-establish these routes to maintenance standards. This could include minor realignment of several motorized and non-motorized trails. This includes the Monarch trail # 362, Bison Mountain trail, Bison Creek Motorized Trail 123-T, CDNST along route 1863 and 1863-A1 and Snowmobile Route 1801. Trail locations and use designations were determined in the Divide Travel Plan Record of Decision and trail activities associated with this project are consistent with that decision.

All of the action alternatives would construct temporary roads to implement the vegetation treatments. These roads would be obliterated following implementation activities. Alternatives 3 and 4 propose fewer of these roads than alternative 2. To the extent that the construction and use of these temporary roads would impact dispersed recreation use such as hunting and camping, the action alternatives would have a minor, short-term direct impact on dispersed recreation opportunities. Alternatives 3 and 4 would have less of an impact of this type than alternative 2.

The recreation opportunities and settings that would be impacted the most would be dispersed recreation, and hunting in particular. These impacts would be primarily short-term in duration. The effect on hunting would come from the disruption of road travel and level of implementation activity during the 4 to 6 years that the vegetation treatments are being carried out. Vehicle travel into and around the project area would likely experience delays on main roads during implementation of the project, which would likely be primarily in the summer, fall, and winter months. Side roads could experience temporary closures. Timber harvesting, prescribed burning, and log hauling operations would affect the roads hunters and campers might use. When the main roads in the project area are being used to conduct logging operations, drivers would experience delays; weekend and holiday traffic would likely continue as normal, however, depending on the timing of treatment activities. Dispersed camping sites could also potentially be directly impacted by logging operations. This direct effect would be short-term only, as any dispersed recreation campsites that were used as log landing areas would be reconditioned to their previous state following operations. Reconditioning

would include seeding and re-contouring the area, in addition to removing debris. Most of the dispersed recreation sites in the project area are located along roads, and most roads in the project area would be affected in some way by implementation of project activities. Therefore, dispersed recreation use can be expected to drop during the project's operational period.

When implementation activities occur during hunting season, hunting opportunities in the area, such as big game hunting, could be heavily impacted in the short term. These disruptions, however, would be site-specific, and would not occur across the project area at any one point in time. While access to a specific, hunting location could be difficult temporarily, other locations in the project area would be unencumbered. In addition to the limitations on hunters' access to hunting grounds, discussed above, big game species, such as deer and elk, could be affected by the noise and other disruptions associated with logging and burning operations. This short-term impact could lead to the displacement of hunters into other local hunting grounds. This would not only displace the recreationists from their setting of choice, but could also crowd the areas they are displaced into, thereby impacting other hunters.

While the Telegraph Project may create a short-term direct effect of temporarily interrupting hunting opportunities in the project area, the long-term impact on hunting is expected to be positive. Increasing forest health would likely have a positive impact on browse and forage production for big game species. For a discussion of the project's impacts on wildlife and associated habitat, see the Telegraph Vegetation Project Wildlife Specialist Report (USDA FS 2013).

The action alternatives may also have a short-term direct impact on winter motorized recreation opportunities. As shown in appendix A, Map A1, a total of 36 miles of roads in the project area are used by snowmobile recreationists in the winter (approximately 28 miles of these are groomed and 8 miles not groomed). In accordance with soils design features, logging operations would be conducted when soils are generally dry, or during winter conditions. Therefore, it is likely that logging operations may cause disruptions to some snowmobile routes during the season. These disruptions would be temporary and site-specific; they would not occur on all of the trails at once. In addition, as operations are likely to be conducted during the week, weekend and holiday use of winter routes would likely be able to proceed with minimal disruption. As with the hunter displacement discussed above, displacement of winter motorized recreation activities would be short-term for both the users that are being displaced as well as the users of other snowmobiling areas where they are being displaced to. This loss of snowmobiling days and space would be minimized by communicating and coordinating with local winter recreation groups.

The action alternatives would have a minimal short-term impact on non-motorized recreation opportunities in the area. As discussed above, nearly half of the miles available for non-motorized recreation in the project area (which is primarily the CDNST) are not truly non-motorized, as portions of the trail route is coincidental with roads that are open to motorized uses. The proposed treatments do not conflict with existing recreation direction for the project area, including Forest Plan direction. The majority of the 13 miles of trail in the area runs through the T-1 management area, where the emphasis is on cost-effective timber production and a management goal is to provide healthy timber stands. Project activities may disrupt some uses of the trail during implementation; the length of this disruption would be short-term. This temporary disruption may also impact users of the Monarch Creek trailhead. Unit 87, a regeneration harvest unit, is located adjacent to the trailhead. Activities proposed for this unit are clearcut with leave trees and a site prep burn. Implementation of this treatment could temporarily disrupt use of the trailhead. Under alternative 4, an additional prescribed burn unit, #212, is also located at the trailhead. During burning activities, this area would

likely be closed to public use on a temporary basis. Because most of the visitor use of this trailhead is during hunting season, scheduling before or after this time would lessen impacts to users.

Prescribed burn units vary by alternative. The least amount of acres to be burned are proposed in alternative 3; the most fall in alternative 4. If burn times are staggered, visitors would likely not be displaced. If adjacent units are burned consecutively, visitors could encounter smoke, delays, and the presence of fire crews. In some instances, nearby roads and facilities could be temporarily closed during prescribed fire operations. Impacts from smoke would be the greatest under alternatives 2 and 4, along with the associated machinery and possible delays on forest roads. Smoke could linger for days in some areas, causing visitors to avoid those locations. Favorite locations for camping, hiking and recreating may be temporarily unavailable during the burn activities and for a period afterward while residual smoke exists. Smoke in the air during the prescribed burns (i.e., pile burning, jackpot burn, understory burning) may limit the quality of the recreation experience within the project area and in the adjacent dispersed camping areas by temporarily reducing air quality and visibility. The effects of burning may be spread over a larger area and, depending on the fuel, humidity and prescription, smoke could linger for several days. Large logs and snags could smolder and burn over multiple days.

As displayed in Table 318 above, alternative 4 has the highest amount of acres proposed for vegetation treatment with the least amount proposed in alternative 3. The differences are mainly in regeneration harvest and in prescribed burning. Alternative 4 poses a slightly higher temporary impact to recreational users than the other action alternatives. Access by machinery to the regeneration harvest units would primarily be off existing roads; however, in some cases skid trails would be created. Until these were rehabilitated, these temporary trails would appear unnatural on the landscape and would present a potential risk of unauthorized public motorized vehicle use. Timely rehabilitation after implementation would prevent this temptation.

Feller-bunchers, skidders, and other machinery would cause continuous noise in the immediate area during implementation. The main impacts would be to visitors wishing to camp, picnic, or recreate in the vicinity. In the areas proposed for regeneration harvest, 75 to 90 percent of the trees would be removed (dead lodgepole), leaving the appearance of a clear cut. As the units are colonized by regeneration, these areas may become difficult to hike through for several years. The impacts to recreation would be greater in alternatives 2 and 3. However, in the long term, the additional treatments would provide the greatest benefit to recreation by addressing the mountain pine beetle outbreak, improving fire suppression opportunities and effectiveness, and decreasing opportunities for access from downfall.

Under alternatives 3 and 4, 32 miles of road closed through the Divide Travel Plan are proposed for decommission. The effects of closure on the recreation opportunity, particularly motorized use were discussed in the Divide Travel Plan. Decommissioning refers to full obliteration of the road: re-contouring (returning the road prism to natural contour), removing culverts, replacing topsoil, placing woody debris upon the disturbed area to provide stability, and seeding the disturbed area. The actual effect of decommissioning would be minor and would include the presence of equipment in the area.

Most of the roads proposed for decommissioning are short, dead-end spur routes. Many are no longer driveable and overgrown, and some are no longer recognizable as roads. Decommissioning these roads represents a potential loss of recreation opportunity in the project area, however, this effect is minor since many of the roads currently cannot be accessed by motorized travel. Alternative 2 would not decommission any of the roads closed through the Travel Plan.

Under alternatives 2, 3, and 4, stream crossing improvements are proposed, with the highest level of improvement (bridge placement and road reconstruction) proposed in alternatives 3 and 4. Impacts to recreation would be short-term and minor, consisting of short delays, detours and occasional temporary closures while the bridge is constructed and the road reconstruction was occurring.

Irreversible and Irretrievable Commitments

There are no irreversible or irretrievable commitments affecting recreation resources with any of the action alternatives.

Cumulative Effects

Present and reasonably foreseeable future activities include continued maintenance on open forest roads, including improving road and surface drainage, clearing roadside vegetation, and repairing and maintaining culverts. All of these activities, when added to the activities proposed in the Telegraph Project, have the potential to cumulatively affect the recreation experience within the project area. The primary impacts would be due to the increased presence of people, vehicles and associated noise that would directly affect the ability of visitors to enjoy their desired recreation experience, and may lead to the short-term displacement of visitors who choose to avoid the area during implementation of the various activities. Occasionally and in site-specific areas, sections of the project area may appear crowded with workers and equipment for the several years that it takes to complete treatments.

The longer-term impacts of ongoing and reasonably foreseeable activities, when added to the activities proposed in the Telegraph Project, have the potential to cumulatively impact the recreation setting by causing changes to the scenic qualities within the project area and creating a setting where resource modifications and utilization practices are evident. Most of these effects would be beneficial because they would increase the resiliency of forest conditions, and improve conditions for fire suppression effectiveness as well as firefighter and public safety in the area in the event of a wildfire, therefore, maintaining the recreation settings currently valued by the public.

The proposed vegetation management treatments cumulatively would result in improvements in forest health and conditions for fire suppression effectiveness as well as firefighter and public safety in the area in the event of a wildfire. In the event of a wildfire or insect infestation, the restored forest would likely experience more typical low-severity fire and small-scale insect infestation. This would indirectly benefit recreation in the long term.

Conclusions

Under the no-action alternative, disruptions to recreation access would result from not addressing the mountain pine beetle outbreak, and the associated fallen trees that a lack of treatment would produce. Under the action alternatives, a certain degree of temporary motorized vehicle travel restrictions or delays could be expected, primarily during the summer, fall, and winter. Under these alternatives, although access to recreation opportunities may be disrupted, the disruptions would be temporary, and would be the direct result of treatment implementation. The action alternatives could be expected to have short-term impacts in terms of displacement of hunting and winter motorized recreation opportunities in the project area, as a result of treatment implementation. Long-term, the action alternatives would have a positive impact on recreation opportunities by improving the recreation setting. Treatment of mountain pine beetle-affected stands would have a positive effect on the accessibility of off-trail recreation opportunities, and would make it easier to hunt and camp away from roads and trails. While the threat of a large fire would still be present, the treated areas would slow or hamper fire behavior, moderating the effects.

Forest Plan Consistency

The actions proposed by all alternatives are consistent with Forest Plan direction. However, the no-action alternative is minimally consistent with Forest Plan direction; over time the goals for forage and healthy timber stands could become compromised without attention to the mountain pine beetle problem and associated risk of wildfire. The goals for recreation would be met through implementation of the action alternatives.

Roadless Expanse

Introduction

This analysis describes the existing condition of the roadless expanse within the Telegraph Vegetation Project area. The roadless expanse includes the Jericho Mountain Inventoried Roadless Area (IRA), lands that are roadless and contiguous to the Jericho Mountain IRA, as well as the Electric Peak IRA, which lies adjacent to the project boundary. There are no treatments proposed within the Electric Peak IRA. This roadless analysis also describes the potential effects to the roadless characteristics and wilderness attributes of the roadless expanse from the proposed treatment activities identified in the alternatives.

Both Jericho Mountain and Electric Peak areas have an unroaded area adjacent to their boundary, and so these areas are referred to as “Jericho Mountain roadless expanse” and “Electric Peak roadless expanse.” The entire area (both the Jericho roadless expanse and the Electric Peak roadless expanse) is also referred to as the “roadless expanse” when all are considered as a whole.

Inventoried Roadless Areas are those areas designated as Inventoried Roadless Areas pursuant to 36 CFR §294 Subpart B, §294.11. This includes areas identified in a set of inventoried roadless area maps, contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000.

The USDA Forest Service, Helena National Forest (HNF) is proposing the Telegraph Vegetation Project (Telegraph Project), within a 23,669-acre analysis area. The project is approximately 15 miles southwest of Helena, Montana, and 5 miles from Elliston, Montana, in the Little Blackfoot River drainage. The project responds to the mortality associated with the mountain pine beetle (MPB) epidemic in the area within the context of three action alternatives. Alternative 2 (proposed action) proposes to treat 6,754 acres, Alternative 3 proposes 4,185 acres, and Alternative 4 proposes 8,103 acres through a combination of harvest, mechanical rearrangement of fuels and prescribed fire activities.

The Jericho Mountain IRA, 8,440 acres, is located in the Helena Ranger District of the Helena NF, approximately 10 miles southwest of Helena, Montana. Eleven percent of the Jericho Mountain IRA lies within the Telegraph project area. The remainder of the Jericho Mountain IRA lies directly east of the project area in the Tenmile watershed, which serves as the municipal water source for the City of Helena. Contiguous unroaded land lies immediately adjacent to the Jericho Mountain IRA to its southwest which are not separated from the IRA by a system road. These unroaded lands adjacent to the Jericho Mountain IRA are approximately 750 acres. In addition to this project, restoration treatments are also proposed in portions of the Jericho Mountain roadless expanse in the Tenmile - South Helena Vegetation Project. While the effects of those treatments are analyzed in a separate analysis, approximately 91 percent of the roadless expanse will fall within either the Telegraph Vegetation project boundary or the Tenmile – South Helena project area boundary. However, not all acres within both project area boundaries are proposed to be treated.

In addition, the Electric Peak IRA, which spans the Helena and the Beaverhead-Deerlodge National Forests, (49,732 acres, 27,858 HNF), lies directly adjacent to project area to the southwest.

The action alternatives propose various activities in the Jericho Mountain roadless expanse. There are three proposed only prescribed fire treatment units that are located partially within the roadless expanse in Alternatives 2 and 3. Alternative 4 proposes one prescribed fire unit, three regeneration harvest units and mechanical rearrangement of fuels rather than hand treatments within the roadless expanse. Treating these units along with other nearby harvest and prescribed fire units would help to reduce hazardous fuels near private residences, maintain diverse wildlife habitat, and provide treated acres near the Tenmile municipal watershed. Approximately 2.4 miles of an existing road (527-B1) are also proposed for decommissioning within the roadless expanse under Alternatives 3 and 4. Additional road decommissioning in the roadless expanse is proposed under the Tenmile-South Helena project (6.78 miles).

The Roadless Area Conservation Rule (RACR 2001) prohibits road construction and road reconstruction as well as certain kinds of timber harvesting within IRAs in IRAs on National Forest System lands, except under limited circumstances.

The anticipated effects of treatments that allow cutting of generally small diameter trees in roadless areas in the Telegraph project area are expected to be within the exceptions identified above. Management activities focus on removal of timber and prescribed burning that is aimed at reducing the risk of uncharacteristic wildfire effects, meeting (b) (1) (ii) in the list above.

The effects of uncharacteristic wildfires often include unnatural increases in wildfire size, severity, and resistance to control and the associated impacts to people and property. These uncharacteristic effects have been caused primarily by past wildfire suppression, and past timber harvesting and grazing practices. These have contributed to often-dramatic changes in some areas in wildfire frequency, size, and severity (Roadless Area Conservation FEIS, 2000, Vol. 1, 3–72 to 3–73). The vegetative structure, density, and composition of these areas have changed when compared to less altered ecosystems (Roadless Area Conservation FEIS, 2000, FEIS Vol. 1, 3–144).

The action alternatives target even-aged stands of primarily dead lodgepole pine for treatment, with very little diversity in size class. The majority of the overstory is composed of dead trees.

The effects to the roadless expanse were analyzed using qualitative indicators. The indicators used are the five principal wilderness attributes of potential wilderness areas, as cited in Forest Service Handbook 1909.12. The existing condition of the potential wilderness attributes of the roadless expanse is described, as documented in Appendix C of the Helena National Forest Plan Environmental Impact Statement and updated to reflect the condition today. Specialists then analyzed the effect of the action alternatives on each of these attributes.

The action alternatives would potentially have no long-term effect on wilderness attributes of the roadless expanse in the Telegraph project area, as resource design features would safeguard these values. A certain amount of short-term downward effect on the natural, undeveloped and opportunities for solitude or primitive and confined recreation attributes would be noticeable, due to the human manipulation of the environment, visually apparent management activities, and temporary displacement of visitors. The difference in these short-term effects between alternatives 2 and 3, compared to 4 are twofold. On one hand, effects on solitude and primitive recreation would last longer in alternatives 2 and 3, due to the longer amount of time it would take to meat treatment objectives with the use of hand methods when compared to the use of mechanical methods. On the other hand, the presence of mechanical equipment such as fellerbuncher could have a greater effect

on solitude during implementation than if only hand crews and chainsaws were present. In the long-term, the action alternatives would create more diverse and sustainable forest stands in the area, which would have a positive effect on the visual and biological components of the area.

Cumulative effects of the past, present, and reasonably foreseeable future actions listed in Appendix B to the Roadless Expanse Resources Report located in the project record would be largely neutral to somewhat positive for the roadless expanse in the Telegraph Project area.

Assumptions

As discussed above throughout the Regulatory Framework section, the exception 36 §294.13(b) (1) (ii) of the Roadless Area Conservation Rule would apply to this project. A description of how this exemption applies to the project is described as follow:

Maintain or Improve Ecosystem Composition: 36 §294.13(b)(1) - This exception allows the cutting of generally small diameter trees within inventoried roadless areas when it is needed to improve, maintain or restore the characteristics of ecosystem composition and structure as well as to maintain or improve one or more of the roadless area characteristics as defined in §294.11. The 2001 Roadless Rule also states, “Because of the great variation in stand characteristics between vegetation types in different areas, a description of what constitutes ‘‘generally small diameter timber’’ is not specifically included in this rule. Such determinations are best made through project specific or land and resource management plan NEPA analyses, as guided by ecological considerations...” (Federal Register 2001. p.3257).

The 2001 Roadless Rule further states, “In any event, all such determinations of what constitutes ‘‘generally small diameter timber’’ will consider how the cutting or removal of various size classes of trees would affect the potential for future development of the stand, and the characteristics and interrelationships of plant and animal communities associated with the site and the overall landscape. Site productivity due to factors such as moisture and elevational gradients, site aspect, and soil types will be considered, as well as how such cutting or removal of various size classes of standing or down timber would mimic the role and legacies of natural disturbance regimes in providing the habitat patches, connectivity, and structural diversity critical to maintaining biological diversity.” (Federal Register 2001. p.3257).

This exemption would apply within units where stands are primarily made up of dead lodgepole pine intermixed with patches of smaller live trees. The majority of the dead lodgepole pine are characterized as having a consistent diameter class averaging between 10 to 15 inches dbh.

The cutting and removal of trees in the IRA (under Alternative 4) would target locations dominated by dead lodgepole pine (10 to 15 inches diameter) however, some live trees that are so suppressed and not likely to respond to release and would be prone to windthrow may also be cut. Patches of predominately live lodgepole pine would not be cut or removed from the IRA (see design features). Other live species of trees and riparian areas would also be retained. Because the dead trees targeted to be cut and removed are generally of similar size within these stands, the Forest has determined that no discernable distinction can be made between different diameter classes. Treatments are designed to mimic the role of natural disturbance.

Information Used

Analysis of the roadless resource relies on site visits, information included in the 1986 Helena Forest Plan, review of most current resource reports for this project and from relevant data layers from the Helena National Forest. A review of existing law, regulation and policy relevant to roadless areas

was conducted and relevant sections of the Helena Forest Plan, FSH 1909.12 Chapter 70 and the Roadless Area Conservation Rule were used to help guide the analysis. Public comments on the Draft EIS were also used in the development of Alternative 4. These comments recommended using mechanical equipment to remove fuel from treatment units located near existing roads within the Jericho Mountain Inventoried Roadless Area (IRA) to minimize fuel hazards. Field recognizance validated that the use of mechanical equipment would be a more effective means to rearrange and remove dead and down fuel in these units.

Methodology and Scientific Accuracy

Treatment activities as identified in the action alternatives are evaluated in relation to their effects on each roadless expanse (Electric Peak and Jericho Mountain). The analysis discloses potential effects to roadless area characteristics and wilderness attributes from the Telegraph proposed treatment activities in order to determine if, or to what extent these effects might influence future consideration for wilderness recommendations.

The roadless expanse for project analysis was determined through Geographic Information Systems (GIS) by overlaying the Helena National Forest roads layer with the two IRA layers to identify unroaded polygons adjacent to the Jericho Mountain and the Electric Peak IRAs. The protocol used to identify roadless expanse was to include openings between roads of at least ½-mile span and unroaded polygons of at least 100 acres. These sizes were chosen because of the loss of opportunities for solitude and primitive recreation opportunities below these thresholds. Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans (USDA 2010, Our Approach to Roadless Area Analysis and Analysis of Unroaded Lands Contiguous to Roadless Areas). Soundscape research in Rocky Mountain National Park suggests visitors travel an average of at least a half mile from common noise factors in order to reach natural quiet (Park et. al. 2009).

Although the Electric Peak roadless expanse has no treatments proposed, impacts to this area are considered in the analysis. Research on the impact of noise pollution on landscapes suggests sounds from the project area could impact the Electric Peak roadless expanse. Smoke and the sights and sounds of machinery and workers directly adjacent to the roadless expanse could affect visitor experience as well. For this analysis, ½ mile from the roadless expanse boundary forms the spatial context for this area.

The resulting roadless expanse identified above is the direct, indirect and cumulative effects boundary for the analysis.

This analysis focuses on the potential effects of project activities on roadless characteristics as defined in 36 CFR 294 Subpart B 294.11 – Roadless Area Conservation, Final Rule and wilderness attributes as defined in the 1964 Wilderness Act and Forest Service Handbook (FSH) 1909.12 (72.1).

Table 319 shows the crosswalk or relationship between the wilderness attributes identified in Forest Service Handbook 1909.12 and the roadless area characteristics defined in the 2001 Roadless Area Conservation Rule (36 CFR Subpart B 294.11). The wilderness attributes and associated roadless characteristics are used to compare the effects of the proposed treatment activities on wilderness quality of each roadless expanse in the project area.

Table 319. Wilderness attributes and roadless characteristics crosswalk

Wilderness Attributes	Roadless Characteristics
Natural: Extent to which the area's ecological systems are substantially free from the effects of modern civilization and generally appear to have been affected primarily by forces of nature.	High quality or undisturbed soil, water, and air. Source of public drinking water. Diversity of plant and animal communities. Habitat for threatened, endangered, proposed, candidate, and for sensitive species dependent on large, undisturbed areas of land.
Undeveloped: Degree to which the area is without permanent improvements or human habitation.	Natural appearing landscapes with high scenic quality. Reference landscapes of relatively undisturbed areas.
Solitude and Primitive Recreation: Personal subjective value defined as the isolation from the sights, sounds, and presence of others and the developments of man	Primitive, semi-primitive non-motorized, semi-primitive motorized ROS classes of dispersed recreation.
Special Features: Unique and/or special geological, biological, ecological, cultural, or scenic features.	Other locally identified unique characteristics, traditional cultural properties and sacred sites.
Manageability/boundaries: Ability to manage a roadless area to meet the minimum size criteria (5,000 acres) for wilderness.	No criteria

Measurement Indicators

In response to comments received on the Telegraph Vegetation Project DEIS, the Helena Ranger District developed a fourth alternative, which was presented to the public for review and comment during an additional comment period.

Numerous comments were received on the fourth alternative. Several were supportive of the alternative. Other comments referred to the need for road decommissioning, wildlife security issues, compliance with the Roadless Rule, concern over mechanical treatments in the IRA, and potential degradation of the roadless area. The issue and indicator below help determine and compare the differences between alternatives.

Issue: Impacts of mechanized / non-mechanized treatments and prescribed fire on wilderness attributes and roadless area characteristics within the project area.

Issue Indicator: Duration and trend of the impact on roadless area characteristics and wilderness attributes (see Table 1 – Wilderness Attributes and Roadless Characteristics Crosswalk and Appendix A worksheet).

Spatial and Temporal Context for Effects Analysis

The potential direct, indirect and cumulative effects to roadless resources were considered within the roadless expanse (described above in the Methodology section). The direct effects would be short-term and temporary, occurring during project implementation and expected to last up to 5 years. These would include disturbances associated with implementation of the proposed activities as well as impacts that would endure beyond implementation, up to five years. The long-term indirect effects would be related to ecosystem restoration, changes in visual qualities, and other items within the

project area that would influence several of the area's roadless characteristics. Long-term effects are those projected to endure beyond 5 years.

Cumulative Effects Process

Analysis of cumulative effects on the roadless expanse resources considers the effects of other past, present, and reasonably foreseeable future activities on the roadless characteristics and wilderness attributes of these lands. When the effects of other past, present, and reasonably foreseeable activities overlap in space and time with direct and indirect effects of the Telegraph Project proposed activities in the roadless expanse, potential cumulative effects could occur.

Connected Actions, Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

The effects of past actions within the project area are incorporated into the description of the existing conditions. Present and foreseeable actions are relevant to the cumulative effects analysis for roadless resources within the analysis area. See appendix B of Roadless Expanse Resource Report for further details on cumulative effects to the roadless expanse resource with the project area.

Affected Environment

Introduction

This section describes the roadless expanse resources for the project. Information included in this section is from the various resource areas referred to throughout this report as well as field validation by Helena Ranger District staff. This section includes a description of the analysis area and existing condition for the roadless expanse. Roadless characteristics and wilderness attributes are referenced when describing the existing condition which also serves as a baseline for analysis and represented by alternative 1 (no action).

Analysis Area

The analysis area includes the roadless expanse for Jericho Mountain and Electric Peak IRAs. The roadless expanse includes the Jericho Mountain IRA and lands that are roadless and contiguous to the Jericho Mountain IRA. This area has past harvest history and is primarily included within the T-1 management area. Although no treatments are proposed in the Electric Peak roadless expanse, treatments are proposed directly adjacent to the boundary. As discussed in the Methodology section above, ½ mile into the interior of the roadless expanse was considered in this analysis to address impacts of noise and visual impacts to wilderness characteristics of the area. Identification of the roadless expanse associated with both IRAs followed the process identified in the Methodology section.

None of the Jericho roadless expanse has been identified as potential wilderness areas or recommended for federal wilderness consideration. The Electric Peak IRA, however, has been designated a potential wilderness area and is managed as such.

Existing Condition

Jericho Mountain Roadless Expanse

General Description

The Jericho Mountain Roadless Expanse is approximately 10 air miles southwest of Helena, Montana. The area lies on both sides of the Continental Divide and is in portions of both Lewis and

Clark and Powell Counties. Access is provided at many points along the Tenmile, Minnehaha, and Bryan Creek Roads. Trail #337, which originates at MacDonald Pass, also provides access into the IRA along the Continental Divide.

The area itself is a rectangular-shaped area running seven miles north-south and ranging in width from one-to-four miles. The Continental Divide runs north-south through the area. The two-thirds of the roadless area that is east of the Divide is part of the Tenmile municipal watershed.

The northern boundary runs east from MacDonald Pass, along U.S. Highway 12. The eastern boundary runs south along the Tenmile and Minnehaha Creek road. The southern boundary is defined by Bryan Creek. The western boundary turns north to Jericho Mountain, and then follows the Continental Divide and private land to MacDonald Pass.

Topography changes from the 5,200-foot valley floor to steep 25 to 60 percent slopes, to rolling 0 to 25 percent slopes at 7,300 feet along the Continental Divide. Annual precipitation is about 25 inches. Habitat types are Douglas fir/pinegrass, Douglas fir/Idaho fescue, and subalpine fir/grouse whortleberry.

Habitat

The roadless expanse provides habitat for a diversity of wildlife species including elk, moose, black bear, mule deer, grouse, and numerous nongame animals and birds. The area also provides habitat for sensitive species, including Halls Rush and whitebark pine. Whitebark pine is a keystone species because of its various roles in supporting community diversity and a foundation species for its roles in promoting community development and stability. Aspen is found in isolated patches in the roadless expanse.

Watershed

All streams flow intermittently within the Jericho Mountain IRA. The Tenmile watershed is located just east of the project area and is the primary source for the City of Helena's municipal water supply.

Human Uses

Residents of the adjacent communities of Rimini, Helena, and Elliston use the area for fuel-wood gathering and hunting. There are and multiple private land inholdings and private land adjacent to and within the IRA. The IRA lies such that prevailing winds would tend to carry a wildfire into the Tenmile drainage and potentially towards the community of Rimini (See the project's Fire and Fuels Background report for additional information).

Roads and ground disturbance from past and present mining is prevalent, allowing both authorized and unauthorized motorized access throughout the area. Primitive motorized and non-motorized recreation activities occur in the area including snowmobiling, hunting, mountain-biking, and hiking. Reclamation has been conducted on some mining sites within the roadless expanse. Please refer to the Telegraph Recreation Report regarding existing condition for recreation opportunities.

The Jericho Mountain roadless expanse is moderately natural appearing, with a moderate level of scenic integrity. There is evidence of human activity in the expanse, including scattered historic mining sites with accompanying access roads. There are also two cabins plus other remnants of old miner's cabins in the roadless area, which detract somewhat from the undeveloped integrity of the expanse. The roadless expanse contains many access spur roads and there are many roads around the edges. The relatively high concentration of roads in the roadless expanse has a negative impact on

the naturalness of the roadless expanse. The Jericho Mountain IRA is not proposed wilderness under the Helena Forest Plan.

Roadless Area Characteristics and Wilderness Attributes:

The following section discusses each attribute in terms of the existing condition.

Natural: The extent to which long-term ecological processes are intact and operating.

The Forest Plan was silent on long-term ecological processes. However, due to the MBP epidemic and decades of fire suppression, ecological processes have departed from what would have historically taken place on this landscape thus, the current state of this attribute is degrading.

Since the Forest Plan was implemented, the MBP epidemic and past fire suppression have resulted in a homogenous age and size class, lack of species diversity, and high tree density along with unprecedented fuel loads (Fire and Fuels report).

Due to the continuity and uniform size class of the lodgepole pine-dominated forests, the area was highly susceptible to mountain pine beetle (MPB) infestation, and mortality of overstory trees, often higher than 90 percent, occurred during the MPB outbreak of 2007 to 2013. The dominant live tree size over the area has shifted from 10 to 15 inches dbh to 5 to 10 inches dbh, except in areas where lodgepole pine was mixed with Douglas-fir or Engelmann spruce. There also occurred a shift in species composition from pure lodgepole pine to spruce, Douglas-fir, and mixed stands of lodgepole pine, Douglas-fir and spruce/fir. As the dead trees fall, increases in heavy concentrations of dead and down material have accumulated near the ground surface resulting in a buildup of uncharacteristic fuel loads.

Although even-aged conditions and stand-replacement mortality from wildfire or insects is consistent with natural lodgepole pine forest ecology, the Telegraph landscape likely contains conditions more homogeneous than would have been present had fires not been suppressed for much of the last century. Fires generally become less frequent and more severe with active suppression. Wildfires on these late-seral landscapes tend to be larger, more intense and more severe because of high biomass loading and multi-layer stand structure. Elements within a late-seral forest include large trees, slowed tree growth, and occurrence of features such as snags, down logs, and mortality of overstory trees (Vegetation Introduction and Fire and Fuels reports). Under the existing condition with MPB induced mortality, untreated areas can be expected to realize higher intensity fires that consume a considerable portion of duff and litter due to current density, stand structure, red needled litter, and stand composition (Agee and Skinner 2005; Graham et al. 2004). At this time there will certainly be the potential for a surface fire of adequate intensity to kill any residual live Douglas-fir, lodgepole pine, or ponderosa pine due to fireline intensity and the resultant heat pulse to the cambium (Kauffman et al. 2008).

Additionally, much of the roadless expanse where stands are comprised of dead and dying lodgepole pine, have lost their suitability as habitat for species associated with a certain level of live canopy cover and live tree density (Telegraph Wildlife Report).

