Lonesome Wood Vegetation Management EA
Appendix A – Other Issues – Non-significant

Several issues/concerns were found to be non-significant and were given less detailed disclosure. While these concerns are important, they were either unaffected or mildly affected by the proposed vegetation management, or the effect would be adequately mitigated. This Appendix includes a short summary related to those issues. The full report for each resource is in the Project File and is available for review.

Aesthetics/Scenery (Ruchman 2007)

Scenery is a relevant and important concern in this project. It is not a significant issue in that no alternatives need to be formulated to address the scenery issue, since mitigation measures would incorporate design features (EA 2.4.3) so that the units proposed in all of the alternatives would meet Forest Plan standards for scenery.

Certain elements of the proposed fuel reduction activities could lower the quality of the scenery from key observation points and areas, as well as from some private land. These elements include slash piles, skid corridors and temporary roads, stumps, unnatural vegetation patterns, increased exposure of constructed features formerly hidden by vegetation. However, removal of some fuels may help reduce the probability of a stand replacing fire. Stand replacing fires are often considered undesirable by residents and recreationists when it dominates entire viewsheds, especially where the visual buffering and setting provided by the forest is considered desirable. Last, aspen is generally considered a desirable scenery component, especially where evergreen conifers are the dominant tree type. This project could increase its presence.

Affected Environment

Mountains, forest, meadow areas: This project area is located in the lower portions of the most critical viewshed for this project, which is the dramatic backdrop that Hebgen Lake anchors for viewers along the northeast shore. To those viewers, the far shoreline just above the lake appears as a combination of gently sloping open meadows and very open and patchy conifer stands, occasionally interspersed with some aspen stands. The conifers in this lowest band generally display strong canopies, most of which extend to the ground. Above these lower trees, is a band of densely tree-covered slopes that rise up to open treeless ridges and peaks, along with some sparsely and patchy tree-covered slope faces just below tree line. The character of the tree line varies widely, depending upon the slope aspect, moisture, rockiness and other factors. Some of the ridges to the north end of the project area have open gullies that extend down toward the middle of the slope.

From all along Highway 287 and from the lake the middle, densely treed slopes appear obviously altered, especially in winter with snow on the ground, due to the visual dominance of abrupt, straight edges of some of the large, geometrically shaped existing clearcuts and other harvests, especially the flat upper edges formed by the roads that accessed the uphill edge of old cable-harvested units. All of those visually dominant clearcuts that are visible from the Highway 287 corridor are outside and uphill of this project area. There are two old tractor-harvested areas immediately downhill of the Contour Road, adjacent to proposed unit 26, that are visible at such a horizontally oblique angle from any point along the Highway 287 corridor that their straight edges are barely, if at all, discernible. Those two units are not at all visible from the very east end of Highway 287 since they are blocked by Horse Butte. Even on a clear day and with snow on the ground, the northwestern edge of the northernmost old unit would appear broken up,

foreshortened and not visually dominant at all. However, the eastern edge of proposed unit 17 abuts an old harvested area, with a section of visibly dominant straight edge.

From the Denny Creek Road (FS 167), as it winds along the southwest shore of the lake, in and out of forest or alongside meadows or patchy treed areas, only portions of a few of the large existing clearcuts are visible. However, since even before the Gallatin National Forest Plan (1987), there has been timber harvesting along the Denny Creek Road. From the road itself, there is evidence of logging, though in general it is not dominant. Some of the old harvested areas are full of tightly spaced lodgepole pine trees that are 20 feet tall and, in places, contrast with the adjacent taller, skinny, spindly older lodgepole pines. The edge of an old clearcut, along the eastern edge of proposed unit 17 (mentioned above), does appear visibly dominant from the Denny Creek Road.

Buildings and constructed features: From along the northeast shore, buildings and other constructed features that are on both private and national forest land, accessed by the Denny Creek Road, are generally only very minimally visible, with a few structures on private land that are out in the open being the most visible. Those features, along with shoreline improvements, such as docks and boat launches and campgrounds, become more visible to boaters who approach more closely. During the high season, groups of vehicles parked at the recreation sites are discernible from the Highway 287 corridor, but are not dominant. As viewed from the Denny Creek Road, except for the very open southern end of the project area from south of Basin Station Cabin up to around Lonesomehurst Campground, most of the houses and other constructed features are either not at all visible or not visually dominant.

Applicable Laws, Regulations, Policy And Forest Plan Direction

The Gallatin National Forest developed the Forest Plan Visual Quality Objectives (VQOs) to provide guidance for all landscape-altering activities (Forest Plan II-16), based upon procedures set out in the National Forest Landscape Management, Volume 2, Chapter 1, The Visual Management System, FS, USDA, Agriculture Handbook No. 462, 1974 The Forest Plan glossary defines the term Visual Quality Objective as "A desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations of the characteristic landscape."

The Forest Plan VQO map (July 1987) specifies the VQOs for this project as being:

Retention for those units, or portions of units, proposed on the land generally between the Denny Creek Road and Hebgen Lake that are visible from the lake or the Highway 287 corridor. Retention is defined by the Forest Plan Glossary as "Human activities are not evident to the casual Forest visitor."

Partial Retention for the area immediately along both sides of the Denny Creek Road (FS 167) and for those units (or portions of units) proposed uphill (west and southwest) from the Denny Creek Road, including units 30, 31 and 32 that are visible from the lake, Highway 287 or from the Denny Creek Road. Partial Retention is defined as "Human activities may be evident but must remain subordinate to the characteristic landscape."

Partial Retention for the immediate views from the designated recreation sites within the project area, such as Lonesomehurst, Cherry Creek and Spring Creek Campgrounds and the recreation

residence tracts (all within Management Area 1: Developed Recreation Sites). The Forest Plan management goal for MA 1 is to "Maintain these sites and facilities for the safety and enjoyment of users".

Methodology For Analysis:

The following steps were used for analyzing the effects to the scenery resource.

The project area was observed from the Highway 287 and Highway 191 corridors and the Denny Creek Road. Proposed units were observed from the Highways 287 and 191, the Denny Creek Road, the Contour Road and the recreation sites along the Denny Creek Road and the Forest Service recreation residence tracts in the area. Existing condition was determined by on-the-ground truthing and viewing aerial photographs and to determine proximity of proposed units to old existing harvested areas. Effects analysis was conducted by comparing the amount and method of fuel thinning being proposed with the existing condition of the forested areas and the angles and distances from which they would be viewed.

The spatial bounds for this project analysis are: the Highway 287 vicinity on the northeast, the rough line formed by the uphill edges of the units on the southwest and west, and the Denny Creek Road on the east near the Basin Station Cabin.

Spatial bounds for analysis of cumulative effects of this project include all of the above, but extend to the visible skyline (edge of the viewshed) in the west and southwest.

Temporal Bounds: The description of visual effects are based upon how the project area would look at the end of one year after all of the thinning, slash burning, temporary road restoration and prescribed under-burning has been completed.

Direct, Indirect And Cumulative Effects Of The No Action Alternative

If no action were implemented in the project area, an indirect effect would be that the forest and developed urban interface areas could be more at risk for an unusually large crown fire. Crown fires in forested areas such as these may result in large areas or entire viewsheds that have primarily blackened dead shrubs and trees for many years, whereas fires that drop down out of the crowns usually cause more vegetative mosaic patterns, leaving some unburned areas. Very large areas or entire viewsheds of crown fire that cause a drastic change in the character of the scenery is often viewed as undesirable by people who live in, recreate in or use those forested areas.

Another indirect effect of the no action alternative would be that the aspen stands might continue to become smaller as they are encroached upon by the conifers. Along the Denny Creek Road, the aspen component provides a desirable year-round visual contrast to the conifers, that is visible not only from the Denny Creek Road but from the northeast side of the lake as well.

One direct effect, if this project were not accomplished, would be that the work of proposed unit 17, to mitigate the visual effects of a past adjacent harvested area would not be accomplished. That area would continue to visually dominate, especially from the Denny Creek Road and not meet the Forest Plan standard of Partial Retention due to the straight lines and abrupt edge.

There would be no short-term cumulative effects to the scenery resource if the No Action Alternative were implemented. However, if fuel reduction activities were not accomplished, the

risk for a scenery character changing fire event would, most likely, continue to increase.

Direct, Indirect And Cumulative Effects Of Action Alternative 2

Reducing fuel in the project area would have the indirect effect of decreasing the probability of a large scale immediate and long lasting change in the character of the scenery due to a stand replacing fire. However, even the fuels reduction work proposed in this Action Alternative 2 would not eliminate all risk to the scenery from crown fires.

The direct effects of the thinning, prescribed fire and other associated activities would have direct effects on the scenery. Those effects depend upon the specific activities or combination of activities proposed.

Thinning: As described in other sections of this document, the type of thinning that would be done to accomplish the desired level of remaining fuel depends upon the trees that are in each unit. Where there are trees over 6" in diameter, they would most likely be commercially logged, using ground based equipment. In those areas, roughly 50% of the trees, of all age classes and sizes, would be removed. Trees that are smaller than 6" in diameter would either be hand thinned (on slopes over 35%) or machine thinned (on slopes under 35%).

The effects to the scenery of that thinning work depend upon the current visual characteristics of the units. After thinning, all treated areas would appear more open, as seen in the immediate foreground from the Denny Creek Road and recreation sites along the road, and as seen in the middle ground from sites along or adjacent to Highway 287. From Highway 287, that openness would become most apparent in the winter when some more white ground would be visible between trees on the steeper slopes, as compared to similar aspect slopes where no thinning was done outside the project area. However, when viewed from the northeast side of the lake, as long as all the mitigations (see list of mitigations) regarding edge treatments and leave trees are implemented, along with the mitigations for the existing already-harvested adjacent areas, the visual result would still meet the VQO of Partial Retention.

Compared with the affects to viewers near and along Highway 287, the visual result of the thinning and associated activities would be more visible to viewers, in their foreground, along the Denny Creek Road and in the recreation sites, especially in the first few years. Where much of the forested areas along the Denny Creek Road and recreation sites appear fairly dense, with some leaning and down deadfall, these areas would appear more open. The dense Douglas fir stands that generally have crowns that are fuller than the lodgepole pine, would result in being more open and park-like, and viewers would be able to see more of the trunks and farther into the woods than now. The lodgepole pine, in places, has grown very densely and appears almost impenetrable, with so many small diameter trees. Since these areas are currently so dense, they would look very different to viewers who are familiar with the area. However, by implementing the mitigations (see list) for leaving the largest trees, grouping trees, transitioning into unthinned areas, the thinning treatments would not become visually dominant to casual observers. Where the tall spindly lodgepole trees form walls or are adjacent to younger fuller trees, they accentuate the old harvests. Since some of those old lodgepole trees would be thinned or removed, along with some of the younger trees, the visual effect of that contrast would be reduced or eliminated.

Commercial Thinning: In all areas where there would be commercial thinning, there would be skid trails and temporary roads visible in the foreground. Landings for temporary decks,

equipment or possibly some slash piles, in most areas, would be located back away from the Denny Creek Road, thus minimizing visual dominance to viewers. Due to the narrow shape of the project area, and the more open nature of the forests after the thinning is completed, these landings would still, most likely, be discernible to people on the Denny Creek Road. By incorporating into the project design and implementing the mitigations listed for scenery, these elements (skid trails, temporary roads, landings) would not end up being visually dominant after all the tree cutting and subsequent slash treatment and then temporary road and landing restoration work is completed. For a few years, the stumps would be visible. However, by implementing the listed mitigation about stump height the visual dominance would be reduced. Also, within a few years the stumps would become less visible after the cut surfaces start to turn gray and after grass, forbs and other lower vegetation and in the area of the aspen clones, aspen shoots start to fill in with increased sunlight hitting the ground and less competition for the sunlight.

Prescribed under burning: None of the units in which under burning is proposed as the primary fuel-reduction treatment are immediately adjacent to either the Denny Creek Road or any other recreation site roads or developed areas. The visual effects of the under burning would be hardly discernible from the Highway 287 side of the lake. From there, any intermittent crown torching would appear as a natural occurrence to the casual viewer. However, there are locations visible in the foreground of the Denny Creek Road where this project proposes to open up areas of approximately 100 feet around existing aspen clones by removing the conifers and possibly using some prescribed under-burning to remove some of the slash and further stimulate growth of the aspen. The visual effect of this under-burning would initially blacken the ground, any cut stumps and the bases of many of the tree trunks within the burn. Most of that black would disappear within a year or two, leaving the stumps less visible, and herbaceous plants, encouraged by a flush of available nitrogen and more sunlight, would start to green up. Any intermittent tree crown mortality would appear as red-needled trees during the first or second year, and then the needles would fall leaving a standing dead tree.

Cumulative Effects of Alternative 2: The cumulative effects of this alternative when viewed from the Highway 287 corridor, would be to introduce some subtle visual variety into the lower portion of the overall predominantly conifer band which would help reduce the focus on the old, visually dominant (especially in winter) existing large cable-harvested clearcuts that are higher up on the slopes. A few of the proposed thinning units, such as 16 and 17, would be located within a viewshed along the Denny Creek Road where an old clear cut, outside the project bounds, is still visible on upper slopes. Generally, where there is enough distance for viewers to see the proposed units at the same time as the old existing harvests, the viewer would not be close enough to easily discern details like stump faces. At that distance the patterns resulting from this proposed alternative would not be visually dominant.

Direct, Indirect And Cumulative Effects Of Action Alternative 3

Other than some subtle visual differences discernible to viewers in the Highway 287 corridor, on the Denny Creek Road and in the recreation sites, Alternative 3 would appear fairly similar to Alternative 2.

In this alternative, the uphill edge of unit 1, a commercial thin unit, would have a straight western edge, corresponding with the Roadless boundary, rather than extending up into and

being surrounded by the understory thin, as it would in Alternative 2. Viewers in the Kirkwood Subdivision and along Highway 287 across the reservoir would notice less commercial thinning up the ridges in units 7 and 11 since in this alternative those units would be smaller. However, the design of these units would incorporate a transition area between the two prescriptions that would prevent the edge between the two units from becoming a distinct line visually dominant to viewers along Highway 287.

Since the slopes on which unit 12 in Alternative 2 would be face east/southeast and would be somewhat visible above the flat ridge to the east, viewers in the Dave Johnson Creek area subdivision would notice, to some degree, the absence of unit 12, which would not be thinned in this alternative. In the short term, that area would remain as it appears now. However, with unit 12 not in this alternative, the difference between the east side of the Denny Creek Road that would be understory thinned would appear somewhat different from the west side of the road that would receive no treatment. With implementation of the listed mitigation and leaving a few unthinned groupings along the roadside in unit 10, that visual difference would be reduced.