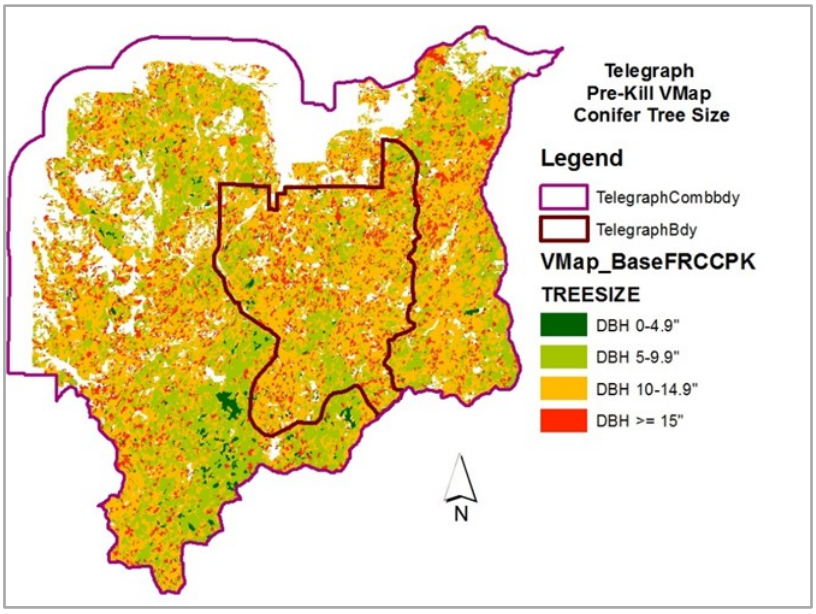

Figure 144. Pre-MPB tree size

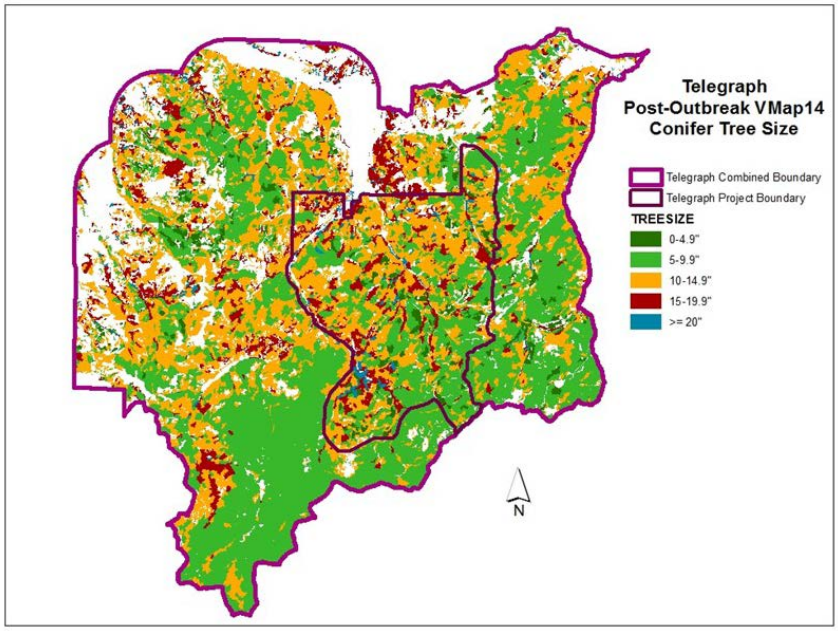

Figure 145. Post-MPB tree size

Figure 146. Jericho IRA current condition

Undeveloped: The degree to which development and uses are apparent to most visitors.

The impact of human activity is present on much of the area. Past mining, recent reclamation, firewood cutting, recreation use, private land and access and some past harvest and fuels activities are a few examples of what has contributed to defining the degree to which development and uses are apparent to most visitors and departure from the undeveloped characteristic within the IRA. These are described in detail below.

Mining:

Mining activities is the most predominant developed feature within this area resulting in an altered landscape. Individual abandoned mine sites and relict mining-related features can still be found within the IRA boundary; features range from small prospects to developed adits and shafts remaining in association larger-scale mining operations that altered surface conditions such as the Armstrong and Beatrice Mines. Remnants of old miner's cabins are scattered throughout the Jericho Mountain IRA along with other mining artifacts such as loadouts and ore bins. Also associated with past mining activities was the extensive cutting of trees for the purpose supporting the mining industry in Butte, Montana as well as for domestic use such as fuelwood. Forest visitors can see remnant stumps of past tree cutting scattered throughout some areas of the IRA in areas that have not been covered over by understory growth.

Figure 147. Armstrong mine site

The most obvious evidence of past mining activities include seven inventoried mine sites with associated access roads which have diminished the roadless character of the IRA. These sites have created areas devoid of vegetation, with equipment, structures and debris, and surrounding stands that contain stumps from associated timber cutting. They also constitute a source of contamination to surrounding soil and water. Of the inventoried mine sites, three (Beatrice, Armstrong, Bear Gulch) have been designated by the Montana Dept. of Environmental Quality as priority abandoned hardrock mine sites due to site conditions documented as contributing to known or potential risks to human health and/or the environment (MDSL, 1995). Three inventoried mine sites occur within or intersect the boundary of the Telegraph Vegetation Project (two which are priority sites), and all seven inventoried sites occur within or intersect the boundary of the Ten-Mile South Helena project (three of which are priority sites). EPA has proposed CERCLA removal actions be conducted at 5 mine sites within the sub-area. Two of these sites occur partially or fully within the Telegraph Vegetation Project boundary while four occur partially or fully within the TSH project boundary. EPA proposed actions would involve the removal of metals contaminated materials from primarily privately owned lands, however one NFS land based mine site (Beatrice North) and use of Forest Service routes for waste transport for disposal would be included.

Past mining has created access roads throughout the area that are still very evident today. Some roads have naturally revegetated while other forest service system roads provide yearlong motorized access through part of the roadless expanse and access to private land. This area contains a private land inholding and also has a history of extensive mining and those effects are evident on the landscape. There are patented mining claims that now have structures for private use. Bounding roads in this area have seasonal restrictions that also access private inholdings.

Facilities:

Communication towers located on MacDonald Pass can been seen from numerous higher elevation points (mountain tops) within the roadless expanse and the presence of the Yellowstone Pipeline is evident immediately adjacent to the northern boundary. An active, fenced grazing allotment is

present on the north end of the roadless expanse. This IRA also include private land inholdings which include buildings.

Roads:

Roads within the IRA were primarily constructed at the turn of the century to support access to mining claims. Many of the roads mentioned in Appendix C of the 1986 Helena National Forest Plan have since been decommissioned, converted to trails, or gated. Some of the gated roads provide administrative emergency access for fire suppression. Other roads are also available for motorized use to access private property and OHV recreation, mine reclamation activities, as well as hiking and bicycling. A main road (1864, 3.60 miles) is used by the public and is slated to become part of the Continental Divide National and Scenic Trail, though it will still be available for motorized use on some segments. Roads 1863 and 1863-E1 dissect the Jericho roadless expanse along the Continental divide and road 527-B1 dissects the southwestern end of this roadless expanse. A list of these and additional roads located in the roadless expanse are provided below (Table 320). In addition, some of the roads are in poor shape and have sediment problems.

Figure 148. Sediment on road within the Jericho Mountain IRA

Figure 149. Firewood cutting slash in the roadless expanse

Unauthorized motor vehicle use occurs in the project area as well as within the Jericho Mountain IRA, mostly as a result of personal use firewood cutting and removal. Firewood cutting has shown to contribute to initiating unauthorized route development as gatherers tend to drive off of designated routes in order to collect the firewood. This is known to occur in areas within the roadless expanse where existing roads are present. Inventories within the Jericho Mountain IRA have identified miles of non-system unauthorized motorized routes from this activity.

The road proposed for decommissioning (527 B-1) is used frequently as an access point for hunting and other recreational activities, as well as receiving unauthorized use by OHVs. It has become a repository for trash and automobile parts. The road prism itself is muddy and rutted from the continuous unauthorized OHV use.

Table 320. Existing roads in Jericho Mountain Roadless Expanse

Road ID	Road Name	Roadless Expanse	Miles of road in Roadless Expanse
1864	Bear Gulch	Jericho Mountain	3.60
1864 A-1	Bear Gulch A-1	Jericho Mountain	0.28
1863	Bullion Parks	Jericho Mountain	1.71
1863-E1	Bullion Park Spur	Jericho Mountain	.76
1856 H-1	North Fork Mike Renig Gulch	Jericho Mountain	1.08
527 B-1	Beatrice Mine	Jericho Mountain	2.40
527 C-1	Minnehaha Spur	Jericho Mountain	0.98
Total miles of road in Jericho Mountain Roadless Expanse			10.81

Harvest and Fuels Activities:

Since the 1986 analysis of roadless lands, the Helena National Forest, consistent with Forest Plan direction, has completed harvest and fuels activities within the roadless expanse, as shown in Table

321. These activities have also contributed to some evidence of human activity. The following table displays past fuel and harvest activities within the Jericho Mountain IRA.

Table 321. Past harvest and fuel activities in the roadless expanse

Past Activity	Jericho Roadless Expanse Acres
Burning of piled material	14.2
Compacting/crushing of Fuels	5.9
Piling of Fuels, hand or machine	15.1
Rearrangement of Fuels	0.9
Sanitation Cut	0.9
Stand Clearcut	5.9
Total Acres	42.9

The Electric Peak roadless expanse, bordering the project area to the south, has a higher base level of natural and undeveloped qualities than does the Jericho roadless expanse. Activities that have altered natural processes, including evidence of past and present human activities such as mineral or logging activities or development activities, are minimal within the Electric Peak roadless expanse. It is noted, however, that visitors traveling along the higher open ridges may view human activities and development within areas adjacent to Electric Peak, such as in the project area. This is considered the baseline existing condition in the roadless expanse.

Outstanding Opportunities for Solitude or Primitive and Unconfined Recreation

Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.

The Jericho Mountain roadless expanse is described in Appendix C of the Forest Plan (USDA 1986a) as having “potential for solitude on pockets of forested slopes.” Because of its long, narrow shape, the area has limited potential for the visitor to experience a vastness of scale, as the area is only approximately one mile wide from its core to either side. This limits the opportunity to experience isolation from sights, sounds, and the presence of others. In particular, sounds from traffic on Highway 12 and noise from nearby communities may be heard from within the roadless expanse. Chainsaws may often be heard from firewood gathering both inside and outside the roadless expanse.

The majority of recreation use occurs in fall and early winter with wood gathering and hunting, though the area is used year-round due to proximity to Helena and surrounding communities. Skiing and snowmobiling are popular and in more recent year, mountain biking has become a popular activity along the Continental Divide trail #337 and Sidewinder trail #348. The Tenmile picnic area and Moose Creek Campground are located just outside the boundary on the north. The Continental Divide National Scenic Trail (CDNST) runs the length of the area. The Switchback trail and the Tenmile Interpretive Trail are also used by visitors. Forested stands along the trail are dominated by lodgepole pine and Douglas-fir. Stands of lodgepole pine have been impacted by the Mountain Pine Beetle outbreak, resulting in dead trees falling across the trails that pose a hazard and impediment to trail users. Maintenance of trail and removal of hazard trees on the CDNST in particular has generated excess fuel along the travel corridor and evidence of chainsaw use from cutting downed trees and stumps from hazard tree felling operations.

The ROS classification for the Jericho roadless expanse in the project area is primarily Roaded Natural. This does not indicate a primitive recreation setting. A smaller section of the roadless expanse, towards the east side of the project area, is classified semi-primitive motorized, and a small section in the northern part of the roadless expanse area is classified semi-primitive non-motorized. The lack of Primitive or much Semi-primitive Non-motorized setting indicates recreation opportunities in the area are generally not primitive in nature.

The Electric Peak roadless expanse is considered to have moderate potential for solitude and primitive recreation. The roadless expanse's solitude value in the vicinity of the project area is negatively impacted by road noise from the Little Blackfoot Road as well as the Monarch/Ontario Creek Road, which has the potential to penetrate northern portions of the roadless expanse area.

Special Features

There are no known special features in the Jericho roadless expanse or the portion of the Electric Peak roadless expanse closest to the project area, including no known sensitive soils. There are 13 identified historical/cultural sites and two historic mining districts within the Electric Peak and Jericho Mountain roadless expanses. These historical sites are primarily associated with early (1890-1920 mining and lumbering activities (USDA FS 1986). For more information on these sites, see the Telegraph Heritage Report.

Manageability

Although most of the roadless expanse boundary is well defined by roads and topographic breaks, approximately 10 percent of it would be difficult to describe and locate on the ground, as it is located midslope. In addition, there are private lands within the area with existing access roads (much of which are old mining roads). These roads present a wilderness manageability challenge, as they would be essentially impossible to close without acquiring the private lands.

Roadless Expanse Environmental Consequences

Introduction

The proposed Telegraph Vegetation Project would help meet Forest Plan goals and objectives to ensure diverse and sustainable forest stands and habitat in the future, improve conditions for fire suppression effectiveness as well as firefighter and public safety in the area in the event of a wildfire and to maintain or improve watershed values. Reducing current and expected fuel loadings within treatment units will result in modifying the existing fuel profile enhancing fire suppression capabilities as well as firefighter and public safety in the area. Another aspect of this project is the strategically placed prescribed fire units designed to modify fire behavior that would complement and assist predetermined wildfire response strategies and tactics along the Continental Divide. The Tenmile watershed located just east of the project area provides a crucial water supply to the Helena valley. Treatment objectives for these units are to reduce the likelihood of a fire moving east over the Continental Divide and into the Upper Tenmile watershed (See the Fire and Fuels Report).

The effects to the roadless expanse were analyzed using qualitative indicators. The indicators used are the five principal wilderness attributes of potential wilderness areas, as cited in Forest Service Handbook 1909.12. The issue indicator is the duration and trend of the impact on roadless area characteristics and wilderness attributes. Four alternatives are analyzed in this section. Alternative 1 is the no action alternative. Alternative 2 and 3 proposes to conduct treatments using hand methods while Alternative 4 proposes to conduct treatments with the use of mechanical equipment. These methods are analyzed below in regards to the wilderness attributes.

Alternative 1

Direct and Indirect Effects

By not implementing the management activities proposed in the action alternatives, Alternative 1, the no-action alternative, would leave the current roadless character unchanged from the description presented in the Affected Environment section above. The existing condition of the potential wilderness values of the analysis area described above would not change. Any direct or indirect effects of this alternative would be the result of continued MPB activity in the area. If Alternative 1 is chosen, no vegetation treatments would occur. Consequently, fuel loading would continue to increase over the project area, as MPB-killed trees would continue to fall. This would create an increased risk of wildfire and to firefighter and public safety, since the spread of wildfire would be the greatest under this alternative. Should wildfires occur, due to the proliferation of dead, standing trees, firefighters would be at greater risk from both snags and greater/more intense fire spread, or may need to conduct more indirect attack to avoid these hazards, further increasing the likelihood of a larger wildfire. Evacuation routes for both firefighters and local residents could become compromised. The potential event of an uncharacteristic wildfire could impact the naturalness and/or recreation values in the area as discussed below.

<u>Natural: The extent to which long-term ecological processes are intact and operating</u>

Fire would not be reintroduced to the landscape under this alternative. This is a fire-adapted ecosystem, and the continuation of fire suppression and potentially more intense wildfire instead of mosaic burns that historically occurred here would contribute to the degradation of the natural attribute, including continuation away from heterogeneous stands with species diversity, age diversity, and tree density diversity that is necessary for perpetuation of wildlife and vegetative species. Currently much of the dead material is still standing, however, as time passes this material is falling at an ever increasing rate. It is estimated in the next five years the majority of existing standing dead will be on the ground (Mitchell and Preisler 1998). As this change occurs, it will result in a change in fuel loadings and fire severity as fuels models will shift from low load of litter and down logs to high loads of large down logs. Heavy loading of down fuels also has the potential to increase fire severity and residence time, causing soil damage and associated sedimentation, degradation of water quality, and long-term loss of soil productivity.

Without treatment, existing stands with a dead overstory would regenerate more slowly due to the time it takes for the dead overstory to fall and open up sufficiently; it may take several decades for regeneration to establish (Axelson et al. 2009). Composition would likely be more uniform spruce/fir which may establish before the stands open up enough to allow lodgepole pine regeneration. Habitat fragmentation due to the MPB would continue.

No further manipulation of the environment or “trammeling” would occur under this alternative.

<u>Undeveloped</u>: The degree to which development and uses are apparent to most visitors

No treatments would occur under this alternative, and no new development or uses would become apparent to visitors. Since no road decommissioning would occur, there would be no improvement to the undeveloped quality.

<u>Outstanding opportunities for solitude or primitive unconfined recreation: Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.</u>

The existing condition for solitude would not be immediately affected under this alternative. However, over time conditions could become challenging for visitors to recreate due to fuel loading from MBP and associated downfall. This could increase opportunities for solitude for those who are able and willing to negotiate an increasingly brushy and inaccessible area. In addition, large wildfires could dramatically change the landscape, also changing how people access or recreate in the roadless expanse due to deadfall, lack of tree cover, and personal preference. Conversely, no road decommissioning would occur under this alternative, therefore opportunities for primitive and unconfined recreation as well as for solitude would not increase, and management of unauthorized motor vehicle use would not be improved. Trails could become impassable and favorite campsites inaccessible due to fallen trees. In the case of a large fire, sight distance and topography screening could be changed for decades, impacting solitude, as sights and sounds of visitors in the area as well as activities on adjacent lands would more easily be seen and heard. In addition, impacts of a large wildfire would include presence of crews, helicopters and possibly machinery for long periods of time, until suppression goals were achieved.

Special Features-

The existing identified historical sites would not be affected under this alternative.

Manageability-

Choosing the no action alternative would not change the manageability of the area and would not improve management of unauthorized motorized vehicle use.

Irreversible and Irretrievable Commitments

Irreversible or irretrievable commitments of roadless resources could occur under Alternative 1. In the event of a wildfire due to continuing high fuel loads and mortality associated with the MBP outbreak the roadless resources could be at risk to irretrievable outcomes including species and habitat loss until the trees become established. For example, the sustained homogeneity of age/size class and the extent of high amounts of downed woody fuels may result in conditions not resilient to landscape level disturbances. In the event of a severe wildfire, the seed source currently provided by MPB-killed trees in some areas could be lost. (Telegraph Vegetation Project Forested Vegetation Report). There are no irreversible commitments.

The future continued homogeneity in forest structures, particularly the abundance and extent of downed fuels, may result in severe surface fire effects in the event of a wildfire. If such a fire occurs between the time seed from serotinous cones germinate and the trees again produce cones, there could be an irreversible loss of seed source and thereby long term loss of conifer cover in some areas.

Cumulative Effects

Analysis of cumulative effects on the roadless and unroaded resources considers the effects of past, present, and reasonably foreseeable future activities on the potential wilderness attributes of these lands. When the effects of past, present, and reasonably foreseeable activities overlap in space and time with direct and indirect effects of proposed activities in the roadless expanse, potential cumulative effects could occur. Since there are no actions proposed under the no action alternative, there would be no cumulative effect associate under the no action alternative.

Effects Common to All Action Alternatives

Each action alternative proposes methods of vegetation treatments within the roadless expanse. Each alternative would have some short-term adverse effect to the undeveloped, natural, and outstanding opportunities for solitude or primitive unconfined recreation attributes of the area, but would result in a long-term beneficial effect. The differences between alternatives lies in the amount and type of treatment as well as methods employed. In Alternative 2 and 3, no mechanized treatment or commercial harvest are proposed within either the Jericho Mountain or Electric Peak roadless expanses.

In the long term, tree-stumps from past firewood cutting and proposed activities may be still evident in some areas as they could take decades to decompose. However, since tree-stumps would deteriorate over time on this landscape, they would be temporary in nature and would not contribute to degrading the undeveloped characteristic of the IRA to the extent that would preclude it from potential wilderness designation. In most areas, it is anticipated in the short term, understory vegetation (grasses and shrubs) would become established within approximately 2 years making these stumps unnoticeable to forest visitors.

Under all action alternatives, ecosystem composition and structure would be maintained or restored to varying degrees based on the amount and type of treatment proposed. Differences are discussed in analysis for each action alternative. As mentioned above, the current fuel and vegetation conditions have degraded the natural attribute of the roadless expanse. Treating dead and dying trees would promote regeneration of lodgepole pine, aspen, and whitebark pine, as opposed to subalpine fir, and would alter the behavior and severity of potential future wildfires (Collins et al. 2012). The action alternatives create patches and patterns that to some extent emulate natural fire which has been excluded from this ecosystem for a century. The restoration of fire adapted ecosystems does not involve simply the maintenance of open, late seral stands, but also promoting a mosaic of conditions on the landscape on all forest types. Proposed treatments would promote resilience to disturbances by creating a mosaic of conditions in densities, species composition, and age class that differ from untreated areas that would help ensure that not all forests are equally susceptible to the same disturbances at the same time (Forested Vegetation report).

At a landscape scale, proposed treatments would utilize ***variable retention*** concepts; that is, retention of biological legacies in a mosaic fashion would occur. Visually, tree retention would gradate within units and into adjacent units, blending into untreated adjacent forests, to somewhat mimic the variability that would be expected naturally. For example, intermediate harvests would result in clumpy tree distribution, generally retaining the best individuals from multiple size classes. Regeneration harvests would follow variable retention concepts for moist forests, which involve the retention of structures, organisms, and conditions from a pre-harvest forest stand for incorporation into the post-harvest ecosystem and, ultimately, forest stand (Franklin and Johnson 2011). This allows for retention of windfirm individuals and clumps from the previous stand, while creating open conditions desirable for the establishment of early successional forest (ibid). Given wide-scale mortality of dominant lodgepole pine, mature tree reserves would often be relatively sparse and consist of individuals or clumps of Engelmann spruce, subalpine fir, or Douglas-fir. Forest aggregates including dead lodgepole pine would be retained in riparian areas, inoperable areas such as seeps and rock outcrops, and the mosaic of untreated areas across the landscape. Some amount of other biological legacies such as windfirm snags and downed wood would also be retained (Forested Vegetation Report)

Effects Common to Alternatives 2 and 3

Although Alternatives 2 and 3 differ in the acres treated, size of units, and number of units, their impact on roadless values would be the same. Alternative 3 was developed partly for wildlife reasons, to minimize disruptions to elk and lynx habitat. Alternative 3 drops 34 of the units treated in Alternative 2, and treats 2,033 fewer acres than in Alternative 2. In relation to the roadless expanse, there are 119 fewer acres treated in Alternative 3 than in Alternative 2. Table 322 summarizes the major differences between action alternatives in terms of treatments in the roadless expanse. These differences between alternatives affect size only, and do not change the type of the treatment. The magnitude of the acreage change would not substantially change the impact of the burn units on roadless resources; therefore, the alternatives will be analyzed together. Table 322 shows the actions proposed in these two alternatives.

Table 322. Actions proposed in roadless expanse (RE) in action alternatives

Telegraph Treatment Unit #	Treatment Type	Total Unit Acres in RE, Alternative 2	Total Unit Acres in RE, Alternative 3
122/122a	Slash, broadcast burn	242	208
123/123a	Slash, broadcast burn	208	123
169	Slash, broadcast burn	87	87
Total acres treated in Roadless Expanse (Jericho Mountain)		537 Percent of RE=6%	418 Percent of RE=5%

There are three prescribed fire units (122, 123, 169 slash & broadcast burn) proposed within the Jericho Mountain roadless expanse in alternatives 2 and 3. The purpose of these units is to use fire as a treatment tool to accomplish fuels reduction, vegetation restoration, and other habitat goals. To prepare the area for the prescribed fire treatment, cutting down dead trees would be used to modify the fuel bed or heavy concentrations of slash (Jack-straw trees), and/or to mitigate (cut-down) hazard trees adjacent to prescribe fire control lines for safety concerns to holding resources during prescribed fire activities. Cutting down dead trees would be concentrated in areas dominated by dead trees of up to approximately 15 inches in diameter with chainsaws, bucking these into smaller pieces and carried by hand and piled in order to facilitate broadcast burning and to improve safety conditions prior to burning along control lines. In areas where hand piling is not going to occur, slashing would be used to create sufficient surface fuels to carry a prescribed fire, and/or to add fuels to meet woody debris goals for nutrient cycling. In Units 122, 123, and 169 in the Jericho Mountain roadless expanse, the slashing would all be done by hand with chainsaws. Following the slashing preparation, the burn prescription would be mixed severity broadcast burns, which are used to reduce hazardous fuels and restore appropriate fire regimes to the landscape. However, the amount of treatment in alternatives 2 and 3 that can be accomplished by hand methods may be limited, if not infeasible, due at effectively meeting treatment objectives due to the abundance and large size of material in units. The inability to disperse or pile fuels by hand would result in heavier concentration of fuels than desired or originally planned. Consequentially, increases in fire severity and spread during prescribed fire operations could be higher than originally planned thus resulting in a greater amount of impact to residual green trees as these areas would be more likely to come in contact with fire (see Fire and Fuels report). There could also be a greater effect to soils as heavier concentration of fuels would result in longer resident burning times (see the Soils and Fire and Fuels reports). Regeneration response could also take longer to establish post implementation due to greater soil impacts leaving the areas also more susceptible to noxious weed infestations (See the Soils, Forested

Vegetation, and Fire and Fuels reports). Additionally, alternatives 2 and 3 would take a longer amount of time to accomplish treatment goals with hand methods resulting in longer durations of chainsaw noise, presence of crews, and prescribed fire smoke. These effect to wilderness attributes are analyzed below.

Many other vegetation treatments are proposed in the adjacent unroaded lands. These actions were also considered by the specialists in the effects analysis below.

Direct and Indirect Effects

Roadless Characteristics:

For a complete discussion of the expected impacts of Alternatives 2 and 3 on potential roadless characteristics in the analysis area, see Appendix A (to this report): Roadless Characteristics Worksheet located at the end of this report. This worksheet contains analyses from resource specialists concerning the impact of the action alternatives on potential wilderness values, such as those involving botanical, wildlife, soils, or hydrological resources.

In summary, the effects from Alternatives 2 and 3 are expected to be minor and short term, and no characteristic is expected to experience a degrading trend. Management activities may cause direct short-term impacts to air resources from fugitive dust and smoke. Temporary effects to solitude and recreation could occur from the project activities, including sights and sounds of people working, chainsaws, dust and smoke; however, long term impacts to recreation and opportunities for solitude are not expected to occur. There are sensitive plant species in the analysis area potentially impacted by Alternatives 2 and 3. Of those, the activities proposed are expected to have no effect on the Hall's rush, and a possible improving effect on whitebark pine individuals and habitat. The location of the Halls' rush in the roadless expanse is between units 122 and 123, and it would be protected by standard riparian design features. Whitebark pine is also known to be in the roadless expanse and within the analysis area. This species would likely benefit from the proposed units, as it would help them compete. See the Forested Vegetation report for further detail on benefits to WBP. In the Electric Peak roadless expanse, there are two populations of Missoula phlox, and possibly more whitebark pine; these would be unaffected by the proposed activities.

There are four noxious weed species mapped in the Electric Peak IRA, all in the west unit. Where they are mapped is along roads and the Little Blackfoot River. There are noxious weeds mapped in a small portion of the Jericho Mountain roadless expanse. Actions proposed near these four species in the Electric Peak roadless expanse are not expected to have an impact because there would be no ground disturbing activities in this IRA.

While prescribed burning activities can spread weeds, implementing project design features for weed control and emphasizing weed management after soil disturbing activities would move the area toward meeting Forest Plan Standards for weed control and would reduce the risk of introduction and spread of undesirable plants within the project area. Early and aggressive treatment of new infestations would likely result in much smaller infestations than projected. (Telegraph Vegetation Project Noxious Weed Report).

Wilderness Attributes:

<u>Natural: The extent to which long-term ecological processes are intact and operating.</u>

Prescribed fire in this fire adapted ecosystem would begin modifying the trends caused from past fire suppression and reduce the potential risk of large, severe wildfires. This would enhance the

characteristic of “naturalness” throughout the area, by establishing forest characteristics that would have been more typical of this area if fire had been allowed to play its natural role in landscape processes (see Effects Common to all Action Alternatives).

Alternatives 2 and 3 could potentially impact different components of natural processes and resources, including soils, botanical resources, and wildlife. The slashing and prescribed burning activities proposed are expected to produce some level of detrimental soil disturbance, but not in excess of Region 1 soil quality standards, and not at a level that would impact apparent naturalness. However, these effects could be greater than those in alternative 4 because heavy concentrations of fuel may not be adequately dispersed and/or piled by hand as design which could lead to longer burning resident times. Appendix A contains more detailed information on potential impacts.

Management treatments are a form of “modern human control or manipulation” and would to some extent affect the “untrammeled” and natural character within the roadless areas. There is disagreement about whether the effects of additional management actions such as prescribed fire (i.e., trammeling) to correct the effects of previous management actions such as the suppression of natural fire is appropriate (Yung, undated).

The impact of human manipulation of the environment must be balanced against the benefit of restoring roadless and wilderness areas from degraded conditions. The proposed action would mimic natural disturbance across the landscape, but with smaller maximum patch sizes. Forest regeneration and “greenup” would occur shortly after treatment and improve upon the visual appearance of this landscape cycle by resembling and increasingly healthy forest.

In the long term the actions proposed in Alternatives 2 and 3 would enhance or help to maintain the roadless resources including high quality soil, water and air; diversity of plant and animal communities; and habitat for threatened, endangered, proposed, candidate, and sensitive species, and for those species dependent on large, undisturbed areas of land. Whitebark pine habitat conditions would be improved by removing competing conifers and providing suitable conditions for survival. In the long term, treatments would promote regeneration of lodgepole pine, aspen, and whitebark pine, as opposed to subalpine fir, and would alter the behavior and severity of potential future wildfires. Proposed treatments would promote resilience to disturbances by creating a mosaic of conditions in densities, species composition, and age class that differ from untreated areas; that would help ensure that not all forests are equally susceptible to the same disturbances at the same time. Encouraging a mosaic of reforestation and downed-fuel conditions would increase the likelihood that natural wildfires would burn at sizes and intensities more consistent with historic regimes. This would help ensure that a full range of ecological and social values are provided throughout time (Telegraph Vegetation Project Forested Vegetation Report). Refer to Appendix A to this report for specifics on various resources.

<u>Undeveloped: The degree to which development and uses are apparent to most visitors</u>

Alternatives 2 and 3 would have a short-term negative impact and long-term stable effect on the undeveloped quality of the roadless expanse. A beneficial effect would occur under Alternative 3 as a result of road decommissioning. Any prescribed fire control lines would be less evident on the landscape after each growing season. They may be visible by the average forest visitor for about 2 years. Hand piles would also be evident on the landscape in the short term until they are burned. Under alternatives 2 and 3, it is anticipated that the amount of hand piles would be greater in the number of piles dispersed across units and contain shorter length material when compared to alternative 4.

In the short-term, visitors to the roadless expanse would see black and charred vegetation and occasionally soils. Although these visible effects of prescribed burning can mimic natural fire disturbances, such blackened landscapes are often perceived negatively by the public. In the long-term, the prescribed burning actions would reduce fuel loading and promote regeneration of trees, shrubs, wildflowers and other herbaceous plants. This activity would diversify the vegetative mosaic. Additionally, when aspen is present in the stand, the aspen regeneration would be enhanced by burning.

Under Alternative 3, 2.4 miles of road (527 B-1) in the Jericho Mountain roadless expanse would be decommissioned. Decommissioning would include full obliteration of the road: recontouring (returning the road prism to natural contour), removing culverts, replacing topsoil, placing woody debris upon the disturbed area to provide stability, and seeding the disturbed area. During implementation, these activities would have a short term adverse effect on the natural attributes of the area, but would, over time, reduce the amount of roads in the area and provide a more natural and undeveloped state in the roadless expanse. Decommissioning of road 527 B-1 would reduce the level of development in the Jericho Mountain roadless expanse.

Outstanding opportunities for solitude or primitive unconfined recreation: Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.

Alternatives 2 and 3 would have a short-term impact on the existing solitude and primitive recreation values of the roadless and unroaded areas while treatment activities were occurring. The presence of workers and the sights and sounds of project work, including noise from chainsaws, could temporarily displace forest visitors. Some dispersed campsites could become temporarily unavailable.

The Jericho Mountain roadless expanse has only moderate existing solitude or primitive recreation value, due in part to the many roads in the expanse, motorized uses, and long, narrow shape. The management activities proposed throughout the expanse would not permanently alter this baseline condition. However, road decommissioning in Alternative 3 would improve opportunities for solitude, particularly in hunting season when this route is used as an access point. Under Alternative 2, no road decommissioning would occur; therefore opportunities for primitive and unconfined recreation as well as for solitude would not increase or decrease from this action.

In the Electric Peak roadless expanse, the existing potential for solitude and primitive recreation is higher. However, in the roadless expanse near the project area, the solitude value could be compromised by noise from area roads during project implementation. In the long term, the proposed activities would not further deteriorate this existing solitude condition in the area.

Alternative 2 proposes several regeneration harvest units with haul routes immediately adjacent to the western boundary of the Jericho Mountain roadless expanse, and Alternative 3 proposes a smaller amount of this type of treatment in the same area. Noise and dust produced during ground based activities may negatively disrupt the solitude qualities directly inside the boundary. The sounds of equipment may be audible until visitors travel further into the interior. These effects are expected to be short term and only persist near the roadless expanse boundary.