In the Spring Creek area, part of unit 17, on the west side of the road across from unit 9, has been eliminated in this alternative. By implementing the mitigation for trying to make both sides of the road appear somewhat similar, this visual difference would be reduced.

Unit 30a would add 120 acres of commercial thin in an area that is slightly more than ½ mile from the Denny Creek Road. If all mitigations are implemented, this unit would be discernible but not visually dominant. It may also result in improved visual variety as aspen fills in with less competition from conifers.

Cumulative Effects of Alternative 3: The cumulative effects of this alternative when viewed from the Highway 287 corridor, would be similar to those of Alternative 2, that being to introduce some subtle visual variety into the lower portion of the overall predominantly conifer band which would help reduce the focus on the old, visually dominant (especially in winter) existing large cable-harvested clearcuts that are higher up on the slopes. A few of the proposed thinning units, such as 16 and 17, which is a bit smaller in this alternative, would be located within a viewshed along the Denny Creek Road where an old clear cut, outside the project bounds, is still visible on upper slopes. Generally, where there is enough distance for viewers to see the proposed units at the same time as the old existing harvests, the viewer would not be close enough to easily discern details like stump faces. At that distance the patterns resulting from this proposed alternative would not be visually dominant.

Air Quality (Story 2007)

Understory and pile burning associated with the Lonesome Wood Vegetation Management Project area may temporarily increase $PM_{2.5}$ levels along residential areas and roads in the Westside of Hegben Reservoir. Smoke from the Project may temporarily obscure visibility along Road 167 and around residences and campgrounds.

Indicator: Smoke in as measured in $PM_{2.5}$ in tons of total emissions, tons/day, and in downwind concentrations in ug/m3.

Concern: Increased smoke from understory and pile burning could adversely affect health of

people in the Lonesome Wood Vegetation Management Project area.

Spring broadcast burns would likely occur during a period of more wind dispersion than the fall pile burning, due to longer spring daytime length, and higher mixing heights. The understory and pile burn smoke plume would likely disperse to the north and east of the project area. The $PM_{2.5}$ from burns would not likely be measurable in West Yellowstone since the smoke would tend to disperse to the NE. Some concentration of smoke could be occur near the Recreational Residences and private residences, particularly near units 1-4 Clark Springs Summer homes, unit 14 (Cozy Corners homes), 22, 24, and 29 (Rumbaugh Summer homes), and units 26 and 29 (Romset Summer homes and Lonesomehurst Summer homes). These units are constrained to a minimum ambient distances of 0.1 to 0.2 miles to minimize $PM_{2..5}$ exceedences at the residences.

The minimum ambient distance is the spacing from the burn the public would have access to the air when outside of a vehicle or residences. Public access to the air triggers the 24 hour average $PM_{2.5}$ 35 ug/m3 standard. The pile burns have minimum ambient distances of 0.1 to 0.2 miles. Within the minimum ambient distances the public would be warned about high smoke concentrations and advised not to travel outside of a vehicle or residence during the time of burning. Pile burn units would be burned one unit at a time to avoid cumulative smoke effects between units. Several units would require multiple days. All burns would disperse to low concentrations beyond 5-10 miles. The timing of pile burning is planned in the spring or fall when few residents are present. These design features minimize potential impact.

Outside of the minimum ambient distances the smoke concentrations are expected to be within NAAQS and State of Montana air quality standards. The Lonesome Wood Vegetation Management Project burns would be coordinated with the Montana/Idaho State Airshed Group (http://www.smoke.org). The operations of the Montana/Idaho State Airshed Group are critical to minimize cumulative smoke/$PM_{2.5}$ air quality impacts. The State Airshed Group, Monitoring Unit in Missoula, evaluates forecast meteorology and existing air quality statewide by individual airshed and specifies restrictions when smoke accumulation is probable due to inadequate dispersion.

Indirect effects would include some localized visibility reduction from the plumes. Some obscurement of visibility for driving along Road 167 could occur in narrow bands during the burns. Dispersion of the plumes would be expected to quickly mix the project smoke to insignificant visibility impact levels.

Air resources are somewhat unique in that the past impacts to air quality are not usually evident or cumulative. The Lonesome Wood Vegetation Management Project emissions would be cumulative only with the local emission sources described in the affected environment occurring at the time of burning. Cumulative effects would likely be the same for Alternatives 2 and 3 in the Direct and Indirect Effects and are constrained by the air quality mitigation measures in the EA Chapter 2.4.3.

With the mitigation identified in Features Common to Action Alternatives in the EA, Chapter 2, the Alternatives would comply with the Clean Air Act in 1963, as amended because the National Ambient Air Quality Standards (NAAQS), would be met as would the Gallatin NF Forest Plan in Forest Wide Standards pp. II-23 which requires that the Forest Service would cooperate with the Montana Air Quality Bureau (now DEQ) in the SIP and smoke management plan.

Aquatic / Fish and Amphibian Species including Sensitive and MIS Aquatic Species (Roberts 2007)

Fish

Fuel reduction activities, including timber harvest, thinning, construction of temporary roads, skid trails, landings, and prescribe burning, could:

- disturb soils and overland flow regimes, which in turn increases the potential for erosion and sediment transport to streams and other water bodies. Increased fine sediment in streams and other water bodies can reduce habitat quality and cause adverse effects to fish and other aquatic biota.
- affect fish habitat and biological productivity by reducing the number of larger trees that fall in to mountain streams. Large woody debris is the primary pool-forming feature in forested, moderate gradient stream channel types. Removal of riparian trees can reduce the potential to recruit trees into the stream channels and alter stream temperatures.
- increase water yield and the magnitude or duration of peak flow by altering a variety of hydrologic processes. This hydrologic imbalance may adversely affect aquatic habitat through increased scour potential, channel incision, bank erosion and increased sediment transport capacity.

Because of treatment unit layout and designed, it is thought that the only effects to trout and trout habitat would be those related to increased sediment delivery.

Indicator: Projected Incremental changes in fine sediment deposition in spawning gravels associated with predicted sediment yield changes. Resulting values are not considered definitive or absolute; rather they are used to evaluate the relative magnitude and direction of incremental change in spawning habitat and as a means to make relative comparisons between alternatives.

Applicable Laws, Regulations, Policy and Forest Direction Coomon toAquatic and Amphibian Species.

Clean Water Act and Montana Water Quality Act - The Clean Water Act provides the overall direction for the protection of waters of the United States, from both point and non-point source of water pollution. The Montana Water Quality Act establishes general guidelines for water quality protection in Montana. The project adheres to theses laws. (Story 2007a)

Presidential Executive Order 12962 - Presidential Executive Order 12962, signed June 7, 1995, furthered the purpose of the Fish and Wildlife Act of 1956, the National Environmental Policy Act of 1969, and the Fish and Wildlife Coordination Act, seeking to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. This order directs Federal agencies to "improve the quantity, function, sustainable productivity, and distribution of aquatic resources for increased recreational fishing opportunity by evaluating the effects of Federally funded, permitted, or authorized actions on aquatic systems and recreational fisheries and document those effects relative to the purpose of this order." Completion of this analysis meets the intent of this order.

Sensitive Species - Sensitive species are those animal species identified by a Regional Forester for which population viability is a concern as evidenced by a significant current or predicted downward trend in population numbers, density, or in habitat capability that will reduce a species' existing distribution (FSM 2670.5.19). There are ten species listed as sensitive for Region 1. Protection of sensitive species and their habitats is a response to the mandate of the National Forest Management Act (NFMA) to maintain viable populations of all native and desired non-native vertebrate species (36 CFR 219.19). The sensitive species program is intended to be pro-active by identifying potentially vulnerable species and taking positive action to prevent declines that will result in listing under the Endangered Species Act.

As part of the National Environmental Policy Act (NEPA) decision-making process, proposed Forest Service programs or activities are to be reviewed to determine how an action will affect any sensitive species (FSM 2670.32). The goal should be to avoid or minimize impacts to sensitive species. If impacts cannot be avoided, the degree of potential adverse effects on the species (and habitat) within the project area and for the species throughout its range must be disclosed. A viability analysis is required whenever a proposed project may adversely affect a sensitive species or its habitat. A given project can be approved even if it may adversely affect a sensitive species, but it must not jeopardize the viability (ability to persist through time) of a population or species.

Westslope cutthroat trout, Yellowstone cutthroat trout, fluvial (river dwelling) Arctic grayling, western toad and the northern leopard frog are all classified as sensitive species throughout their native range within lands administered by the Northern Region of the U.S. Forest Service. The project area falls outside the native range for both Yellowstone cutthroat trout and northern leopard frogs. An isolated population of westslope cutthroat trout inhabits a disconnected unnamed creek between Watkins Creek and Trapper Creek. A hand full of Incidental reports of grayling being caught in the Madison River and South Fork Madison River are included in the District fish files. The latest occurring in 2006 when an individual sub-adult grayling was caught in a downstream migrant trap in the Madison River operated by Montana Fish, Wildlife and Parks (Travis Lohrenz, personal communications). Based on these reports, it can be assumed that grayling of unknown origin also occupy Hebgen Lake in low numbers. It is not known if these fish are remnant fluvial Arctic grayling or lacustrine (lake dwelling) fish trickling down from upstream lakes in Yellowstone National Park. Arctic grayling have not observed in the smaller project area streams. Individual western toads and breeding sites have been observed around Hebgen Lake including within the project area.

Forest Direction

The following sediment standard has been incorporated as part of the Gallatin National Forest Travel Management Plan signed December 18, 2006 (GNF 2006). "Class A streams are those streams supporting a sensitive fish species or provide spawning or rearing habitat to the Gallatin, Madison, or Yellowstone Rivers, or Hebgen Lake. Class A streams are to be managed at a level which provides at least 90 percent of their inherent fish habitat capability. Class B streams are those streams that are regionally or locally significant and support both a quantity (substantial quantities of harvestable fish) and quality (numerous fish over 10 inches in length) fish populations. Class C streams are characterized as having limited local significance and provide a diversity of lower quality dispersed fishing opportunity." Trapper, Rumbaugh, Cherry and West Denny Creek are tributaries to Hebgen Lake. As a result, these streams are considered Class A

streams.

Management Indicator Species (MIS) are those species whose habitat is most likely to be affected by management practices thereby serving as indicators of habitat quality. The Gallatin National Forest Plan directs that habitat is provided for identified management indicator species and those native indigenous species that use special or unique habitats. All wild trout have been identified as MIS in the Gallatin National Forest Plan on page II-19 (GNF 1987).

Methodolgy

The following analysis describes anticipated direct, indirect and cumulative effects to fish and amphibian populations and their habitat. The primarily potential effects to fish populations and habitat would be a result of sediment delivery. The analysis characterizes the direction of effect, the magnitude of the anticipated effect and the duration of the effect.

Potential effects of the Lonesome Wood Fuels Reduction Project on fish and fish habitats were analyzed by a quantitative assessment. This assessment includes evaluating the combined effects of all treatments and associated activities by alternative on sediment delivery rates on salmonid spawning and rearing habitat. Incremental changes in fine sediment deposition in spawning gravels associated with predicted sediment yield changes was used as an indicator to compare between alternatives.

Both the R1/R4 sediment delivery and sediment/routing models are very simplified approximations of complex natural processes that affect sediment production and fish embryo survival, due to the models inability to predict all aspects of natural variation associated with sediment delivery and routing. Because of this, resulting values are not considered definitive or absolute; rather they are used only to evaluate the relative magnitude and direction of incremental change in spawning habitat and as a means to make relative comparisons between alternatives.

Spatial Boundary - Aquatic environments in forested ecosystems are known to be heavily influenced by the physical and biological processes within the watershed as a whole (Vannote et al. 1980). For this reason the analysis area for fish will encompass the four smaller drainages (Trapper, Cherry, Rumbaugh, and West Denny) from their headwaters to their confluence with Hebgen Lake. Since most trout spawning occurs within flowing streams, the following effects analysis will be limited to those areas that directly flow into one of these four streams. Trout that spawn within the shallows of Hebgen Lake most likely do so in areas of up dwellings and springs where sediment most likely would not accumulate.

Temporal Boundary - The fisheries analysis is based on the sediment modeling data provided by the Forest hydrologist (Story 2007). For the fisheries analysis, the temporal bounds were set from 1980 to 2015. The earliest date was approximate year when the last of the large road systems were constructed within the four analysis drainages. The later date was extended one year beyond when the sediment modeling showed any increase in sediment delivery for any of the action alternatives. Sediment transport in streams is highly variable and is influenced by several factors including channel type, amount of sediment, length of time sediment input occurs, flow regime, substrate composition and geology.

Direct and Indirect Effects of Alternative 1 (No Action Alternative)

There would be no change to existing sediment delivery rates and fine sediment in spawning gravels. Populations of all trout, including Management Indicator Species and Sensitive Species, would remain the same. The No Action Alternative is consistent with all Applicable Laws, Regulations, Policy and Forest Direction. There would be no irreversible or irretrievable commitment of aquatic resources including fish and amphibians.

Direct, Indirect and Cumulative Effects of Alternative common to both Action Alternatives

Generally upto 50 percent of the basal area would be removed with predominately younger age-class trees being removed. In riparian areas, commercial and non-commercial treatments would occur according to State of Montana Streamside Management Zone (SMZ) compliance rules with one exception. No trees would be cut within 15 feet of any Class 1 or 2 stream segments. Limbing of lower branches of larger trees would be allowed. This "no cut" mitigation is designed to protect streambanks along all stream segments as well as thermal regulation and overhead cover along fish bearing stream segments. No mechanized equipment would be allowed within 50 feet of the stream in accordance with existing protections. Deciduous vegetation within treated riparian areas would most likely be disturbed, but not intentionally removed or cut down.

The R1/R4 sediment modeling was run in a cumulative mode accounting for all roads (existing, previously decommissioned and proposed temporary), previous and proposed timber harvest, previous and proposed prescribed and wild fires, and residential and recreational developments in the four analysis drainages (Story 2007). This model does not take into account on-going activities such as livestock grazing on the Watkins Creek Allotment.

Of the reasonably foreseeable activities listed in EA 3.8, only three projects would increase sediment delivery above what is already modeled: 1) construction of a fish barrier along the unnamed creek between Watkins Creek and Trapper Creek; and 2) replacement of two culverts along Watkins and Trapper creeks. All three of these projects were or would be designed to improve fish habitat.

Direct and Indirect Effects of Alternative 2

It is projected that fine sediment would increase by 1.8 percent along West Denny Creek, 0.26 percent along Trapper Creek, 0.96 percent along Rumbaugh Creek, and 1.27 percent along Cherry Creek. Project generated sediment delivery is projected to cease in 2016 or 2017 depending on the drainage. This sediment is expected to remain within these stream systems for a couple extra years. Because of the flatter terrain adjacent to the four project area streams, there is a good chance that the projected increases are inflated. Alternative 2 would meet the Forest Plan for the four drainages being analyzed. Alternative 2 is consistent with all Applicable Laws, Regulations, Policy and Forest Direction to protect fish and fish habitat, including Sensitive and Management Indicator Species.