In some of the units, there would be a greater sight distance than at present and for several years visitors could become more aware of other activities in the area as well as on private lands. This effect would not be as great as potential effects from a large wildfire. An indirect effect of proposed

prescribed fire activities could be displacement of visitors to untreated areas for recreation, mostly because of visuals however, this effect would last for about one year after prescribed fire activities when green-up would occur.

Under alternative 2 and 3, the short term effects to solitude or primitive unconfined recreation would potentially last longer when compared to alternative 4 because the use of hand methods are not as efficient at achieving treatment objectives than if mechanical equipment was utilized. This would extend the time short term effects during implementation such as the sights and sounds of project work including forest workers, noise from chainsaws, and smoke from prescribed fire. On the other hand, the presence of mechanical equipment such as fellerbunchers could have a greater effect on solitude during implementation than if only hand crews and chainsaws were present due to the inherent louder sounds machinery makes and their mere presence.

Near the Electric Peak roadless expanse, regeneration harvesting and precommercial thinning are proposed. During the implementation of these treatments, visitors to the Electric Peak roadless expanse near the project boundary may perceive the sights, sounds, and smells of equipment operating. These would be short term, lasting only for the duration of the project. Mitigation measures would be put in place limiting log hauling operations to weekdays and minimizing activities during hunting season. Alternative 3 proposes less treatment near Electric Peak roadless expanse than Alternative 2.

Special Features:

The action alternatives are expected to have no impact on existing special features values of the roadless and unroaded areas. There are no existing sensitive soils or other known special features in the Jericho Mountain roadless expanse or the Electric Peak roadless expanse of the analysis area. There are existing identified historical/cultural sites and historic mining districts within the Electric Peak and Jericho Mountain roadless expanse. With the employment of mitigation measures, however, no impacts to these historical and cultural attributes are expected.

Manageability:

Alternative 2 and 3 would not affect the existing manageability value of the roadless expanse in the analysis area except that road decommissioning could improve the ability to manage the Jericho Mountain roadless expanse as potential wilderness. There are no new permanent roads proposed in the roadless expanse that would complicate potential wilderness boundary management. As discussed above, the Jericho roadless expanse is not considered highly manageable in its existing configuration and proposed activities would not appreciably change this attribute.

Alternative 4

This alternative was developed in response to public comment on the draft EIS. Public comments recommended using mechanical equipment to remove fuel from treatment units located near existing roads within the Jericho Mountain Inventoried Roadless Area (IRA) to minimize hazards. This alternative proposes additional opportunities and methods to modify fuels (mechanical and prescribed fire) adjacent to infrastructure/private lands and within the prevailing wind path. Additionally, this alternative was designed to minimize exposure to forest workers from standing dead trees during felling operations and efficiently and effectively meet treatment objectives. Field recognizance validated that the use of mechanical equipment would be an effective means to rearrange and remove dead and down fuel in these units and is anticipated to take less time to achieve treatment objectives when compared to conducting them with hand methods. Under this

alternative, mechanical treatments would replace hand only treatments proposed in alternatives 2 and 3.

Anticipated effects of this alternative that differ from alternatives 2 and 3 would be short term and mainly include the sight and sounds of mechanized equipment and skid trails. Utilizing mechanical equipment in the roadless expanse provides the ability to disperse and pile fuel in an effective manner so as to meet prescribed fire objectives and limit the amount of impact to resources. Heavy concentrations of fuel would be broken up and disperse across units with precision. The severity and spread of prescribed fire would be consistent as originally planned. The likelihood of burning residual green trees would be minimized. Breaking up heavy concentrations of fuel would also reduce resident burning times and associated soil disturbance. Rapid regeneration response would occur and the spread of noxious weed would be reduced due to the lower level of soil disturbance post treatment when compared to alternatives 2 and 3. The use of mechanical equipment would also be the quickest option at accomplishing treatment goals which would curb the short term effects of chainsaws and machinery noise, presence of crews, and prescribed fire smoke. These effect to wilderness attributes are analyzed below.

All prescription types have been explored within each proposed treatment unit. Within units proposed with a prescription of clearcut there are no other options due to the high levels of mortality.

Silvicultural terminology is based on the function of the system, rather than its appearance. For example, generally even- or 2-aged regeneration harvests (clearcutting, seed-tree cutting, or shelterwood cutting) leave behind few residual trees because of high mortality, or because the tree species to be regenerated require open, sunny conditions. However, these treatments may visually appear similar to one another. For example, a clearcut with reserves may contain many residual trees that are not retained to provide seed or shelter, but rather to provide snag recruitment or diversity. Similarly, shelter and seed tree harvests retain trees to provide seed and/or shelter as required by the desired regeneration species, and may contain additional remnants for other purposes. In some cases, these may look like thinning, but because the objective is to establish new regeneration, they are regeneration harvests. Conversely, an intermediate treatment such as an improvement harvest may result in an open forest, but regeneration is not required as part of the treatment goal.

Clearcut: A stand in which essentially all trees have been removed in one operation and may or may not have reserve trees left to retain goals other than regeneration (Helms 1998). This is proposed in lodgepole pine stands with high levels of mortality. Leave trees or reserves would be retained for snags and diversity, and would consist of scattered individuals or patches of other species, and in some cases lodgepole where it is mixed with other species or is healthy and vigorous. Depending on the remaining stocking, the resulting stand could be 2-aged or even-aged. Generally, at a minimum live Douglas-fir and spruce would be retained, and all whitebark pine where present. Lodgepole pine, Douglas-fir, Engelmann spruce, and/or whitebark pine natural regeneration is expected depending on the unit.

Direct and Indirect Effects

For a complete discussion of the potential impacts of Alternative 4 on roadless characteristics in the analysis area, see the Roadless Characteristics Worksheet located at the end of Roadless Expanse Resource section (page 848). This worksheet contains analyses from resource specialists concerning the impact of the action alternatives on potential wilderness values, such as those involving botanical, wildlife, soils, or hydrological resources.

Alternative 4 proposes 601 acres treated in the roadless expanse, all within the Jericho Mountain roadless expanse (7 percent of roadless expanse acres). The total is slightly more than proposed in Alternative 2 (537/6 percent) and 3 (418/5 percent). The main difference is the proposed regeneration harvest and mechanical rearrangement of fuels under this alternative.

Table 323. Proposed treatments in roadless expanse, alternative 4

Treatment	Acres
Regeneration harvest, clearcut with leave trees and jackpot burn	207
Mechanical Arrangement of Fuels, broadcast burn	372
Prescribed fire	22

Roadless Characteristics:

Impacts will be similar to Alternatives 2 and 3, with the following differences noted below.

Wilderness Attributes:

Natural: The extent to which long-term ecological processes are intact and operating.

This alternative proposes one additional prescribed fire unit in the Jericho Mountain roadless expanse, but less total acres. Effects would be similar to alternatives 2 and 3.

Regeneration harvest and mechanical rearrangement of fuels treatments are proposed under this alternative. These harvests could include clearcutting, seed/shelterwood cutting, and single or group tree selection depending on the tree species and desired regeneration. For 1- or 2-aged systems, most of the dead overstory is removed and the stand is dominated by new regeneration. In a 2-aged system some overstory could be left. Where green trees exist, they will be retained on the landscape with the exception of hazard trees. Mechanical rearrangement of fuels include felling trees and piling concentrations in the forest with mechanical equipment for later burning. This work would be done with a feller-buncher. Other equipment that may be used include excavators, skidders and forwarders.

Regeneration treatments are proposed mainly in stands comprised of dead and dying lodgepole pine. These stands have already lost their suitability as habitat for species associated with a certain level of live canopy cover and live tree density. Proposed harvest activity, while modifying existing and future deadfall, would not be a major factor driving habitat fragmentation. Currently, the primary agent of mature forest fragmentation in the project area and across the Divide landscape is the mountain pine beetle. Because of its scale, the beetle-kill will produce genuine fragmentation and wholesale replacement of mature forest communities across large sections of the landscape. (Telegraph Vegetation Project Wildlife Report).

Slashing, burning, mechanical rearrangement of fuels and regeneration harvest could potentially impact components of natural processes and resources, including soils, botanical resources, and wildlife in the short term. However, as mentioned above, the effect to these resources, particularly soils, would be lower than if treatments were conducted with hand methods. See the Roadless Characteristics Worksheet located at the end of Roadless Expanse Resource section (page 848) for more specific details.

In the long term, forest health and resiliency would be most improved over the other alternatives due to the development of a less homogenous forest, more diversity of species, and a mosaic of age classes. In the long term, treated areas would be more resilient to wildfire, drought, and insect

outbreaks, which would more likely maintain the quality of soil, water, and air in the future. The combination of proposed treatment areas, past treatment areas, and unmanaged areas would result in a variety of tree age classes and stand density and composition on the landscape that would mimic mosaic patterns created by wildfire, which would help to restore some of the natural quality of these previously altered areas within the roadless expanse.

Openings and burned areas would likely regenerate rapidly to lodgepole pine due to the abundance of serotinous cones and light. Untreated portions of the stands would either contain pole sized lodgepole pines, mature trees of other species, or gradually release advanced regeneration, mainly spruce/fir. The result would be a mosaic of patches of fast-growing lodgepole pine regeneration, slower growing spruce/fir regeneration, and larger trees of different species.

Due to these proposed treatments, human manipulation of the environment, or trammeling, would be the greatest under this alternative.

Undeveloped: The degree to which development and uses are apparent to most visitors

Impacts from prescribed fire would be similar to alternatives 2 and 3. The main differences in this alternative are the proposed regeneration harvest and mechanical rearrangement of fuels treatments. Evidence of development and use would be present in the short term in the form of burn piles, active harvest management, and brushing/limbing and skid trails for machinery access to units. Burn piles would also be evident on the landscape in the short term until they are burned. Under alternative 4, it is anticipated that the amount of piles would be less in the number dispersed across units and contain longer material when compared to alternatives 2 and 3 because mechanical equipment has the ability to manage and rearrange large material where hand methods cannot. The overall footprint burn piles would have on the landscape would be less in alternative 4.

Removal or cutting of trees would create evidence of use such as tree stumps in some areas and would be greater in alternative 4 than 2 and 3. This evidence would be evident on 7 percent of the entire roadless expanse. The remaining portion of the roadless expanse would remain in its current state. See discussion above regarding stumps in Effects Common to All Action Alternatives.

This alternative proposes the highest level of mechanized treatment and motorized equipment in the roadless expanse. The sights and sounds of mechanized equipment such as fellerbunchers, forwarders, skidders, and chainsaws would be present during implementation, thus noticeable in the short term. Until rehabilitation was accomplished, evidence of machinery ingress and egress to units (skid trails) would be noticeable. The difference in these short term effects between alternatives 2 and 3 compared to 4 are two-fold. On one hand, effects on solitude and primitive recreation would last longer in alternatives 2 and 3 due to the longer amount of time it would take to achieve treatment objectives with the use of hand methods when compared to the use of mechanical methods which would be completed in a shorter amount time. On the other hand, the presence of mechanical equipment such as fellerbuncher could have a greater effect on solitude during implementation than if only hand crews and chainsaws were present due to the inherent louder sounds machinery makes and their mere presence. There would be no long term negative impact to the undeveloped attribute. However, road decommissioning would benefit the undeveloped attribute by removing evidence of development from the roadless expanse.

Outstanding opportunities for solitude or primitive unconfined recreation:

Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its own terms, without comfort and convenience of facilities.

Impacts would be similar to the other two action alternatives; however, effects would be greater at certain time periods due to the activity occurring in the regeneration harvest and mechanical rearrangement of fuels treatment areas. This alternative has the most potential short-term direct effect to solitude. Impacts would occur during project implementation due to the presence of Forest personnel managing the implementation and noise associated with the use of chainsaws and machinery for mechanical treatments. Under this alternative, a precommercial thinning unit is also proposed immediately adjacent to the southwest of the Jericho Mountain roadless expanse boundary. Sights and sounds of machinery and crews would be obvious and apparent to visitors just inside the expanse while treatments were ongoing. Overall, short term effects on solitude and primitive recreation would last a shorter duration when compared to alternatives 2 and 3 because the use of mechanized equipment would be more efficient at accomplishing treatment objectives. Refer to the Fire and Fuels report for a discussion on hand crew production rates.

Solitude could be affected in the long term in the regeneration harvest units where the tree density and spacing allows for greater sight distance. In general, recreation patterns are not expected to deviate from the existing condition, since the total acreage proposed for this treatment makes up a small percentage of the overall roadless expanse area.

Indirect effects to opportunities for primitive and unconfined recreation could result from changes to the appearance of the units following the regeneration harvest and mechanical rearrangement of fuels treatment activities. These treatments are proposed to occur in a very small portion of the roadless expanse. The remainder of the roadless expanse would offer the same opportunities as it has in the past, unless a large wildfire changes the landscape.

The proposed vegetation management treatments would result in improvements in forest health and sustainability that are large and widespread. In the event of a wildfire, or insect infestation the restored forest would likely experience more typical low severity fire and small scale insect infestation. This would indirectly benefit primitive and unconfined recreation in the long term by retaining opportunities for activities currently enjoyed by the public.

For more information on impacts to recreation, refer to the Telegraph Vegetation Project Recreation Report.

This alternative also proposes regeneration harvest activities near the Electric Peak roadless expanse; impacts would be similar to alternative 2. Unlike the other alternatives, this alternative also proposes prescribed fire immediately adjacent to the eastern boundary. While the proposed units are small, visitors inside the expanse could experience smoke from these units, which could affect their ability or desire to recreate in their chosen manner. This would be short-term and specific only to that portion of the expanse.

Impacts from road decommissioning would be the same as under Alternative 3.

Special Features:

Similar to alternatives 2 and 3.

Manageability:

Similar to alternatives 2 and 3.

Irreversible and Irretrievable Commitments

There would be no irreversible or irretrievable commitments to roadless resources with this alternative. The likelihood of severe wildfire and the associated impacts would be reduced in the treated areas, lowering the risk of an irretrievable effect.

Cumulative Effects

Analysis of cumulative effects on the roadless expanse considers the effects of past, present, and reasonably foreseeable future activities on the potential wilderness attributes of these lands. When the effects of past, present, and reasonably foreseeable activities overlap in space and time with direct and indirect effects of proposed activities in the roadless expanse, potential cumulative effects could occur. Activities in any part of the roadless expanse could, when considered with project activities, combine to have an impact on the IRA's wilderness potential. Actions considered date back to pre-1960 actions that are known, and date forward to all reasonably foreseeable planned future activities. A list of these actions considered is provided in Appendix B to this report located in the project record. They include timber harvesting, prescribed burning, road and trail reconstruction, recreational use, mining, the proposed Tenmile-South Helena vegetation project, EPA mine reclamation work and private land development.

Past timber harvesting and road construction contributed to the existing condition of roadless expanse, creating an area where human activity is evident, and there is only moderate existing potential for most wilderness attributes. These proposed treatments would have the potential to maintain or restore the characteristics of ecosystem composition and structure by reducing the risk of uncharacteristic wildfire effects within the Jericho Mountain roadless expanse. The exception to this existing condition is in the majority of the Electric Peak IRA, as discussed above in the Affected Environment section. Some past activities, such as improvements to non-motorized trails, have contributed positively to the primitive recreation values in the area, maintaining some non-motorized trail experiences for recreation visitors as well as hunting and fishing access. Present and reasonably foreseeable future trail maintenance projects will contribute to this effect.

Other present and reasonably foreseeable future activities include continued maintenance on open forest roads, including improving road and surface drainage, clearing roadside vegetation, and repairing and maintaining culverts. These activities will have a largely neutral effect on potential wilderness attributes in the analysis area, as they will perpetuate the existing human-modified landscape condition. A short section of OHV trail (0.38 mile) off the Rimini Road is targeted for decommission, which, when considered with the decommissioning proposed in this project, would improve the undeveloped quality.

Additionally, the reasonably foreseeable Tenmile – South Helena Project proposes vegetation and prescribed burning treatments in the Jericho Mountain IRA. These proposed treatments would have the potential to maintain or restore the characteristics of ecosystem composition and structure by reducing the risk of uncharacteristic wildfire effects within the Jericho Mountain IRA. Cumulatively, the majority of the roadless expanse (approximately 91 percent) would fall within either the Telegraph Vegetation project boundary or the Tenmile – South Helena project area boundary. However, within the project boundary not all acres will be treated. Treatments also would affect the untrammeled, undeveloped and opportunities for solitude attributes in the IRA when considered in conjunction with the proposed Telegraph treatments. Units from each project, though separated by a road (1863), are adjacent to each other and, depending on timing of treatments, could create

unfavorable, though short term, impacts to visitors wishing to experience solitude or to recreate in the area. Table 6 shows proposed acres of treatments in the Jericho Mountain roadless expanse by each project to show potential cumulative effects of both projects.

Table 324. Proposed Jericho Mountain Roadless Expanse (RE) treatment acres in Tenmile-South Helena (TSH) and Telegraph Projects

TSH Alt. 2, RE acres (Proposed Action)	TSH Alt. 3, RE acres	Telegraph Alt. 2, RE Acres	Telegraph Alt. 3, RE acres	Telegraph Alt. 4, RE acres
3,944	1,468	537	418	601

Should implementation of both projects occur through an action alternative, cumulatively up to 4,545 acres of the roadless expanse total of 9,190 acres could be treated in some form. While the level of human manipulation, impacts to solitude and recreation would be high in some portions of the roadless expanse, most of the cumulative effects would ultimately be beneficial because they would increase the resiliency of forest conditions and reduce the risk of potential negative impacts from wildfire, therefore maintaining the roadless and wilderness qualities that are currently valued by the public. Most effects would be short term and experienced during the project implementation phase. Since no treatments are proposed in the Electric Peak IRA, the cumulative effects would be limited to the continuation of the MBP activity and the potential for wildfire there. Appendix G (maps) of this FEIS, map Cumulative Effects Boundaries and Past, Present and Foreseeable Project, displays proposed units for both the Telegraph and Tenmile – South Helena projects.

Forest Plan Consistency

The actions proposed by alternatives 2, 3, and 4 are consistent with Forest Plan direction for goals and standards prescribed for management areas located within the roadless expanse. The impacts of the proposed activities on the roadless expanse would remain within Forest Plan standards. The no action alternative is minimally consistent with Forest Plan direction; over time the goals for forage and healthy timber stands could become compromised without attention to the MPB epidemic and associated risk of wildfire.

Roadless Rule Consistency

All alternatives comply with the Roadless Area Conservation Rule and applicable Forest Plan standards as amended by this rule. All action alternatives are within the exceptions identified in 36 CFR §294.13(b) (1) and/or in paragraphs (b) (2) through (b) (4). Management activities focus on restoring 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. Trees removed through harvest or mechanical rearrangement of fuels would be either dead or those that were so suppressed as to not be likely to respond to release and would be prone to windthrow. Occasionally larger trees could be removed for safety considerations.

The action alternatives target even aged stands of primarily dead lodgepole pine for treatment, with very little diversity in age and size class. The majority of the overstory is composed of dead trees. Approximately 70-90 percent of the dead trees are in the same size class. The majority (90 percent) of the live trees are less than 5” DBH. See also design features.

The effects of uncharacteristic wildfires often include unnatural increases in wildfire size, severity, and resistance to control and the associated impacts to people and property. These uncharacteristic effects have been caused primarily by past wildfire suppression, and past timber harvesting and

grazing practices. These have contributed to often-dramatic changes in some areas in wildfire frequency, size, and severity (Roadless Area Conservation FEIS, 2000, Vol. 1, 3–72 to 3–73). The vegetative structure, density, and composition of these areas have changed when compared to less altered ecosystems (Roadless Area Conservation FEIS, 2000, FEIS Vol. 1, 3–144).

Conclusions

Under the no-action alternative, potential negative impacts to the natural and primitive and unconfined recreation attributes would result from not addressing the MPB epidemic, the associated fallen trees and the increased risk of uncharacteristic wildfire that a lack of treatment would produce. Potential impacts of large, severe wildfires could include health and safety risks to public recreational uses as well as to forest workers and fire suppression crews.

The action alternatives would have short-term direct impacts to roadless resources during project implementation such as increased presence of people and noise within the project area. The proposed treatments would address the purpose and need for the Telegraph Vegetation Project, resulting in a more diverse, resilient and sustainable forest ecosystem with a reduction in risk of negative impacts from wildfire. The long-term indirect effects from the action alternatives to roadless resources would be generally beneficial and help to maintain the existing recreation settings and scenic qualities within the project area. Decommissioning of 2.4 miles of road (in alternatives 3 and 4) would enhance opportunities for solitude and benefit the undeveloped attribute in the roadless expanse.

Impacts would be stable or improving for a majority of roadless area characteristics and wilderness attributes with short-term impacts to the undeveloped attribute from the hand slashing activities, regeneration harvest, mechanical rearrangement of fuels, and prescribed fire control lines and short-term impacts to solitude during project implementation.

Cumulative effects to roadless resources from both Alternative 2 and 3 would generally be short term and related to an increased presence of people, vehicles and the associated noise that may affect solitude. In some of the units, there would be a greater sight distance than at present and for several years visitors could become more aware of other activities in the area as well as on private lands. This effect would not be as great as potential effects from a large wildfire. An indirect effect of proposed prescribed fire activities could be displacement of visitors to untreated areas for recreation, mostly because of visuals however, this effect would last for about 1 to 2 years after prescribed fire activities when green-up would occur.

The effects of Alternative 4 relative to roadless resources would be similar to those described for Alternative 2, although the regeneration harvest and mechanical rearrangement of fuels proposed would benefit naturalness more than the other alternatives in the long term.

Under alternative 2 and 3, the short term effects to solitude or primitive unconfined recreation would potentially last longer when compared to alternative 4 because the use of hand methods are not as efficient at achieving treatment objectives than if mechanical equipment was utilized. This would extend the time short term effects during implementation such as the sights and sounds of project work including forest workers, noise from chainsaws, and smoke from prescribed fire. On the other hand, the presence of mechanical equipment such as fellerbunchers could have a greater effect on solitude during implementation than if only hand crews and chainsaws were present due to the inherent loud sounds machinery makes and their mere presence in the roadless expanse.

Burn piles would also be evident on the landscape in the short term until they are burned for all action alternatives. Under alternative 4, it is anticipated that the amount of piles would be less in the number dispersed across units and contain longer material when compared to alternatives 2 and 3

because mechanical equipment has the ability to manage and rearrange large material where hand methods cannot. The overall footprint burn piles would have on the landscape would be less in alternative 4 and have a lesser effect on the natural setting of the roadless expanse when compared to alternatives 2 and 3.

The long term forest health and resiliency would be most improved under alternative 4 over the other alternatives due to the development of a less homogenous forest, more diversity of species, and a mosaic of age classes. In the long term, treated areas would be more resilient to wildfire, drought, and insect outbreaks, which would more likely maintain the quality of soil, water, and air in the future. The combination of proposed treatment areas, past treatment areas, and unmanaged areas would result in a variety of tree age classes and stand density and composition on the landscape that would mimic mosaic patterns created by wildfire, which would help to restore some of the natural quality of these previously altered areas within the roadless expanse.

Solitude could be affected in the long term in the regeneration harvest units where the tree density and spacing allows for greater sight distance though this effect would be temporary because trees will grow back and would limit line of sight. In general, recreation patterns are not expected to deviate from the existing condition, since the total acreage proposed for this treatment makes up a small percentage of the overall roadless expanse area.

Telegraph Project Roadless Characteristics worksheet

Evaluating the Effects of Project Activities on Roadless Characteristics

Date:	December 22, 2015 – Updated for the FEIS: March 29, 2016
Roadless Area:	Jericho Mountain and Electric Peak Inventoried Roadless Areas

Description of Project Activity in Roadless Area:
The Electric Peak IRA lies directly adjacent to project area to the southwest, but does not fall within the project area. 11% of the Jericho Mountain IRA falls within the Telegraph Project Area. Prescribed fire units and regeneration harvest are proposed within the IRA. There is land immediately adjacent to Jericho Mtn. IRA to its southwest that could be considered unroaded, as it is not separated from the IRA by a system road. This unroaded area does have past harvest history and is primarily located within T-1 management area. Many other vegetation treatment units are proposed within the adjacent unroaded lands.

Effect to Roadless Characteristics			
Roadless Characteristics As described in 36 CFR 294 – Roadless Area Conservation Final Rule, 2001	**Is there an effect?** Yes or No	**Which direction is the effect**? Improving, Stable or Degrading?	**Describe the actual effect**. Use descriptive terms that discuss the effect, not the activity. Explain if the proposal would Alter or Modify the landscape.
Soil, Water and Air Resources These three key resources are the foundation upon which other resource values and outputs depend. Healthy watersheds catch, store, and safely release water over time, protecting downstream communities from flooding; providing clean water for domestic, agricultural, and industrial uses; helping maintain abundant and healthy fish and wildlife populations; and are the basis for many forms of outdoor recreation. Identify any unique or critical watershed resources. Describe how the project will affect these key resources areas and the habitats that depend on them.	Soils: Yes Air: Yes Water: No effect	Stable Stable No effect	There are proposed activities that may affect soils in the Jericho Mountain IRA. These activities are designed to create no more than 15 % detrimental soil disturbance within the activity area. The slashing activities proposed in the IRA would not detrimentally impact the soil resource under the action alternatives. The broadcast burning activities proposed in the Jericho Mountain IRA is expected to produce a range of 2% - 10% detrimental soil disturbance. The mechanical rearrangement of fuels and regeneration harvest are also designed to fall below the 15% detrimental soil disturbance threshold. For more information, see the Helena Telegraph Soils Background Report. Air: Management activities associated with prescribed burning may pose a nuisance to some visitors to the forest. However, implementation of alternatives would be in compliance with the Forest Plan by complying with air quality standards by not causing or contributing to any exceedances or violations of Federal or State standards and by cooperating with the Montana Air Quality Bureau in the Prevention of Significant Deterioration (PSD) program and by using Best Available Control Technology (BACT) techniques as defined in the Administrative Rules of Montana for Open Burning (ARM 17.8.601). Smoke concentrations are expected to be within NAAQS and state of Montana air quality standards. The Telegraph Project prescribed burns would be coordinated with the Montana/Idaho State Airshed Group, and specific restrictions would be implemented when smoke accumulation is probable due to inadequate dispersion. Water: There is a low probability of elevated erosion and sediment delivery to streams or wetlands from proposed activities. However, if design features intended to minimize sediment delivery are properly implemented, this effect is unlikely to be measurable. In addition, this effect would be short term in nature.

Effect to Roadless Characteristics			
Roadless Characteristics As described in 36 CFR 294 – Roadless Area Conservation Final Rule, 2001	**Is there an effect?** Yes or No	**Which direction is the effect**? Improving, Stable or Degrading?	**Describe the actual effect**. Use descriptive terms that discuss the effect, not the activity. Explain if the proposal would Alter or Modify the landscape.
Sources of public drinking water National Forest System lands contain watersheds that are important sources of public drinking water. Roadless areas within the National Forest System contain all or portions of 354 municipal watersheds contributing drinking water to millions of citizens. Maintaining these areas in a relatively undisturbed condition saves downstream communities millions of dollars in water filtration costs. Careful management of these watersheds is crucial in maintaining the flow and affordability of clean water to a growing population. Identify any public drinking water systems or sources within the project area or that would be affected by the project. Describe how the project would affect water quality and quantity of the public drinking water source.	No	N/A	The municipal water supply is located within the Jericho IRA but not within the project area. However, prevailing winds could push a fire into the Tenmile Watershed. Fire suppression plans dictate the need to contain fire on the Telegraph side to prevent spread into the Tenmile drainage. Treatments are designed to improve conditions for fire suppression effectiveness.
Diversity of plant and animal communities Roadless areas are more likely than roaded areas to support greater ecosystem health, including the diversity of native and desired nonnative plant and animal communities due to the absence of disturbances caused by roads and	Yes	Improving	Botany: No effects for Hall's rush. Possible effects to whitebark pine individuals and habitat: direction = improve. There are two sensitive plant species in Jericho Mountain IRA. One (Hall's rush) is in the project area, and between but not in units 122/123. It would be protected with standard riparian buffers for the meadow it grows in. The only other known location in Jericho Mountain is whitebark pine, just outside the project area (but it probably exists in more places than just there). Scattered individuals and regeneration may occur. There could be impacts to individual whitebark pine, most likely as inadvertent or unavoidable damage from fire,

Effect to Roadless Characteristics			
Roadless Characteristics As described in 36 CFR 294 – Roadless Area Conservation Final Rule, 2001	**Is there an effect?** Yes or No	**Which direction is the effect**? Improving, Stable or Degrading?	**Describe the actual effect**. Use descriptive terms that discuss the effect, not the activity. Explain if the proposal would Alter or Modify the landscape.
accompanying activities. Inventoried roadless areas also conserve native biodiversity by serving as a bulwark against the spread of nonnative invasive species. Discuss the diversity of plant and animal communities. Identify any unique plant and animal communities within the area. Describe effects to the diversity of communities and impacts to populations in the areas.			equipment, or trampling. Generally, though, whitebark pine would benefit from the proposed activities by providing some relief from competition and promoting natural regeneration. In the Electric Peak IRA, there are two populations of Missoula phlox, and very likely whitebark pine as well; these would be unaffected by the proposed activities. There are four noxious weed species mapped in the Electric Peak IRA, all in the west unit. Where they are mapped is along roads and the Little Blackfoot River. There are noxious weeds mapped in a small portion of the Jericho Mountain roadless expanse. Actions proposed near these four species in the Electric Peak roadless expanse are not expected to have an impact. While prescribed burning activities can spread weeds, implementing project design features for weed control and emphasizing weed management after soil disturbing activities would move the area toward meeting Forest Plan Standards for weed control and would reduce the risk of introduction and spread of undesirable plants within the project area. Early and aggressive treatment of new infestations would likely result in much smaller infestations than projected. Regeneration treatments are proposed mainly in stands comprised of dead and dying lodgepole pine. These stands have already lost their suitability as habitat for species associated with a certain level of live canopy cover and live tree density. For some species (e.g., elk), the removal of standing dead trees results in a reduction of ‘hiding cover’ or screening that otherwise could allow for safe passage through the project area. For other species, in the short term, the non-forested openings that would be created through regeneration harvest would improve forage habitat for species that are attracted to these openings during snow free months (e.g., mule deer, grizzly bears). As trees regenerate in these units, habitat conditions would become favorable for species associated with early stand initiation environments (e.g., snowshoe hare and subsequently lynx). Areas proposed for regeneration harvest will take several decades to regenerate to stand structure conducive to species associated with mature and late-successional forests.

Effect to Roadless Characteristics			
Roadless Characteristics As described in 36 CFR 294 – Roadless Area Conservation Final Rule, 2001	**Is there an effect?** Yes or No	**Which direction is the effect**? Improving, Stable or Degrading?	**Describe the actual effect**. Use descriptive terms that discuss the effect, not the activity. Explain if the proposal would Alter or Modify the landscape.
Habitat for TES and species dependent on large undisturbed areas of land Roadless areas function as biological strongholds and refuges for many species. Of the nation's species currently listed as threatened, endangered, or proposed for listing under the Endangered Species Act, approximately 25% of animal species and 13% of plant species are likely to have habitat within inventoried roadless areas on National Forest System lands. Roadless areas support a diversity of aquatic habitats and communities, providing or affecting habitat for more than 280 threatened, endangered, proposed, and sensitive species. More than 65% of all Forest Service sensitive species are directly or indirectly affected by inventoried roadless areas. This percentage is composed of birds (82%), amphibians (84%), mammals (81%), plants (72%), fish (56%), reptiles (49%), and invertebrates (36%). Identify any TES or sensitive species within the Roadless area. Describe how the project would affect the habitats or populations and whether this effect is significant across the	Yes	Long term improving	See above

Effect to Roadless Characteristics			
Roadless Characteristics As described in 36 CFR 294 – Roadless Area Conservation Final Rule, 2001	**Is there an effect?** Yes or No	**Which direction is the effect**? Improving, Stable or Degrading?	**Describe the actual effect**. Use descriptive terms that discuss the effect, not the activity. Explain if the proposal would Alter or Modify the landscape.
normal range and distribution of these habitats and populations.			
Primitive and semi-primitive classes of recreation Roadless areas often provide outstanding dispersed recreation opportunities such as hiking, camping, picnicking, wildlife viewing, hunting, fishing, cross country skiing, and canoeing. While they may have many Wilderness-like attributes, unlike Wilderness the use of mountain bikes, and other mechanized means of travel is often allowed. These areas can also take pressure off heavily used wilderness areas by providing solitude and quiet, and dispersed recreation opportunities. Describe current recreation opportunities within the Roadless area. Identify the effects of your project of the area and these activities. Describe the effect in terms of availability for similar experiences in surrounding areas or within the region of use. Consider link to ROS mapping.	Yes	Improving in long term	ROS mapping of the expanse indicates the majority of the Jericho Mountain roadless expanse and the part of the area adjacent to the Electric Peak IRA is in Roaded Natural (RN). Small portions of the area, adjacent to each IRA, are managed as Semi-primitive Motorized and Semi-primitive Non-motorized. In a RN area, there is equal probability to encounter other user groups and for isolation from sights and sounds of other humans. The roadless expanse has limited existing potential for primitive and unconfined recreation, as most of the area is roaded. In Roaded Natural settings, “Challenge and risk opportunities associated with more primitive types of recreation are not very important.” This aptly characterizes most of the Jericho Mountain roadless expanse. The Electric Peak IRA, which is proposed as a potential wilderness area, has higher existing potential for primitive recreation, but no activities in the project area will impact primitive recreation in Electric Peak. Temporary effects to solitude and recreation could occur from the project activities, including sights and sounds of people working, machinery, dust and smoke, which could cause visitors to be displaced from areas they wanted to recreate in. Other areas do exist for these opportunities. In some prescribed fire units, the presence of blackened trees, downfall, and greater sight distance would change the recreation experience for a number of years on a small amount of acres. In Alternative 4, solitude could be affected in the long term in the regeneration harvest units where the tree density and spacing allows for greater sight distance however this would temporary as tree would grow back over time. No road construction or reconstruction is proposed within the roadless expanse; therefore the current roadless characteristic would not change. Decommissioning of 2.4 miles of road in the Jericho IRA (Alternatives 3 and 4) would represent a loss of motorized recreation opportunity, but would improve opportunities for solitude.

Effect to Roadless Characteristics			
Roadless Characteristics As described in 36 CFR 294 – Roadless Area Conservation Final Rule, 2001	**Is there an effect?** Yes or No	**Which direction is the effect**? Improving, Stable or Degrading?	**Describe the actual effect**. Use descriptive terms that discuss the effect, not the activity. Explain if the proposal would Alter or Modify the landscape.
Reference landscapes for research study or interpretation The body of knowledge about the effects of management activities over long periods of time and on large landscapes is very limited. Reference landscapes of relatively undisturbed areas serve as a barometer to measure the effects of development on other parts of the landscape. Describe the landscape that is present. Describe any unique reference landscapes that exist within the Roadless area. Describe how the project activities might affect the reference, landscape values of the Roadless area. Consider how the landscapes within the Inventoried Roadless area fits within the broader landscape and if the project creates any overall change. Consider landscape character descriptions in SMS.	No	N/A	Past human activity within the roadless expanse could preclude this area being considered as a reference landscape. The current landscape is comprised of dense forests susceptible to insect and wildfire mortality (Douglas fir and lodgepole pine). In addition, a large-scale mountain pine beetle epidemic has killed most of the mature lodgepole pine and ponderosa pine. The proposed action would result in a landscape more resilient to disturbance. Forest regeneration and “greenup” would occur shortly thereafter and improve upon the visual appearance of this landscape cycle by resembling an increasingly healthy forest. Additionally, past mining activities and associated roads have altered this landscape from an undisturbed setting. See existing condition section in the report.
Natural appearing landscapes with high scenic quality. High quality scenery, especially scenery with natural-appearing landscapes, is a primary reason that people choose to recreate. In addition, quality scenery contributes directly to real estate values in	Yes	Long term improving	There would be no direct effects to the naturalness of the scenic resources of the Electric Peak IRA. For the Jericho Mountain IRA, short-term direct effects from prescribed burning include the presence of black and charred vegetation and sometimes soils. “While prescribed burning can mimic natural disturbance, like a wildland fire it can leave a forest blackened and charred and is perceived negatively by the public.” (Ryan 2005, in Visuals Report) This effect is overcome within one year, and would only have a short-term effect as seen by the average forest visitor. Multiple prescribed burns may be ignited during the annual period of time when the forest performs prescribed burning.

Effect to Roadless Characteristics			
Roadless Characteristics As described in 36 CFR 294 – Roadless Area Conservation Final Rule, 2001	**Is there an effect?** Yes or No	**Which direction is the effect**? Improving, Stable or Degrading?	**Describe the actual effect**. Use descriptive terms that discuss the effect, not the activity. Explain if the proposal would Alter or Modify the landscape.
nearby communities and residential areas. Describe the current scenic quality and character of the area. Describe project effects to the scenic integrity of the area and changes to the character of the area. Consider existing scenic integrity. Scenic Quality- essential attributes of the landscape. (Glossary 5, Landscape Aesthetics Handbook) Landscape Character – Particular attributes, qualities, and traits of a landscape that give it an image and make it identifiable or unique. (Glossary 3, Landscape Aesthetics Handbook)			Long-term direct effects from broad scale, low to moderate intensity broadcast burning would reduce fuel loading and promote regeneration of trees, shrubs, wildflowers and other herbaceous plants. This activity would diversify the vegetative mosaic in regards to vegetative forms, natural appearing lines, and additional colors and textures in the forest stands. When aspen is present in the stand, the aspen regeneration will be enhanced by burning. Short-term indirect effects from prescribed burning include views of the fire and smoke, and forest visitors may smell the fire. Activities proposed adjacent to and near the Electric Peak IRA are regeneration harvesting and precommercial thinning. Indirect effects to forest visitors from mechanical logging systems and machinery working on roads includes the sights, sounds, and smells of equipment operating in the Forest during implementation of the project. Short-term indirect effects from prescribed burning include views of the fire and smoke, and forest visitors may smell the odor from prescribed burning. The action alternatives propose treatments in the Jericho Mountain IRA including hand piling of fuels, burning piles, and wildfire. The average forest visitor may notice evidence of prescribed burning within units in the IRA, such as charring of bark and the presence of fire killed understory trees and shrubs until the next growing season. Prescribed fire control lines would be less evident in the landscape after each growing seasons. They may be visible by the average forest visitor for about 2 years.

Effect to Roadless Characteristics			
Roadless Characteristics As described in 36 CFR 294 – Roadless Area Conservation Final Rule, 2001	**Is there an effect?** Yes or No	**Which direction is the effect**? Improving, Stable or Degrading?	**Describe the actual effect**. Use descriptive terms that discuss the effect, not the activity. Explain if the proposal would Alter or Modify the landscape.
Traditional cultural properties and sacred sites Traditional cultural properties are places, sites, structures, art, or objects that have played an important role in the cultural history of a group. Sacred sites are places that have special religious significance to a group. Traditional cultural properties and sacred sites may be eligible for protection under the National Historic Preservation Act. However, many of them have not yet been inventoried, especially those that occur in inventoried roadless areas. Identify generically any significant cultural resources within the Roadless area and describe the effect of the project on these resources. Typically mitigation will be designed to prevent significant effects to these resources.	No	No effect	There are 13 identified historical/cultural sites and 2 historic mining districts within the Electric Peak and Jericho Mountain IRAs. However, with mitigation measures employed to protect the sites from project activities, the project would have no adverse effect on any known or listed historic properties

Effect to Roadless Characteristics			
Roadless Characteristics As described in 36 CFR 294 – Roadless Area Conservation Final Rule, 2001	**Is there an effect?** Yes or No	**Which direction is the effect**? Improving, Stable or Degrading?	**Describe the actual effect**. Use descriptive terms that discuss the effect, not the activity. Explain if the proposal would Alter or Modify the landscape.
Other locally unique characteristics Inventoried roadless areas may offer other locally identified unique characteristics and values. Examples include uncommon geological formations, which are valued for their scientific and scenic qualities, or unique wetland complexes. Unique social, cultural, or historical characteristics may also depend on the roadless character of the landscape. Examples include ceremonial sites, places for local events, areas prized for collection of non-timber forest products, or exceptional hunting and fishing opportunities. Identify any locally unique characteristics and describe how the project would affect these values.	No	No Effect	There are no special soils and no known special features in the Jericho Mountain Roadless Expanse or the portion of the Electric Peak IRA closest to the project area. See discussion on historic sites above

Visuals

Introduction

Potential impacts to visual resources didn't drive the development of alternatives. However, analysis of potential impacts to visual resources is necessary to determine forest plan consistency. The project area boundary and the viewshed from Highway 12 and the Cromwell-Dixon Campground was used as the spatial bounds for determining direct, indirect, and cumulative effects for the analysis. The issue indicator is whether the Visual Quality Objectives (VQO) of retention, partial retention, and maximum modification would be achieved in the project area. No activities are proposed in the modification VQO, therefore, no additional analysis regarding this VQO will be done. Areas within the project area that are assigned the VQO of retention are portions of Treasure Mountain, portions of the Jericho Inventoried Roadless Area (IRA), areas of Jericho Mountain, and small areas of retention along Ontario Creek close to dispersed camping areas.

Areas to be managed to meet partial retention occur within and adjacent to the Jericho Mountain IRA, and the Bison Mountain area. See table 325 for acres of partial retention within the project area.

Highway 12 and the Cromwell-Dixon Campground are more than 3 miles away from the project area. Any potential views of the project area from Highway 12 and the Cromwell-Dixon Campground would be in the background distance zone with a VQO of partial retention. The majority of the project area is managed for maximum-modification VQO.

Assumptions

This analysis assumes that the existing condition within the project area is in compliance with Forest Plan Goals, Objectives, Standards and Management Area Direction regarding management of scenic and visual resources.

The cycle of insect infestations is a natural process in forested landscapes. This unprecedented epidemic of insect infestation resulted in dead and dying trees or stands of dead trees across the Telegraph landscape. This is a component of those natural processes that influence the overall vegetative mosaic and scenic characteristics.

An entire unit was assumed to be viewed if any portion of the unit was viewed from a sensitive area. It was also assumed private property adjacent to the project area provided foreground views to the project area. The most revealing distance zone was assigned to the unit if that unit was viewed from multiple distance zones. The most restrictive VQO was assigned to a unit if more than one VQO existed for that unit. Effects to the most restrictive VQO (assigned through Forest Plan direction) from the most revealing distance zone were determined for viewed units. This allowed the greatest potential impact viewed in the landscape to be disclosed.

Design features necessary to meet the most restrictive VQO from the most revealing distance zone were developed. It was assumed a design feature that decreased viewed effects to a VQO from the most revealing distance zone would also decrease the effects viewed from other lesser revealing distance zones. If a design feature was needed to meet a VQO in a viewed unit, it was assumed the design feature would be applied across the entire unit, depending on topography and shape of that unit.

When determining if there would be adverse impacts upon analyzing cumulative effects, it was assumed that suggested design features would be implemented. The rehabilitation goal was used

where it was determined proposed activities would not immediately achieve the assigned VQO due to the existence of one of the following scenarios:

- A disturbance (natural or manmade) dominated the unit
- The proposed activity allowed the desired future condition defined in the Silviculture report to be achieved sooner than with no action
- The current existing condition hindered the desired future condition of the landscape to be met in the short term

Insect-infested trees were considered obtrusive elements. It was assumed a landscape with less visible dead trees is a visually desired landscape. These assumptions are based on Forest Service Hndbook guidance, which states natural disturbances are considered alterations to the characteristic landscape and the characteristic landscape is defined as what visually represents the basic vegetative patterns, landforms, rock formation and water forms viewed (USDA Forest Service 1980, p. 55 and USDA Forest Service 1974, p.7). This assumption differs from some public comments received on personal preferences of viewing aesthetics.

It was assumed existing and new landings may be viewed in units with proposed activities. Specific landing location information was not available. It is assumed that no large fires or additional fires would occur when analyzing effects for the no-action alternative. Beetle-caused mortality exists on approximately 40 percent of the existing mature lodgepole pine stands in the project area and is expected to increase.

Information Used

The effects analysis is based on the project description, reports written for vegetation and recreation use, map reviews, and professional judgment of the Regional Landscape Architect. Landing locations have not been identified; however the majority of landings would occur along roads within the project area. Design features have been developed to address landings that may occur in any of the VQOs.

Methodology and Scientific Accuracy

This analysis was completed using the framework of the USDA Forest Service Landscape Management Series Volume 2, Chapter 1, The Visual Management System.

During field observations, a variety of photos were taken from various viewpoints. The photos of the existing condition were used in conjunction with descriptions of proposed activities and photos of similar treatments in other locations to determine the extent and duration of potential impacts to scenic and visual resources.

ArcMap geographic information system (GIS) was used to analyze the proposed activities in regards to visual quality objectives (VQOs) assigned to the area, distance zones, and visibility from Highway 12. Visual quality objectives, distance zones, and visibility were determined for the project area using the Forest’s corporate GIS data. A viewshed from Highway 12 was run to see if any units were potentially visible from the highway. This process does not account for the height and screening of vegetation, therefore, visible areas in the GIS viewshed output are considered as possibly visible, not definitely visible.

Visual Nature Studio (VNS) was used to identify proposed units visible from Highway 12 and the Cromwell-Dixon Campground. Vegetation is representation is based on the National Land Cover Database. ArcMap data was imported to represent the project activities in a geographically correct

method. The determinations are displayed in appendix A of the Visuals Specialist Report located in the project record.

Since management of forest resources along the Continental Divide National Scenic Trail (CDNST) is based on Forest Plan direction for the areas it crosses through, a specific analysis of views from the CDNST and subsequent effects to scenery resources is not included.

Proposed treatment methods for specific tree species were analyzed to determine if the effects to visual and scenic resources were compatible with the assigned VQOs and if any design features or mitigation measures were necessary.

Indicators

The viewed VQO assigned through the Forest Plan within seen areas provided the primary qualitative analysis indicator when determining direct and indirect effects. Consideration of an activity's "duration of impact" and "degree of alternation" within the viewed VQO also provided qualitative analysis indicators. The degree of acceptable alteration ("degree of alteration" and "duration of impact") for each VQO was determined considering natural disturbances found in the characteristic landscape (USDA Forest Service 1974, p. 27-28). The size of a management activity is compared to the size of similar natural activities expected in the landscape.

Activities mimicking natural disturbances or simulating vegetation patterns found or expected to be found in the landscape are said to be viewed similarly to their natural counterparts by the casual forest visitor. Duration of impact is discussed in more detail in the Temporal Boundaries section. Changes in the characteristic landscape attributes, when considering past, present, and reasonably foreseeable activities (natural or manmade) within all seen areas, provided the qualitative analysis indicator when determining cumulative effects.

Viewed VQO acres within distances of sensitive areas affected by management activities were determined to provide additional quantitative analysis indicators for alternative comparisons (USDA Forest Service 1974, p. 7).

Landing locations are not determined, but would be located along roads.

Spatial Context for Effects Analysis:

The project boundary and the viewshed from Highway 12 and the Cromwell-Dixon Campground cover the spatial extents of this analysis. Views extending beyond the project analysis area from sensitive areas were determined. In addition, views into the project area from sensitive areas and lands of other ownership (i.e., private lands) were determined. When assessing direct and indirect effects from sensitive areas, the viewed units within the seen area were considered the spatial boundary. When assessing cumulative effects, all viewed lands within the seen area from sensitive areas were considered the spatial boundary.

Temporal Boundary for Effects Analysis:

The temporal boundary used varied from "immediate upon project completion" up to 5 years (short-term) and up to 20 years (long-term) when analyzing effects from an activity. The short-term timeframes were determined by reviewing the VQO information provided below. When determining if the "duration of impact" was met for each VQO upon implementation of a management activity, the criteria below were considered short-term.

- Retention – "Reduction in line, form, color, and texture contrast should be accomplished during operation or immediate upon project completion" (USDA Forest Service 1974, p. 30).
- Partial Retention – "Reduction in line, form, color and texture should be accomplished as soon after project completion as possible or at a minimum within the first year" (USDA Forest Service 1974, p. 32).
- Modification – "Reduction in line, form, color, and texture should be accomplished in the first year or at a minimum should meet existing regional guideline" (USDA Forest Service 1974, p. 34).
- Maximum Modification – "Reduction of contrast should be accomplished in five years" (USDA Forest Service 1974, p. 36).
- Rehabilitation – the VMS does not define a timeframe for duration of impact.

In addition, the following concepts were considered when compliance with both the "degree of alteration" and "duration of impact" criteria per VQO was determined:

- "Each landscape unit has its individual capacity to accept alteration without losing its inherent visual character" (USDA Forest Service 1974, p. 4).
- "Visual impact of management activities increase as the viewer's line of sight tends to become perpendicular to the slope upon which the management activity is to take place" (USDA Forest Service 1974, p. 4).
- Each objective describes a degree of acceptable alteration of the natural landscape based upon the importance of aesthetics (USDA Forest Service 1974, p. 28).
- Whether or not the disturbance from management activity is consistent with the natural disturbances viewed in the landscape is also considered when determining if a VQO was met (USDA Forest Service 1974, p. 30).
- "Generally, considerable change can take place in the positive or natural appearing elements even under Retention VQO if the change achieves desirable variety and follows the principles of landscape design, such as proper scale and arrangement of these elements" (USDA Forest Service 1980, p. 7).

Scenery Resources Affected Environment

Introduction

This section will discuss the effects to visual resources from the proposed management activities, and determine whether the Land and Resource Management Plan will be met. No activities are proposed in the Modification VQO; therefore, no further analysis is needed regarding whether the project would be in compliance with this VQO.

Issue Indicator: Whether the visual quality objectives of retention, partial retention, and maximum modification would be achieved in the project area.

The purpose of the project is to be responsive to the mountain pine beetle outbreak in this area, recover economic value of dead and dying trees, promote desirable regeneration, reduce fuels and the risk of wildfire, and maintain diverse wildlife habitats.

Analysis Area

The project area boundary and the viewshed from Highway 12 and the Cromwell-Dixon Campground were used as the spatial bounds for determining direct and indirect effects for the analysis. The project area is approximately 23,669 acres.

Existing Condition

The project area is located on the Helena Ranger District. The project area lies south of Elliston, Montana and U.S. Highway 12. The project extends from the Little Blackfoot River on the west site, the Forest Boundary on the southwest of the Continental Divide in the Little Blackfoot drainage. The Jericho Mountain Inventoried Roadless Area (IRA) lies within and adjacent to the northeast side of the project area.

Past activities that have altered the landscape characteristics include timber harvesting, natural and prescribed burning, grazing, mining, and endemic insect and disease presence. A recent epidemic outbreak of mountain pine beetle is currently the most noticeable impact to the landscape characteristics. In some portions of the project area the beetle infestation has killed entire stands of lodgepole pines. Past timber harvesting has created a vegetative mosiac that includes stands of regeneration and thinning treatments that have created a diversity of vegetation regarding species and size classes. The insect epidemic has resulted in a large amount of dead gray trees throughout the landscapes of the project area. See Figure 149 for the impacts of the beetle epidemic. Figure 150 shows that current logging of hazard trees has left a straight line of vegetation at the edge of the hazard tree removal corridor as seen from Road 495. The recent hazard tree removal project has resulted in un-natural lines where the edge of the cutting distance of the hazard tree corridor from the road occurs.

Figure 150. Stands of dead trees from beetle outbreak along Road 4104 area looking into the Telegraph project area

Figure 151. Hazard tree removal corridor

Figure 152. View of Jericho Mountain in the background

Visual Quality Objectives

Areas within the project that are assigned the VQO of retention are portions of Treasure Mountain, portions of the Jericho Mountain IRA, areas of Jericho Mountain, and small areas of retention along Ontario Creek close to dispersed camping areas. See table 325 for acres of retention.

Areas to be managed to meet partial retention occur within and adjacent to the Jericho Mountian IRA, and the Bison Mountain area. See table 325 for acres of partial retention.

Highway 12 and the Cromwell-Dixon Campground are more than 3 miles away from the project area. Any potential views of the project area from Highway 12 and the Cromwell-Dixon Campground would be in the background distance zone with a VQO of partial retention. The majority of the project area is managed for maximum-modification VQO. ArcMap viewshed modeling and VNS simulations display that some of the maximum modifications areas are within the viewshed of Highway 12 and would be required to be managed as partial retention as viewed from the highway and Cromwell-Dixon Campground. Refer to Appendix A and Appendix B of the Visuals Specialist Report for the VNS simulations. See table 325 for acres of visual quality objectives throughout the project area.

Table 325. Acres of visual quality objectives within the project area

Visual Quality Objecive	Retention	Partial Retention	Modification	Maximum Modification
Acres	3,299	227	321	17,931

Scenery Resources Environmental Consequences

Effects Common to All Alternatives

Areas within all action alternatives where no treatments are proposed would have the same effect as described in alternative 1. There would be an increase in line, form, and color from viewing beetle-infested trees as these trees lose their foliage in the short term. Loss of these trees would equate to a decrease in the forest canopy followed by an increase in ground texture intermixed with the surrounding, remaining forest canopy leading to various size openings in the long term. These effects would be noticeable in the foreground and middleground from sensitive areas by the casual forest visitor in the short and long term. Down woody material would increase as dead trees fall, increasing ground fuel density. The increase in fuel density would increase the potential for these areas to experience more intense forest fires.

These dead trees would provide an altered landscape expected to be viewed as part of a natural disturbance by the casual forest visitor. However, some viewers could consider dead trees undesirable elements in the landscape. It could take 20 years or more before new vegetation fills in areas with beetle mortality, allowing these areas to blend back into the landscape.

Effects Common to All Action Alternatives

Direct and Indirect Effects

The effects to visual resources from the proposed prescriptions are described below. Refer to table 329 and table 337 for the units with prescriptions in partial retention and retention VQOs that need design features.

Intermediate Harvest with Improvement Cut, Slashing, Jackpot Burn: Harvest designed to enhance growth, quality, vigor, and composition of a stand after establishment. Density, structure, and/or composition of the stand are altered, and the stand maintains a forested appearance. In Telegraph, these treatments result in 2-aged or even-aged stands.. In Telegraph, this treatment is proposed in mature stands dominated by or containing a mix of healthy Douglas-fir and/or aspen along with varying amounts of mostly dead lodgepole pine, where an increase in tree quality and an open structure would be emphasized. Diameters cut would generally range from 7 to 20 inches dbh

and rare seral species such as ponderosa pine, whitebark pine, and aspen would be favored for retention where they occur.

Direct effects of intermediate harvest by thinning and removal of live trees and reducing the understory component include opening up the stands to a park-like vegetative mosaic that is characteristic of pre-fire suppression efforts, essentially restoring the landscape characteristics and enhancing the visual quality. “The amount of visual access, or how far one can see into a forest, also has been found to be a significant predictor of landscape preference… As the density of smaller trees increases, visibility and scenic beauty decrease” (Ryan 2005). This treatment would create additional variety in the canopy such as aspen regeneration and removal of dead lodgepole pine. This would improve the existing landscape characteristics.

The variability of seral stages and stand patch sizes would increase the diversity of the vegetative mosaic enhancing the aesthetics of the landscape characteristics. Research by Ryan provides information that supports this determination. “Many studies have shown that people prefer large mature trees….Likewise, forests with many closely spaced small trees receive lower scenic ratings (Brown and Daniel 1986). For example, Schroeder and Daniel (1981) found the number of large ponderosa pine trees (greater than 16 inches dbh) had a significant positive impact on scenic beauty ratings…In forestry terms, areas with low visual quality would include wide-open areas caused by extensive clearcuts or windthrow and forests with dense, even-aged stands as characterized by early stages of regeneration after timber harvest (Anderson 1978, Brush 1979, Magill 1994). However, some types of timber harvesting that involves selective cutting and thinning can actually improve visual quality.”(Ryan 2005)

Aspen would be enhanced whenever it is present in these units. Regeneration of aspen will add diversity of color and texture to the stands. These activities would create additional visual depth into the forest, and increase age-class diversity by decreasing the density of vegetation. The VQOs assigned to these units would be met if the design features described above are implemented.

Precommercial Thinning: Felling in an immature stand to accelerate growth and improve the form of residual trees; typically done in sapling to pole stands, often to a spacing objective. In Telegraph, this is proposed in young stands established after previous harvest. Species such as ponderosa pine, whitebark pine, and aspen would be favored for retention where they occur. Target trees per acre (TPA) is generally 150 to 400 depending on species and site conditions.

Direct effects of precommercial thinning medium to high stocked stands is the reduction of risk of insect and disease problems, as well as reducing fire risk. This treatment would also increase the growth and vigor of the stands. The VQOs assigned to these units would be met if the design features described above are implemented.

Regeneration Harvest: Harvesting to create a new age class, resulting in uneven-aged, 2-aged, or even-aged stands. These harvests could include clearcutting, seed/shelterwood cutting, and single or group tree selection depending on the tree species and desired regeneration. For 1- or 2-aged systems, most of the overstory is removed and the stand is dominated by new regeneration. For 3-aged or multi-aged systems, only single trees or small groups are removed, with regeneration established in gaps.

Clearcut: Most overstory trees are removed. Leave trees may be retained for snags or structure; leave trees are defined site-specifically with prescriptions. Target density is minimal and the resulting stand is even-aged. In Telegraph, this is proposed in beetle-killed lodgepole stands with few to no living

trees of other species present. Generally, live trees such as Douglas-fir would be retained. Lodgepole pine and/or whitebark pine natural regeneration is expected.

Direct effects of clearcuting dead lodgepole pine would improve the landscape characteristics by taking out the dead trees and leaving live trees in place. Regeneration of lodgepole and/or whitebark pine would create a vegetative mosaic, improving landscape characteristics over time.

Seedtree: Most trees are removed except those needed to provide seed for regeneration. Seed trees may be retained as reserves to create a 2-aged stand or removed after seedling establishment to maintain an even-aged stand. In Telegraph, this is proposed in beetle-killed lodgepole pine dominated stands that have enough healthy trees (generally Douglas-fir or Engelmann spruce) to provide seed. A mix of lodgepole pine, Douglas-fir, Engelmann spruce, and/or whitebark pine regeneration is expected. The seed trees would be left as reserves.

Direct and indirect effects from seedtree harvesting include reducing the amount of dead lodgepole pine, retaining Douglas-fir, Engelmann spruce, and/or whitebark pine to promote regeneration of the stand. In the short term, these stands would appear like an open park-like setting. As regeneration of the stand occurs over time, the park-like setting would transition to 2-aged stands with various TPA. The removal of dead lodgepole would improve the vegetative mosaic.

Shelterwood: All trees are removed except those needed to provide seed and shelter for regeneration. A group shelterwood is left in a clumpy distribution. Shelter trees may be retained as reserves to create a 2-aged stand or removed after seedling establishment for an even-aged stand. In Telegraph, this is proposed in beetle-killed lodgepole stands that have a heavier mix of Douglas-fir and/or spruce to provide both seed and shelter. Douglas-fir and spruce-dominated natural regeneration is expected. Most live trees would be retained. Shelter trees would be left as reserves.

Direct effects from shelterwood harvesting include removing the dead lodgepole pine, retaining existing Douglas-fir and Engelmann spruce trees as reserves to promote regeneration of the stand. In the short term, these stands would appear like an open park-like setting. As regeneration of the stand occurs over time, the park-like setting would transition to 2-aged stands with various TPA. The shelterwood reserve trees would be left in random clumpy pattern that in the long term would provide a more natural-appearing landscape with the regeneration of the stands. The tree clumps would create visual variety in the landscape regarding color, texture, line, and forms. The removal of dead lodgepole would improve the vegetative mosaic. The shelterwood prescription would only be applied in units with a VQO of maximum modification. With implementation of the design features, the maximum modification VQO would be met.

Prescribed Burning: Burning activities are proposed throughout the Telegraph project area. Fire is used as a treatment tool to accomplish a variety of goals, primarily fuels reduction and vegetation restoration. This category includes necessary slash preparation work. Handlines will be constructed as needed.

Slashing: Cutting small-diameter trees (generally less than 6 inches dbh) mechanically or with chainsaws. Slashing is used to reduce ladder fuels to lower crown fire potential; to create sufficient surface fuels to carry a prescribed fire; and/or to add fuels to meet woody debris goals for nutrient cycling. Prescriptions may call for retaining certain species (such as ponderosa or limber pine), or a desired spacing to meet target stand conditions.

Short-term direct effects from prescribed burning include the presence of black and charred vegetation and sometimes soils. “While prescribed burning can mimic natural disturbance, like a

wildland fire it can leave a forest blackened and charred and is perceived negatively by the public." (Ryan 2005) This effect is usually overcome within one year, and would only have a short-term effect as seen by the average forest visitor. Multiple prescribed burns may be ignited during the annual period of time when the forest performs prescribed burning. Units that are proposed to have a silvicultural treatment prior to prescribed fire would generally be burned one to five years following harvest or slashing, depending on meeting prescription criteria as stated in the burn plan.

Long-term direct effects from broad-scale, low- to moderate-intensity underburning in thinning units and surrounding locations would reduce fuel loading and promote regeneration of trees, shrubs, wildflowers, grasses, and other herbaceous plants. This activity would diversify the vegetative mosaic in regards to vegetative forms, natural-appearing lines, and additional colors and textures in the forest stands. When aspen is present in the stand, the aspen regeneration will be enhanced by burning.

Short-term indirect effects from prescribed burning include views of the fire and smoke, and forest visitors may smell the fire.

Fireline would be created on the perimeters of all units with a prescribed burning prescription after the other treatments have been completed. Typically, firelines are about 12 to 18 inches wide. Firelines would be constructed in all VQOs between 2 to 5 consecutive years after the first season of timber harvesting. After implementation of design features, the visual quality objectives of partial retention and modification would be met. The retention VQO should be met after 1 to 2 growing seasons.

Logging Systems

The effects to visual resources from the proposed logging system removal methods are described below. Refer to table 327 and table 334 for the acres of logging systems per VQO. Refer to the design feature section above to see the design features in place to minimize effects to visual resource.

Tractor logging

Direct effects to visual resources from the use of tractor logging removal methods would include visible evidence of slash on the ground, soil disturbance, and other signs of disturbance associated with use of machinery for project implementation for one or two growing seasons. "Residual woody debris is one of the most significant predictors of negative perception of scenic beauty" (Ryan 2005). Design features are in place to reduce the impact of slash on the visual quality of the project area. Skid trails and landings for tractor logging may be noticeable to the average forest visitor.

Tractor logging operations could achieve the retention VQO with the reduction of impacts from implementation of the design features for general and retention VQOs around three years after completion of implementation of a unit. During unit implementation, the VQOs of modification could be achieved, and as the work in the unit progresses, the VQO of partial retention would be met, and eventually retention would be met within three years after completion of unit implementation.

Cable logging

Direct effects to visual resources from the use of cable-logging-removal systems include potential views into the cable corridors. Travelers driving through the project area may notice trees that have been damaged or even broken off by other trees going up the cable system. The cable corridors could create an unnatural line void of vegetation that would be an apparent change from the surrounding canopy.

Landings

The location of landings has not been identified at this point. A typical landing would meet modification in the short term. It would take one to two growing seasons before a landing would meet partial retention and between three to five years to meet retention. Without further information on landing location, no additional effects can be predicted.

Roads

All proposed temporary roads would be obliterated following use. With the implementation of design features the temporary roads would meet VQOs. Road maintenance and road reconstruction are also proposed. Upon implementation of the design features for roads, all of the VQOs should be met. It may take up to three years to meet the retention VQO. Table 328 and table 336 display proposed road activities per VQO.

Indirect Effects from Logging Systems and Road Work

Indirect effects to forest visitors from mechanical logging systems, machinery working on roads, and prescribed burning includes the sights, sounds, and smells of equipment operating and smoke in the forest for approximately 7 to 10 years during the operating seasons.

Alternative 1, No Action

If alternative 1 is chosen, no vegetation treatments would occur and no new roads would be constructed. There would be no opportunity to efficiently regenerate new stands to a desired species mix and density. Fuel loading would continue to increase over the project area as trees killed by the mountain pine beetle epidemic continue to fall. The quality of the scenic characteristics would not be improved because the stands of dead trees would not be removed.

Direct and Indirect Effects

Direct effects occur at the same time and place. Indirect effects occur at a later time or are farther removed in distance.

Under the no-action alternative, the crowded, overstocked conditions in portions of the project area would continue. The vast stands of dead lodgepole pine detract from the scenic qualities of the landscape, as noted by Ryan. “Insect-damaged forests received negative ratings, especially when survey participants were informed beforehand of the cause of the deforestation and leaf color change (Buhyoff et al. 1979, 1982; Hollenhorst et al. 1993)” (Ryan 2005). Together, these elements would maintain the uncharacteristic vegetative mosaic across the landscape over the long term. If the vegetation is consumed by fire, or widespread insect infestations, the desired landscape character would be lost.

Irreversible and Irretrievable Commitments

No irreversible or irretrievable commitments of scenic resources would occur.

Cumulative Effects

All past activities are included in the existing condition, since there are no proposed management activities, no cumulative effects would occur. Anticipated trends include additional tree mortality, which would create a decline in the scenic characteristics of the project area.