Direct and Indirect Effects of Alternative 3

It is projected that fine sediment increases would be the same as Alternative 2 except for Trapper Creek. Projections show an increase of .17 percent in Trapper Creek, which is slightly less than in Alternative 2. Project generated sediment delivery is expected to cease in 2016 or 2017 depending on the drainage. Fine sediment is expected to remain within these stream systems for

a couple extra years. Because of the flatter terrain adjacent to the five project area streams, there is a good chance that the projected increases are inflated. Alternative 3 is consistent with all Applicable Laws, Regulations, Policy and Forest Direction to protect fish and fish habitat, including Management Indicator Species and Sensitive Species.

Biological Evaluation

Because the project area lies outside the native range of Yellowstone cutthroat trout and northern leopard frogs, both the action alternatives analyzed would have "No Impact" on these species. Because fluvial Arctic grayling are not known to occupy the five smaller analysis streams, both action alternatives would have "No Impact" of this species. Because the genetically pure population of westslope cutthroat trout in the unnamed creek are isolated and lie upstream of any of the proposed treatment units, both action alternatives would also have "No Impact" on this species.

Amphibians

Issue: Fuel reduction activities, including timber harvest, thinning, construction of temporary roads, skid trails, landings, and prescribe burning, could:

- change vegetative structure to the point that thermal and moisture conditions are unsuitable. Western toads use terrestrial habitat in ways that allow them to conserve body water (Bartelt et al. 2004). It has been shown that western toads tend avoid clear cuts (Bartelt et al. 2004).
- increase the risk of direct mortality from burning and heavy equipment. Western toads have been shown to use slash pile for their hibernacula (Bartelt et al. 2004) and road prisms of less frequently used roads for basking and feeding (Bryce Maxwell, personal communications).

Indicator: A qualitative description of effects relative to the no action alternative is included in the effects analysis and biological evaluation.

Affected Environement - Nine shoreline reaches of Hebgen Lake were surveyed for amphibians in the summer of 2005 (Sestrich 2006). Of these three were immediately adjacent to the Lonesome Wood fuels reduction project area: Watkins-Spring Cove, Rumbaugh Cove, and Cherry Cove. A fourth breeding site was identified further to the west near Cozy Corners and the Firehole Ranch in 2007. Four amphibian species were present during these surveys around Hebgen Lake: western toad (*Bufo boreas*), Columbia spotted frog (*Rana luteiventris*), boreal chorus frog (*Pseudacris maculata*), and tiger salamander (*Ambystoma tegrinum*). Only western toads and Columbia spotted frogs were observed at the three shoreline reaches listed above. Within these three shoreline reaches, three western toad and one Columbia spotted frog breeding sites were identified. Western toad larvae and/or metamorphs were observed at two sites between Spring Creek and the mouth of Watkins Creek and at a third site along the south shore of Rumbaugh Cove. Because of the presence of western toad juveniles within Cherry Cove, a fourth breeding site is expected. A Columbia spotted frog breeding site was identified within Cherry Cove. Although not surveyed, Trapper Creek Cove, Moonlight Creek Cove, and the shoreline between Cherry Creek and Romset summer homes appear to be potential breeding sites. Adult western toads have also been observed at potential breeding sites away from Hebgen Lake. Adult western toads, Columbia spotted frog, and tiger salamanders were observed in one of two ponds located just west of Watkins Creek near the Coffin Lake trailhead. Another adult

western toad was observed in a stagnant backwater near the Trapper Creek culvert along FS Road # 167.

Adult western toads have been shown to migrate long distances (up to 2.5 km) from their breeding sites to hibernate during the colder months (Bartelt et al., 2004). Female western toads have a tendency to migrate further from their breeding site than do males. These winter hibernacula can be found in a variety of locations including uplands. It is possible that dispersing would be passing through or hibernating within a portion or all of the proposed treatment units.

PPL-Montana funded a radio-telemetry study during the summer of 2007 to track dispersing adults. Several adult western toads were tagged at three breeding sites early in the summer (Clint Sestrich, personal communications): Rumbaugh Cove, Watkins-Spring Cove and Fire Hole Ranch breeding sites. Most if not all of the tagged toads were thought to be males. At the Firehole breeding site, all of the tagged toads dropped their radio transmitters. At the Rumbaugh Cove breeding site, tagged toads stayed fairly close remaining below FS Road # 167. At the Watkins-Cove site, three of the tagged toads migrated up to 1.8 km from their breeding site in to the southeast corner of treatment unit 17. All toads were thought to be in the winter hibernacula by October 18, 2007. The last toad to hibernate was observed above ground on October 4, 2007 and relocated in a burrow on October18, 2007 approximately 200 yards away from the previous sighting. Before the data is fully analyzed, it seems that toads hibernated slightly earlier at sites located along cooler riparian areas versus dryer, warmer upland sites (Sestrich, personnel communications). During this study, several juvenile toads were also observed in a small lodgepole plantation immediately adjacent to treatment unit 17 and to the three radio-tagged adults previously mentioned. It is assumed that these juveniles also came from the Watkins-Spring Cover breeding site.

Methodology - Potential effects of the proposed project on western toads could come in two forms: 1) direct mortality from mechanical equipment and/or burning of slash piles used for hibernacula; and, 2) indirect changes to the vegetative structure along migration routes to and from their lake breeding sites. Because these effects have been lightly studied, the effects analysis for western toads will be a qualitative analysis discussing these potential effects.

Spatial boundary - Western toads have been shown to make seasonal migrations of up to 2.5 km away from their breeding sites (Bartelt et al., 2004). Several breeding sites have been documented around Hebgen Lake including shorelines around Madison Arm, South Fork Arm, Grayling Arm, and Horse Butte Peninsula (Sestrich 2006). Western toads have been shown to make short movements of up to ½ mile across Rumbaugh Bay in an ongoing radio telemetry study (Clint Sestrich, District data). It is assumed that movements across the reservoir do occur, but they are not common. For this reason, analysis area for western toad only includes the southwest side of Hebgen Lake between Lonesomehurst campground and Clark Springs summer homes.

Temporal boundary - For the amphibian analysis, the temporal bounds were set from 2002 to 2015. Up until the late-1990's, very little was known about western toads on the Gallatin National Forest. Atkinson and Atkinson (2003) documented several breeding sites around Hebgen Lake. Since so little was known prior to this study, the earliest temporal bound for western toads was set at the time when the last data were collected by Atkinson and Atkinson

(2003). The latest temporal bound was set for one life span generation after the completion of the proposed project or 2017.

Direct and Indirect Effects of Alternative 1 (No Action Alternative)

There would be no change to the vegetative structure of timber stands along the southwest side of Hebgen Lake or road traffic use patterns as a result of this project. Population of amphibians, including sensitive species, would also remain the same. The No Action Alternative is consistent with all Applicable Laws, Regulations, Policy and Forest Direction. There would be no irreversible or irretrievable commitment of aquatic resources including fish and amphibians.

Direct and Indirect Effects Common to Action Alternatives

Vehicle traffic unrelated to the proposed project has been shown to be a cause of mortality of western toads along FS Road # 167. Dead toads appear widely dispersed along this road (Atkinson and Atkinson, 2003). Cattle grazing on the Watkins Creek allotment in 2005 were thought to be the cause of an age-class failure at one of the Watkins-Spring Cove breeding sites and the near failure of a second site (Sestrich, 2006). Vehicle traffic along FS Road # 167 and adjacent open spurs roads along with cattle trampling of known breeding sites are thought to be most prevalent causes of mortality of individuals within this population. The issue of cattle trampling will be addressed in the upcoming Environmental Assessment to analysis the impacts of ongoing grazing on the Watkins Creek Allotment. Even with these sources of increased mortality; the population of western toads within the project area appears to be a viable and self-perpetuating.

Direct and Indirect Effect Alternative 2 (Proposed Action)

The vegetative structure immediately adjacent known breeding sites would not change. With the exception of the prescribed burning units (13, 18 and 30), it is believed that the vegetative structure within the proposed treatment units would not change to the point that migrating western toads would avoid these areas. The retention of the larger over story trees and under story shrubs and smaller trees would most likely maintain the existing thermal and moisture regimes. Cooler and moister stream corridors would remain intact even with limited fuels reduction treatments along stream courses and associated riparian areas.

Alternative 2 as planned would impact individual toads and their habitat. However, it is believed that the population of western toads along the south shore of Hebgen Lake would remain viable. Alternative 2 is consistent with all Applicable Laws, Regulations, Policy and Forest Direction to protect amphibians and their habitat, including Sensitive Species.

Direct and Indirect Effect Alternative 3 (Mitigated Alternative)

Effects to amphibians from Alternative 3 would be less as compared to those described under Alternative 2. Mitigation measures for Alternative 3, as listed in Chapter 2.4.2.3 would provide additional protection for individual western toads. Treatment unit layout and design coupled with these mitigation measures would reduce the negative effects on individuals and their habitat. The population of western toads along the south shore of Hebgen Lake would remain viable under Alternative 3. Alternative 3 is consistent with all Applicable Laws, Regulations, Policy and Forest Direction to protect amphibians and their habitat, including Sensitive Species.

Biological Evaluation

With the exception of the 440 acres of under story burning proposed under both action alternatives, the thermal and moisture regimes at ground level should not be changed to the point that western toads would avoid these treated areas. Because of increased road traffic, heavy equipment traffic within the treated units, and burning, individual western toads may be killed or harmed. Even with the potential for increased mortality, it is believed that the implementation of both action alternatives with or without the incorporation of the mitigation measures listed in Chapter 2 would not contribute to the loss of viability to the population of western that live along the south shore of Hebgen Lake. These listed mitigation measures were design to reduce the level of negative impacts to individuals. As a result, the implementation of either action alternative "May Impact Individuals or Habitat, but will not likely contribute to a Trend Towards Federal Listing or Loss of Viability to the Population or Species".

Economics (Lamont 2007)

This report addressed three different aspects of financial analysis.

(1.) Is the commercial timber sale component of this project viable?

(2) How much of the non-commercial activities can be funded with revenue from timber sales?

(3) What are the costs and benefits of implementing this project, both on the short term and on the long term – 20 years?

This financial analysis used two different indicators: project feasibility and financial efficiency. Project feasibility describes the likelihood that the timber sale would sell using Present Net Value (1) for activities associated with the sale. Where as, financial efficiency describes the revenue and costs for all projects associated with each alternative including activities not related to the timber sale component Present Net Value (2).

Some of these activities may need to be accomplished with funds generated from the timber sale in accordance with Forest Service Handbook (FSH) 2409.19 Chapter 60 – Stewardship Contracting and / or cooperative contributions.

Table 1 lists the predicted high bid and the present net value for each alternative. See Table 2 for a complete list of non-commercial activities and estimated costs. Clearly, the revenue generated from the timber sale will not pay for all of the non-commercial activities. Some of these projects will need to be funded by other sources.

Table 1- Project Feasibility and Financial Efficiency Summary (2007) dollars

Category	Measure	Alt 1	Alt 2	Alt 3
Timber Harvest Information	*Acres harvest	0	1,770	1,287
	*Volume Harvest (ccf)	0	13,400 ccf	10,000 ccf
	Predicted High	0	$64.09/ccf	$63.10/ccf

	Bid Rate ($/ccf)			
	Predicted High Bid Total Revenue $	0	$858,806	$631,000
Sawtimber revenue minus sale prep and administration costs	PNV (1)	0	$629,701	$461,863
Sawtimber & post/pole minus all project costs	PNV(2)		-$881,162	-$333,718

*Volume and acres are office estimations, not field timber cruise date

Table 2 – Expenditures for Other Fuel Reduction and Restoration Activities for each Alternative over the next ten years.

Activities	**Alt. 1**	**Alt. 2**	**Alt. 3**
Revenues			
Predicted High Bid for sawlogs ($)	$0	$858,806	$631,000
Indicated Advertised Rates for sawlogs*	$0	$434,026	$314,000
Standard Rate for Post and Pole**		$2,480	$1,000
Costs			
Thin and hand pile sub-merchantable trees in commercial units	$0	$353,600	$257,600
Thin and pile non-commercial units	$0	$459,800	$418,000
Burn hand piles	$0	$156,300	$143,520
Prescribed fire	$0	$140,800	$102,400
Obliterate Road end of Clark Springs	$0	$500	$500
Emergency vehicle turnabout Clark Springs Summer Homes	$0	$600	$600
Emergency vehicle turnabout Rumbaugh Summer Homes	$0	$600	$600
Emergency vehicle turnabout Romset Summer Homes	$0	$600	$600
Rock Barriers in Spring Creek and Cherry Creek Campgrounds along lakeshore	$0	$1,000	$1,000
Culverts with fish passage Trapper Ck and Watkins Ck	$0	$10,000	$10,000
Weed spray and monitoring 2013	$0	$16,000	$16,000
Weed spray and monitoring 2014	$0	$16,000	$16,000
Weed spray and monitoring 2015	$0	$16,000	$16,000
Weed spray and monitoring 2016	$0	$16,000	$16,000
Weed spray and monitoring 2017	$0	$16,000	$16,000

*Indicated advertise rate based of appraised value and costs, uses a $31.70/ccf roll back factor from the predicted high bid.
** As listed in FSH 2409.22

Cost and Benefits of Fuel Reduction: Assigning monetary value to some of the costs and benefits of this project is difficult. For example, a primary purpose for this fuel reduction project is to improve the safety for evacuees and firefighters, should a fire occur in this area. The value of health and safety is priceless. Conversely, some of the costs of this project are also difficult to assign a monetary value, such as a reduction in hiding cover for wildlife. However, a qualitative value could be assigned to all of these attributes, for each alternative, based on the specialist reports. Mixing qualitative and quantitative values is nonproductive; so will be avoided in this analysis.

Table 3 displays attributes identified in this Environmental Analysis as positive (benefit) or negative (costs). More than one plus or negative is assigned if the effects are different for each alternative. For example, Alternative 2 reduces fuel in more area than Alternative 3; consequently, it received two pluses because it provides more safety for firefighters.

Table 3, costs and benefits for non-monetary values

	Alt 1	Alt 2	Alt 3
Safety for firefighter and evacuees	-	+ +	+
Risk to structures and NFS resources	-	+	+
Aspen regeneration	-	+	+

Alternative 2 offers the most safety for fire fighter and evacuees, while Alternative 3 offers slightly less. Alternative 1 would not incur project cost however, Alternative 1 does not benefit the purpose and need. The effectiveness of the treatment is expected to last to approximately 30 years (M.Novak, personal communication, September 2007).

Heritage Resources (Allen 2007)

Inventories identified one cultural site on 7/3/07-adjacent to units 1-3. The site's features could potentially be directly impacted by proposed actions within those units. These impacts can easily be avoided by simple flagging and avoidance in consultation with the sale administrator. The total site area is approximately 6 acres most of which is in open meadow so there so be little appreciable effect to the proposed action. The site would be protected with the implementation of 'Features Common to Action Alternatives' in the EA, Chapter 2. Because of the project is expected to have no impact on heritage resources.

The Gallatin Forest Plan incorporates the requirements under the following statutes: the National Historic Preservation Act (1966) and the American Indian Religious Freedom Act (1978). Forest Plan standards applicable to this project reflect the mandates under the above statues include inventory procedures, evaluation procedures, protection/preservation procedures, and coordination/consultation procedures (see FP II-14 and II-17). The Lonesome Wood Vegetation Management Project has been on the SOPA and the Shoshone Bannock Tribe and the Shoshone

Business Council were on the scoping mailing list. The Lonesome Wood Vegetation Management Project is consistent with the laws, regulations and Forest Plan direction discussed in this section.

Invasive Weeds (Lamont 2007a)

Issue The vegetation management project has the potential to increase the spread and density of noxious weeds throughout the proposed treatment area. Weeds can be spread by soil disturbance (such as mechanized equipment and burned areas) and by vegetation management (creating an opening in the forest canopy cover) that creates habitat suitable for the establishment of invasive weeds.

The effects of weed control treatments, such as the use of herbicides, were disclosed in the 2005 Gallatin National Forest Noxious and Invasive Weed Treatments EIS. The Lonesome Wood project refers to the Gallatin's Weeds EIS for the effects analysis on treatment of weeds.

Indicator The number of acres at high risk of weed spread due to the project is the indicator used to evaluate the effects and trade-offs between alternatives.

Alternatives 2 and 3 would incorporate the design features common to action alternatives in the EA, Chapter 2, so would not likely cause a direct or an indirect effect on weeds. The two action alternatives have essentially the same effect on weeds. Many of the units in both alternatives are rated as "Moderate" risk of weed spread, meaning the weeds are present but the treatment is not likely to contribute to the spread of weeds. Only unit 29 rated as "High" risk for spreading orange hawkweed because this plant is already in the area, and can spread regardless of management action. Since hawkweeds are wind disseminated and can grow in a verity of light conditions, they will spread even with the No Action alternative. However, the mitigation measure that prohibits disturbance during flower/ seed dispersal would reduce the risk of spreading hawkweed as a result of the timber harvest. Also, the hawkweed has been sprayed with herbicide for the last three years and which reduced the density substantially. Alternatives 2 and 3 are not any different than the No Action alternative with respect to the risk of spreading orange hawkweed.

Livestock/Range Allotments (Lamont 2007b)

Issue There is a concern that the proposed Lonesome Wood project may directly, indirectly or cumulatively impact livestock grazing. The Watkins allotment is within the treatment boundary, may be impacted by the activities associated with the treatment units.

Indicators used to evaluate the effects of the treatment on the grazing allotment include the amount cows would be displaced during the vegetation treatment and the degree to which the treatment would alter grazing utilization of the allotment (e.g., removal of natural fences or increase in forage area).

There is very little difference between the two action alternatives and impacts to grazing. Both alternatives would increase forage within the treatment areas. The table below compares the alternatives with the different indicators. Alternative 2 does remove the natural fence along the southern edge of unit 17 allowing cows access to unit 18. However, it is not likely the cows

would migrate uphill into unit 18.

Alternative	Displacement	Removal of natural fences	Increase in secondary pasture
1	None	No	0 acres
2	Short term, minor impact	Yes, unit 18	175 ac (units 17 & 18)
3	Short term, minor impact	No	119 ac (units 17)

Recreation/Special Uses (Fusselman 2007)

Issues: Fuel reduction and Aspen management activities, including timber harvest, thinning, construction of temporary roads, skid trails, landings, and prescribed burning, could potentially impact the recreation experience for Forest Users. Potential impacts were considered relative to outfitted clients, unsafe road conditions, recreation access and use, recreation experience related to noise, road maintenance and unwanted activities related to access..

Outfitters operating in the Lonesome Wood project area are limited by their permit to designated operating trails or areas. As a result, their opportunities to take clients elsewhere during logging operations are more limited than for the general public. This issue is discussed in further detail below.

Road Safety: There is concern over the potential hazards of logging truck traffic on busy secondary roads. The Denny Creek road (Forest Road 167) has relatively high recreational traffic that diminishes steadily as the major attractions (boat launches, campgrounds, recreation residence groups and private residential areas) are reached as one travels further from Highway 20. Of special concern are areas typically used by children, and traffic entering the Denny Creek road from side roads, especially near blind corners. The character of the West Fork of the Denny Creek road (Forest Road 1735) is such that vehicle speed is naturally slow, but the road is narrow enough to create problems when a logging truck encounters oncoming vehicles. This issue is discussed in further detail below.

Indicators

Outfitting -Impacts to outfitters can be measured by direct feedback from outfitters, and by analysis of actual use reports.

Road Safety -Road safety due to logging truck traffic can be measured by direct observation of truck driver's habits, especially in congested areas, and by other traffic monitoring, such as a lack of accident reports (if any), or by the number of complaints received (if any).

Recreation access would not be impeded except for some short-duration moments when equipment is entering and exiting areas, or when temporary hazards associated with the project threaten the road or trail (for example, tree felling). Additionally, there would be no long-term impacts on recreation use associated with the project. Some short-duration impacts could occur, such as a temporary closure of a dispersed non-fee campground or camping area while actual treatment operations are taking place. However, multiple opportunities of a similar nature exist

in the near vicinity. Treatment operations would not take place within ¼ mile of recreation residences for safety, access, and disturbance reasons during the prime cabin visitation season during the Memorial Day week, and July 4th week through Labor Day. These design features would minimize conflicts with recreation access.

The proposed project activity could affect the *recreation experience with logging noise*. By its nature, logging operations would produce noise. However, logging noise is expected to have nominal impact on most recreationists due to its temporary nature and confined area, due to nearby opportunities for similar recreation activities, and due to existing background noise on a developed lake. Logging operations would compete with noise from boating traffic, OHV traffic, recreational vehicle and other vehicular traffic, water and beach activities in the summer, and snowmobile activities in the winter. Additionally, the forest itself, and any snow cover would reduce the noise of logging operations. Quiet recreation opportunities would still abound in the areas they exist now. All logging operations would be temporary in nature, and not have a lasting effect. Therefore, the effects of logging noise is determined not to be significant to the decision.

Proposed treatments and associated activity could affect the *recreation experience with road dust, logging truck traffic noise, and wash-boarding of the roads.* The amount of road dust, washboarding, and traffic noise related to the Lonesome Wood project is expected to be negligible relative to the existing road dust, washboarding and traffic noise from current traffic. These effects are expected to be negligible because of the relatively small number of vehicles related to the project using the roads. If the project lasts for 2 to 3 years, it is anticipated that only 5-10 logging truck trips per day during 4 months of possible operations due to timing restrictions would travel down the Denny Creek Road. On many days zero to three trucks per week would be anticipated. If the project takes longer to complete, up to a projected 3 to 5 years for logging, and 8 to 12 years total, the logging truck traffic would be less during the operating seasons. The operating season varies, but is limited to about 44 to 88 days per year. The highest recreation use season is July through Labor Day. Operations would be restricted during this time period for much of the area which further limits potential conflict. Vehicles associated with harvesting would also be expected to be very low, with personnel transport occurring once at the beginning of the day, and once at the end of the day, again on a sporadic basis. Additionally, it is standard practice for logging operations on NFS roads to either maintain roads in the pre-operation conditions or deposit funds for maintenance to minimize impacts to Forest roads. The traffic associated with the Lonesome Wood project is so negligible relative to recreational and residential traffic, that road dust, wash-boarding, and traffic noise issues are determined not to be significant to the decision.

Unwanted Activities create enforcement issues with potential access created by temporary roads and winter plowing of existing roads. The Hebgen Lake Ranger District maintains an active law enforcement, off-highway vehicle (OHV) ranger program, and snow ranger program, for year-round patrol. The general public regularly accesses the west side of Hebgen Lake on a year-round basis. The Lonesome Wood project area falls within the regular patrol route of the OHV ranger and Law Enforcement personnel. With the implementation of the new Gallatin National Forest travel plan, roads would not be open to motorized travel unless designated open. Temporary roads would not be designated open routes, and their access would be regularly patrolled, just as access to existing closed roads are currently patrolled. Additional law enforcement problems related to temporary roads or winter plowing are not expected, and patrols

would continue. Therefore, this issue is determined not to be significant to the decision.

Affected Environment

Affected environment descriptions and environmental analyses are based on general reviews of the project area, site-specific field reviews, outfitter actual use reports, and visitor use monitoring. The Lonesome Wood project area lies within an area of high summer recreation use, moderate fall recreation use, and low winter and spring recreation use. Types of recreation use include, but are not limited to, outfitting and guiding, hunting, fishing, trapping, camping, recreation residence use, swimming, boating, OHV use, snowmobile use, cross-country skiing, and mountain biking. This analysis addresses recreation resource issues identified during project development and those identified by public scoping that have the potential to affect recreation residents, outfitters, and the general recreating public.

Outfitting

The affected environment is the authorized outfitter area used by outfitter and clients for a western backcountry experiences. Although the outfitter is a single local interest, clients come from across the nation and from around the globe. (See Attached Map.)

Road Safety

Forest Roads 167 (Denny Creek road) and 1735 (West Fork of Denny Creek road) are the primary areas of traffic concern. FR 167 is, for the most part, wide, with numerous curves, some blind curves, and sustains a moderate level of traffic that includes entering and exiting traffic, vehicles towing trailers and campers, motor homes, ATV's, and vehicles towing horse trailers. In the vicinity of the campgrounds and recreation residences, children can be found on or crossing the road on foot, bikes, or ATV's. FR 1735, and other smaller roads in the project area, are narrow, winding and hilly. People using these roads comprise a mix of permanent residents, seasonal residents, and visitors from around the nation.

Applicable Laws, Regulations, Policy and Forest Plan Direction

Gallatin National Forest Direction:
Forest Plan - Management Areas 1, 5, 7, 13, & 15 (see EA, Chapter 1)

Gallatin National Forest Travel Plan (October 2006)

Methodology for Analysis:
Outfitting

Treatment units for the Lonesome Wood project were compared to the permit maps authorizing areas of use for permitted outfitters, and to topographical maps to check for potential impact areas. Outfitter actual use reports were used as a basis to determine potential impacts to outfitted operations. Outfitter discussions were also used as a basis for determining impacts to operations. Other factors limiting the timing of treatment options relative to outfitter operations were considered in the analysis, such as spatial and temporal constraints on treatment options due to wildlife and other concerns.

Road Safety

Treatment units for the Lonesome Wood project were overlaid on the Gallatin Forest map to

determine the estimated location, amount, and duration of logging truck operations.

The majority of the logging truck activity on the Denny Creek Road, would take place south of the Firehole Ranch and Cozy Corners, along the road corridor to the vicinity of the Lonesomehurst Campground and Recreation Residence group. However, within this area, there can be minor levels of recreational traffic, as well as residential traffic.

The duration of the project, and the amount of truck traffic cannot be determined with certainty due to the variability of extended harvesting operations. It is anticipated that all phases of the project would take a maximum of 8 to 12 years, but that logging traffic associated with brushing and harvesting would only take a maximum of 3 to 5 years. The proposed size of the Lonesome Wood project is expected to require, as a minimum, zero to three trucks per week, on a sporadic basis; and as a maximum, 7 to 10 trucks per day, on a sporadic basis, during the harvest season (either the summer or fall), for 2 – 3 years. If the brushing and harvesting components of the Lonesome Wood project take 3 – 5 years to complete, the numbers of trucks using the road on any given day would drop significantly. This reduced number is a result of the fact that the amount of timber harvest would remain the same, but the harvest operations would be spread out over a longer time period.

Spatial boundary for effects analysis (common to all alternatives):
Outfitting The analysis area comprises the authorized outfitter areas or trails that coincide with the proposed treatment areas, and the authorized outfitter areas or trails outside the treatment areas that could be reasonably be impacted by treatment operations (for example, logging operations could impact the recreation experience for a reasonable visual or hearing distance in the same drainage). The only outfitter with reported actual use in the Lonesome Wood project area in the last 5 years is the Firehole Ranch. The only actual use reported by the Firehole Ranch in the last 5 years in the project area is day-use horseback rides up the Watkins Creek and Coffin Lake trails. Assuming the clients ride the horses from the ranch to the trailhead, clients could possibly see/hear any mechanical treatments taking place in units 14, 15, and on the Watkins Creek drainage side of unit 17, while on their rides.

Road Safety The analysis area comprises the Denny Creek Road from Highway 20 to its end just beyond the Clark Springs Recreation Residence tract, and the West Fork Denny Creek Road from Highway 20 to the end of the project area in unit 31, as well as associated side roads in the project area. There are no speed limits on NFS roads in the project area. Although the portions of Denny Creek and West Fork of Denny Creek road have speed limits on sections under county jurisdiction, those limits do not extend to the NFS roads. On the portions of FR 167 in the project area, traffic concerns are related to speed. On FR 1735 and other roads traffic concerns are related to narrow travel lanes. Logging truck traffic on FR 167 and FR 1735 effects are limited to short duration effects. No additional harvesting projects are anticipated with the Lonesome Wood project in the reasonably foreseeable future. No cumulative effects are expected.

Temporal boundary for effects analysis (common to all alternatives):
Outfitting Actual use reports for the previous 5 years (2001-2006 operating seasons) were used to analyze the potential impact of proposed treatment options during the authorized outfitter operating season. The Firehole Ranch operating season runs from May 1 to October 1. However, actual use reports from the last 5 years show actual use from June 14 – September 22.

The prime operating season (3 – 6 clients per week) ran from June 14 through Labor Day over the last 5 years. Outside the prime season, post-Labor Day through the end of the 3rd week of September, there were less than 2 clients per week. (See attached spreadsheet.)

Road Safety The temporal boundaries for road safety effects are limited to the treatment period. The Lonesome Wood logging operations are anticipated to last between 2 to 5 years, on a sporadic basis, and perhaps as long as 5 to 10 years, dependent on timing restrictions. The shorter the time period, the higher the logging truck traffic density. At its highest density, logging truck traffic is expected to be around 5 to 10 trucks per day, on a sporadic basis, with many times traffic dropping to zero to three times per week. The effects of the logging truck traffic are of short duration. Except for undefined stewardship projects, no other projects are anticipated in conjunction with the Lonesome Wood project, and there are no additive effects associated with the logging trucks.