Alternative 1 would be in compliance for visual resources; because no management activities would occur.

Alternative 2

Alternative 2 is the proposed action that was designed to aggressively meet the purpose and need for the project while addressing Forest Plan direction.

Direct and Indirect Effects

Proposed Prescriptions

Table 326 displays the prescriptions and acres proposed in this alternative. The effects to visual resources from the proposed activities are shown under the Effects Common to All Action Alternatives section.

Table 326. Alternative 2 proposed activities

Treatment Type	Prescription	Acres
Intermediate harvest	Improvement cut, slashing, jackpot burn	434
Sub-Total		434
Precommercial thinning	Precommercial thin Precommercial thin, underburn	1,758 28
Sub-Total		1,786
Prescribed fire 1,050 Acres Total	Slashing, broadcast burn Slashing, handpiling, burning piles	1,039 11
Sub-Total		1,050
Regeneration harvest	2-aged seedtree with reserves 2-aged seedtree with reserves, site prep burn 2-aged shelterwood with reserves, site prep burn Clearcut with leave trees Clearcut with leave trees, jackpot burn Clearcut with leave trees, site prep burn Clearcut with reserves, site prep burn	16 166 155 651 1,046 1,355 95
Sub-Total		3,484
Grand Total		6,754

The acres of prescriptions proposed in retention and partial retention units are shown in Table 327. This table also illustrates the units that would need design features applied to meet the retention and partial retention VQOs. The general design features also apply to units proposed in maximum modification.

Table 327. Alternative 2 units with design features

Visual Quality Objective	Treatment/ RX	Acres	Unit(s)
Retention	Precommercial thinning	1,648	045, 046, 055, 064, 067, 126, 137, 139, 141
	Prescribed fire- slashing, hand piling, burning piles	11	024
	Prescribed Fire-slashing, broadcast burning	176	035, 123, 142, 169
	Clearcut with leave trees	170	140, 138, 036, 034, 044
	Clearcut with leave trees, site prep burn	37	056
	Clearcut with leave trees, jackpot burn	17	019
	2-aged seed tree with reserves	16	043
	2-aged seed tree with reserves, Site prep burn	3	143
Partial Retention	Precommercial thinning	52	134, 136, 137, 097
	Clearcut with leave trees, jackpot burn	13	091
	Slashing, broadcast burn	295	123

Logging Systems and Hand and/or Fire Treatments

Management activities would be accomplished with the use of three separate types of logging methods including ground-based, cable and hand, and/or fire treatments. The majority of all treatments would occur in the maximum modification VQO. Refer to the Effects Common to All Action Alternatives section for a description of the typical effects to scenic resources. Table 328 shows the acres of each type of logging system per visual quality objective.

Table 328. Alternative 2 logging system for mechanical harvest activities and VQOs (acres per visual quality objective)

Logging Method	Retention	Partial Retention	Modification	Maximum Modification
Ground-based	159	14	0	3,672
Cable	85	0	0	383
Hand and/or fire treatment	296	202	0	1,941

Direct effects to visual resources from the use of cable-logging-removal systems include potential views into the cable corridors from Road 123 looking into the south side of Treasure Mountain in the middleground distance zone and retention VQO. The cable corridor could create an unnatural line void of vegetation that would be an apparent change from the surrounding canopy. Design features such as blending units with natural landscape features like natural openings, rock outcrops, and topography will be implemented where possible. Harvest units will be shaped to mimic natural patterns found in the landscape where possible. Use of straight lines or geometric shapes along edges would be minimized during unit design where feasibility and safety allow. Additional design features are in place to minimize effects to visual resources; refer to the design feature section above.

After the design features are implemented, the modification VQO would be met. After one growing season, the appearance of slash would be reduced, and ground cover would come back in meeting the partial retention VQO. The time it would take cable logging units to meet retention varies

depending upon whether the corridors are visible from Road 123 and the width of the cable corridor. It would take between 3 to 5 years to meet retention based on the factors described above.

Proposed Road Activities

Table 329. Alternative 2 road activities (miles per visual quality objective)

Road Activity	Retention	Partial Retention	Modification	Maximum Modification
Temp. road construction & obliteration	1	0	0	6
Road maintenance	1	0	0	8
Road reconstruction	1	>0.5	0	20

Potential effects to visual resources from road-related activities are shown in the Effects Common to All Action Alternatives section.

Sensitivity Level 1 Areas

Highway 12

Table 330 shows the units seen from Highway 12 that need to meet partial retention in the background distance zone. The management area VQO for all of these units is maximum modification. The VQO for activities viewed from sensitivity level 1 areas in the background distance zone is partial retention. Travelers on Highway 12 could see various units in the project area. Travelers would be moving primarily at highway vehicle speeds through the landscape. Therefore, views of the proposed activities would be short in duration, and a low level of detail of features in the landscape in the background distance zone (3 miles to the horizon) would be perceived. Simulations were created in VNS to determine which units are visible from Highway 12 and the Cromwell-Dixon Campground. Refer to appendix A of the Scenery Specialist Report for the results of the visual simulations. If the design features shown above are implemented, partial retention should be met. The units in retention and partial retention that need design features shown in table 327 do not include these units seen from sensitivity level 1 areas.

Cromwell-Dixon Campground

Table 331 shows the units seen from Cromwell-Dixon Campground that need to meet partial retention in the background distance zone. The management area VQO for all of these units is maximum modification. The VQO for activities viewed from sensitivity level 1 areas in the background distance zone is partial retention. Forest visitors camping or moving through the campground have views of proposed activities. These visitors would be moving slowly in a vehicle or walking. The slow movement of the visitors would provide long duration of views of the proposed activities in units shown in table 331. The proposed units are a little over 3 miles away from the campground. Only a low level of detail of features in the landscape is expected to be perceived in this background distance zone.

Table 330. Units seen from Highway 12

Viewpoint	Unit(s)	Treatment
Highway 12 Camera B	034, 037 014, 015, 016, 017, 018 005, 007	Clearcut with leave trees Precommercial thin Improvement cut, slash, jackpot burn
Highway 12 Camera C	034 014, 015, 016, 017 007	Clearcut with leave trees Precommercial thin Improvement cut, slash, jackpot burn
Highway 12 Camera D	035	Slashing, broadcast burning

Table 331. Units visible from the Cromwell-Dixon Campground

Viewpoint	Unit(s)	Treatment
Cromwell Dixon Campground Point 1, 2, 3, 4	126	Precommercial thin
Cromwell Dixon Campground Point 1, 2, 3, 4	123	Slashing, broadcast burning
Cromwell Dixon Campground Point 2, 3, 4	034	Clearcut with leave trees
Cromwell Dixon Campground Point 3 & 4	167	Clearcut with reserves, jackpot burning

If the design features shown above are implemented, the partial retention VQO should be met. The units in retention and partial retention that need design features shown in table 327 do not include these units seen from sensitivity level 1 areas.

Effects to scenery include the immediate visual change to the existing landscape character after project implementation. Where managed stands are seen, a noticeable differences may take place between naturally occurring landscapes and those managed for timber. Over time these changes become more subtle as managed stands reach a point of maturity. At that time the effects of management blend into more natural occurring forests characteristics.

Irreversible and Irretrievable Commitments

There are no irreversible or irretrievable commitments of resources associated with this analysis as they relate to scenery. The effects of harvest and road construction will over time regain naturally occurring characteristics as seen by the casual observer. The landscape will resume those visual characteristics anticipated by the general public immediately after implementation and within the short-term timeframe. Design features have been established with regard to all management activities to increase the rate of visual recovery. Therefore, no irreversible or irretrievable commitments of visual resources are anticipated after project implementation.

Cumulative Effects

The cumulative effects analysis area for this resource is the project area, including both National Forest System lands and those under other ownership, and the viewshed from Highway 12 and the Cromwell-Dixon Campground. This spatial boundary includes the views from sensitivity level 1 travel routes and use areas identified in the forest plan. Temporal bounds for cumulative effects are the same as direct and indirect effects; 1 to 5 years for short term and 6 years and beyond for long term. Analysis methods are the same as for direct and indirect effects.

Issue Indicator: Whether or not the visual quality objectives of retention, partial retention, and maximum modification would be achieved in the project area.

Past and Ongoing Activities in the Analysis Area

The cumulative effects analysis area for this resource is the project area, including both National Forest System lands and those under other ownership, and the viewshed from Highway 12 and the Cromwell-Dixon Campground. Past and ongoing management activities including but not limited to timber harvesting and vegetation management, mining, domestic grazing and range management, transportation system construction, summer and winter trail maintenance and construction, Helena Lion's Sunshine Camp Special Use Permit, fire suppression, prescribed burning and fuels reduction, and changes in insects and disease levels have created a mosaic of forested areas interspersed with meadows and some pockets of aspen providing diversity in the landscape including a network of roads and trails, and a few structures. It is anticipated that the Forest Plan would be met regarding these ongoing activities planned in the cumulative effects analysis area.

The roadside hazard tree reduction project has created lines and forms in the vegetative canopy and resulted in cut stumps and slash piles visible from roadsides. Removal of the hazard trees was conducted a specific distance from the road corridor. This is resulting in a geometric corridor of forest vegetation and textures along the roads adjacent to treatments that appear unnatural and is very obvious to forest visitors. Refer to Figure 150 for a photo of the results of hazard tree removal in the project area The majority of the hazard tree removal units were planned in the maximum modification VQO. On the southwest side of the Treasure Mountain area some units have been implemented in management area M-1. These units are parallel to Little Blackfoot - 227, Ontario - 123, and a small portion of Monarch - 4104 roads. Telegraph alternative 2 proposed activities along these roads include 2-aged seed trees with reserves in unit 043, clearcut with leave trees in unit 044, and precommercial thinning in units 064 and 067. These units overlap some of the hazard tree removal units.

Due to the conditions of hazard trees, long-term results of the hazard tree removal project are similar with or without implementation of the project. The effects of treatments vary in duration and intensity, depending upon site-specific conditions. It is anticipated that the short-term effects of cut stumps and slash would diminish over time as understory vegetation grows above the stumps. Long term, it may take 6-years or longer for vegetation to break up the lines and geometric forms of the hazard tree removal treatments and soften the edges of units. However, accelerated regeneration of the understory would result, creating species diversity and increased variety in color and texture to the landscapes.

In areas where proposed activities overlap with the hazard tree reduction project, design features would be in place that would reduce the impacts of the activities on visual resources. By implementing the design features, proposed activities may not meet the retention VQO immediately upon implementation of the activities. Additionally, implementation of these measures minimized short-term negative impacts and will result in longer term, positive effects to the scenic quality of the project area.

Fire suppression would attempt to control the spread of fire, leaving as much of the forest canopy intact as possible. Since fire suppression would limit large fires in the project area, it is a tool in maintaining the characteristic landscape. Like fire suppression, noxious weed management is a tool in maintaining the characteristic landscape. Treatment of noxious weeds would continue to improve the visual characteristics of the analysis area. These activities, considered with the proposed actions, do not contribute to cumulative effects regarding visual and scenery resources. It is anticipated that the Forest Plan would be met with the addition of fire suppression and noxious weeds management.

Reasonable Foreseeable Activities in the Analysis Area

The North Divide Travel Planning is not anticipated to contribute to cumulative effects of visual resources in the analysis area. This planning effort will not contribute to effects, there are no ground-disturbing activities associated with this activity.

The Tenmile – South Helena project area is located immediately adjacent to the Telegraph Vegetation Project (east of the Continental Divide). This project proposes to conduct a variety of vegetation treatments and prescribed burning that may be visible from higher elevations within the Telegraph project area. With regard to adjacency, it is highly probable to assume visual effects from Tenmile – South Helena project implementation and Telegraph Project implementation will not be seen from Highway 12 simultaneously within the same viewshed. The Continental Divide provides screening between the two projects, limiting effects between projects. Direct and indirect effects, along with cumulative effects, to visual resources were disclosed in the Tenmile – South Helena DEIS. Views of both the Telegraph and Tenmile – South Helena Projects would also not be seen simultaneously from the Cromwell-Dixon Campground because the campground sits to the east and lower in elevation of the Continental Divide, thus obstructing views of the Tenmile – South Helena Project.

Since there are no regulations for scenic resource management on private lands, the effects of ongoing private development adjacent to National Forest System lands can sometimes have negative effects on scenic resources of the continuous landscape. When activities on private land are designed to limit impacts to scenic resources, the differences between private lands and National Forest System lands are less noticeable.

Conclusions

Potential impacts to visual resources didn’t drive the development of alternatives. However, analysis of potential impacts to visual resources is necessary to determine forest plan compliance.

By implementing the design features described above, the following proposed activities would meet the VQOs they are proposed in (maximum modification, partial retention, and retention):

- Intermediate harvest with improvement cut, slashing, jackpot burn
- Precommercial thinning
- Clearcut regeneration harvest (lodgepole pine)
- Seed tree regeneration harvest
- Shelterwood regeneration harvest

By implementing the design features described above, the following proposed activities would meet the maximum modification and partial retention VQOs:

- Tractor logging operations
- Cable logging operations
- Constructed landings
- Proposed temporary toads
- Prescribed burning, slashing and firelines

By implementing the design features described above, the following proposed activities would meet the retention VQO in the short term (1 to 5 years), but not immediately upon implementation of the activity:

- Tractor logging operations
- Cable logging operations
- Constructed landings
- Proposed temporary roads
- Prescribed burning, slashing and firelines

Retention is defined in Chapter 1 of the Visual Management System (VMS) as "A visual quality objective which in general means man's activities are not evident to the causal forest visitor" (USDA 1974). The proposed activities shown above may not meet this definition upon completion of the activity and design features. It would take approximately 1 to 5 years for the landscapes in which these activities are proposed to achieve the retention VQO.

Sensitivity Level 1 Areas

Proposed activities seen from Highway 12 and the Cromwell-Dixon Campground need to meet partial retention in the background distance zone. If the design features shown above are implemented, partial retention would be met.

Cumulative Effects

The roadside hazard tree reduction project has created lines and forms in the vegetative canopy and resulted in cut stumps and slash piles visible from roadsides. Removal of the hazard trees is conducted a specific distance from the road corridor. This is resulting in a geometric corridor of forest vegetation and textures along the roads adjacent to treatments that appear unnatural and is very obvious to forest visitors. Refer to figure 150 for a photo of the results of hazard tree removal in the project area. The majority of the hazard tree removal units were planned in the maximum modification VQO. On the southwestern side of the Treasure Mountain area some units have been implemented in management area M-1. These units are parallel to Little Blackfoot - 227, Ontario - 123, and a small portion of Monarch - 4104 roads. Telegraph alternative 2 proposed activities along these roads include 2-aged seed trees with reserves in unit 043, clearcut with leave trees in unit 044, and precommercial thinning in units 064 and 067. These units overlap some of the hazard tree removal units.

Due to the conditions of hazard trees, long-term results of the hazard tree removal project are similar with or without implementation of the project. The effects of treatments vary in duration and intensity depending upon site-specific conditions. It is anticipated that the short-term effects of cut stumps and slash would diminish over time as understory vegetation grows above the stumps. Long term, it may take 6 years or longer for vegetation to break up the lines and geometric forms of the hazard tree removal treatments and soften the edges of units. However, accelerated regeneration of the understory would result, creating species diversity and increased variety in color and texture to the landscapes.

In areas where proposed activities overlap with the hazard tree reduction project, design features would be in place that would reduce the impacts of the activities on visual resources. By implementing the design features, proposed activities would meet the retention VQO, but not immediately upon implementation of the activity. Additionally, implementation of these measures minimized short-term negative impacts and will result in longer term, positive effects to the scenic quality of the project area.

Forest Plan Consistency

The proposed activities would promote rehabilitation of the landscape, improving natural visual characteristics in the long term. Forestwide standards for insects and disease provide direction to use silvicultural systems to: (1) improve species diversity and growth, and vigor for stands, and (2) increase the size diversity and class diversity between stands. The management activities proposed in this project are tools to rehabilitate the vegetative condition within the project area. Several large stands of dead trees would be removed, providing an opportunity to improve the species diversity, growth and vigor of the vegetation. The Visual Management System identifies rehabilitation as a short-term management alternative. “Landscape rehabilitation is used to restore landscapes containing undesirable visual impacts to a desired visual quality. It may not always be possible to immediately achieve the prescribed visual quality objective with rehabilitation, but should provide a more visually desirable landscape in the interim” (USDA 1974).

The potential direct, indirect, and cumulative effects of the proposed activities to visual resources would be consistent with forest plan direction for visual resources because the application of the landscape rehabilitation management alternative as outlined in the VMS would allow a longer period of time for the retention VQO to be achieved.

Alternative 3

Alternative 3 was developed based on internal and external resource issues that were identified through scoping. Key issues that drove the development of this alternative are:

- Modifying treatments within elk security areas and other wildlife use areas, especially where some green stands still exist.
- Minimizing temporary road construction
- Dropped treatments in WUI zones that meet lynx habitat guidelines.
- Maintaining effective elk habitat within elk security areas.
- Modifying precommercial thinning densities to retain more elk hiding cover.

Direct and Indirect Effects

The proposed activities are shown in table 332. Effects to visual resources from the treatments and prescriptions are described in the Effects Common to all Action Alternatives.

Table 332. Alternative 3 proposed vegetation treatments

Treatment Type	Prescription	Acres
Intermediate harvest	Improvement cut, slashing, jackpot burn	434
Sub-Total		434
Precommercial thinning	Precommercial thin Precommercial thin, underburn	1,261 28
Sub-Total		1,289
Prescribed fire	Slashing, broadcast burn Slashing, handpiling, burning piles	595 11
Sub-Total		606
Regeneration harvest	2-aged seedtree with reserves 2-aged seedtree with reserves, broadcast burn 2-aged shelterwood with reserves, site prep burn Clearcut with leave trees Clearcut with leave trees, jackpot burn Clearcut with leave trees, site prep burn Clearcut with reserves, site prep burn	16 29 132 288 547 838 6
Sub-Total		1,856
Grand Total		4,185

The acres of prescriptions proposed in retention and partial retention units in alternative 3 are shown in table 333. This table also illustrates the units that would need design features applied to meet the retention and partial retention VQOs. The general design features also apply to units proposed in maximum modification.

Table 333. Alternative 3 units with design features

Visual Quality Objective	Treatment/ RX	Acres	Unit(s)
Retention	Precommercial thinning	101	045, 046, 055, 064, 139, 141
	Prescribed fire - slashing, hand piling, burning piles	11	024
	Prescribed fire - slashing, broadcast burning Clearcut with leave trees	343	035a, 123a, 142a, 169
	Clearcut with leave trees, site prep burn	233	140, 034a, 044
	Clearcut with leave trees, jackpot burn	45	143a
		16	019a
Partial Retention	Precommercial thinning	21	134, 136, 137a, 097
	Clearcut with leave trees, jackpot burn	13	091a
	Slashing, broadcast burn	37	123a

The proposed treatments shown above would be removed with a variety of logging removal methods illustrated in table 334. Effects to visual resources from logging removal systems are described in the Effects Common to all Action Alternatives section. Alternative 3 does not propose any cable logging systems in the retention VQO, unlike alternative 2. This would reduce the effects to visual resources in management area M-1.

Table 334. Alternative 3 logging system for harvest activities and VQOs (acres per visual quality objective)

Logging Method	Retention	Partial Retention	Modification	Maximum Modification
Ground-based	61	14	0	2,331
Cable	0	0	0	237
Hand and/or fire treatment	255	57	0	1,230

Proposed road activities would primarily occur in the maximum modification VQO. A limited amount of road maintenance and road reconstruction would occur in the retention VQO, and a small amount of reconstruction in the partial retention VQO. See table 335 for the miles of road activities. Effects to visual resources from the proposed road activities are described in the Effects Common to all Action Alternatives.

Table 335. Alternative 3 road activities per visual quality objective (miles per visual quality objective)

Road Activity	Retention	Partial Retention	Modification	Maximum Modification
Temp road construction & obliteration	0	0	0	2
Road maintenance	>1	0	0	11
Road reconstruction	>0.5	>0.5	0	12

Sensitivity Level 1 Areas

Highway 12

Table 336 shows the units proposed in alternative 3 seen from Highway 12 that need to meet partial retention in the background distance zone. The management area VQO for all of these units is maximum modification. The VQO for activities viewed from sensitivity level 1 areas in the background distance zone is partial retention. Travelers on Highway 12 can see various units in the project area. The proposed activities these travelers may see are less than what is proposed in alternative 2. However, the effects are the same as described in alternative 2.

Simulations were created in VNS to determine which units are visible from Highway 12 and the Cromwell-Dixon Campground. Refer to appendix B of the Visuals Specialist Report for the results of the visual simulations for alternative 3. If the design features shown above are implemented, partial retention should be met. The units in retention and partial retention that need design features shown in table 327 do not include these units seen from sensitivity level 1 areas.

Table 336. Units seen from Highway 12

Viewpoint	Unit(s)	Treatment
Highway 12 Camera B	014, 015 005, 007	Precommercial thin Improvement cut, slash, jackpot burn
Highway 12 Camera C	008 014, 015, 017	Clearcut with leave trees Precommercial thin
Highway 12 Camera D	none	

Cromwell-Dixon Campground

Table 337 shows the units seen from Cromwell-Dixon Campground that need to meet partial retention in the background distance zone for alternative 3. For the units that are visible from the campground, the effects per acre of activity to visual resources are the same as alternative 2, but less spatially.

Table 337. Units visible from the Cromwell-Dixon Campground

Viewpoint	Unit(s)	Treatment
Cromwell Dixon Campground Viewpoint 1 & 2	none	none
Cromwell Dixon Campground Viewpoint 3	025	Precommercial thin
Cromwell Dixon Campground Viewpoint 4	167	Clearcut with reserves, jackpot burning
Cromwell Dixon Campground Viewpoint 4	134	Precommercial thin

If the design features shown above are implemented, the partial retention VQO should be met. The units in retention and partial retention that need design features shown in table 327 do not include these units seen from sensitivity level 1 areas.

Irreversible and Irretrievable Commitments

No irreversible or irretrievable commitments of resources are anticipated. See above in alternative 2 for additional information on irreversible and irretrievable commitments.

Cumulative Effects

The cumulative effects for alternative 3 are the same as alternative 2, except fewer acres would be treated.

Conclusions

There are more acres of prescribed fire with slashing and burning, clearcut with leave trees with site prep and burning, and clearcut with leave trees proposed in retention VQO in alternative 3 than in alternative 2. Fewer acres of precommercial thinning and slashing followed by broadcast burning is proposed in alternative 3 than alternative 2 in partial retention and retention VQOs.

The potential effects to visual resources from activities proposed in alternative 3 are fewer acres spatially but the same on each acre as alternative 2, as long as the design features are implemented.

Forest Plan Consistency

Forest plan consistency is the same for alternative 3 as disclosed for alternative 2.

The proposed activities would promote rehabilitation of the landscape improving natural visual characteristics in the long term. Forestwide standards for insects and disease provide direction to use silvicultural systems to: (1) improve species diversity and growth, and vigor for stands, and (2) increase the size diversity and class diversity between stands. The management activities proposed in this project are tools to rehabilitate the vegetative condition within the project area. Several large stands of dead trees would be removed, providing an opportunity to improve the species diversity, growth and vigor of the vegetation. The Visual Management System identifies rehabilitation as a short-term management alternative. “Landscape rehabilitation is used to restore landscapes containing undesirable visual impacts to a desired visual quality. It may not always be possible to immediately achieve the prescribed visual quality objective with rehabilitation, but should provide a more visually desirable landscape in the interim” (USDA 1974).

The potential direct, indirect, and cummulative effects of the proposed activities to visual resources would be consistent with forest plan direction for visual resources. The application of the landscape rehabilitation management alternative as outlined in the VMS would allow a longer period of time for the retention VQO to be achieved.

Alternative 4

The Helena Ranger District of the Helena-Lewis and Clark National Forest released a Draft Environmental Impact Statement (DEIS) on the Telegraph Vegetation Project in July 2015. Public comment was received regarding the DEIS and the three alternatives within. In response to the comments, a fourth alternative was developed. The issues that drove the development of this alternative are:

- ***Treatments designed to complement fuels reduction activities on private land***. This includes using mechanical equipment within units that were analyzed for prescribed fire only in alternative 2 or 3. Approximately 1.5 miles of temporary road would be necessary to access these treatment areas.
- ***Comments recommended using mechanical equipment to remove fuel from treatment units located near existing roads within the Jericho Mountain Inventoried Roadless Area (IRA).*** Field reconnaissance validated that the use of mechanical equipment would be a more effective means to rearrange and remove dead and down fuel in these units. Within the IRA, in alternative 4 mechanical treatments including clearcuts with reserves would replace some of the hand only treatment proposed in alternatives 2 and 3.
- ***Additional treatment units were recommended to further enhance existing fire suppression strategies, locating treatments contiguous to existing treatments and/or natural fuel breaks.*** These areas connecting proposed harvest units would strengthen the long-term fire suppression strategies for this portion of the Divide Landscape. These treatment units, as designed, would also reduce resource impacts and costs associated with post activity fuels disposal.

Direct and Indirect Effects

The proposed management activities in alternative 4 that are in addition to alternatives 2 and 3 are shown in Table 338 below and are illustrated in Figure 152. Effects to visual resources from the treatments and prescriptions are similar to alternative 3 and are described in the Effects Common to all Action Alternatives section. Direct and indirect effects to visual resources resulting from alternative 4 treatments are well within Forestwide Standards for Visuals as identified in the Helena National Forest Plan, as amended (1986). As described previously within the Spatial and Temporal Analysis section, VQOs are anticipated to be met immediately upon project completion or within the short-term timeframe.

Proposed Prescriptions

Table 338 displays the prescriptions and acres proposed in alternative 4. The effects to visual resources from the proposed activities are shown under the Effects Common to All Action Alternatives section.

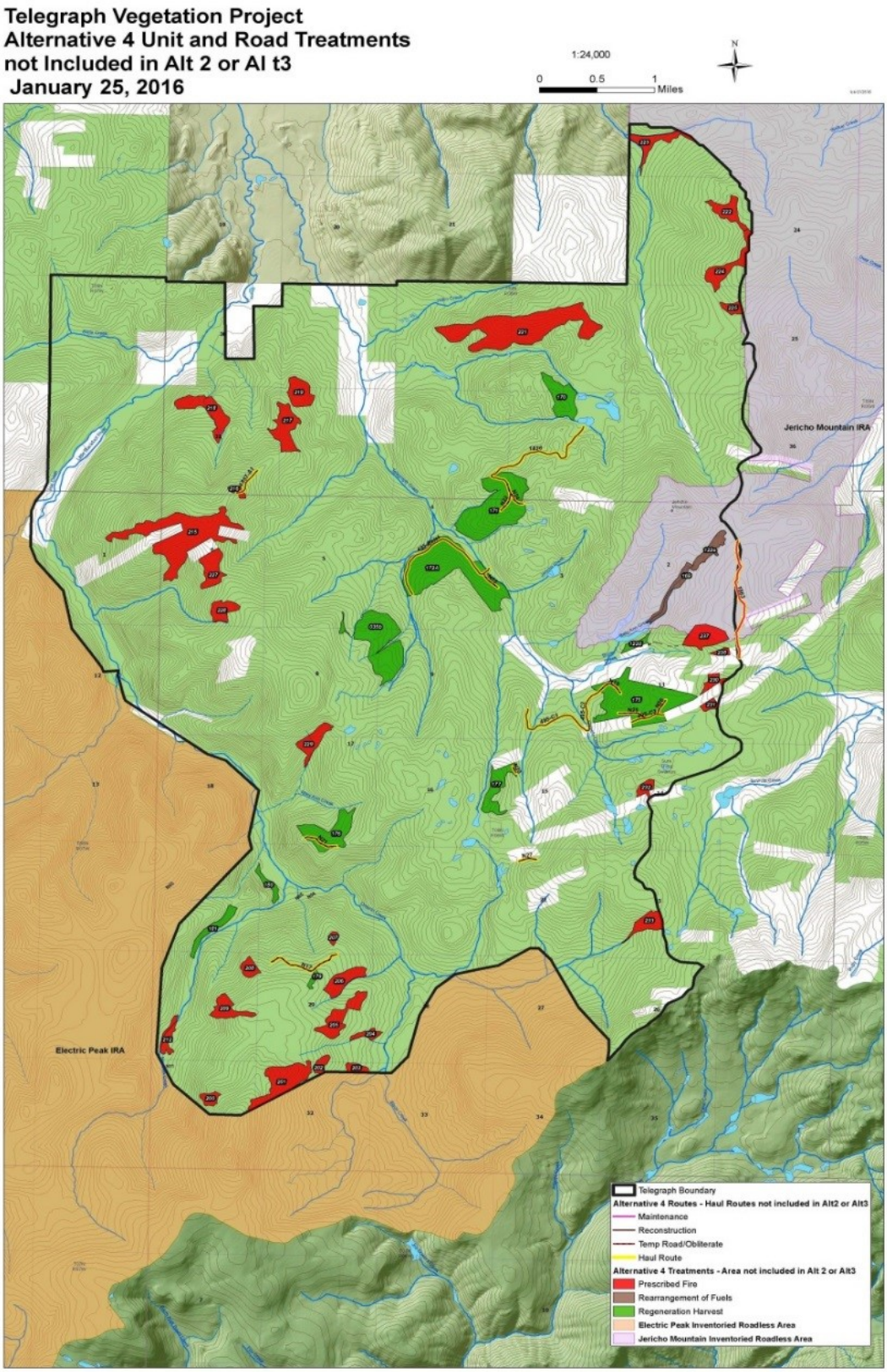

Figure 153. Alternative 4 unit and road treatments not included in alternatives 2 or 3

Table 338. Alternative 4 proposed activities

Treatment Type	Prescription	Alt. 4 Acres
Intermediate harvest	Improvement cut, slashing, jackpot burn	360
Precommercial thinning	Precommercial thin	1,277
	Precommercial thin, underburn	28
Whitebark pine release	Whitebark pine release	158
Mechanical Re-arrangement of fuels	Mechanical re-arrangement of fuels, followed by prescribed fire	596
Prescribed Fire	Slashing, broadcast burn	854
	Slashing, handpiling, burning piles	159
Regeneration Harvest	2-aged seedtree with reserves	16
	2-aged seedtree with reserves, site prep burn	166
	2-aged shelterwood with reserves, site prep burn	225
	Clearcut with leave trees	173
	Clearcut with leave trees, jackpot burn	2,721
	Clearcut with leave trees, site prep burn	1,370
	Clearcut with reserves, site prep burn	0
Grand Total		8,103

Acres of prescriptions proposed in retention units in alternative 4 are shown in table 16. This table also illustrates the units that would need design features applied to meet the retention VQO. The general design features also apply to units proposed in maximum modification.

Table 339. Alternative 4 units with design features

Visual Quality Objective	Treatment/ RX	Acres	Unit(s)
Retention	Regeneration harvest 2-aged shelterwood with reserves, site prep burn	11	180
	Prescribed fire - slashing, handpiling, burning piles	149	215
	Prescribed fire-slashing, broadcast burning	32	227
	Prescribed fire-slashing, broadcast burning	27	229

Effects to scenery include the immediate visual change to the existing landscape character after project implementation. Where managed stands are seen, noticeable differences may be apparent between naturally occurring landscapes and those managed for timber. Over time, these changes become more subtle as managed stands reach a point of maturity, and the effects of management blend into more natural-occurring forest characteristics.

Irreversible and Irretrievable Commitments of Resources

As in previous alternatives, there are no irreversible or irretrievable commitments of resources associated with alternative 4 as they relate to scenery. The effects of harvest and road construction will over time regain naturally occurring characteristics as seen by the casual observer. The landscape will resume those visual characteristics anticipated by the general public immediately after implementation and within the short-term timeframe. Design features have been established with regard to all management activities to increase the rate of visual recovery. Therefore, no irreversible or irretrievable commitments of visual resources are anticipated after project implementation.

Cumulative Effects

The cumulative effects for alternative 4 are the same as for alternatives 2 and 3. Refer to Figure 152 for a map of alternative 4 proposed activities and the units planned and implemented for the Forestwide Hazardous Tree Removal and Fuels Reduction – Healthy Forests Restoration Act Project.

Conclusions

There are more acres of prescribed fire with slashing and burning, clearcut with leave trees with site prep and burning, and clearcut with leave trees proposed in retention VQO in alternative 4 than in alternatives 2 and 3. Fewer acres of precommercial thinning and slashing followed by broadcast burning is proposed in alternative 4 than alternative 2 in partial retention and retention VQOs.

The potential effects to visual resources from activities proposed in alternative 4 are fewer acres spatially, but the same on each acre as alternative 2, as long as the design features are implemented.

Forest Plan Consistency

Forest plan consistency is the same for alternative 4 as disclosed for alternative 2 and 3.

The proposed activities would promote rehabilitation of the landscape improving natural visual characteristics in the long term. Forestwide standards for insects and disease provide direction to use silvicultural systems to: (1) improve species diversity and growth, and vigor for stands, and (2) increase the size diversity and class diversity between stands. The management activities proposed in this project are tools to rehabilitate the vegetative condition within the project area. Several large stands of dead trees would be removed, providing an opportunity to improve the species diversity, growth, and vigor of the vegetation. The Visual Management System identifies rehabilitation as a short-term management alternative. “Landscape rehabilitation is used to restore landscapes containing undesirable visual impacts to a desired visual quality. It may not always be possible to immediately achieve the prescribed visual quality objective with rehabilitation, but should provide a more visually desirable landscape in the interim” (USDA 1974).

The potential direct, indirect, and cumulative effects of the proposed activities to visual resources would be consistent with forest plan direction for visual resources because the application of the landscape rehabilitation management alternative as outlined in the VMS would allow a longer period of time for the retention VQO to be achieved.

Cultural / Heritage Resources

Introduction

The term “cultural resource” refers to an object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence (Forest Service Manual 2360). Cultural resources are prehistoric, historic, archaeological, or architectural sites,

structures, places, or objects and traditional cultural properties (FSM 2360). In this section, cultural resources include the entire spectrum of resources for which the Heritage Program is responsible for from artifacts to cultural landscapes without regard to eligibility for listing in the National Register of Historic Places (FSM 2360).

Cultural resources are non-renewable resources; once an archeological site is destroyed it is gone forever. Therefore, it is policy to protect the resources from destruction or adverse effects from Federal undertakings. The analysis indicator for cultural resources is their continued integrity, and this is measured by changes in the integrity and condition of the site.

In this section, the cultural and historic context of the Telegraph project area is examined and cultural resources in the plan area are identified. Existing information is used to assess the condition of these resources, including historic resources in the plan area identified as eligible or listed in the National Register of Historic Places and designated traditional cultural properties. Trends that affect these resources are also assessed.

Assumptions

A good faith effort in accordance with 36 CFR 800.4(b) (1) has been made by the Heritage program to identify historic properties prior to on the ground implementation. A good faith effort as defined in 36 CFR 800.4(b)(1),can range from field investigation (sample and full coverage), background research, oral interviews and consultation to comply with Section 106 of the National Historic Preservation Act. It is currently assumed that GIS maps showing known cultural resource distribution, existing inventory (field survey) data, historic context review, and NHPA Section 106 consultation, provided an adequate means of assessing the general effects of the alternatives on cultural resources. For additional information, see Table 340**.**

As currently planned it is anticipated that mitigation/resource protection measure can be implemented to avoid adverse effects to historic properties, which would result in a No Adverse Effect finding on cultural resources. If it is determined thru Section 106 consultation that effects to a historic property(s) cannot be feasible or prudently avoided, the steps outlined in 36 CFR 800.4 through 800.7 will be followed.

Resource Protection Measures: The Forest Service Heritage Program is responsible for management of cultural resources to prevent loss or damage before they can be evaluated for scientific study, interpretive efforts, or other appropriate uses. This requires projects to be implemented in a manner that avoids adverse effects on historic properties. Where a proposed treatments could have resulted in impacts to historic properties, project design anticipated that treatment of the property and conformed to sound preservation practice and were consistent with all applicable preservation standards. Project design ensured that the essential form and integrity of historic properties was not impaired.

Information Used

When a project is proposed on the Helena National Forest, Heritage program specialists participate in its planning and in the analysis of potential project effects. This participation consists of:

- review of historical materials, archival documents, and overviews relevant to the project area;
- analysis of the nature of the project and its potential to affect cultural resources;
- review of public concerns regarding the project and its potential effect; and

- consultation with interested Tribes, cultural resource interest groups and the Montana State Historic Preservation Officer (MTSHPO).

In the process, the Heritage Specialist determines the project's "area of potential effect" based on the geographic area in which a project may alter the character or use of any existing historic properties.

Based on this information, Heritage Specialists determine whether existing cultural resource data is adequate to complete the environmental analysis and disclose potential effects on cultural resources. If the information is insufficient, additional research and inventory is undertaken as needed. Where additional inventory is needed, Heritage personnel would design a survey strategy to locate all historic properties within the area of potential effect. This strategy is designed in accordance with the criteria defined in "Site Identification Strategy Prepared for the East Side Forest" (SIS). If a survey discovers previously unknown cultural resources, those resources are recorded and their National Register eligibility status determined in consultation with the Montana State Historic Preservation Officer (MTSHPO). Both background research and fieldwork are documented in a Section 106 report submitted to the MTSHPO. The Heritage program manager consults with MTSHPO to determine the nature of the project's effects on significant properties. If needed, the Heritage program manager and MTSHPO work together to determine appropriate project redesign, restrictions, designation of sensitive areas or mitigation measures. The Heritage program manager coordinates recommendations, actions and monitoring with the project leader, MTSHPO and interested Tribal preservation officials.

A project is determined to affect a historic property when project activities alter the characteristics that qualify the property for inclusion in the National Register of Historic Places (NRHP). In determining the effect, alteration to features of the property's location, setting, or use may be relevant, depending on the property's significant characteristics. An adverse effect results when the project may diminish the integrity of a historic property's location, design, setting, materials, workmanship, feeling, or association. According to the National Register Bulletin #15, adverse effects include (but are not limited to):

- physical destruction, damage, or alteration of all or part of the property
- isolation of the property from its setting; alteration of the setting's character when that character contributes to the property's National Register eligibility
- introduction of visual, audible, or atmospheric elements out of character with the property or its setting
- neglect of a property resulting in its deterioration or destruction

The Telegraph Vegetation Project area has evidence of 31 historic sites and 2 historic mining districts (Rimini and Elliston Mining Districts) within or up to 50 feet from the proposed units. The 2014-2015 field seasons added 26 new sites, which are located within units added under alternative 4. The Rimini Mining District is on the outside edge of the eastern boundary of the project area. Analysis and mitigation measures will be specific to sites within the districts, not the districts themselves. There are 39 historic sites within the Telegraph Vegetation Project boundary that are not part of the analysis because they are located outside the project treatment units and are not in the area of potential effect by project activities (appendix B).

Incomplete and Unavailable Information

The above methodology assumes that all known sites in proposed treatment units have been adequately identified. However, much of the greater project area has not been inventoried, so therefore information on the location of cultural resources within the larger Telegraph project area is

incomplete and unavailable. Only treatment units which meet certain criteria have been inventoried, as described above. Therefore, it is inaccurate to say that all sites within the project area have been adequately identified. Survey is 99 percent complete within the alternative 2, 3, and 4 treatment units. It is projected that minimal survey will continue as unit boundaries are clarified into the implementation phase.

Overview of Issues Addressed

The forest plan requires the integration of cultural resources in project planning and forest management. Compliance inventory, evaluation of site significance and project effect, consultation with the Montana State Historic Preservation Office and Tribal Historic Preservation Offices, and implementation of mitigation treatment plans for project affected cultural resources would comply with the NHPA and its implementing regulations in 36 CFR 800, as well as Helena National Forest Plan (USDA Forest Service 1986) standards and guidelines.

Issue

Ground disturbance and prescribed fire in the 20 historic sites could result in loss of the historical integrity of the sites. (See appendix B of the Heritage Specialist Report.)

- This issue is addressed with project design features (general) (see Design Features section in chapter 2 of the FEIS) and resource protection measures tables (site-specific and location-specific, confidential) to avoid adverse impacts to the known cultural resource sites.

Methodology

The key indicators for cultural resource analysis are generally: (1) the list of sites, by type, that are eligible for or included in the National Register of Historic Places, or those that have not been evaluated, which overlap with proposed activities; (2) the potential for the occurrence of cultural resources in areas that have not previously been surveyed; and (3) the nature of the proposed treatments. Undertakings involving ground disturbance or those that may adversely affect the character of significant cultural resources are primary considerations of the NEPA effects analysis. Sites that have been evaluated and found ‘not eligible’ (insignificant) according to criteria of 36CFR60.4 are reviewed for context, but not otherwise carried forward into the analysis.

The Regional PA and the Forest-specific SIS address details of NHPA/Sec. 106 compliance. They prescribe certain percentages of survey coverage for various types of undertakings, in order to adequately complete Sec. 106 effects analysis. The amount of survey and research anticipated depends on the undertakings involved. Information from this portion of the analysis assigns the ‘potential for the occurrence of cultural resources’ used in both NEPA and NHPA review.

Information from historic maps, the heritage resource database, and from numerous surveys done in the project area identifies specific locations of prehistoric and historic sites relative to proposed impact areas. This information provides historic context and helps identify both specific sites present and the kind of sites which may exist across the project area. For more information, see Table 340.

Evaluation of all potential historic properties, including traditional cultural properties follows a set of criteria established by the Montana SHPO and the National Park Service. Historic properties are determined to be significant if they meet one or more of the following criteria (USDI-NPS Bulletin 15):

a. They are associated with events that have made a significant contribution to the broad patterns in our history; and/or

b. They are associated with the lives of persons significant in our past;

c. They embody distinctive characteristics of a type, period, or method of construction that represents 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;

d. They have yielded, or may likely yield, information important in prehistory or history.

If sites do not meet the criteria of eligibility for the National Register of Historic Places after consultation with the appropriate parties, Section 106 of NHPA stipulates no further consideration of cultural resources is necessary and the undertaking may proceed.

If a site meets any of these criteria, Section 106 requires an agency to determine the effect of the proposed action on the site. One of the following three determinations is possible:

1. No historic properties affected – a Heritage Specialist has determined that either there are no historic properties present or there are historic properties present, but the undertaking will have no effect upon them. The agency will notify all consulting parties and make the documentation available for public inspection before approving the undertaking.

2. Historic properties affected – a Heritage Specialist finds that there are historic properties the undertaking may affect or the SHPO/THPO or the Advisory Council objects to the agency's findings. The agency then will notify all consulting parties, invite their views on the effects, and assess adverse effects, if any.

3. Adverse effect – the Heritage Specialist determines that the effect on eligible cultural resources will be adverse. When an undertaking has been determined to have an adverse effect on a property eligible for listing, the agency is directed to consult with the SHPO/THPO and other consulting parties to develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize or mitigate adverse effects on historic properties. Mitigation of a significant cultural resource entails a range of options including project redesign, and avoidance, documentation (photography and archival research), restoration and data recovery (through archaeological excavation). Mitigation options are selected on a case-by-case review and are tailored to the distinct values of the property and the planning options available within the project design. Once the agency and the SHPO agree on the mitigation measures for eligible properties affected by the undertaking and the conditions or stipulations have been met, the project may proceed.

The primary goal of a cultural resource inventory is to locate and describe archaeological, historic and cultural sites and to make a recommendation of significance when such sites are found. Archaeological sites, historic sites, and traditional cultural properties are known to occur in the Telegraph project area. Significance evaluations of known cultural resources and new sites discovered during inventories of the project area would follow general guidelines as set forth below:

1. Cultural materials were observed in depositional or surficial settings where cultural remains may have been buried or disturbed in essentially their original positions, thus preserving spatial context.

2. Artifacts diagnostic of historic or prehistoric cultural periods were found. Presence of such artifacts allows dating of cultural components and establishment of temporal and cultural context.

3. Presence of diagnostic artifacts in potentially preserved context makes it possible for a site to contribute significantly to understanding of local and regional history and prehistory.

4. Historic sites were found to associate with the lives of person(s) significant to local or regional history. Such associations can be apparent through archival research.

5. Historic or prehistoric sites were found to contain well-preserved features such as buildings, roads, trails, tipi rings, cairns, effigies, pictographs, or petroglyphs. Such features may be representative of or associated with, an important period, and architectural style, an artistic style, or a unique or specialized activity.

6. Physical evidence of past or present cultural use of a locality for prayer, fasting, vision questing, piercing, burial, and other ceremonial activities were found. That evidence could include prayer cloth, rock structures, marked trees, sweat lodge remnants or hearths, or other lodge remnants. Presence of these things allow for identification of Traditional Cultural Properties.

Affected Environment

Recorded cultural use of the Telegraph Vegetation Project analysis area is limited to historical sites. There are no previously recorded prehistoric sites, but aboriginal sites to the north and east in and adjacent to the Little Blackfoot River drainage basin indicate long-term visitation by native peoples. In particular, the heavy use of the Avon chert, which outcrops several miles to the north, suggests that adjacent areas might have been heavily used as well, either as travel corridors or as seasonal field camps. The absence of recorded prehistoric sites within the analysis area is more likely a reflection of Helena National Forest project locations in heavily timbered areas (steeper areas with limited ground visibility) and resource loss by historical mining and logging activities than it is of limited aboriginal use. Those prehistoric sites recorded closest to the analysis area include lithic quarries and workshops, multi-component buried campsites, culturally modified trees, and even a small number of stone circle sites. These sites are often found along minor stream tributaries in the Avon Valley. Most of the historic sites in the analysis area are either mining or logging sites.

General Project Area

The sequence of cultural history within the Telegraph Project area may be assumed to contain most of the usual phases from the Northwestern Plains chronologies. They will generally be referred here as the Prehistoric Period (Early, Middle and Late), Protohistoric Period and Historic Period. Details of the prehistoric periods will not be presented in detail since prehistoric archaeological sites or remains are limited in the project area. For more details on these cultural chronologies, the reader is referred to *Overview: Ecological and Cultural Prehistory of the Helena and Deerlodge National Forest, Montana* (Knight 1989), Prehistoric Hunters of the High Plains (Frisson 1991), and Indian Creek Paleoindians: Early Occupations of the Elkhorn Mountains' East Flank, West-Central Montana in *Ice Age Hunters of the Rockies* (Davis and Greiser 1992).

The start of the Protohistoric Period overlaps with the end of the Late Prehistoric Period and ends with the arrival of the first Euroamericans in the Great Plains (Aaberg et al. 2004). During this time period, European trade goods and horses generally reached Native American groups before full-scale contact. The influence of the Protohistoric Period, especially the horse, created competition for similar resources and territory (Aaberg et al. 2004). As a result, complex tribal organization, alliances, and larger band size developed (Aaberg et al. 2004). These tribal organizations belong to the anthropologically defined Northwestern Plains subdivision of the Plains Culture.

By the start of the Historic Period on the Plains, modern Native American tribal configurations and settlement patterns were in place. A number of tribes, beginning with the Flathead (Salish and Pend O'reille) in the 1600s, may have occupied central Montana during the Protohistoric and Historic Periods (Aaberg et al. 2004). Around A.D. 1700, the Shoshone, who had acquired the horse earlier than other Montana tribes, pushed the Flathead west across the Continental Divide (Aaberg et al. 2004). Soon other Plains tribes acquired the horse and displaced the Shoshone to the south (Aaberg et al. 2004). Salish and Kootenai peoples continued to cross the Continental Divide for bison hunting opportunities in what was once their land. Common and well established oral histories among the Salish describe the bison rich Helena and Townsend basins along the Missouri River.

The Blackfeet became dominant in most northern Montana east of the Divide and in central Montana by the mid-1700s. Numerous historic accounts, most notably those of John Colter between 1807 and 1811, tell of encounters with the Blackfeet in the area of the headwaters of the Missouri River (McKay et al. 2002:44-45). One tragic event that places the Blackfeet in the Helena Valley was the murder of prominent rancher Malcolm Clarke by several rogue members of Mountain Chief's band in 1869 (McKay 2002:44-45). That act led to an even more infamous incident, the Baker Massacre, in which the U.S. Military murdered 173 innocent Blackfeet on the Marias River in north-central Montana in revenge for Clarke's murder (McKay 2002:44-45).

During the early 1800s, the Helena Valley served primarily as a stopping place for Native people on their way to and from buffalo grounds to the east and south. Salish and Nez Perce frequented the valley until their traditional enemies, the Blackfeet, drove them away. The Blackfeet were subsequently forced permanently to the north by pressure from Euroamerican trappers, miners and settlers. The Fort Laramie Treaty of 1851 designated the Helena Valley as a hunting area to be shared by all tribal groups.

The first Euroamericans to reach the Helena Valley were members of the Lewis and Clark expedition, who traveled through in 1805 and commented on the lush green grass that reached 24 inches height (McKay 2002:44-45). From then until 1860, fur trappers and traders viewed the valley as a crossroads for east-west and north-south travel (McKay 2002:44-45).

Congress appropriated money in 1855 for the construction of a 640-mile military wagon road between Fort Walla Walla, Washington and Fort Benton, the head of steamboat navigation on the Missouri River. The Mullan Road was completed in 1860. The future home-site of Helena was located a few miles from the road.

The Forest Service has a long history in the project area. Between 1905 and 1907, eight Forest Reserves were established near the plan area and by 1908, these Forest Reserves were combined into what is now known as the Helena-Lewis and Clark National Forest. The first several decades of Forest administration saw each Forest following similar trends as other national forest in the interior Northwest. Mapping of the plan area occurred along with the establishment of initial communication lines, fire lookout locations and administrative sites. The project area is dotted with this administrative history. Two historic administrative sites are within the project boundaries, although not near any treatment units. These are the historic Blackfoot Ranger Station (unevaluated), and the historic Kading patrol cabin (24PW0463). Additional features associated with these administrative sites are expected to include communication features such as telephone line and insulators. Other administrative feature types found in the project area include survey corners and boundary markers to historic trails that appear on old maps, but are no longer managed.

The Elliston Mining District was an extensive silver and lead ore lode mining around the turn of the 20th century. The majority of mines are located at the 5,600- to 7,000-foot elevation on slopes. The

ore deposits were mostly lead, silver, zinc, copper, and some gold. There was not as much placer mining in the district, but there were rich placers located along the Little Blackfoot River's northern tributaries in Ophir Creek and Snowshoe Gulch in the 1860s and 1870s. By the 1880s they were mostly abandoned except for the Chinese miners. Local placer miners then turned their attention to the Telegraph Creek area. Mining in the Little Blackfoot River drainage was not as rewarding as the adjacent Big Belt Mountains (Davis 2006).

The Elliston area was mostly a lode-mining district, which contained a variety of major and lesser silver/-lead lode mines during its peak production period at the turn of the 20th century. Mining during this boom period was done on both corporate and individual scales for both precious and base metals. Lode exploration and prospecting was widespread. In 1884, the Northern Pacific Railway Company built its transcontinental line up the Little Blackfoot River drainage, creating the community of Elliston in the process. In 1890, the Elliston & Southern Railroad (a spur line) was also constructed, in support of the Elliston Flume Company, which engaged in a massive mining-related logging effort in the area on behalf of the Anaconda Company. Both railroads provided an invaluable means of transporting local ore to outside mills and smelters and wood to the Anaconda copper smelters. Railroads provided an efficient means of transporting heavy mining and milling equipment into the Elliston Mining District. In addition to the mining and railroad activity, limestone quarrying became another economic mainstay for the growing community of Elliston (Davis 2006).

The high level of mine development and production in the Elliston Mining District lasted for about 20 years—from the early 1890s until about 1911. The repeal of the Sherman Silver Purchase Act in 1893 caused severe economic depression and was the death knell of many Montana silver mines. However, the Elliston Mining District's diverse precious and base metals mining base, coupled with its proximity to nearby smelters in Anaconda and East Helena, allowed some operations to continue. Nevertheless, the Elliston & Southern Railroad ceased operations in 1907, although this was also due to a depleted supply of smelter wood. Lode production thereafter was spotty, but some of the big corporate mines, such as the Ontario and Evening Star, operated intermittently throughout the 1920s (Davis 2006).

The Great Depression of the 1930s was the end for many of the mining operations. Some operations in the Little Blackfoot River drainage continued, such as the Evening Star, Monarch, Charter Oak, Orphan Boy, and Ontario mines. The Depression also spurred "subsistence" prospecting and mining, as exemplified by the hundreds of hand and mechanically dug pits and trenches throughout the drainage. Old adits were reopened and waste dumps were reworked by Elliston area miners. The district's proximity to the railhead at Elliston and smelters in Anaconda and East Helena appears to have provided an incentive for continued minerals exploration and mining even in tough times. World War II created a heavy demand for lead, zinc, copper, and other "strategic metals." Many mines were either improved or reopened in the upper Little Blackfoot River drainage for about a 10-year period. Mining benefited from government price supports and Federal investment through low-interest loans. It continued into the post-war period, but eventually market decline, elimination of World War II price supports, and environmental regulation led to the demise of major lode-mining enterprises in the upper Little Blackfoot River drainage by the early 1960s. However, minor prospecting, exploration, and mining, as well as reworking of old waste rock dumps and mill tailings, continues to the present. Today, the current mining focus is largely on reclamation rather than exploration and development (Davis 2006).

Analysis Area

For purpose of this analysis, the project area boundary is used as the general "heritage analysis area" where contextual research and background record checks provide the information on the existence of

or potential for, the occurrence of cultural resources. Within this broader analysis area, a site-specific "area of potential effect" (APE) is intensively analyzed under NHPA Section 106 review process. The APE includes treatment units, landings, road construction, and a buffer zone of 50 feet beyond these areas. Where a cultural resource is partially located within the APE, the effects analysis must be expanded to encompass the entire site (including a buffer). The exception is linear features (such as historic ditches), where the majority of the feature is well outside of the project area.

Existing Condition

The 36 CFR 800 regulations define an area of potential effect as:

> …the geographic area or areas within an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR 800.16(d)).

The area of potential effect for analysis encompasses the treatment units designated within the larger Telegraph Vegetation project boundary. All known cultural resources located within designated treatment areas have been included in the analysis. Ground survey for archeological resources took place in units according to the Telegraph Project Heritage Survey Plan. The larger project boundary of the Telegraph Vegetation Project lies within the Helena Ranger District of the Helena National Forest, specifically in T9N,R6W, sections 14, and 23-26; T8N, R6W, sections 1-23, and 26-33.

The Helena National Forest cultural resource inventories and site locations were evaluated for known cultural resources and previous cultural resource surveys. In addition, BLM GLO (digitized historic maps) and historic maps were studied for cultural resource potential. The Helena National Forest cultural site atlas and site files were also searched. A detailed GIS analysis of the project area took place using the Helena National Forest Site Identification Strategy and site probability layers. In addition, previous cultural resource surveys in the area were evaluated for confidence level. All of these sources informed the development of the Telegraph Vegetation Project heritage survey plan. An analysis of the areas of potential effect and implementation units within the project boundary allows for different potentials for effect, depending on the prescribed treatments.

Surveys were needed because previous to the 2014-2015 seasons, only 3,494 acres within the project APE had been analyzed. Of that, only 118 acres had been surveyed within the last 10 years. The 2015 survey and analysis were driven by the development of Alternative 4. Under this alternative, there are 31 previously known sites and two historic mining districts within 50 feet or inside of treatment units. As of the end of the 2014-2015 field season, driven by the development of Alternative 4, 26 new sites were discovered within treatment units. At the end of the 2015 field season, a total of 5817 acres has been surveyed, which constitutes a "Good Faith Effort" and fulfills the requirements of 36 CFR 800 as defined above. See Table 340 for list of previous surveys within the Telegraph Vegetation Project boundaries.

Table 340. Cultural resource inventories within the Telegraph Vegetation Project treatment units

Survey Name	Survey #	Year
Viking Mine Mineral Claim	80-2-2	1980
Bison Mountain Timber Sale	81-2-7	1981
Mike Renig Gulch Timber Sale	81-2-4	1981
Ontario Timber Sale	84-2-3	1984
Treasure Mountain Timber Sale	87-2-5	1987
Upper Telegraph Salvage Timber Sale	90-2-1	1990
Phelps-Dodge Corp./Karger Drill Program	91-2-2	1991
Pegasus Gold Clemmer & O'Keefe Drill Project	92-2-3	1992
Jericho Salvage	96-2-06	1996
Powelson Mining POO	96-2-81	1996
Silver City SUP Road	98-2-47	1998
Ten Mile Abandoned Mine	98-2-58	1998
LP/Bignell SUP Road	98-2-45	1998
Armstrong-Beatrice Mine Rec.	99-2-50	1999
Haug SUP Road	99-2-32	1999
Nellis SUP Road	99-2-35	1999
Ontario Mine Test Holes	00-2-21	2000
Jericho Mountain Trail Re-Route	03-1-6	2003
Telegraph Mine Borrow Site	06-02-17	2006
Bignell Access SUP	06-02-08	2006
Telegraph Creek Road ROW Conveyance	07-02-04	2007
2010 Roadside Hazard Tree Survey	10-02-22	2010
2014 Telegraph Vegetation Project	R201301120016A	2014
2015 Telegraph Vegetation Project	R201301120016B	2015

NHPA Section 106 Inventory Strategy

For the proposed prescribed fire treatment units, we implemented the 2-phased methodology spelled out in our East Side Forest Site Identification Strategy (1995). This approach requires a pre-survey records search to identify above ground, combustible historic properties and any areas where cultural resources would be expected to occur (SIS 1995). The Phase 1 inventory strategy focused on locating expected sites identified through the records search. Furthermore, the Phase 1 methodology consists of intensive-level inventory of a minimum of 10 percent of the proposed prescribed fire APE. The Phase 2 consisted of a post-implementation "monitoring" type inventory resulting in a 20 percent minimum coverage of the entire prescribed fire APE. The result being a 30 percent sample of the undertakings' prescribed fire APE.

The Heritage crews performed a sample survey of all units which had prescribed fire treatment during 2014-2015 field seasons. This means 30 percent sample of the prescribed fire unit have been surveyed.

The pre-implementation ground survey methodology of timber harvest units consisted of intensive level inventory of 100 percent coverage of high probability areas, 30 percent of medium probability areas, and 10 percent coverage of low probability area in the project's Area of Potential Effects.

Past experience has shown mechanical treatment has the greatest chance to cause ground disturbance, therefor units proposed for improvement harvest, regeneration harvest and precommercial thinning needed the highest amount of Section 106 inventories to achieve compliance. Generally we are able to employ a Stratified Inventory Strategy based on slope, due to the fact that humans don't usually occupy slopes greater than 20 percent. However, historic sites associated with mining do not have the same constraints. Historic adits, shafts, ditches and mill structures routinely occur on steep slopes. For this reason, all proposed timber harvest units are considered to be within the Area of Potential Effect (APE) for cultural resources and needed on the ground inventory coverage. It should be noted, that past experience has shown that some environmental conditions, such has dense downfall, thick new vegetation growth and un-safe slope conditions, produce a low confidence level for cultural resource inventories due to poor ground visibility. In this type of situation, a post implementation inventory could produce a higher confidence level.

For the Telegraph Vegetation Project, a "good faith" effort based on the Site Identification Strategy, 36 CFR 800 and the professional judgement of the Forest Archeologist was utilized. This means that the general tenants of the SIS and 36 CFR 800 were followed, but were adjusted to account for the high concentration of historic resources within the project area.

Environmental Consequences

Spatial and Temporal Context for Effects Analysis

The spatial context for analysis is the extent of the current project area boundary. The temporal context for effects analysis is two-fold. The immediate temporal context is essentially the direct effects that the current proposed project would have on cultural resources; that is, immediate changes to site condition or integrity, or even National Register status, as a direct result of project actions. The long-term temporal context is essentially the indirect effects that the current proposed project would have on cultural resources, that is, long-term changes to site condition, integrity, or National Register status resulting from changes instigated by the project actions.

Effects Common to All Action Alternatives

A total of 5,817 acres in the Telegraph Project APE has been inventoried for cultural resources. Cultural resources are non-renewable resources; therefor NHPA Section 106 inventories are required prior to any on the ground action alternative implementation. Positive effects of the action alternatives to heritage resources include an opportunity for the Forest to monitor eligible cultural resources, a reduction in fuel loading, and the management of control lines to reduce the risk of wildfire. These actions all help in protecting the cultural resources of the Helena National Forest by getting our program closer to its desired conditions. That is all moderate-to high probability terrain could be inventoried for cultural resources and the results documented. Any moderate-to high probability areas that received surveys prior to 2005 could be re-examined. Eligibility of unevaluated sites and newly recorded sites would be determined in consultation with SHPO prior to project implementation. The existing or desired condition may be further enhanced if project activities (under-burning, vegetation removal) reveal additional significant features of the Elliston Historic Mining District (trails, railroad grades, ditches, camp locations, etc.).

Alternative 1 – No Action

Under no action, none of the elements of the proposed action would occur in the Telegraph Vegetation Project area.

Direct Effects and Indirect Effects

Under alternative 1, no new direct effects would occur. Cultural resources would continue to be vulnerable to the effects of fuel loading within the project area, increasing the risk of wildfire. Cultural resources would continue to naturally deteriorate over time. Cultural resources would continue to be threatened by natural processes (wildfire, erosion) and simply from recreational activities that bring people in contact with cultural sites.

Wildfires have a negative effect on fire-sensitive cultural resources due to high temperatures, an inability to control the effects, and because resource inventories cannot be conducted in advance. Fire suppression activities such as bulldozer-created control lines, hand lines, and fire retardant drops all have the potential to destroy or damage cultural resources. In addition, wildfires cause erosion through vegetation loss, resulting in resource deterioration. Vegetation loss may also inadvertently lead to increases in vandalism and looting of cultural sites. The high temperatures of wildfires cause rapid surface weathering of features and artifacts, accelerating loss.

Cumulative Effects

Since no actions would be done under this alternative there would be no cumulative effects.

Summary of Effects

The no-action alternative would have an undesired effect on cultural resources. Most significant of these is the increased risk of damage to cultural resources from wildfires resulting in artifact damage, wooden structure and feature loss, and loss of site integrity through erosion.

Alternative 2 – Proposed Action

The Helena National Forest proposes to treat approximately 4,328 acres of the 23,669-acre project area using prescribed fire. Approximately 118 acres of the Telegraph Vegetation Project treatment units in alternative 2 have been inventoried for cultural resources. Treatments are to respond to the mountain pine beetle outbreak in the area, recover economic value of the dead and dying trees, promote desirable regeneration, improve conditions for fire suppression effectiveness as well as firefighter and public safety in the area in the event of a wildfire, and maintain diverse wildlife habitats. The project also seeks to maintain or improve watershed values. Proposed treatments include regeneration harvest, intermediate harvest, precommercial thinning, and prescribed fire; 1,050 acres of the proposed units are planned for prescribed fire treatments. All of these actions have the potential to adversely affect cultural resources if design features are not implemented. Positive effects of the proposed action to heritage resources include an opportunity for the Forest to monitor eligible cultural sites, a reduction in fuel load, and the management of control lines to reduce the risk of wildfire. These actions all help in protecting the cultural resources of the Helena National Forest. Alternative 2 has the potential to directly affect 17 known cultural resources in treatment units. Three additional sites are located near (within 50 feet of) treatment units and would be at risk should project activity extend outside the unit boundaries.

Direct Effects and Indirect Effects

Under alternative 2, new direct effects would likely occur if design features and resource protection measures, as described in the Final Section 106 report, are not followed. Direct effects to cultural resources are those that physically alter, damage, or destroy all or part of a resource; alter

characteristics of the surrounding environment that contribute to the resource's significance; introduce visual or audible elements out of character with the property or that alters its setting; or resource neglect to the extent that it deteriorates or is destroyed (USDA Forest Service 2005: III-411). The proposed action has the potential to directly affect the cultural resources within the proposed project area. Several potential impacts to cultural resources were identified including: thinning projects and burn treatments. Felled trees can also damage or destroy features and historic structures. Burn treatments have the potential to adversely affect cultural resources by burning historic structures and damaging or destroying artifacts and features within archaeological sites.

Indirect effects under the current proposal are related primarily to reducing the risk of wildfires in the project area. Adverse effects to cultural resources tend to be greater in wildfire situations because of high temperatures, an inability to control the effects, and because resource inventories cannot be conducted in advance (USDA Forest Service 2005: III-413). In addition, wildfires cause erosion through vegetation-cover loss, resulting in resource deterioration. Vegetation-cover loss may also inadvertently lead to increases in vandalism and looting of cultural sites. The high temperatures of wildfires cause rapid surface weathering of features and artifacts, accelerating loss.

Cumulative Effects

For all alternatives, the cumulative effects analysis area is the extent of Forest Service land in the Telegraph project area. A diverse panel of Forest resource specialists compiled a report and maps of connected past, present and reasonably foreseeable actions or events that have altered or could alter the project area's natural and cultural landscapes. Cumulative actions initiated by the Forest relevant to cultural resources include timber harvests and tree thinning; prescribed burning and wildfire suppression; weed and grazing allotment management; and minimal recreation developments. Actions and events not initiated by the Forest include climate conditions, insect infestations, wildfires, and aspects of grazing, firewood cutting, post and pole cutting, and recreation. These actions cause increased exposure of sites due to loss of vegetative cover, soil compaction or erosion, looting, and changes to routes and use patterns of historic linear features.