Direct, Indirect and Cumulative Effect of Alternative 1 (No Action Alternative) Effects Analysis:

Outfitting Under the No Action Alternative, there would be no interruptions to outfitting operations. Risk to evacuees and homes in case of wildfire would remain high. Under certain wildfire scenarios, the risk to fire fighters would be too great to dispatch them into the project area to fight fires or assist in evacuations. There are no cumulative effects from the No Action Alternative on day-to-day outfitting operations. However, the potential risk to outfitter clients as wildfire evacuees increases each year with unmanaged vegetative growth along the evacuation route.

Road Safety Under the No Action Alternative, there would be no logging, and no need for logging trucks. Risk to evacuees and homes in case of a wildfire, would remain high. Under certain wildfire scenarios, the risk to fire fighters would be too great to dispatch them into the project area. Under the No Action Alternative, there are no logging operations, and thus no cumulative effects on road safety issues related to logging trucks.

Direct, Indirect and Cumulative Effect of the Alternative 2 and 3 (Action Alternative) Effects Analysis:

Outfitting

Treatment options would take place with mitigations, such as timing restrictions, and impacts to the recreational experience of outfitted clients is minimized. Mitigations limit mechanical treatment in the areas of outfitter actual use reported in the last 5 years (2002-2006, inclusive), (units 14, 15, and the Watkins Creek drainage side of unit 17), with no mechanical treatment in the prime operating season (3 – 6 clients per week), which lasts from June 14 – Labor Day. Outside the prime operating season (less than 2 clients per week), defined as after Labor Day to the end of the third week in September, mechanical treatment is limited to start after 9 a.m. on days when the outfitter has clients in the areas of actual reported use. This mitigation trade-off would allow the Lonesome Wood project to be completed in a shorter period of time. There are no cumulative effects on outfitting due to the temporary influence of treatment options on outfitting operations. Risk to clients under evacuation conditions would be reduced after completion of treatment options.

Road Safety Logging would take place, and logging truck traffic would occur with mitigations. Road safety related to logging trucks would be enhanced. Risk to evacuees and homes would be

reduced, escape routes would be enhanced. There are no cumulative effects related to logging trucks versus road safety due to the temporary nature of the logging operations. The safety of forest visitors on the main roads during logging operations would be enhanced.

Summary conclusion:
Under Alternative 2 and 3, treatment unit layout and design, coupled with mitigation measures, would provide adequate protection to outfitters and clients, and increase the safety potential of forest road users in the project area. Both Action Alternatives are consistent with applicable laws, regulations, policy and Forest direction related to recreation management.

Sensitive Plants (Pils 2007h)

Introduction: Sensitive species are those plants and animals identified by a Regional Forester for which population viability is a concern as evidenced by a significant current or predicted downward trend in population numbers or density or a downward trend in habitat capability that would reduce a species' existing distribution (FSM 2670.5.19). All Forest Service planned, funded, executed or permitted programs and activities are to be reviewed for possible effects on sensitive species (FSM 2672.4). Proposed vegetation management activities may impact sensitive plant species.

Discussion: The sensitive species program is intended to be pro-active by identifying potentially vulnerable species and taking positive action to prevent declines that will result in listing under the Endangered Species Act. The Gallatin National Forest (GNF) recognizes 19 sensitive plant species (Table 1). The table below indicates the effects determination for the 19 species listed on the GNF Sensitive Plant List.

Several sensitive plant surveys were conducted specifically for this project. Early surveys were conducted for Jove's buttercup in particular. This species was reported to occur in the area, and it is in bloom when other species are barely beginning to grow. Surveys for Jove's buttercup were done in likely habitats on May 16 & 17, 2006. Surveys for other sensitive plant species were done on July 3, 7, and 16, 2006. Plant phenology during these surveys was well advanced so that most other species (besides Jove's buttercup) could be observed if they were present. A number of sensitive plant surveys were conducted previous to this project in association with other activities (see Figure 1). The Hebgen Lake Road, summer homes, and campgrounds along the road were surveyed for sensitive plants in association with the Gallatin Forest Weeds EIS. Each side of the road was surveyed to 100 feet. Similar surveys were done on the Denny Creek Road (#1735 and #2525 as well as a short spur). The dates of these surveys were July 8, 10, 25, 26, and August 19, 2001. Surveys on the Watkins Grazing Allotment were conducted on June 26 & 27, 2000, July 13 & 14, 2000 and July 2, 2001. Surveys were conducted for several prescribed burns: Watkins Creek, Aug. 12, 1999, Trapper Creek, and Rumbaugh Ridge 1998. Sensitive plant surveys for the West Lake timber sale were conducted on July 15, 2000 and various dates in 1999. Other surveys from West Lake outside the Lonesome Wood project had similar habitats and are useful for cumulative effects analysis.
No sensitive plant species were found within the treatment units for this project. However, Jove's buttercup was found in close proximity to several units. This plant was found in very small numbers near the Romset summerhomes (adjacent to Unit 29) and in large numbers near Watkins Creek (somewhat near Units 16 and 17). The Romset population has two

subpopulations of 50 and 15 plants. The plants are intermingled with a similar buttercup species *Ranunculus glaberrimus* var. *ellipticus*. The common species was also abundant in the Lonesomhurst Campground and although Jove's buttercup was not found there, it could be present. Jove's buttercup could also be present in Unit 29 because potential habitat is found in the open meadow in there. The Watkins Creek area was a much larger population with over 3000 plants. This population was divided into 3 subpopulations: A large 14 acre area with approximately 3000 individuals, a small area of 75 x 250 feet with 150-200 individuals, and a pocket about 10 x 15 feet in size with 12 plants.

The open meadows of Unit 30, had additional habitat for Jove's buttercup, but the area was surveyed too late to find the plant. Jove's buttercup prefers open sagebrush meadows, often in transition with Douglas fir, in open areas where the sagebrush and plant cover is sparse and bare ground is plentiful. This buttercup is not tolerant of much competition from other vegetation. It is often found in small pockets of open ground or rock outcrops surrounded by less suitable (more heavily vegetated) habitat.

Historic surveys and the surveys for this project did not identify any other plants currently listed on the Gallatin National Forest Sensitive Species List. Habitat is abundant for rattlesnake plantain, and it's common counterpart (*Goodyera oblongifolia*) has often been found. Potential habitat also exists for musk root, short-styled columbine, large leaved balsamroot, hiker's gentian, northern rattlesnake plantain, discoid goldenweed, Hall's rush, and California false helleborine. However, none of these species have been located in the area. Some common species in the same genera as sensitive plants may be observed: yellow columbine, Baltic rush, and knotweed (*Aquilegia flavescens, Balsamorhiza sagittata,*and *Juncus balticus,* respectively). While these plants were readily observable, their sensitive cousins were not observed.

The only species that may be affected by project activities is Jove's buttercup (*Ranunculus jovis*). This species will not be affected by activities in most units, because the units are forested and the plant does not occur in or near them. However, Units 29 and 30 may be of concern if activities such as piling slash, skidding, or burning should occur outside the boundaries of the units or in open meadows within the units. These activities would directly damage the plants if done where they are growing. Underburning, as proposed in Unit 30 is acceptable, since Jove's buttercup is part of a plant community that adapted for fire. However, the area where this plant is found does not naturally burn in the spring, so spring burns would likely damage the plants. Design features in EA2.4.3 eliminate this concern.

Indirect effects to Jove's buttercup and any other sensitive plant species center around the introduction or spread of noxious weeds. Weeds occur in the vicinity of the buttercup populations and their potential habitat. Machinery may carry weed seed, and ground disturbing activities produce an environment favorable to weed establishment. Weed mitigation in EA2.4.3 address thiese concerns.

Potential effects to Joves Buttercup would be minimized with incorporation of design features in EA,2.4.3.

Lonesome Wood Vegetation Management EA
Appendix A – Other Issues – Non-significant

Table 1. Plants listed on the Gallatin National Forest Sensitive Plant list, and their determination for the Cache-Eldridge AMP project. MIIH = May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Species	Existence on the Gallatin National Forest	Within the elevation of the Hebgen Ranger District	Determination	Statement of Rationale
Musk root (*Adoxa moschatellina*)	yes	yes	MIIH	Suitable habitat may be present but species is not known in the project area or vicinity.
Short-styled columbine (*Aquilegia brevistyla*)	no	yes	MIIH	Suitable habitat may be present but species is not known in the project area or vicinity.
Large-leafed balsamroot (*Balsamorhiza macrophylla*)	yes	yes	MIIH	Suitable habitat may be present but species is not known in the project area or vicinity.
Small yellow lady's slipper (*Cypripedium parviflorum*)	no	no	No impact	Suitable habitat not present.
English sundew (*Drosera angelica*)	yes	yes	No impact	Suitable habitat not present.
Beaked spikerush (*Eleocharis rostellata*)	No	no	No impact	Suitable habitat not present.
Giant helleborine (*Epipactis gigantea*)	no	no	No impact	Suitable habitat not present.
Slender cottongrass (*Eriophorum gracile*)	no	yes	No impact	Suitable habitat not present.
Hiker's gentian (*Gentianopsis simplex*)	yes	yes	MIIH	Suitable habitat may be present but species is not known in the project area or vicinity.
Northern rattlesnake plantain (*Goodyera repens*)	yes	yes	MIIH	Suitable habitat may be present but species is not known in the project area or vicinity.
Discoid goldenweed (*Happlopappus macronema* var. *macronema*)	yes	yes	MIIH	Suitable habitat may be present but species is not known in the project area or vicinity.
Hall's rush (*Juncus hallii*)	yes	yes	MIIH	Suitable habitat may be present but species is not known in the project area or vicinity.
Dwarf purple monkeyflower (*Mimulus nanus*)	yes	yes	No impact	Suitable habitat not present.
Austin's knotweed (*Polygonum douglasii* ssp. *austiniae*)	yes	yes	No impact	Suitable habitat not present.
Jove's buttercup (*Ranunculus jovis*)	yes	yes	MIIH	Species found near units. Simple mitigation measures will ensure the populations are not affected by the project.
Barratt's willow (*Salix barrattiana*)	yes	yes	No impact	Suitable habitat not present.
Shoshonea (*Shoshonea*	yes	yes	No impact	Suitable habitat not present.

pulvinata)				
Alpine meadowrue (*Thalictrum alpinum*)	yes	yes	No impact	Suitable habitat not present.
California false-hellebore (*Veratrum californicum*)	yes	yes	MIIH	Suitable habitat may be present but species is not known in the project area or vicinity.

Soils (Shovic 2007)

Issue : Protecting soil quality under forest management is important for long-term productivity. All soils issues revolve around meeting Regional soil quality standards ((USDA Forest Service, 1999). These specify a maximum 15% allowable detrimental disturbance for all treatment units having ground-disturbing activities. This includes landings, skid trails, harvest units, and temporary roads. Skyline yarding systems generally have low disturbance and helicopter systems have even less disturbance, since there is no machine ground contact. Helicopter landings however, are counted in evaluating detrimental disturbance. The primary issue lies generally with ground-based machinery, such as tractors, skidders, clippers, feller/bunchers, and harvesters.

Further, previous harvest in an area can result in detrimental disturbance that may influence cumulative effects, that becomes a concern if it is over the 15% standard. Regional standards acknowledge the effects of previous harvest and require that proposed management meet the existing standards, as well as making cumulative post-harvest conditions no worse (and hopefully better) than the existing situation. In these situations, some form of soil restoration is needed to reduce existing disturbance on these areas.

Indicators:

Ground-based Harvesting and Protecting Soil Quality – For areas not having previous harvest, do treatments meet soil quality standards by using the soil protection best management practices, and appropriate restoration.

Previous Harvest and Protecting Soil Quality- For areas having previous harvest, incorporate soil protection best management practices and specify restoration of soils detrimentally disturbed by previous harvest.

Applicable Laws, Regulations, Policy and Forest Plan Direction

Forest Plan Standards and Direction (USDA, Forest Service, 1987)

Soil and site productivity issues relate to the Forest Plan as follows:

Soil and Water Quality Maintenance: All practices will be designed or modified as necessary to maintain land productivity (p.II-24).

Timber Production: Provide a sustained yield of timber products and improve the productivity of timber growing lands (p.II-1). Site prep. and debris disposal methods will be prescribed which maintain an adequate nutrient pool for long-term site productivity through the retention of topsoil and soil organisms.

Regional Standards

Regional standards for protection of long term soil productivity should be an integral part of project design (USDA, Forest Service, 1999). These are dated 11/12/1999 and are titled: FSM 2500 - Watershed and Air Management R-1 Supplement 2500-99-1, Chapter 2550 - Soil Management.

These standards state: "Design new activities that do not create detrimental soil conditions on more than 15 percent of an activity area. In areas where less than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 15 percent. In areas where more than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration should not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality."

Methodology

Soil characterization, status and extent of previous harvest, predicted impacts of project management, best management practices applied to the project, restoration, and effects by alternative were developed using the following methods.

Soil characterization and interpretations are derived from the Gallatin National Forest Soil Survey (Davis and Shovic, 1996). The published soil survey was used to generate landscape, soils, and hazard data. A GIS was used to analyze and calculate results.

Analysis results for the Activity Areas are based on field investigation of each noted unit (June 20, 2006, Nov 21, 2006, Jun 4, 2007, and July 23, 2007; Shovic, 2006b and this report). All units have been reviewed on the ground.

Previous Harvest Assessment and Monitoring: Aerial photos, local timber data, and field observation of each Unit were used to determine if there was previous harvest. This would be indicated by cut stumps, burn piles, disturbed soil, skid roads, landings, and other evidence of machine-based harvest. If previous harvest was indicated, formal monitoring using the Northern Region Soil Monitoring Protocol (USDA Forest Service, 2007) was used to determine a quantitative estimate of detrimental disturbance for all units meeting that criterion. This is as directed by policy (Tidwell, 2007).

Predicted Harvest System Impacts on Soil: Previous studies in within the Region have shown that detrimental disturbance from non-winter tractor harvest systems are within or close to Regional standards (Farley, 1005 (<13% from 1997 and later sales); Page-Dumroese et. al., 2006 (55% of summer tractor plots had <15%); Svoboda, et. al., 2007 (14.5%); Shovic, 2006 (16.5%), including landings. Hence, for this report predicted detrimental soil disturbance from summer tractor harvest systems is estimated at 15%.

Some units may be treated with ground-based methods that have lower impacts than those used here. In particular, methods of biomass removal may be used in thinning units. These have very low ground pressure. There are no data on specific impacts of these methods, so they are treated as a commercial harvest to avoid under-estimating impacts.

Estimates of detrimental disturbance by other harvest methods are taken from existing local examples and recent studies (Shovic, June 7, 2007; Shovic and Widner, 1991; Shovic and Birkeland, 1992).

The Soil BMP was incorporated in project design as described in EA 2.4.3 and B.