This alternative improves cultural resource protection in the Telegraph project area in the short- and long-term. See below for a description of Past, Present and Reasonably Foreseeable Future Actions.

Past Actions – The Telegraph and Little Blackfoot River drainage, and its adjacent foothills and mountains, has supported livestock grazing, logging, mining, recreation and utility development during the last 150 years. These activities and particularly the road construction associated with them, have exposed, and in some cases damaged, cultural resources. However, it is difficult to quantify the effects of these past actions on cultural resources in the Telegraph Project area.

Since the late 1970s, cultural resource inventories have preceded all ground-disturbing Forest Service projects in the Telegraph Project area including vegetation treatments, livestock grazing, restoration, and recreation development. The majority of the cultural resources described in this analysis were discovered as a result of these compliance inventories. In fact, many archaeological sites were found because they were exposed in old road and trail beds. In most cases, project boundaries and treatments would be reconfigured to avoid impacting significant cultural resources so the cumulative effect of these actions on cultural resources would be relatively minor.

Present Actions – Cultural resource inventory and evaluation have preceded restoration work, fencing, weed treatment, road and trail repairs, reforestation and stock watering repairs. Ongoing forest activities would continue to have a cumulative effect on cultural resources. All forest actions require NHPA and consultation therefore the effects on cultural resources would be mitigated

through project redesign and/or avoidance. Roads and trails have been constructed through archaeological and historic sites over a period of many years. Regardless of alternative, road use has the potential to degrade cultural resources, particularly prehistoric archaeological sites. Cultural resources exposed in roadbeds and borrow pits invite illegal artifact collecting.

Reasonably Foreseeable Future Actions – Future actions in the analysis area will likely focus on public safety and environmental health and include fire and watershed restoration, hazardous fuels reduction, abandoned mine reclamation, and minor recreation developments, and mineral operations. In all likelihood, the effects of these projects on cultural resources can be mitigated through project re-design and avoidance.

Cumulative effects background is provided above. This alternative would invoke more vegetation management activity in the drainage. This would add to the cumulative effects of FS management activities on cultural resources in the Telegraph project area since the turn of the century. The current known cultural resources in this area are very high, whether for historic mining, homesteading and other ruins. Further, the direct and cumulative effects of the Telegraph project could be abated if the identified cultural resources are protected through treatment unit redesign, avoidance or mitigation measures. For further information, please see the Cumulative Effects Table located in the NEPA project files.

Alternative 3

Alternative 3 proposes to treat approximately 4,185 acres of the 23,669-acre project area. Treatments are to respond to the mountain pine beetle outbreak in the project area, recover economic value of the dead and dying trees, reduce fuels and the risk of wildfire, and maintain diverse wildlife habitats. Proposed treatments include regeneration harvest, intermediate harvest, precommercial thinning, and prescribed fire. All of these actions have the potential to adversely affect cultural resources if mitigation measures are not implemented. Positive effects of the proposed action to heritage resources include an opportunity for the Forest to monitor eligible cultural sites, a reduction in fuel load, and the management of control lines to reduce the risk of wildfire. These actions all help in protecting the cultural resources of the Helena National Forest. Alternative 3 has the potential to directly affect 15 known cultural resources in treatment units. Three additional sites are located near (within 50 feet of) treatment units and would be at risk should project activity extend outside the unit boundaries.

Direct Effects and Indirect Effects

Under alternative 3, new direct effects would likely occur if design features and mitigation measures, described above, are not followed. Direct effects to cultural resources are those that physically alter, damage, or destroy all or part of a resource; alter characteristics of the surrounding environment that contribute to the resource's significance; introduce visual or audible elements out of character with the property or that alters its setting; or resource neglect to the extent that it deteriorates or is destroyed (USDA Forest Service 2005: III-411). The proposed action of Alternative 2 and 3 have the potential to directly affect the cultural resources within the proposed project area. Several potential impacts to cultural resources were identified including: thinning projects, and burn treatments. Felled trees can also damage or destroy features and historic structures. Burn treatments have the potential to adversely affect cultural resources by burning historic structures and damaging or destroying artifacts and features within archaeological sites.

Indirect effects under the current proposal are related primarily to reducing the risk of wildfires in the project area. Adverse effects to cultural resources tend to be greater in wildfire situations because of high temperatures, an inability to control the effects, and because resource inventories cannot be

conducted in advance (USDA Forest Service 2005: III-413). In addition, wildfires cause erosion through vegetation-cover loss, resulting in resource deterioration. Vegetation-cover loss may also inadvertently lead to increases in vandalism and looting of cultural sites. The high temperatures of wildfires cause rapid surface weathering of features and artifacts, accelerating loss.

Cumulative Effects

Same as alternative 2.

Alternative 4

Alternative 4 proposes to treat approximately 8,103 acres of the 23,669-acre project area. Treatments are to respond to the mountain pine beetle outbreak in the project area, recover economic value of the dead and dying trees, reduce fuels and the risk of wildfire, and maintain diverse wildlife habitats. Proposed treatments include Intermediate Harvest (360 acres), Precommercial Thinning (1,305 acres), Regeneration Harvest (4,671 acres); 6,479 acres of the proposed units are planned for prescribed fire treatments. All of these actions have the potential to adversely affect cultural resources if mitigation measures are not implemented. Positive effects of the proposed action to heritage resources include an opportunity for the Forest to monitor eligible cultural sites, a reduction in fuel load, and the management of control lines to reduce the risk of wildfire. These actions all help in protecting the cultural resources of the Helena National Forest. Alternative 4 has the potential to directly affect 26 known cultural resources in treatment units. Thirty-one total sites are located near (within 50 feet of), or within, treatment units and would be at risk should project activity extend outside the unit boundaries.

Alternative 4 Section 106 Inventory Summary: Note*Analysis is based on Prescription, not Treatment*

Under alternative 4, each unit was surveyed in 20- to 30-meter transects which intensively covered areas judged “high probability for cultural resources.” “Moderate” to “Low” probability areas received a “sampling” type inventory. In addition, areas where temporary roads may be built received intensive survey.

Under alternative 4, the units listed below are prescribed for hand treatments such as slashing and jackpot burning and are low priority for survey, according to the professional judgement of the Helena National Forest Archeologist. This is because of the low potential for adverse effects to historic properties. Units 24, 7, 142, 001, 123, 169, 200-238 are all slated for a combination of hand slashing and burning. Project activities for these units may proceed as planned, as long as requirements for individual site special treatment areas are followed.

Under alternative 4, 35.8 miles of road is slated for reconstruction. 43.1 miles of road is scheduled for maintenance. 9.7 miles of temporary road is scheduled for construction and obliteration. Mitigation of potential adverse effects to Cultural Sites will be facilitated by maps with site boundary/buffer/special treatment zones of avoidance clearly delineated prior to implementation.

All other units listed for implementation under alternative 4 have received intensive pre-implementation surveys which meet the standards laid out in 36 CFR 800 and Sect. 106 of the National Historic Preservation Act and the professional judgement of the Forest Archeologist. None of the Units listed below are purely mechanical treatment, timber sale, or burn, but rather combinations of those treatments. For this reason, they have been surveyed to the most stringent standard of possible treatment, in this case, mechanical timber harvest. None of the units which were added or changed in alternative 4 were eligible for post implementation survey. Certain areas within

units, which are detailed in Appendix A: Special Concerns (not subject to FOIA) of the Heritage specialist report will require consultation with Heritage specialists during the layout phase of implementation.

Direct Effects and Indirect Effects

Under alternative 4, new direct effects would likely occur if design features and mitigation measures, described above, are not followed. Direct effects to cultural resources are those that physically alter, damage, or destroy all or part of a resource; alter characteristics of the surrounding environment that contribute to the resource's significance; introduce visual or audible elements out of character with the property or that alters its setting; or resource neglect to the extent that it deteriorates or is destroyed (USDA Forest Service 2005: III-411). The proposed actions of alternatives 2, 3 and 4 have the potential to directly affect the cultural resources within the proposed project area. Several potential impacts to cultural resources were identified including: thinning projects, and burn treatments. Felled trees can also damage or destroy features and historic structures. Burn treatments have the potential to adversely affect cultural resources by burning historic structures and damaging or destroying artifacts and features within archaeological sites.

Indirect effects under the current proposal are related primarily to reducing the risk of wildfires in the project area. Adverse effects to cultural resources tend to be greater in wildfire situations because of high temperatures, an inability to control the effects, and because resource inventories cannot be conducted in advance (USDA Forest Service 2005: III-413). In addition, wildfires cause erosion through vegetation-cover loss, resulting in resource deterioration. Vegetation-cover loss may also inadvertently lead to increases in vandalism and looting of cultural sites. The high temperatures of wildfires cause rapid surface weathering of features and artifacts, accelerating loss.

Cumulative Effects

Same as alternative 2.

Conclusions

The Telegraph project area contains a variety of cultural resources. Overall, the project would have a beneficial effect on cultural resources. Under alternative 1, no new direct effects would occur. Alternative 1 would not increase protection of cultural resources since no new inventories would be conducted or new cultural resources would be recorded. Cultural resources would continue to be vulnerable to the effects of fuel loading within the project area, increasing the risk of wildfire.

Alternatives 2, 3, and 4 could have positive effects to heritage resources including an opportunity for the Forest to monitor eligible cultural resources, discover new cultural resources, a reduction in fuel loading, and the management of control lines to reduce the risk of wildfire effects. These actions all help in protecting the cultural resources and to achieve our desired conditions on the Helena National Forest.

If additional sites are identified in the proposed APE, consultation with SHPO, Tribes and other identified consulting parties, will determine whether they are historically significant. The Final Record of Decision will address how affects to significant cultural resources will be avoided, minimized or mitigated.

Summary of Effects

In summary, alternatives 2, 3 and 4 could have both negative and positive impacts on cultural resources within the project area. There would be no adverse or negative effects if the proposed

resource protection measures are followed. The negative effects are possible cultural resources damage from ground disturbance from burn line construction with heavy machinery and the heat damage to resources from prescribed fires. The loss of vegetation can indirectly lead to vandalism to cultural resources because of the increased visibility. The resource protection measures defined in the Final Section 106 report would mitigate adverse effects to cultural resources within the project area. Positive effects include the reduction of fuels that could result in fire-damaged cultural resources and increased erosion of archaeological sites.

Alternatives 2, 3and 4 would meet the Helena National Forest management goals for cultural resources by reducing the risk of fire. Damages to cultural resources from wildfires, suppression efforts and erosion, are irreversible losses of cultural resources.

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

The Forest Plan requires the integration of cultural resources in project planning and forest management. Compliance inventory, evaluation of site significance and project effect, consultation with the Montana State Historic Preservation Office and Tribal Historic Preservation Officers, and implementation of design features for project-affected cultural resources would comply with the National Historic Preservation Act and its implementing regulations in 36 CFR 800, as well as Helena National Forest Plan (USDA 1986) standards and guidelines. Therefore, the results of this project on cultural resources will remain within Forest Plan standards and guidelines because NHPA Section 106 will be completed prior to implementation and mitigation will be done to avoid adversely effecting cultural resources within the planning area.

Social and Economic Resources

Introduction

The management of the natural resources on the Helena-Lewis and Clark National Forest (HLC) has the potential to affect local economies. People and economies are an important part of the ecosystem. Use of resources and recreational visits to the National Forests generate employment and income in the surrounding communities and counties, and generate revenues returned to the Federal Treasury or used to fund additional on-the-ground activities to accomplish resource management objectives.

This report delineates the affected area, assesses potential environmental justice impacts, and outlines methods and results of analyzing the economic effects of the Telegraph Vegetation Management Project, including the project feasibility, financial efficiency, and economic impacts. Project feasibility and financial efficiency relate to the costs and revenues of doing the action. Economic impacts relate to how the action affects the local economy in the surrounding area.

Affected Environment

The Telegraph Vegetation Project is located on the Helena Ranger District of the Helena National Forest and is located in Powell County, Montana. RY Timber, INC in Broadwater County and Sun Mountain Lumber in Powell County are likely destinations for the majority of the sawlog material resulting from this project. Marks Lumber and Miller Post and Pole, located in Jefferson County, are the likely destinations of the roundwood material from the project. Lewis and Clark County will likely see positive economic impacts from the project including fuel purchase, equipment repair and hotel visits. Since these are the four counties that would be most affected by the project in terms of social and economic effects, the Affected Environment section focuses on these counties.

Timber, tourism, government and agricultural industries are significantly important to the economy of the affected environment. Despite the common concern for, and dependence on, natural resources within the local communities, social attitudes vary widely with respect to their management. Local residents hold a broad spectrum of perspectives and preferences ranging from complete preservation to maximum development and utilization of natural resources.

Socioeconomic measures are used to describe the affected environment. These measures were obtained from the Headwater Economics' Economic Profile System – Human Dimensions Toolkit (EPS-HDT 2011), which compiles and summarizes primary population and economic data from a variety of government sources into a report. Key measures used in this report include land ownership, population, income, and economic diversity.

Land Ownership

The county region land base consists of 49 percent Federal land. Higher in comparison to the state of Montana at 30 percent and the United States (U.S.) at 28.8 percent. There are communities within the Affected Environment containing infrastructure equipment and facilities with the ability to capitalize on financial and employment opportunities related to the Telegraph Vegetation Project. Many of these communities operate within regional feasibility restrictions making their dependency on local opportunities within their region more significant to their economies. Consequently, as the largest land holder in the Affected Environment the Forest Service's ability to contribute to the local economy is high.

Per EPS-HDT (EPS-HDT 2016), where a large portion of land is owned and managed by federal agencies, local governments may rely heavily on PILT ("Payments in Lieu of Taxes") and revenue sharing payments (e.g., Forest Service Secure Rural Schools and Community Self-Determination Act or BLM Taylor Grazing Act payments). Broadwater County has the lowest percentage of Federal land in the Affected Environment at 35 percent. The other three counties are comprised of Federal land components similar in proportion to one another and averaging about 17 percent higher than Broadwater County. The significance of income for the county related to the Federal land component would be contingent upon whether Powell County chooses PILT or revenue sharing payments. The magnitude of community sourced income for both Broadwater and Powell Counties would be greatly influenced by whether Sun Mountain Lumber or RY Timber LLC. are the processors of wood materials from the project area.

Figure 153 depicts the proportion of Forest Service land in contrast to non-Forest Service Federal, State, private and other land holders.

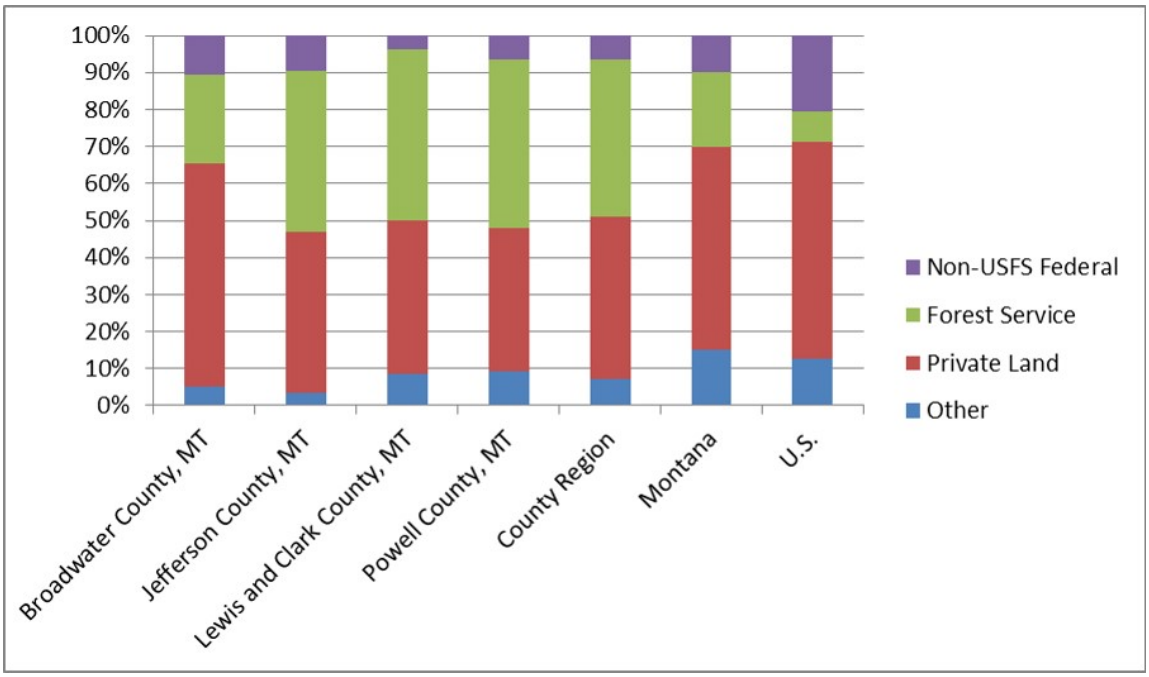

Figure 154. Land ownership, by percent of land area

Population, Employment, and Income

Lewis and Clark County has the highest population in the Affected Environment with 65,856 people. This is more than double the combined populations of the other three counties (24,134 people). However, the likely destinations for the majority of the sawlog component are Powell County and Broadwater County, the two counties with the lowest populations, but which house the major wood processing facilities; Jefferson County would be the likely destination for the roundwood component. Broadwater County has experienced the highest percent increase in population from 1970 to 2014 (123 percent) and Powell County has experience the lowest percent increase in population (4 percent). These counties would likely realize financial benefits associated with the sale of wood products from the project area as they has wood processing facilities. Lewis and Clark County would also likely see economic benefits related to the project through the infrastructure associated with its relatively high population base supporting project activities.

Employment

EPS-HDT (EPS-HDT 2016) describes commodity sectors as industrial sectors that have the potential to use Federal public lands for the extraction of commodities. Commodity sectors include timber, mining (including oil, gas, and coal), and agriculture. In 2014, timber was the largest component of commodity sector employment in the impact area, accounting for 1.6 percent of total jobs. However, there was a significant difference between Powell and Broadwater Counties and the other two counties in the impact area in terms of reliance on timber. In 2014, nearly 30 percent of private employment in Powell County and 9 percent in Broadwater County was in timber-related sectors. The similarly sized sawmills in Powell and Broadwater counties can account proportionately for the percentage of private timber employment in relation to the county's population. Timber-related sectors only accounted for 1.8 percent of Jefferson County's private employment and .2 percent for Lewis and Clark County's private employment. In comparison, timber accounted for 0.66 percent of the Nation's jobs and 1 percent of Montana jobs.

In 2014, the unemployment rate in the impact area was 4 percent. Broadwater County had the highest unemployment rate (6 percent), and Lewis and Clark County had the lowest (3.7 percent). In comparison, in 2014 the U.S. had 6.2 percent unemployment. Since 1970, the annual unemployment rate ranged from a low of 3 percent in 2007 to a high of 8 percent back in 1982.

Income

Labor income and total personal income are often used as proxies for standard of living. Total personal income is comprised of labor earnings (employee compensation and proprietor income) and non-labor income. From 1970 to 2014, total personal income in the Affected Environment grew from $1,192.4 million to $3,696.3 million, a 210 percent increase. Jefferson County had the largest percent increase in personal income (417 percent) and Powell County had the smallest (81 percent).

Per EPS-HDT (EPS-HDT 2014), Long-term, steady growth of population, employment, and real personal income is generally an indication of a healthy, prosperous economy. Erratic growth, no-growth, or long-term decline in these indicators are generally an indication of a struggling economy. Relative to the other counties in the Affected Environment, Powell County's lack of population growth, high unemployment relative to the Affected Environment, minimal increase in personal income suggest a struggling economy. Indicators in the other three counties suggest healthy prosperous economies.

Environmental Consequences

Methodology

The economic measures used for this report are project feasibility, financial efficiency, economic impacts, and environmental justice. These measures, including methodologies, are described below.

Project Feasibility

Project feasibility is used to determine if a project is feasible, that is, will it sell, given current market conditions. The determination of feasibility relies on a residual value (stumpage = revenues - costs) feasibility analysis that uses local delivered log prices and stump to mill costs to determine if a project is feasible. The appraised stumpage rate from this analysis is compared to the base rate (revenues considered essential to cover regeneration plus minimum return to the Federal treasury). The project is considered to be feasible if the appraised stumpage rate exceeds the base rates. If the feasibility analysis indicates that the project is not feasible, the project may need to be modified. A project that is not feasible 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. Financial efficiency considers anticipated costs and revenues that are part of Forest Service monetary transactions. Present net value (PNV) 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. PNV 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 PNV indicates that the alternative, including all activities is financially efficient.

Financial efficiency analysis is not intended to be a comprehensive analysis that incorporates monetary expressions of all known market and nonmarket 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 nonmarket benefits and costs associated with the project are discussed throughout the various resource sections of this document.

Costs for restoration activities are based on recent experienced costs and professional estimates. Activity costs not related to the timber sale are included in the PNV analysis, but they are not included in appraised timber value. Two PNVs are calculated, one that includes all costs associated with each alternative and one which includes only those costs that are necessary to facilitate the removal of timber.

Economic Impacts (Jobs and Labor Income)

Economic impacts are used to evaluate potential direct, indirect, and cumulative effects on the 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 between businesses and 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.

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) Forest Service expenditures for contracted restoration activities included as part of the proposed treatments. The direct employment and labor income benefits employees and their families and, therefore, directly affects the local economy. Additional indirect and induced multiplier effects (ripple effects) are generated by the direct activities. Indirect effects are felt by the producers of materials used by the directly affected industries. Induced effects occur when employees of the directly and indirectly affected industries spend the wages they receive. Together the direct and multiplier effects comprise the total economic impacts to the local economy.

Environmental Justice

According to the CEQ's Environmental Justice Guidelines for NEPA (1997), "minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis." Minority populations represented less than 10 percent of the population in the state and the analysis area in 2013. Thus, the U.S. Census data suggest minority populations within the analysis area do not meet the CEQ's Environmental Justice criterion.

The racial composition of the population in the State of Montana and the analysis area in 2011 is shown in table 341. The overwhelming majority of the population across the state and within Lewis & Clark, Powell, Jefferson and Broadwater Counties is white. The total population of all races other than white was less than 10 percent at both the county and state level.

Table 341. Racial composition of 2013 population

	Lewis and Clark County	Broadwater County	Jefferson County	Powell County	Four County Region	United States
Total Population	64,772	5,697	11,465	7,010	88,944	314,107,084
White alone	60,597	5,414	10,914	6,468	83,393	231,849,713
Black or African American alone	304	**36**	48	**27**	415	39,564,785
American Indian alone	1,759	**90**	118	309	2,276	2,565,520
Asian alone	381	**65**	49	45	540	15,710,659
Native Hawaiian & Other Pacific Is. alone	**26**	**0**	**0**	**15**	**41**	535,761
Some other race alone	190	**9**	**34**	**10**	243	14,754,895
Two or more races	1,515	**83**	302	136	2,036	9,125,751
Percent of Total						
White alone	93.6%	95.0%	95.2%	92.3%	93.8%	73.8%
Black or African American alone	0.5%	**0.6%**	0.4%	**0.4%**	0.5%	12.6%
American Indian alone	2.7%	**1.6%**	1.0%	4.4%	2.6%	0.8%
Asian alone	0.6%	**1.1%**	0.4%	0.6%	0.6%	5.0%
Native Hawaiian & Other Pacific Is. alone	**0.0%**	**0.0%**	**0.0%**	**0.2%**	0.0%	0.2%
Some other race alone	**0.3%**	**0.2%**	**0.3%**	**0.1%**	0.3%	4.7%
Two or more races	2.3%	**1.5%**	2.6%	1.9%	2.3%	2.9%

The Executive Order also directs agencies to consider patterns of subsistence hunting and fishing when an action proposed by an agency has the potential to affect fish or wildlife. There are no Native American Reservations or designated Native American hunting grounds located in or near the analysis area. None of the alternatives restrict or alter opportunities for subsistence hunting and fishing by Native American tribes. Tribes holding treaty rights for hunting and fishing on the Helena National Forest are included on the project mailing list and have the opportunity to provide comments on this project.

CEQ guidance on identifying low-income populations states that "…agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (e.g., migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect." Low-income populations are defined, based on the 2014 Census standard, as persons living below the poverty level (based on total income of $24,008 for a family household of four). Persistent poverty status requires a county to have experienced an individual poverty rate in excess of 20 percent for several Census years. The average percentage of the population living below the poverty line in the affected area between 2010 and 2014 for Broadwater County is 10. percent, 15.2 percent of the population in Powell County, 9 percent of the population in Jefferson County and 11.2 percent of the population in Lewis and Clark County. Based on this data, the characteristic of persistent poverty is not present in the analysis area.

Table 343 predicts more employment and labor income opportunities would be created by alternatives 2, 3 and 4, primarily 2 and 4. Implementation of any of the action alternatives would not likely adversely affect minority or low-income populations. Implementation of the no-action

alternative maintains the status quo and provides no additional employment or income in the economic impact area.

Spatial and Temporal Context for Effects Analysis

The analysis area for the efficiency analysis is the project area. The Telegraph Vegetation Project area is approximately 23,669 acres in size and is located south and east of the town of Elliston in west-central Montana. The Telegraph Vegetation Project area is located in Powell County. The temporal scope of the analysis is the duration of the proposed activities. The project is expected to be accomplished over a 10-year period with the harvest activity occurring primarily in the first 5 years.

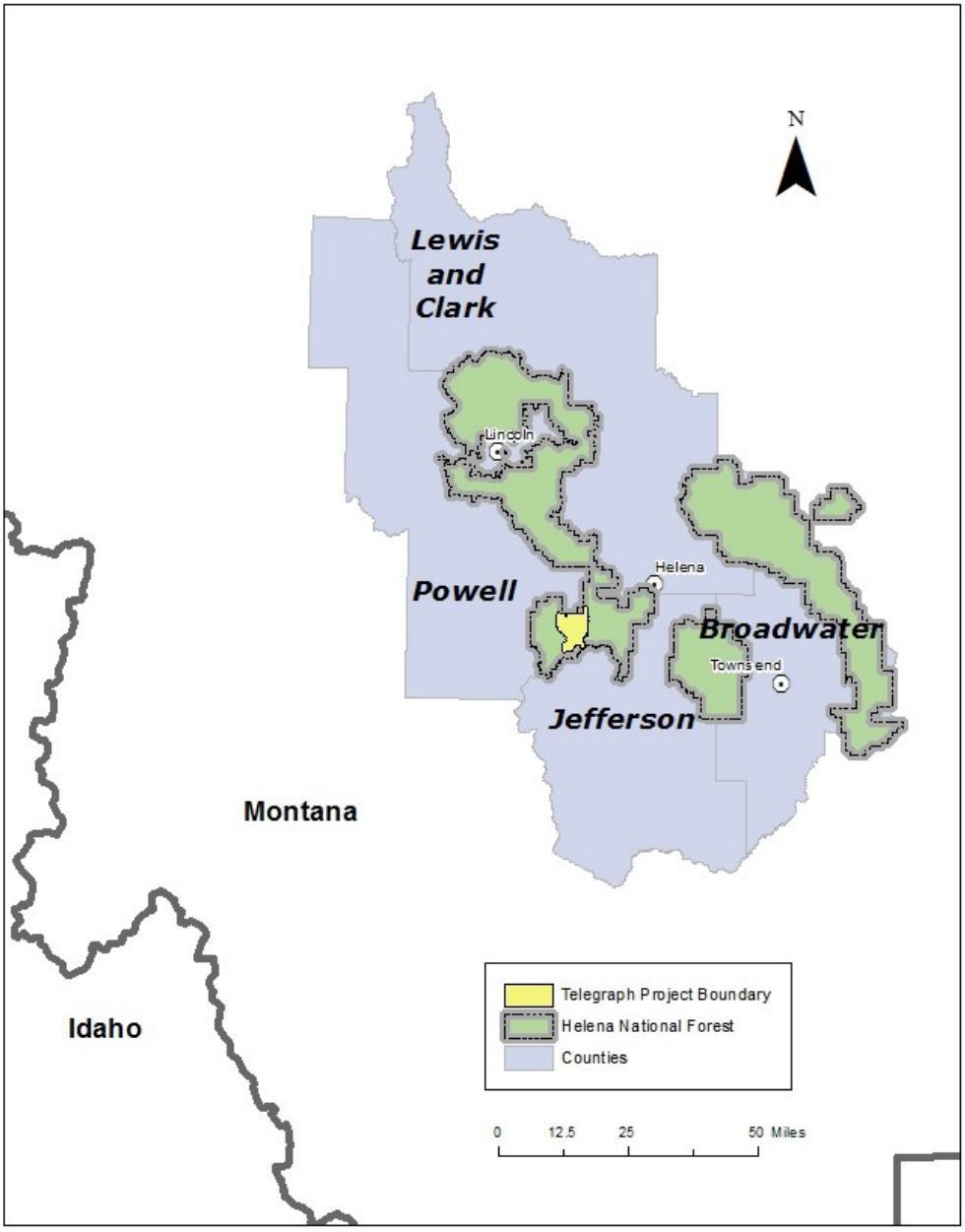

Figure 155. Economic impact area

Alternative 1 – No Action

The no-action alternative would not harvest timber, implement BMPs on haul routes, return fire to the landscape or implement any of the proposed activities, and therefore, incurs no financial costs. Alternative 1 would produce no revenue and have no effects on jobs or income. It would also fail to meet the Helena National Forest Plan for management area T, which emphasizes timber production while protecting other resources.

Alternatives 2, 3 and 4

Project Feasibility

The estimation of project feasibility was based on the Region 1 Sale Feasibility Model, which is a residual value timber appraisal approach. This method 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 and results in an accurate timber appraisal and is referred to as stumpage. The appraised stumpage rate from the feasibility analysis is compared to base rates (revenues considered essential to cover regeneration plus minimum return to the federal treasury), which in this case is the minimum rate of $3.00/CCF (hundreds of cubic feet) for Alternative 2 and 4 and $5.31/CCF for alternative 3. The appraised stumpage rate and base rates for each alternative are displayed in Table 342. For each of the action alternatives, the appraised stumpage rate is greater than the base rate, indicating that each of the alternatives is feasible (highly likely to sell).

Financial Efficiency

The financial efficiency analysis is specific to the timber harvest and restoration activities associated with the alternatives (as directed in Forest Service Manual 2400-Timber Management and guidance found in the Forest Service Handbook 2409.18). All costs, timing, and amounts were developed by the specialists on the project's interdisciplinary team. If exact costs were not known, the maximum of the cost range was used to produce the most conservative PNV result. The expected revenue for each alternative is the corresponding predicted high bid from the sale feasibility analysis. 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 PNV was calculated using a 4 percent real discount rate over the 10-year project lifespan (2018-2027). For more information on the values or costs, see the project file.

This analysis is not intended to be a comprehensive benefit-cost or PNV analysis that incorporates a monetary expression of all known market and nonmarket benefits and costs that are generally used when economic efficiency is the sole or primary criterion upon which a decision is made. Many of the values associated with natural resource management are best handled apart from, but in conjunction with, a more limited benefit-cost framework. An example of this is the difficulty in capturing the benefits in monetary terms of prescribed fire on wildlife habitat. These benefits are discussed qualitatively throughout the EIS document, within each resource section.

Table 342 summarizes the project feasibility and financial efficiency, including the base rates, appraised stumpage rate, predicted high bid, total revenue, and PNV for each alternative. Because all costs of the project are not related to the timber sale, two PNVs were calculated. One PNV indicates the financial efficiency of the timber sale, including all costs and revenues associated with the timber harvest and required design features. The required design features, as used here, include cost allowances for purchaser required work such as road maintenance and purchaser deposits to fund Forest Service work such as brush disposal. The second PNV includes all costs for each action

alternative, including activities that could be funded by the Forest Service, KV or potential Stewardship revenues. For a more detailed view of costs assumption, see the Economics project file.

Table 342. Project feasilbility and financial efficiency (2015 dollars)

Category	Measure	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Timber Harvest Information	Acres Harvested	0	3,918	2,290	5,391
	Volume Harvested (CCF)	0	40,103	22,734	51,402
	Base Rates ($/CCF)	0	3.00	5.31	3.00
	Appraised Stumpage Rate ($/CCF)	0	6.66	6.66	10.80
	Predicted High Bid ($/CCF)	0	12.31	12.31	16.45
	Total Revenue	0	$468,598	$264,921	$794,220
Timber Harvest & Required Design Features	PNV	0	$88,185	$29,952	$308,643
Timber Harvest & All Other Planned Non-timber Activities	PNV	0	-$1,559,331	-$2,292,562	-$4,761,673

Table Summary

The action alternatives predict appraised stumpage rates and predicted high bids closely relative to the volume of timber harvested; alternatives with higher volumes have corresponding higher stumpage rates and predicted high bids.

A major factor that influences the value of the timber particularly in the Telegraph Vegetation Project area is the quality of the dead lodgepole pine (LP). A significant percentage of the volume in this project comes from dead LP. The mortality is a result of the mountain pine beetle outbreak that began in 2008. Following mortality LP retains its value as a sawlog product for a time. As the tree begins to deteriorate that value as a sawlog diminishes, however the tree may still be viable for other less valuable products.

Table 342 displays project feasibility and financial efficiency. It indicates that all three alternatives are financially inefficient (negative PNV) when including all activities associated with the analysis. Table 342 also indicates that all three action alternatives are feasible when considering only timber harvest and the required design features. The no-action alternative has no costs or revenues associated with it.

A reduction of financial PNV in any alternative as compared to the most efficient solution is a component of the economic trade-off, or opportunity cost, of achieving that alternative. The no-action alternative would not harvest timber or take other restorative actions and, therefore, incur no costs. As indicated earlier, many of the values associated with natural resource management are nonmarket benefits. These benefits should be considered in conjunction with the financial efficiency information presented here. These nonmarket values are discussed in the various resource sections found in this document.

Economic Impact Effects

The analysis calculated the jobs and labor income associated with the processing of the timber products harvested, and all other activities in this proposal, such as prescribed fire, noncommercial fuel reduction, and precommercial thinning. Timber products harvested and the non-timber activities would have direct, indirect, and induced effects on local jobs and labor income. Only the expenditures associated with the contracted activities are included in the impact

Table 343 displays the direct, indirect and induced, and total estimates for employment (part and full-time) and labor income that may be attributed to each alternative. Since the expenditures occur over time, the estimated impacts of jobs and labor income would be spread out over the life of the project. It is important to note that these may not be new jobs or income, but rather jobs and income that are supported by this project. These impacts are shown both in total (over the life of the project) and on an annual basis. It is anticipated that the timber harvest would occur over a 4-year period and restoration activities are projected to occur over a 10-year period.

Table 343. Employment and labor income by alternative

	Alternative 1		**Alternative 2**		**Alternative 3**		**Alternative 4**	
Restoration Activities								
Part and Full Time Jobs Contributed	Total	Annual	Total	Annual	Total	Annual	Total	Annual
Direct	0	0	15	2	18	2	22	2
Indirect and Induced	0	0	6	1	7	1	8	1
Total	0	0	21	3	25	2	31	3
Labor Income Contributed ($M2014)								
Direct	0	0	$661	$66	$757	$76	$941	$94
Indirect and Induced	0	0	$184	$18	$205	$21	$257	$26
Total	0	0	$845	$84	$962	$96	$1198	$120
Timber Harvest								
Part and Full Time Jobs Contributed	Total	Annual	Total	Annual	Total	Annual	Total	Annual
Direct	0	0	127	32	72	18	163	41
Indirect and Induced	0	0	131	33	74	19	168	42
Total	0	0	258	65	146	37	331	83
Labor Income Contributed ($M2014)								
Direct	0	0	$6,477	$1,619	$3,672	918	$8,302	$2,076
Indirect and Induced	0	0	$4,765	$1,191	$2,701	675	$6,108	$1,527
Total	0	0	$11,242	$2,811	$6,373	$1,593	$14,410	$3,602
All Activities								
Part and Full Time Jobs Contributed	Total	Annual	Total	Annual	Total	Annual	Total	Annual
Direct	0	0	143	33	90	20	185	43
Indirect and Induced	0	0	137	33	81	19	176	43
Total	0	0	279	66	171	39	361	86
Labor Income Contributed ($M2010)								
Direct	0	0	$7,138	$1,685	$4,429	$994	$9,244	$2,170
Indirect and Induced	0	0	$4,949	$1,210	$2,907	$696	$6,364	$1,553

	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
Total	0	0	$12,087	$2,895	$7,335	$1,689	$15,608	$3,722

* Employment is the total full and part-time wage, salaried, and self-employed jobs in the region.

**Labor income includes the wages, salaries and benefits of workers who are paid by employers and income paid to proprietors.

Conclusions and Forest Plan Consistency

The no-action alternative maintains no jobs or income because there are no proposed project activities associated with this alternative.

Alternative 2 results in 279 total jobs, this is 82 fewer jobs than Alternative 4 and 108 more jobs than Alternative 3. Alternative 2 would contribute $12.1 million and 279 jobs over the life of the project or 2.9 million dollars and 66 jobs annually, over a period of 10 years; this is a larger financial contribution than Alternative 3, but a smaller contribution than Alternative 4. Approximately 258 direct, indirect, and induced jobs and $11.2 million of labor income would be associated with the timber harvest activities. Twenty-one direct, indirect, and induced jobs and $.8 million would be associated with the restoration activities.

Alternative 3 contributes the least number of total jobs at 171, and the least total labor income over the life of the project at $7.3 million. On an annual basis, this would amount to approximately 39 jobs per year over a period of 10 years, and $1.7 million annually in total labor income. If timber harvest activities take longer than anticipated, the total impacts would remain the same, but annual contributions would be reduced. For Alternative 3, this concept is less significant than the other alternatives, as Alternative 3 has the least timber harvest. Approximately 146 direct, indirect and induced jobs and $6.4 million of labor income would be associated with the timber harvest activities. Twenty-five direct, indirect, and induced jobs and $1 million would be associated with the restoration activities.

Alternative 4 results in more part and full time jobs contributed as well as labor income contributed in all categories displayed in Table 343. Alternative 4 would result in 361 total jobs, 82 more total jobs than alternative 2 and 190 more jobs and Alternative 3. Alternative 4 also results in more labor income at $15.6 million over the life of the project. If timber harvest activities take longer than anticipated, the total impacts would remain the same, but annual contributions would be reduced. For Alternative 4, this is more significant than the other alternatives, as Alternative 4 has the most timber harvest. With this alternative, approximately 331 direct, indirect and induced jobs and $14.4 million of labor income would be associated with the timber harvest activities. Twenty-five direct, indirect and induced jobs and $1 million would be associated with the restoration activities.

All action alternatives are consistent with the Helena National Forest Plan.

Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs “to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders.”

Short-term Uses and Long-term Productivity

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Short-term uses, and their effects, are those that occur within the first few years of project implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services long after the project has been implemented. Under the Multiple-Use Sustained-Yield Act and the National Forest Management Act, all renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grown again if the long-term productivity of the land is maintained. This long-term productivity is maintained through the application of the project design features described in chapter 2, in particular those applying to the soil and water resources.

Under alternatives 2, 3, and 4 openings would be created in regeneration cutting units in the short term, but well-stocked vigorous stands would be established for the long term as a result of post-harvest reforestation and stand tending. Alternatives 2, 3, and 4 would provide timber products, in decreasing yields, to benefit consumers in the short term. With alternatives 2, 3, and 4 harvest units there would be a short-term increase in fuel hazard in the period between harvesting and activity fuel treatment. This would be accompanied by a long-term increase in stand vigor, a reduction in fuel hazard, and a corresponding decrease in the risk of stand-replacing fire occurring within the harvest units.

Unavoidable Adverse Effects

Implementation of any action alternative could cause some adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse effects often result from managing the land for one resource at the expense of the use or condition of other resources. Some adverse effects are short term and necessary to achieve long-term beneficial effects. Many adverse effects can be reduced, mitigated, or avoided by limiting the extent or duration of effects. The interdisciplinary procedure used to identify specific harvest units and roads was designed to eliminate or lessen the significant adverse consequences to resource protection standards of the Helena National Forest Plan. The application of project design features was intended to further limit the extent, severity, and duration of potential effects. Such measures are discussed throughout this chapter.

Chapter 4. Consultation and Coordination and Distribution of the Environmental Impact Statement

The Forest Service consulted the following individuals; Federal, State, and local agencies; tribes; and other organizations and individuals during the development of this environmental impact statement.

* Denotes those who were either sent copies of the FEIS or were notified of its availability.

Interdisciplinary Team Members

The following individuals comprised the interdisciplinary team.

Allen Byrd	Team Leader, NEPA Planner
Allison Johnson	Fisheries
Amanda Hendrix	Botany
Amanda Milburn	Silviculture / Climate Change
Amee Rief	Aquatic Species
Arian Randal	Heritage
Bruce Davidson	Sensitive Plants / Weeds
Christopher Bielecki	Logging Engineering
Dave Callery	Hydrology
David Nunn	Fire / Fuels
Denise Pengeroth	Wildlife
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Fred Godrey	Writer/Editor
Hans Oaks	Mineral
Jan Spencer	Visuals
Janet Moser	Wildlife
Jennifer Ryan	Heritage
Jonathan LeBlanc	Soils
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Katherine Condon	Hydrology
Laura Burns	GIS Specialist

Mary Ellen Emerick	Recreation / Inventoried Roadless Area
Megan Dawson	Range and Noxious Weeds
Michael Kaiser	Air Quality / Fire and Fuels
Patricia Goude	Writer/Editor
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Perry Nolan	Heritage
Roy Barkly	Recreation
Sharon Scott	Co-IDT Leader; Veg. Program Mgr.
Vickey Eubank	Project Record Manager

Federal Agencies

Beaverhead-Deerlodge National Forest *

Bureau of Land Management, Butte, MT *

Director Northeast Power Planning Council, Portland, OR *

Director OEPC, Washington, DC *

Director Planning and Review, Advisory Council on Historic Preservation, Washington, DC *

DOE, NEPA Policy and Compliance, Washington, DC *

Federal Aviation Administration, Renton, WA *

Federal Highway Administration, Helena, MT *

Honorable Jon Tester, U.S. Senate *

Honorable Ryan Zinke, U.S. House of Representatives *

Honorable Steve Daines, U.S. Senate *

National Environmental Coordinator, NRCS, Washington, DC *

NOAA Office of Policy and Strategic Planning *

U.S. Army Corps of Engineers, Northwestern Division, Portland, OR *

U.S. Chief of Naval Operations, Energy and Environmental Readiness Division, Washington, DC *

U.S. Coast Guard, Washington, DC *

U.S. Department of Agriculture, APHIS PPD/EAD, Riverdale, MD *

U.S. Environmental Protection Agency, Region 8, Denver, CO *

U.S. Environmental Protection Agency, Washington, DC *

U.S. Fish and Wildlife Service, Montana *

U.S. National Agricultural Library, Acquisitions and Serial Branch, Beltsville, MD *

USDA Office of Civil Rights, Washington, DC *

State and Local Government

Baxendale Fire Department *

City of Helena, Montana *

Governor, Steve Bullock, State of Montana

Jefferson County Commissioners *

Lewis & Clark County Fire Chief for South Helena, MT *

Lewis & Clark County Prevention & Mitigation *

Lewis and Clark County Commissioners *

Montana Department of Environmental Quality, Water Quality Planning Board *

Montana Department of Natural Resources and Conservation *

Montana Fish, Wildlife & Parks (Missoula, Helena, and Bozeman offices) *

Powell County Commissioners *

Powell County Fire Council *

Tri-County FireSafe Working Group *

Federally Recognized Tribes

Badger-Two Medicine Committee, Browning, MT *

Blackfeet Tribal Business Council, Browning, MT *

Chippewa Cree Tribe, Box Elder, MT *

Confederated Salish/Kootenai Tribal Council, Pablo, MT *

Crow Tribal Historic Preservation Office, Crow Agency, MT *

Eastern Shoshone Historic Preservation Office, Fort Washakie, WY *

Fort Belknap, Harlem, MT *

Little Shell Tribe of Chippewa Indians of Montana, Black Eagle, MT *

Little Shell Tribe, Great Falls, MT *

Metis, Choteau, MT *

Nez Perce Tribal Historic Preservation Office - Cultural Resource Program, Lapwai, ID *

Northern Arapahoe Business Council, Fort Washakie, WY *

Northern Cheyenne Tribal Historic Preservation Council, Lame Deer, MT *

Shoshone-Bannock Tribes, Fort Hall, ID *

Tribal Historic Preservation Office, Blackfeet, Browning, MT *

Organizations and Businesses

Alliance for the Wild Rockies (AWR), Helena, MT *

Backcountry Hunters & Anglers, Missoula, MT *

Capital Trail Vehicle Association, Helena, MT *

Continental Divide Trail Society, Baltimore, MD

Helena Hunters & Anglers, Helena MT *

Montana Multiple Use Association, Townsend, MT

Montana Wilderness Association, Helena, MT *

Montana Wood Products Association, Helena, MT *

Native Ecosystems Council (NEC), Willow Creek, MT *

Northwestern Energy, Butte, MT *

Pyramid Mountain Lumber, Inc., Seeley Lake, MT *

Ry Timber Inc., Townsend, MT *

Sun Mountain Lumber, Deerlodge, MT *

Individuals

*** The following individuals were either sent copies of the FEIS or were notified of its availability.**

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Bacon, Don & Charla, Helena, MT

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Bailey, Fred, Helena, MT

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Chell, Dave, Helena, MT

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Crachy, Doris and Doug, Belgrade, MT

Culler, Jane, Clancy, MT

DalSoglio, Julie, Helena, MT

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Darfler, Jim & Ed, Helena, MT

Edens, Dan, Helena, MT

Ellis, Richard & Kathleen, Prunedale, CA

Fabel, Scott, East Helena, MT

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Frasier, Stan, Helena, MT

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Munther, Greg, Missoula, MT

Murdock, Gary, Elliston, MT

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Powell, Doug, Helena, MT

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Ray, Robert, Helena, MT

Regan, Ed, Townsend, MT

Rose, Sharon, Missoula, MT

Salo, Ken, Helena, MT

Samulson, Sam, Elliston, MT

Sanders, Gordy, Seeley Lake, MT

Senseney, Grace, Elliston, MT

Shea, Rose, Butte, MT

Simpson, Ellen, Helena, MT

Smith, Steven, Helena, MT

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Stiger, Sonny, Helena, MT

Stoner, Guy, Elliston, MT

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Thomas Sr., Bill, Elliston, MT

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Thomas, Bruce, Elliston, MT

Thomas, Tom and Kerri, Elliston, MT

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Wuerthner, George, Helena, MT

Young, Donna, Elliston, MT

Young, Gary R., Elliston, MT

Glossary

Anthropogenic emissions: Emissions produced as a result of human activity, including emissions from agricultural activity and domestic livestock.

Aspect – the cardinal direction in which a slope faces.

Appropriate management response (AMR) - Any specific action suitable to meet fire management objectives. The response action is based on an evaluation of risks to firefighter and public safety, the circumstances under which the fire occurs, including weather and fuel conditions, natural and cultural resource management objectives, protection priorities, and values to be protected.

Background. Area located from 3 to 5 miles to infinity from the observer.

Big Game. Those species of large mammals normally managed as a sport hunting resource.

Biological Assessment. An evaluation conducted on Federal projects requiring an environmental impact statement, in accordance with the Endangered Species Act. The purpose of the assessment is to determine whether the proposed action is likely to affect an endangered, threatened, or proposed species

Biological Evaluation. An evaluation conducted on Forest Service projects in accordance with Forest Service policy. The purpose is to determine whether any of the project alternatives are likely to affect threatened, endangered, or sensitive species.

Canopy. The more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth. Layers of canopy may be called stories

Canopy base height – for modeling in BehavePlus, canopy base height refers to understory ladder fuels and the main canopy layer for a stand of trees.

Canopy bulk density – mass of available canopy fuel per unit canopy volume of a stand.

Canopy Closure. The proportion of the sky hemisphere obscured by vegetation when viewed from a single point.

Canopy Cover. Canopy cover is defined as the proportion of the forest floor covered by the vertical projection of tree crowns.

Cavity. The hollow, excavated in snags by birds; used for roosting and reproduction by many birds and mammals.

Chains/h – chains per hour (1 chain = 66 feet).

Characteristic Landscape. The naturally established landscape within a scene or scenes being viewed.

Closed Canopy. The condition that exists when the canopy created by trees or shrubs or both is dense enough to exclude most of the direct sunlight from the forest floor.

Closure. Restriction of motor vehicle use on a travelway by means of elimination or prohibition. Closures may be permanent or temporary depending on management objectives.

Coarse Filter. The coarse filter desired condition is to maintain a diversity of habitats for a full range of wildlife species while meeting other resource desired conditions and ecological processes which alter or maintain habitat structure and function. The coarse filter objective is to retain representative habitats and seral stages and, therefore, the population viability for the majority of species within the diversity of habitats that the Big Belt Mountains provide.

Coarse woody debris – dead wood greater than 3 inches in diameter or 1,000-hr timelag fuels.

Connectivity. This refers to the abundance and spatial patterning of habitat and to the ability of members of a population to move from patch to patch of similar habitat.

Corridor. A narrow strip, stepping stones, or a series of stepping stones of hospitable territory traversing inhospitable territory providing access one area to another. Corridors fall into the following general categories:

Cover. Vegetation used by wildlife for protection from predators, breeding and rearing of young (hiding cover), or to ameliorate conditions of weather (thermal cover).

Cover/forage Ratio. The ratio, in percent, of the amount of area providing cover as compared to that providing forage.

Critical surface intensity – surface fire intensity needed to transition to a crown fire.

Critical surface flame length – surface fire flame length associated with critical surface intensity as needed to transition to a crown fire.

Crown fire – a fire that spreads in the canopy of trees or shrubs more or less independent of a surface fire.

Decadent. Deteriorating; when used in reference to stand condition there are inferences of the loss of trees from the overstory and of the presence of disease, or indications of loss of vigor in dominant trees so that the mean annual increment is negative.

Decommissioning. Activities that result in the stabilization and restoration of unneeded roads or trails to a more natural state.

Denning Site. A place of shelter for an animal; also where an animal gives birth and raises young.

Designated road, trail, or area. A National Forest System road, a National Forest System trail, or an area on National Forest System lands that is designated for motor vehicle use pursuant to 36 CFR 212.51 on a motor vehicle use map.

Distance Zones. Landscape areas denoted by specified distances from the observer. Distance zones are used as a frame of reference in which to discuss landscape attributes or the scenic effect of human activities in a landscape.

Diversity. The relative distribution and abundance of different plant and animal communities and species within an area.

Dominant. Plant species or species groups which, by means of their numbers, coverage, or size, influence or control the existence of associated species. Also, individual animals which determine the behavior of one or more other animals, resulting in the establishment of a social hierarchy.

Ecosystem. An interacting natural system including all the component organisms together with the abiotic environment.

Ecotone. The overlap or transition zone between two plant communities.

Edge. An edge is the juxtaposition of contrasting environments in an ecosystem. This term is commonly used in conjunction with the boundary between natural habitats, especially forests, and disturbed or developed land.

Elk Herd Unit. The total area used by a herd of elk in the course of one years' movement from summer to winter range. This includes areas outside the National Forest boundary.

Elk Security Areas. Elk security is defined as a proportion of an elk herd unit within the administrative boundary of the Helena Ranger District that consists of an area of at least 1000 acres in size that is at least ½ mile from a motorized route open to the public between 9/1 and 12/1.

Endangered Species. Any plant or animal species which is in danger of extinction throughout all or a significant portion of its range. (Endangered Species Act of 1973).

Environment. The aggregate of physical, biological, economic, and social factors affecting organisms in an area.

Fine woody debris – dead wood less than 3 inches in diameter or 1-, 10-, and 100-hr timelag fuels.

Fire behavior fuel model (FBFM) – a cohesive set of parameters that define the necessary inputs to the fire spread model.

Fire type – surface (S), torching (T, [passive crown fire}), or crowning (C, [active crown fire]).

Fireline intensity – a quantitative measure that describes the rate of heat release per unit time per unit length of the linear fire front.

Flame length – within the flaming front, the length of the flame of a spreading surface fire; a function of fire intensity that influences the effect on vegetation.

Foliar moisture – moisture content of overstory foliage; one of the attributes used to determine transition from surface to crown fire; 100 percent refers to mature foliage with new growth complete.

Forage. Vegetation used for food by wildlife, particularly big game wildlife and domestic livestock

Forbs – Herbaceous flowering plants that are not graminoids (grasses, sedges, and rushes).

Foreground. The detailed landscape found within 0 to ¼ to ½ mile from the observer.

Forest road or trail. A road or trail wholly or partly within or adjacent to and serving the National Forest System that the Forest Service determines is necessary for the protection, administration, and utilization of the National Forest System and the use and development of its resources.

Forest transportation atlas. A display of the system of roads, trails, and airfields of an administrative unit.

Forest transportation system. The system of National Forest System roads, National Forest System trails, and airfields on National Forest System lands.

Fragmentation. A change in landscape structure that leads to smaller patch sizes, less interior habitat, and greater distances between patches which in turn can lead to subpopulation isolation. It is generally attributed to human activity rather than to natural disturbances.

Fuel profile – surface, ladder, and crown (aerial) fuel.

Fugitive dust: Dust particles that are introduced into the air through certain activities such as soil cultivation, or vehicles operating on open fields or dirt roadways.

Habitat. The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

Habitat Component. A simple part, or a relatively complex entity regarded as a part, or an area or type of environment in which an organism or biological population normally lives or occurs.

Habitat Effectiveness: The degree to which a patch of habitat is able to support an animal or group of animals. Habitat effectiveness in an otherwise good patch of habitat can be reduced by high levels of human disturbance, long distances to other habitat patches or any other factors in the surrounding landscape that detract from the patch's ability to function as habitat.

Hiding Cover: Vegetation capable of hiding 90 percent of a standing adult deer or elk from the view of a human at a distance equal to or less than 200 feet, and having a minimum size of 40 acres or a stand of coniferous trees having a crown closure of greater than 40 percent

Immigration. The behavior of individuals or populations of animals moving into an area to settle there.

Intermittent Refuge Area. Intermittent refuge areas are those areas at least 250 acres in size and less than 1000 acres in size that are greater than or equal to ½ mile from a motorized route open to the public between 9/1 and 12/1.

Juxtaposition. To place, or compare, side by side.

ladder fuels – fuels that provide vertical continuity between surface and canopy fuels; an example would be conifer seedlings and saplings.

Landscape. The aspect of the land that is characteristic of a particular region or area.

Landscape Character. A combination of physical, biological, and cultural images that gives an area its visual and cultural identity and helps to define a "sense of place." Landscape character provides a frame of reference from which to determine scenic attractiveness and to measure scenic integrity.

Landscape Visibility. Visual accessibility of the landscape to viewers, referring to one's ability to see and perceive landscapes and to the relative importance and sensitivity of what is seen and perceived in the landscape. Concern levels and distance zones are elements of landscape visibility.

Live fuel moisture – herbaceous and live woody fuels; 100 percent refers to mature foliage with new growth complete.

Lynx Analysis Unit (LAU). The LAU is a project analysis unit upon which direct, indirect, and cumulative effects analyses are performed. An LAU is an area of at least the size used by an individual lynx, from about 25 to 50 square miles (LCAS). An LAU is a unit for which the effects of a project would be analyzed; its boundaries should remain constant.

Lynx Habitat. Lynx habitat occurs in mesic coniferous forest that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat is generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas-fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas-fir, grand fir, western larch and aspen when interspersed in subalpine forests. Dry forests do not provide lynx habitat.

Maintenance. The upkeep of the entire forest transportation facility including surface and shoulders, parking and side areas, structures, and such traffic-control devices as are necessary for its safe and efficient utilization.

Maintenance Levels. Defines the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria.

> **LEVEL 1.** These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are “prohibit” and “eliminate“ all traffic. These roads are not shown on motor vehicle use maps.
>
> Roads receiving level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are closed to vehicular traffic but may be available and suitable for nonmotorized uses.
>
> **LEVEL 2.** Assigned to roads open for use by high-clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not provided with the exception that some signing, such as W-18-1 “No Traffic Signs,” may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to:
>
> a. Discourage or prohibit passenger cars, or
>
> b. Accept or discourage high-clearance vehicles.
>
> **LEVEL 3.** Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. The Manual on Uniform Traffic Control Devices (MUTCD) is applicable. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations.
>
> Roads in this maintenance level are typically low speed with single lanes and turnouts. Appropriate traffic management strategies are either “encourage” or “accept.” “Discourage” or “prohibit” strategies may be employed for certain classes of vehicles or users.

LEVEL 4. Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double-lane and aggregate-surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. Manual on Uniform Traffic Control Devices is applicable. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.

LEVEL 5. Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double-lane, paved facilities. Some may be aggregate-surfaced and dust-abated. Manual on Uniform Traffic Control Devices is applicable. The appropriate traffic management strategy is "encourage."

Maximum Modification. A visual quality objective meaning man's activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

Mean fire interval – mean of all fire intervals in a given area for a specified period of time.

Metapopulation. A group of populations, usually of the same species, which exist at the same time but in different places.

Middleground. The space between the foreground and the background in a picture of landscape. The area located from ¼ to ½ to 3 to 5 miles from the viewer.

Midflame windspeed – the windspeed at midflame height above the fuelbed; also referred to as eye-level winds.

Mixing heights: The height to which the lower atmosphere will undergo mechanical or turbulent mixing, producing a nearly homogenous air mass.

Modification. A visual quality objective meaning man's activity may dominate the characteristic landscape but must, at the same time, utilize naturally established for, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Motor vehicle. Any vehicle which is self-propelled, other than: (1) A vehicle operated on rails; and (2) Any wheelchair or mobility device, including one that is battery-powered, which is designed solely for use by a mobility-impaired person for locomotion, and suitable for use in an indoor pedestrian area.

Mule Deer Reproductive Habitat. Areas with resources required for recovery of physical condition and successful reproduction by deer.

National Forest System road. A forest road other than a road that has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority.

Objective Maintenance Level. The maintenance level to be assigned at a future date considering future road management objectives, traffic needs, budget constraints, and environmental concerns. The objective maintenance level may be the same as, or higher or lower than, the operational maintenance level. The transition from operational maintenance level to objective maintenance level may depend on reconstruction or disinvestment.

Old Growth. Old growth is a distinct successional stage in the development of a timber stand that has special significance for wildlife, generally characterized by: (1) large diameter trees (often

exceeding 19 inches dbh) with a relatively dense, often multilayer canopy. (2) the presence of large, standing dead or dying trees. (3) down and dead trees, (4) stand decadence associated with the presence of various fungi and heartrots, (5) and an averageage often in excess of 200 years.

Open Road Density. Generally used relative to a standard set in the Forest Plan that is applied to most Management Areas important to big game. Also used to address overall effects of open roads on wildlife.

Operational Maintenance Level. The maintenance level currently assigned to a road considering today's needs, road condition, budget constraints, and environmental concerns. It defines the level to which the road is currently being maintained.

Overstory. The portion of trees in a forest which forms the uppermost layer of foliage.

Partial Retention. A visual quality objective which in general means man's activities may be evident but must remain subordinate to the characteristic landscape.

Passive crown fire – see torching.

Patch. A unit of measure for determining effects to wildlife connectivity. A patch is an area that is greater than ½ mile from an open road regardless of size of area.

Preferred Alternative. The Agency's preferred alternative, one or more, that is identified in the environmental document (EA or EIS).

Realignment. Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway.

Reconstruction (road or trail). Improvement and/or realignment of a travelway.

Refugia. Large, contiguous areas encompassing the full array of seasonal habitats and are relatively secure from human development.

Remaining Hiding Cover. Standard 6 in the Forest Plan (USDA 1986, p. II/19) requires that hiding cover be in patches of at least 40 acres. In order to determine project consistency with those standards that have a hiding cover requirement (i.e. standard 3 in the Forest Plan [USDA 1986, p. II/17]), hiding cover post-project implementation (i.e. remaining hiding cover) needs to comprise at least 40 acres in size.

Rehabilitation. A short-term management alternative used to return existing visual impacts in the natural landscape to a desired visual quality.

Residence time – the total length of time that the flaming front of the fire occupies one point.

Retention. A visual quality objective which in general means man's activities are not evident to the causal forest visitor.

Richness. Species richness is the number of different species in a given area.

Riparian. Area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Road. A motor vehicle route over 50 inches wide, unless identified and managed as a trail.

Road obliteration. A type of road decommissioning in which the road prism is recontoured; cut and fill slopes are restored to natural grades; and slash, stumps, and woody debris are placed on top of the corridor to effectively block vehicle travel.

Scenery Management. The art and science of planning and designing landscape attributes relative to the appearance of places and expanses in outdoor settings. Scenery management involves administering the use of National Forest System lands within the context of multiple-use ecosystem management to ensure high-quality scenery for the overall well-being and psychological welfare of society and future generations.

Scorch height – height above the ground that the temperature in the convection column reaches the lethal temperature to kill live crown foliage.

Sensitive Species. Those species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in (a) population numbers or density, or (b) habitat capability that would reduce a species' existing distribution.

Sensitivity Level 1 Travel Corridors. Travel corridors used frequently by the public where quality scenic resources are a highly valued.

Seral Stage. A transitory or developmental stage of a biotic community in an ecological succession (does not include climax successional stage or pioneer stage).

Shrub. A plant with persistent woody stems and relatively low growth form; usually produces several basal shoots as opposed to a single bole; differs from a tree by its low stature and non-arborescent form.

Size class – coded attribute representing the fire size.

A	0 – 0.25 acres
B	0.25 – 9.9 acres
C	10 – 99.9 acres
D	100 – 299.9 acres
E	300 – 999.9 acres
F	1000 – 4999.9 acres
G	5000+ acres

Slope - the ratio between the amount of vertical rise of a slope and horizontal distance as expressed in a percent.

Snag. A standing dead tree usually without merchantable value for timber products, but may have characteristics of benefit to some cavity nesting wildlife species.

Species. A unit of classification of plants and animals consisting of the largest and most inclusive array of sexually reproducing and cross-fertilizing individuals which share a common gene pool.

Stand. A community of trees or other vegetation uniform in composition, constitution, spatial arrangement, or condition to be distinguishable from adjacent communities.

Stand-replacement fire - the fire consumes or kills approximately 80 percent or more of the above ground dominant vegetation.

Standard. A particular action, level of performance, or threshold specified by the Forest Plan for resource protection or accomplishment of management objectives. Unlike "guidelines" which are optional, standards specified in the Forest Plan are mandatory.

Storage. Used to describe an intermittent use road during the time it is closed to vehicular use. When referring to a National Forest System road, storage is synonymous with a Maintenance Level 1.

Summer Range. A range, usually at higher elevation, used by deer and elk during the summer; a summer range is usually much more extensive than a winter range.

Surface fire – a fire that burns close to the ground surface including dead branches, leaves, and low vegetation.

Sustainability. Sustainability means that desired ecological conditions or flows or benefits can be maintained over time (*A National Framework Ecosystem Management, USDA Forest Service, Washington, DC, 1994*)

Temporary road. A road necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road or a forest trail and that is not included in a forest transportation atlas.

Thermal Cover. Cover used by animals to ameliorate effects of weather; a stand of coniferous trees 40 feet or more tall with an average crown closure of 70 percent or more, and having a minimum size of 15 acres.

Threatened Species. Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Torching – a fire that burns a single tree or group of trees, also known as passive crown fire.

Travel management atlas. An atlas that consists of a forest transportation atlas and a motor vehicle use map or maps.

Twenty-foot winds – wind speed and direction at 20 feet above the height of the top of the vegetation.

$\mu g/m^{3:}$ Micrograms per cubic meter of air

Unauthorized Road or Trail. A road or trail that is not a forest road or trail or a temporary road or trail and that is not included in a forest transportation atlas.

Wildlife Diversity. The relative degree of abundance of wildlife species, plant species, communities, habitats or habitat features per unit area.

Wind adjustment factor – adjusts the 20-ft windspeed to midflame windspeed depending on the sheltering of fuels from the wind.

0.1 - fully sheltered, dense stands
0.2 - fully sheltered, open stands
0.3 - partially sheltered

0.4 – unsheltered

Winter Range. A range, usually at lower elevation, used by migratory deer and elk during the winter months, usually better defined and smaller than summer ranges.

Acronyms Commonly Used Throughout this FEIS

CDNST	Continental Divide National Scenic Trail
CDT	Continental Divide Trail
CFR	Code of Federal Regulations
CWA	Clean Water Act
CWPP	Community Wildfire Protection Plan
DEIS	Draft Environmental Impact Statement
EHU	Elk Herd Unit
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FS	Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
HLCNF	Helena-Lewis and Clark National Forests
HNF	Helena National Forest
IDT	Interdisciplinary Team
IRA	Inventoried Roadless Area
LAU	Lynx Analysis Unit
MPB	Mountain Pine Beetle
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest Service
RMP	Resource Management Plan
ROD	Record Of Decision
TMDL	Total Maximum Daily Load
WBP	White Bark Pine
WUI	Wildland Urban Interface

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