The Gallatin Soil Protection Best Management Practice (Gallatin BMP).

Non-winter, ground-based methods have a potential for significant soil damage. In the past, by far the largest contributor to detrimental disturbance is dispersed ground-based harvesting using motorized, tracked or wheeled equipment, both on the Gallatin Forest (Shovic and Widner, 1991; Shovic and Birkeland, 1992) and regionally (Kuennen, et. al., May 2000). Dispersed skidding practices using equipment with low ground pressure have been successful on Forests having deep layers of organic material and slash (broken branches.) This layer is from 6 to 20 inches deep and originates from existing organic layers plus slash from the harvest operation. The layer protects the soil surface from displacement and prevents compaction, and is a standard Best Management Practice (BMP) on many Region-One Forests (ibid).

The situation is quite different on east-side Montana Forests. There is no deep litter layer (Davis, C. E. and H. F. Shovic. 1996.) Harvest activities leave much less slash because trees are smaller and they are more widely spaced than on more productive sites. (Kuennen, L, et. al., May 2000.) The term "dispersed skidding" includes all ground-operations that allow ground-based machinery to drag logs on the ground without restricting that machinery to pre-designated skid trails. Since the Gallatin cannot match the soil protection layers used on Idaho forests and their documented protective capabilities, no form of dispersed skidding on the Gallatin National Forest is recommended, until enough research is done to show that dispersed skidding with new kinds of equipment is not detrimental to soil quality.

Studies on recent local and regional harvest operations show that when dispersed machinery operation is allowed, even with tracked harvester equipment, excessive soil damage may occur (Shovic, 1999). This has been verified by more recent data for low-ground pressure equipment (Shovic, 2006; Han, et. al., 2006). However, more recent data has shown that with skidding limited to trails, use of feller/bunchers off trail has not caused excessive soil damage (Svoboda, et. al., 2007). Furthermore, this soil protection was achieved without the use of restoration practices (skid trail ripping and temporary road re-contouring). These results are achieved only when harvest occurs when the soil is dry. Other recent literature supports this (Han, et. al., 2006). Hence the Gallatin BMP has dry soils as a pre-requisite for harvest.

The Basin study (Svoboda, et. al., 2007) showed that a100 foot spacing for skid trails is effective as a component of their soil quality BMP. Results show average detrimental disturbance is just below Regional limits. These data are recent and robust. Also, the 100 foot spacing was used on a recent Gallatin timber sale, (Shovic, 2006) showing it is practical to apply. Hence the Gallatin BMP now uses this spacing. This spacing may change as more research and monitoring is accumulated and analyzed, but it is the best estimated based on recent, relatively local data.

The Gallatin BMP specifies concentrating skidding on trails of 100 foot spacing. It specifies feller/bunchers can leave trails when necessary to access timber. Finally, soils must be dry when harvest occurs. Use of the BMP as described below has been shown to provide adequate soil protection and meet Soil Quality Standards (Shovic, 2006; Svoboda, et. al., 2007).

Restoration Practices

Restoration will consist of re-contouring temporary roads and ripping skid trails where indicated.

These methods have been shown to be qualitatively effective at mitigating detrimental disturbance (Svoboda, et. al., 2007). They are only specified where net detrimental disturbance is over standards. Re-contouring will help to restore the soil profile, increase infiltration, and reduce erosion. It is a common restoration/reclamation method in the West (Reith and Potter, 1986).

Restoration effectiveness is not quantified here, because no local research exists. However, this degree of restoration is considered effective at reducing detrimental soil conditions and is used as an indication that the Regional Soil Quality Standards are met for this analysis. This is based on the professional judgement of the soil scientist and literature (Svoboda, et., al., 2007; Reith and Potter, 1986).

Re-contouring means pulling up the fill slope to approximate the pre-existing contour of the landscape. Where possible, existing topsoil shall be spread on the surface. Ripping skid trails can be accomplished with a tractor. Ripping should be more than 4 inches deep across the entire width of the skid trail

Effects of Fire

Prescribed burning is specified in all action alternatives (Units 13, 18, and 30). Effects of burning are not different between alternatives. Literature shows that prescribed fire often causes little change in soils. This is because of the low heating levels and retention of most ground cover (Debano, et. al, 1998, page 181). Local reviews support this conclusion (Story, 2006). To verify the above predictions and estimated effects, and to provide information for future work, monitoring should be undertaken on a representative sample of burn units.

Wildfire is a component of the lodgepole pine ecosystem (of which the Lonesome Wood project is a part). Though fires burn with high intensity (Debano, 1998, page 4), they generally do not have high severity (severe effects on soil), especially in local environments (Shovic, Ed., 2006). Local effects may be severe, in terms of erosion and flooding, but since soils have developed in these fire environments over thousands of years, no cumulative effects of wildfire on soils is likely.

Direct and Indirect Effect of Alternative 1 (No Action Alternative)

No ground-disturbing harvest operations are specified in the No Action Alternative, so there will be no direct effects of this alternative.

There are no indirect effects nor are there cumulative effects other than a very slow recovery of previously-harvested areas. Wildfires will continue to burn through the area, as is common in lodgepole pine ecosystems. Soils have developed under this fire regime and no significant changes are likely due to the absence of fuels removal.

Direct, Indirect and Cumulative Effects of Alternative 2

The indicator used in disclosing the direct effects is adherence to the Soil Quality Standards. These standards specify no more than 15% total detrimental disturbance in any unit. This only applies to areas having no previous harvest. All units having no detrimental effects of previous harvest (Units 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 14, 15, 17, 20, 23, 25, 26, 27, 29, 31, and 32) meet the standard, when the Soil Protection BMP is used and temporary roads are restored. There is a

total of 6.2 miles of restoration including temporary road restoration and reconstructed existing project roads. Disturbance associated with the old project roads is reflected in previous disturbance estimates. See Shovic (2007) for details.

Wildfires will continue to burn through the area, as is common in lodgepole pine ecosystems. Soils have developed under this fire regime and no significant changes are likely due to fuels removal, so no indirect effects are likely.

The indicator used in disclosing cumulative effects is adherence to the Soil Quality Standards. These standards specify no more than 15% total detrimental disturbance from the proposed action in areas having previous harvest. In terms of cumulative effects, previous detrimental disturbance must be mitigated by restoration within the Activity Area.

All units having previous harvest (Units 9, 10, 16, 19, 21, 22 and 24) have specified restoration for a total of 111 acres of harvest unit restoration (ripping skid trails). Restoration qualitatively mitigates previous treatment effects on soil productivity for those units. Hence, these units meet the Standard when the Soil Protection BMP is used and specified restoration is carried out. Therefore these unit proposals have no significant cumulative effects to soil productivity. See Shovic (2007) for details.

This alternative is consistent with the Soil Quality Standards as applied to cumulative effects and to the Forest Plan in terms of protecting soil productivity.

Direct, Indirect and Cumulative Effects of Alternative 3

The indicator used in disclosing the direct effects is adherence to the Soil Quality Standards. These standards specify no more than 15% total detrimental disturbance in any unit. This only applies to areas having no previous harvest. All units having no detrimental effects of previous harvest (Units 1, 2, 5, 6, 7, 11, 14, 15, 17, 20, 23, 25, 26, 27, 29, 30a, 31, and 32) meet the standard, when the Soil Protection BMP is used and temporary roads are restored. There is a total of 4.7 miles of road to be restored, including old project roads and temporary roads. See Shovic (2007) for details.

Wildfires will continue to burn through the area, as is common in lodgepole pine ecosystems. Soils have developed under this fire regime and no significant changes are likely due to fuels removal, so no indirect effects are likely.

The indicator used in disclosing cumulative effects is adherence to the Soil Quality Standards. These standards specify no more than 15% total detrimental disturbance from the proposed action in areas having previous harvest. In terms of cumulative effects, previous detrimental disturbance must be mitigated by restoration within the Activity Area.

All units having detrimental effects from previous harvest (Units 9, 10, 16, 19, 21, 22, and 24) have specified restoration for a total of 111acres of treatment unit restoration (skid trail ripping). Restoration qualitatively mitigates previous treatment effects on soil productivity for those units. Hence, these units meet the Standard when the Soil Protection BMP is used and specified restoration is carried out. Therefore these unit proposals have no significant cumulative effects to soil productivity. See Shovic (2007) for details.

This alternative is consistent with the Soil Quality Standards as applied to cumulative effects and

to the Forest Plan in terms of protecting soil productivity.

Conclusion: With the specified mitigation there are no direct or cumulative effects to soil productivity for any Alternative. There are no significant differences between alternatives for prescribed burning.

Transportation/Roads Analysis Process (Kempff 2007, Queen 2007)

Several existing National Forest System and County roads will be used as part of this project for access and hauling and are referenced on project maps. Special considerations on specific roads are listed individually below. If not individually listed below, the normal standard of safety, maintenance, and protection applies.

No additional road improvements to the current National Forest Road System have been identified for this project as necessary for public or contractor safety, project economy, or resource protection. If the project implementation uses a stewardship contract, some improvements may be considered, such as replacing culverts for aquatic passage objectives, improved drainage, additional surfacing, etc.

Roads to be constructed will be temporary, used for the life of this project, then restored back to the adjacent land management objectives. These temporary roads will not be a part of the permanent National Forest System of Roads. Temporary roads are constructed to meet minimal objectives for safe vehicle travel by contractor and Forest Service vehicles while protecting adjacent resources. Public motorized vehicle use will be prohibited on these routes.

Road maintenance commensurate with this project's use will either be performed by the contractor or by the Forest Service using collected funds from this project. Maintenance of the roads commensurate with use by the public will be the responsibility of the Forest Service using appropriated or other funds. Road maintenance is performed to keep roads in safe operating condition, preserve road surfaces, and keeping drainage structures operating properly.

Decisions related to the road system were informed by a Roads Analysis completed for this project. The Roads Analysis is in the Project Record (Queen 2007).

West Denny County Road

The West Denny road from the junction with Highway 191 to milepost 3.0 is under Gallatin County jurisdiction. Beyond milepost 3.0 the road falls under the jurisdiction of the Forest Service. Some concern has been expressed regarding durability of the first 3.0 miles of the road. In 1999 Gallatin County paved the first 1.5 miles of the road with "cuttings" from Highway 20 repaving project. In 2005, the County paved the balance of their jurisdiction to milepost 3.0 with additional cuttings. Historically, paving with cuttings does not provide a pavement lifecycle equal to a fresh hot-mix paving. Weak areas can be common and pot-holing typically follows and becomes a longterm maintenance issue. User expectations of these paved roads generally tends to be unrealistically high. Judging from the visual performance of the pavement placed in 1999, the County has done a good job of placing and maintaining the pavement.

The Forest Service has no management authority over county roads. The Forest may enter into a shared maintenance agreement with a county if both parties receive equal value for work performed. The Forest may also improve a county road if the Forest and County agree that the

road required for National Forest management is greater than the County requires for it's needs. If this were the case, the Forest may only pay for the "additional" standard. The Forest would need no greater standard, therefore we have no authorization to spend either appropriated nor Fuels Project funds on this portion the County road.

As a cooperative road partner with the County, it is important that Forest at least notify the County of the project use of the road. The Gallatin County Commissioners and Planning Board recieve the quarterly Project Listing from the Forest. All counties, including Gallatin, eventually recover funds to maintain roads from projects such as Lonesome Wood under the Payment to States Program.

Hebgen Lake Road #167

Safety concerns have been raised regarding additional logging and logging related traffic put on the Hebgen Lake Road because of this project. The Hebgen Lake Road was designed and constructed as a major collector road capable of safely handling mixed commercial, public, and administrative traffic during the summer, fall, and winter months (three season road). Alignments, widths, surfacing, turnouts, and signing all factored into this design.

The Forest has assessed the need for a posted speed limit on the Hebgen Lake Road. The initial findings of the assessment determined that the need for a posted speed limit is reasonable. The Forest will further evaluate this initial finding in consultation with Law Enforcement to determine if posting will be accomplished prior to implementation of this project.

Irrespective of any decision on posted speeds for all users, the project should limit the log trucks and logging related traffic to 25 mph from end of the County road (MP 3.0) to Spring Creek CG (MP 8.8) and 15 mph from Spring Creek to Trapper Creek Road (MP 11.6).(EA 2.4.3) This is for traffic safety and preservation of the aggregate surface by reducing dusting and aggregate seggregation around curves.

Water Quality (Story 2007a)

Proposed fuel treatments along with the cumulative effects of existing roads and recreation and private land development could have an adverse effect of water quality by potentially introducing additional sediment to Hegben Reservoir tributaries.

Scale of Analysis: The geographic and temporal scale of water quality analysis consists of cumulative sediment modeling of all National Forest and private lands, roads, and recreational developments. The R1R4 model was used for sediment analysis for all activities from 1980 to 2015 at an accounting point of primary streams within the analysis area including Trapper Creek, Watkins Creek, Rumbaugh Creek, and Cherry Creek at the Hegben Lake inlet and West Denny Creek at the Forest boundary.

Affected Environment

The Lonesome Wood project area is located in the southern part of the Madison Range west of Hegben Reservoir. All of the drainages are tributary to Hegben Reservoir and provide important spawning habitat to the Reservoir. Watershed size (at the Reservoir inlet) include Trapper Creek 10.9 mi^2, Watkins Creek 11.1 mi^2, Cherry Creek 2.1 mi^2, Rumbaugh Creek 2.2 mi^2, and West Denny Creek (Forest boundary) 7.2 mi^2. The analysis area is located in primarily Tertiary

extrusive volcanic although an area of Belt series Precambrian granite/gneiss occurs in the West Denny drainage. Average annual precipitation in the analysis area varies from about 25 - 40 inches and runoff about 0.8 to 1.5 acre-feet/acre's Rainfall intensity includes moderately high storm intensities with the 2 yr-6hr storm at around 0.9 inches and the 10 year-6hr storm at 1.3 inches.

All of the streams in the assessment are designated by the Montana DEQ as B1 water quality streams. Watkins Creek is listed on the 2006 Montana DEQ 303d list http://www.deq.mt.gov/CWAIC/default.aspx as an impaired stream segment (7.1 miles from the headwaters to Hegben Reservoir). The impairment is listed as siltation, dewatering, bank erosion, riparian degradation, flow and other habitat alteration due to grazing, silviculture, natural sources, and agriculture. Watkins Creek is listed as fully meeting agricultural, drinking water, and industrial beneficial use support but only partially meeting aquatic and coldwater fishery and swimming.

The Lonesome Wood project area is drained area with only a few localized areas which would be considered wetlands. These wetlands consist of three types: (1) lakes, (2) seeps and springs, and (3) streamside areas. A few small bogs in the area are classified as palustrine emergent wetlands. The seeps, springs, and streamside areas are classified as riverine, upper perennial wetlands (Cowardin, 1979). The seeps and springs are perennially saturated, while most of the streamside areas are only seasonally saturated (usually during snowmelt runoff). These areas would be avoided in any ground disturbing activities in the Lonesome Wood project. Spring sources in some of the treatment units serve private and Recreation Residences in Clarks Springs, Rumbaugh, Cozy Corners, and Lonesomehurst. The area within 100' of the spring source areas would be avoided in any ground disturbing activities (skidding or harvesting) to protect these domestic water supply source areas. In addition no surface disturbance would be allowed within 25' of pipelines and water distributions systems.

Additional spring sources used by wildlife have been identified in the Rumbaugh, Cozy Corners, and Romsett areas, and the area within 50' of these springs would be avoided in ground disturbing activities.

The Upper Madison TMDL, which includes all of the Hegben Risk Assessment area, is currently being developed by the Montana DEQ and scheduled for completion in the 2008 -2012 time period http://www.deq.mt.gov/wqinfo/TMDL/TMDLSchedule2006.pdf

Sediment standards for streams in the Lonesome Wood area are listed in the Gallatin NF Travel Plan Standard M-1 for Water, Fisheries, and Aquatic Life**.** Trapper Creek, Watkins Creek, West Denny Creek, and the South Fork of the Madison River are Category A streams (sediment levels of 30% reference) due to spawning habitat for Hegben Reservoir. Rumbaugh Creek and Cherry Creek are Category C streams (sediment levels of 50% of reference).

Methodology For Analysis

Potential effects of the Lonesome Wood Vegetation Management Project were analyzed by an assessment of potential sediment yield from prescribed burn projects and evaluation of low severity spring burns on the Gallatin NF. The effects of mechanical fuel reduction and temporary roads were also evaluated based on sediment modeling and observations of fuel reduction techniques and results on the Gallatin NF. Sediment yield levels for each alternative

were evaluated using the R1R4 sediment model (Cline et.al., 1981) and adjusting sediment coefficients based on existing road and timber harvest unit conditions. Baseline sediment yield coefficients are based on sediment monitoring data on the Gallatin National Forest from 1970 to 2006. The sediment model was run in a cumulative fashion accounting for all existing roads, timber harvesting, and residential, and recreational developments in the tributary watersheds to Hegben Reservoir. West Denny Creek was modeled to the Forest Boundary. The R1R4 model used in the sediment analysis is designed to address the cumulative effects of timber harvest operations, road construction, and fire. The model does not attempt to analyze the effects of grazing and mining activities (other than vegetation removal and road construction) or individual episodic storm events. The model is designed to compare relative differences among alternatives rather than to predict precise sediment and water yields that are likely to occur upon project implementation. Because the R1R4 model relies on climatic conditions averaged over long periods, the models' accuracy is best when averaged over several years. The model is less reflective of individual drought or flood years. The R1/R4 sediment model focuses on slope processes and estimates the water and sediment delivered to the main channel by forest management within the watershed, including the headwater stream channels. However, the routing of sediment and water through the main channel is limited to broadly based regional curves as no main channel hydrologic or hydraulic processes are modeled directly.

Direct, Indirect and Cumulative Effects of Alternative 1 (No Action Alternative)

For all of the drainages in the Lonesome Wood Vegetation Management Project area, sediment levels would not be increased due to fuel treatments. All drainages would meet the Category A 30% over reference sediment standard although Rumbaugh and Cherry Creeks are Category C streams (50% over reference). Wildfire in the Lonesome Wood Vegetation Management Project has the potential to result in extensive impacts to soil erosion, debris flows, and sediment loadings to Hegben Reservoir tributaries. The Hegben Risk Assessment Analysis (USFS, 2005) used a combination of SIMPPLEE and R1R4 modeling to estimate decadal average wildfire potential sediment increase to 19% over natural for Trapper Creek, 12% over natural for Watkins Creek, and 29% over natural for West Denny Creek. An analysis of a hypothetical wildfire (1/3 high burn intensity, 1/3 moderate burn intensity, and 1/3 low burn intensity) resulted in a R1R4 model estimate of 59% over natural first year sediment yield increase in Trapper Creek, 49% over natural in Watkins, Creek, and 90% over natural in West Denny Creek. A moderate to large size wildfire would also have potential for large short term increases in nutrients. The no action alternative would forgo the fuels management opportunity to reduce the likelihood of extensive water quality impacts from a large wildfire in the Lonesome Wood Vegetation Management Project area.

The R1R4 sediment modeling was run for Alternative 1 in a cumulative mode accounting for all existing roads, timber harvesting, and residential, and recreational developments in the project area to Hegben Reservoir. Timeframe for the cumulative effects analysis is 1980 to 2015. Overall sediment impacts of Alternative 1 would not change unless sediment is increased by wildfires. Since effects are insignificant, no cumulative impacts with other sediment or nutrient impacting activities in the Lonesome Lonesome Wood Vegetation Management Project area would occur.

Direct, Indirect and Cumulative Effects of Alternative 2 (Proposed Action Alternative)

The Lonesome Wood Vegetation Management Project includes thinning or prescribed burn treatments on about 3,200 acres in the Lonesome Wood Vegetation Management Project area. The main potential for increase sediment occurs in units 1, 4, 5, 7, 9, 11, 12, 14, 17, 20, 21, 23, 26, 29, 31, and 32 where ground based harvesting equipment would be used in the thinning treatments. Hand thinning has very limited potential to increase sediment due to minimal ground disturbance. Pile burns typically consume the duff and upper soil horizon more deeply than understory burns and take longer for re-vegetation. However, the piles are surrounded by unburned areas, which act to contain erosion to the area of the pile. Spring rains in the proposed treatment areas are typically frontal storms of low intensity as opposed to summer storms which although usually less overall precipitation, are convective driven with cells of high intensity. Actual areas of erosion and sediment delivery within the Lonesome Wood Vegetation Management Project area expected to be minor and very localized -- primarily in areas where more intensive storms impact treated areas before revegetation occurs.

Erosion and sediment increase from the mechanized ground based treatments and timber removal could result from skid trails, log yarding, landings, and piling disturbance. These effects were evaluated for the proposed action (Alternative 2) using the R1R4 sediment model which was run in a cumulative fashion accounting for all existing roads, timber harvesting, residential, and recreational developments in Lonesome Wood Vegetation Management Project area. The model was run assuming fuel treatments understory burns, temporary road construction, and timber harvest was done in a 3 year period (2008 to 2010).

The sediment model estimates that the Lonesome Wood Vegetation Management Project area levels would be slightly elevated in Trapper and Watkins Creek and moderately elevated in Rumbaugh, Cherry, and West Denny Creeks decreased due to proposed fuel reduction treatments in Alternative 2 (Proposed action). Sediment levels are projected to peak in 2010 assuming the implementation would occur in 2008, 2009, 2010 in each drainage. Actual sediment effects would depend on implementation years. Sediment levels increases are projected to increase from 11.1% to 12.2% in Trapper Creek (increase of 1.1%), 2.4% to 2.58% in Watkins Creek (increase of 0.18%), 20% to 24% in Rumbaugh Creek (increase of 4%), 6.4% to 11.1% in Cherry Creek (increase of 7.5%), and 13.7% to 17.6% in West Denny Creek (increase of 3.9%). Sediment levels are projected to decline to or below pre-project levels by 2015. The projected sediment effects are only marginally measurable and too low to pose adverse physical or biological effects. None of the treatments are expected to have significant sediment changes. The projected sediment effects are within Gallatin Sediment guidelines for annual (30% over natural) for the Category A streams standard although Rumbaugh and Cherry Creeks are Category C streams (50% over reference).

The prescribed broadcast burns in units 13, 18, and 30 could result in localized erosion and soil displacement with associated delivery to stream channels (sediment). However, erosion and sediment from spring burns is anticipated to be very minor. Examination of several spring and fall burns on Gallatin NF broadcast burns a few months to two years after treatment during the last 13 years has documented very robust re-vegetation of grass, forbs, and shrubs. Spring burns on the Gallatin NF have usually re-vegetated usually 2-6 weeks after treatment. Implementation monitoring of Gallatin National Forest burns (Hyalite Creek Rx burn in 1994, Bozeman Creek and Squaw Creek burns in 1996, Karst Creek in 2005, and Deer Creek in 2006) have not found any evidence of sheet or rill erosion or stream sedimentation (USFS 1994, USFS 1995, USFS 2005b, USFS 2006). In general spring burns do not attain sufficient heat to result in more than

low intensity with pockets of moderate burn intensity. Fall understory burns have a greater potential for erosion since the drier duff conditions usually burn more deeply and the treated areas typically do not revegetate until the following spring. Typically, spring burns result in shallow surface combustion that leaves roots intact. Nutrient mobilization into soil and usually ample soil moisture during March-May often results in robust grass/forb regrowth and shrub resprouting.

The R1R4 sediment modeling was run for Alternative 2 in a cumulative mode accounting for all existing roads, timber harvesting, and residential, and recreational developments in the project area to Hegben Reservoir. Timeframe for the cumulative effects analysis is 1980 to 2015. Overall sediment impacts of Alternative 2 would be increased over pre-project conditions due to an increase in temporary roads, thinning, and broadcast burn treatments. Sediment impacts would result in minimal cumulative impacts with other sediment or nutrient impacting activities in the Lonesome Wood Vegetation Management Project area which is primarily the existing roads and recreational activities.

Direct, Indirect and Cumulative Effects of Alternative 3 (Mitigated Action Alternative)

Overall Alternative 3 sediment levels are slightly less than Alternative 2 due to fewer acres treated and fewer roads. The sediment model estimates that the Lonesome Wood Vegetation Management Project area levels in Alternative 3 would be slightly less than Alternative 2 in Trapper due to reduced fuel treatment acres in Alternative 2. Sediment increases in Trapper Creek in Alternative 3 are not likely since all of the treatment areas in units 16 and 17 are not connected to Watkins Creek via stream channels or overland flow routes. Sediment levels in Rumbaugh, Cherry, and West Denny Creeks are anticipated to remain the same for both Alternative 2 and 3. Sediment levels increases in Alternative 3 are projected to increase from 11.1% to 11.8% in Trapper Creek (increase of 0.7%), 20% to 24% in Rumbaugh Creek (increase of 4%), 6.4% to 11.1% in Cherry Creek (increase of 7.5%), and 13.7% to 17.6% in West Denny Creek (increase of 3.9 %). Sediment levels are projected to decline to or below pre-project levels by 2015. The projected sediment effects are only marginally measurable and too low to pose adverse physical or biological effects. None of the treatments are expected to have significant sediment changes. The projected sediment effects are within Gallatin Sediment guidelines for annual (30% over natural) for the Category A streams standard although Rumbaugh and Cherry Creeks are Category C streams (50% over reference).

The prescribed broadcast burns in units 13, 18, and 30 and associated potential sediment effects for Alternative 3 are the same as Alternative 2.

The R1R4 sediment modeling was run for Alternative 3 in a cumulative mode accounting for all existing roads, timber harvesting, and residential, and recreational developments in the project area to Hegben Reservoir. Timeframe for the cumulative effects analysis is 1980 to 2015. Overall sediment impacts of Alternative 3 would be increased over pre-project conditions (Alternative 1) due to an increase in temporary roads, thinning, and broadcast burn treatments but less than Alternative 2. Sediment impacts would result in cumulative impacts with other sediment or nutrient impacting activities in the Lonesome Wood Vegetation Management Project area which is primarily the existing roads and recreational activities.

Applicable laws, regulation, and Forest Plan Guidance

State Laws: The State of Montana Water Quality Act requires the state to protect, maintain, and improve the quality of water for a variety of beneficial uses. Section 75-5-101, MCA established water quality standards based on beneficial uses. The Montana Department of Environmental Quality has designated all non-wilderness surface waters in the project area as B1 Classification. Waters classified as B1 must be suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply. A 5 NTU turbidity increase above naturally occurring turbidity is allowed in B1 waters.

The Gallatin Forest Plan, Forest Wide Standards 10.2 (page II-23) requires that Best Management Practices (BMP's) would be used in all Forest watersheds. The Montana Forestry BMP's are included in Appendix B, which are required to be followed in all timber harvest and road construction activities. Forest Plan Direction A.5 (page II-1) requires the Gallatin NF to meet or exceed State of Montana water quality standards. The Affected Environment section lists the specific water quality sediment standards for the Gallatin NF which were revised as part of the GNF Travel Plan process.

The Lonesome Wood Vegetation Management Project area for Alternative 2 and 3 would be in compliance with the Montana Water Quality Act and Administrative Rules of Montana, WQLS/TMDL constraints, and with Gallatin NF Forest Plan direction for water quality protection. Sediment modeling indicates that project sediment changes are low-moderate and well within the Gallatin NF sediment guidelines.

Vegetation – Old Growth, Insect and Disease, Structural Diversity, Huckleberries, Wind thrown trees. (Novak 2007)

Old Growth

Approximately 5,654 acres or 43% of the forested area in compartment 710 is old growth as defined by Region 1 Guidelines (Green et. al.) and is well above the 30% standard. Compartment 709 has 21% or 2,273 acres of old growth as defined by Region 1 Guidelines (Green et.al.). Compartment 709 is below the 30% standard for old growth. However, no harvest is proposed in old growth in Compartment 709 so there would be no change to old growth. Forest structural types were queried using ArcView from the TSMRS database. Ground truthed data were used when available (203 stands in compartments 709 and 710 have been ground truthed with field exams). The Forest Plan (page III-41) requires that we strive to maintain at least 30% old growth by compartment where MA 13 exists. Presently, (as stated above) The analysis for both old growth and vegetative diversity were developed from data gathered from the Timber Stand Management Resource System (TSMRS). TSMRS stores practically all information related to individual forest stands delineated by human photo interpretation. Information such as slope, aspect, forested cover type, elevation, and activities completed (logging, precommercial thinning, stand exams, etc.) to name but a few are stored in this database. Based part on field exams and part from photo interpretation old growth and other forest successional types were identified.

Forest-wide on the Gallatin National Forest (using Forest Inventory Analysis (FIA) data) the

amount of old growth calculated is approximately 28% with a confidence interval of 24% to 32% at the .90 confidence limit. For the Madison Range alone, old growth averages (using FIA data) 30% with a range, at the .90 confidence limit, of between 25% to 36%.

Lodgepole pine old growth (code 6) for the East-side Montana zone has been observed on mostly subalpine fir habitat types. Lodgepole pine is a seral species on these habitat types. Subalpine fir old growth (code 9) for the east side of Montana is the climax species on these subalpine fir types, while whitebark pine old growth (code 11) for eastern Montana is found on mostly subalpine habitats where whitebark pine is a seral coniferous species. Douglas-fir old growth (code 2) is a climax species on Douglas-fir habitat types and a seral species on subalpine fir and whitebark pine habitat types. Lodgepole pine old growth is found at all elevations and aspects and has had a natural fire frequency that ranged from thinning fires on a 35 to 40 year frequency to stand replacing fires spaced around 150 to 200 years. Without periodic disturbances like fire, subalpine fir will eventually dominate. Subalpine fir old growth is found at most elevations and aspects and also has had a natural fire frequency that ranged from thinning fires on a 35 to 40 year frequency to stand replacing fires spaced around 150 to 200 years. Without periodic disturbances like fire, subalpine fir will eventually dominate, but where fire disturbance occurs lodgepole pine will often dominate. Whitebark pine old growth is found at the higher elevations, but on all aspects. Because of the range of fire frequency (reported from 35 to 300 years from a few trees to an entire stand), the concept of fire frequency does not apply well in these upper elevation stands (Fisher and Clayton, 1983). On these higher elevation sites whitebark pine will eventually be overgrown by subalpine fire if no fire disturbances occur. On Douglas-fir sites (types found within this analysis area), historic fire frequency ranged from 35 to 45 years and with or without fire will continue to dominate sites at the lower elevations. On the more cool, moist habitat types (subalpine fir and whitebark pine), Douglas-fir will grow in an area for a shorter period than on the climax sites. Eventually, without disturbance, the more shade tolerant species will dominant.

Lodgepole pine old growth is defined as stands with the following minimum characteristics:
12 trees per acre 10 inches DBH or more,
large trees 150 year old or more,
basal area 50 square feet per acre or more,

Subalpine fir old growth is defined as stands with the following minimum characteristics:
10 trees per acre 13 inches DBH or more,
large trees 160 year old or more,
basal area 60 square feet per acre or more

Whitebark pine old growth is defined as stands with the following minimum characteristics:
11 trees per acre 13 inches DBH or more,
large trees 150 year old or more,
basal area 60 square feet per acre or more

Douglas-fir old growth is defined as stands with the following minimum characteristics:
5 trees per acre 19 inches DBH or more,
large trees 200 year old or more,
basal area 60 square feet per acre or more

For alternative 2 in timber compartment 709, no old growth would be thinned. In 710 around

495 acres of old growth stands or likely old growth stands are planned for thinning as per the prescribed silvicultural prescription described in Chapter 2. These planned thins would reduce old growth by 4% in compartment 710. In compartment 710, after thinning around 495 acres in old growth forest, the percent old growth will be approximately 39% (from the current 43%). This amount is well above the forest plan standard of 30%.

For alternative 3 in timber compartment 709, no acres of old growth would be thinned. In 710 around 232 acres of old growth stands or likely old growth stands are planned for thinning as per the prescribed silvicultural prescription described above. In compartment 710, after thinning, the percent old growth will be approximately 41% (from the current 43%). These amounts are well above the forest standard of 30%.

Conclusion: These alternatives would have no effect on old growth habitat in Compartment 709 and old growth habitat in 710 would remain well above the Plan standard at 39%. Based on this conclusion these Alternatives comply with Forest Plan direction.

Insects & Disease

The mountain pine beetle, which attacks all western pine species, is the most aggressive, persistent, and destructive bark beetle in the United States. Mountain pine beetle outbreaks typically occur in mature to overmature forests. Long-term (preventative) forest management is the best strategy to keep beetle populations at endemic levels. Lodgepole pine become suitable hosts for the beetle when trees are greater than 8 inches in diameter and average 80 or more years old (Amman 1978, Safranyik, 1976). Susceptibility increases with diameter and basal area per acre (Amman 1978). Thinning overstocked, mature and overmature lodgepole pine stands to near 80 square feet of basal area per acre can greatly reduce beetle-caused mortality (USDA 1994).

Mountain pine beetle infestation in the Lonesomewood area (compartments 709 and 710) are experiencing a light attack of mountain pine beetle to the older, larger lodgepole pine. Many of these larger lodgepole pine (approximately 10 to 15 per acre) have been killed within the last 5 years with scattered mortality continuing. The 2005 and 2006 Annual Aerial Detection Survey (Forest Health Protection) shows specific areas where mountain pine beetle activity is the highest. Pine beetle activity will likely continue and may increase given increasing tree stress (competition for resources due to excessively high stand densities) and continuing drought conditions.

The Douglas-fir bark beetle is the most destructive bark beetle attacking Douglas-fir in the Northern Region. Beetle populations can build up in host trees following drought, blowdown, fire, logging, severe defoliation, or in association with root disease. Beetle populations can either build in down material (greater than 8 inches diameter) and then attack surrounding green trees or attack older, larger and fairly dense stands of Douglas-fir with average ages greater than 120 years and stands with root disease or injury. Stand density reduction has been shown to be the most effective method of reducing beetle-caused mortality by reducing tree competition for moisture and exposing beetles to more cold and heat from open stand conditions (USDA 1994, Leslie E. and Bradley, T. 2001).

Douglas-fir bark beetle activity is currently at moderate levels within the project area. The 2005 and 2006 Aerial Detection Survey notes Douglas-fir mortality in small to moderate sized pockets (of 20 to 100 acres) at the lower elevations for both compartments 709 and 710. Much

of the mortality in these pockets of trees (from 30 to 50% of the trees in these pockets) is likely the result of the ongoing drought common throughout much of this part of the United States. This outbreak of Douglas-fir beetle has been occurring for the last eight to nine years in and around this area. Some years see heavier tree mortality than others (during some of those years, beetles numbers were at epidemic levels) but it appears that within the last few years Douglas-fir beetle numbers have been dropping. Future tree kills by this insect is likely to be much less than has occurred within the last decade. However, if drier and wamer conditions increase and or more wildfire occurs within the area, Douglas-fir beetle numbers will likely increase.

Commonly found within most stands of older aged lodgepole pine stands is dwarf mistletoe (Arceuthobium americanum). Dwarf mistletoe is a small, leafless, parasitic plant that is widespread throughout the Northern Region and has great impacts on these forests. These plants are native to forests throughout the western United States, but human influences such as partial cutting and fire exclusion have served to increase the intensification, spread and severity of dwarf mistletoe. Dwarf mistletoe takes most of their carbohydrates and all of their water and minerals directly from the host tree. This plant can at times greatly reduce both height and diameter growth rates, weaken trees to make them more susceptible to attack by secondary insects (for example Ips beetles) and on occasion kill trees directly and create greater fire hazards to an area because of heavy brooms found in heavily infected trees (USDA 1994). Hawksworth's Dwarf mistletoe infection rates for the Lonesome Wood area range from 3 to 6 throughout most older lodgepole pine stands (with 6 being extreme infection). Unless most to all older infected overstory trees are removed, infection rates will most assuredly increase over the coming years.

The western balsam bark beetle is the most common insect that accounts for a high amount of tree mortality in subalpine fir stands throughout the Northern Region. Usually, populations of this beetle maintain themselves by feeding on weakened trees (old age, root disease, storm damage, slash) (USDA, 1994). During periods of drought or other environmental stresses, infestations can build and spread to less susceptible stands. Mortality from this beetle occurs as larvae continues to feed on the phloem and over time this constant feeding girdles the trees enough to weaken and kill.The 2005 and 2006 Annual Aerial Detection Survey shows the ongoing mortality to subalpine fir from the western balsam bark beetle occurring throughout the higher elevations where subalpine fir stands grow. Ranging from 10 to 40 trees per pocket killed, this insect is likely to keep on killing subalpine fir trees as long as warmer temperatures and or drier conditions continue. This level of mortality is considered light in scope and because of the high elevations and sensitivity of these sites, damage control in reducing mortality from this insect will seldom be impossible.

Based on SIMMPLLE model runs, the majority of future insect attacks will likely occur in lodgepole pine and some whitebark pine by the mountain pine beetle. Lesser acres will likely be affected by Douglas-fir beetle (in mostly pure Douglas-fir forest stands) and western spruce budworm (in mostly Douglas-fir forest types). However, based on current conditions, the acres being affected by Douglas-fir beetle and western spruce budworm over the next 10 years may be much higher than the modeled numbers suggest. Two common diseases, dwarf mistletoe and Schweinitii root rot, can also be expected to increase as more and more stands of forest continue to age. Both of these diseases depend on older forest types to grow and spread. Dwarf mistletoe is found in most mature lodgepole pine stands and Schweinitii root rot is found in many mature and older forest stands of Douglas fir.

Action Alternatives 2 and 3

Thinning activities under the Proposed Actions would open up the existing stands and reduce slightly inter-tree competition for resources. With more resources available, individual tree stress will decrease and tree health/vigor will increase. The amount of increased vigor will be dictated by the actual residual density around individual trees and future moisture availability. Improved tree vigor will reduce tree susceptibility to bark beetle attacks since trees will be better able to pitch-out or wall-off beetles. Thinning activities will also capture recent or potential tree mortality.

Reducing stand densities to around 80 square feet of basal area per acre will in lodgepole pine stands and to around 100 square feet of basal area per acre for Douglas-fir tree stands will improve vigor and increase resistance to mountain pine beetle and Douglas-fir beetle attacks (Gibson, per. comm.). Even in areas where the basal area is below 80 to 100 square feet of basal area per acre some reduction and increased resistance to mountain pine beetle attack will occur. Additionally, although tree diameters will be within the susceptible size classes, reduced competition and improved vigor will increase the probability that individual trees can pitch-out or wall-off bark beetles to prevent mortality.

Douglas-fir beetle populations, however, could increase to low and moderate levels within the treatment units that are burned (depending on the level of fire damage to live trees). Weakened trees from fire damage will attract Douglas fir beetles and depending on the amount of damage, determine the number of beetles that can kill. The burn plan is designed to keep fire damage to as low a level as possible. This means that flame lengths and time of year to burn will be conducted so as to minimize damage to larger trees.

Structural Diversity.

Because of the nature of the prescribed thins, the overall size class for each treated forest stand will remain the same. In other words, if the stand was a pole stand before treatment, it will remain so after treatment. The structure/size class changes are entirely the result of forest succession and sporadic unplanned ("natural") insect and fire disturbances.

The project scope was defined to allow treatment of areas immediately adjacent to the wildland urban interface and evacuation route. Within the scope of this project there is very little opportunity to affect notable change to structural diversity. However, where small areas within the larger thinning units are treated to create younger aged forest, this project would ever so slightly begin to move the area closer to the prescribed distribution (FP p. 2-20) which is consistent with the Forest Plan direction.. The current distribution reflects very high levels of mature and older forest and relatively low levels of seedling, sapling and pole size trees. (Novak 2007)

Mechanized logging and damage to huckleberries.

In general, there is a reported negative response to various huckleberry plant species from mechanical disturbance. However, plant response varies by treatment. For the Lonesome Wood project, soil disturbance would be minimized through application of Soil best management practices (Appendix B and EA, 2.4.3). As a result, direct disturbance to established plants would be minimized.

Research specific to vaccinium globulare (common huckleberry) in subalpine fir and lodgepole pine habitats similar to the project area are scarce. Research relative to grouse whortleberry or vaccinium scopularum, also common in the Area, is more available but not abundant Following thinning in lodgepole pine forests of Colorado, grouse whortleberry cover declined the 1st year but then increased consistently. Pretreatment levels were regained with 5 years. (Crouch , 1986) In response to overstory removal, berry production increases for Vaccinium membranaceum (big huckleberry), with population numbers increasing slowly. (Coates 1986) Light fires may favor dwarf huckleberry (Vaccinium caespatosum) by reducing competitors, increasing nutrient availability, and opening the canopy so that greater amounts of light reaches low shrubs. Reestablishment is rapid where rhizomes are capable of resprouting. Postfire cover can greatly exceed preburn levels. (Foster 1985) In parts of the central Rockies, light fires in high elevation spruce-fir forests create a ground cover made up primarily of dwarf huckleberry and a "few hardy herbaceous ... relics". (Langenheim, 1962)

After thinning is complete in the areas around Rumbaugh and Moonlight Bay the huckleberries (Vaccinium globulare) would likely be damaged at light to moderate levels. This means within three to five years, the huckleberry shrubs could be damaged enough to reduce berry production. With a decrease in forest canopy cover and an assumed low level of ground disturbance, huckleberry damage after thinning may be less than stated above because of the likely positive response to increased sunlight.

Opening stands in lodgepole pine may cause windthrow. This is always a concern where older stands of lodgepole pine exist. However, there are many examples found throughout the area where little to no windthrow has occurred in thinned mature lodgepole pine stands. The soil survey for the Gallatin Forest shows this area to have some potential for windthrow, but historically little windthrow has been seen.

Wildlife (Terrestrial)

Biological Evaluation for Sensitive Wildlife Species - Lonesome Wood Vegetation Management (Pils 2007i)

Introduction:

Sensitive species are those plant and animal species identified by the Regional Forester for which population viability is of concern. All Forest Service planned, funded, executed or permitted programs and activities are to be reviewed for possible effects on sensitive species (FSM 2672.4). This report analyzes the potential effects of the alternatives on sensitive wildlife species.

I. Grizzly Bear

Issue: Grizzly bears are known to be sensitive to the effects of human activities. The project would involve temporary increases in motorized access values within occupied grizzly bear habitat, and may therefore increase the potential for displacement of bears from important habitat and increase risk of grizzly bear mortality. Other activities associated with fuels treatments also have the potential to displace bears.

Discussion: The Yellowstone grizzly bear population is increasing both in number ((Interagency Grizzly Bear Committee 2003, page 36) and distribution (Schwartz et al. 2002), and has met

demographic criteria for recovery since 1998 ((Interagency Grizzly Bear Committee 2003, page 39). As a result, grizzly bears in the Yellowstone Ecosystem were removed from the threatened species list in 2007 and they are now listed as a Forest Service sensitive species on the Gallatin National Forest. Sensitive species are those identified by the Regional Forester for which population viability is a concern, and proposed Forest Service programs or activities are to be reviewed to determine how an action will affect sensitive species (Forest Service Manual 2670.32). Additionally, the grizzly bear is listed as a Management Indicator Species (MIS). MIS are those species whose habitat is most likely to be affected by Forest management activities, and will be monitored to determine population change (USDA Forest Service 1987, page II-18).
The project area is within the Primary Conservation Area, or what was known prior to delisting as the Grizzly Bear Recovery Zone. The project area and adjacent lands provide suitable habitat for grizzly bears. No estimates are available for the number of grizzly bears using the project area, but they are known to regularly occur there.

Motorized Access
Grizzly bears are known to be sensitive to the effects of human access, especially motorized uses. A number of studies addressed the effects of roads on grizzly bears and, to various degrees, universally showed negative impacts (Claar et al. 1999, pages 7.24-7.25). The most common theme seems to be that motorized routes generally displace bears, and they use the habitat adjacent to motorized routes less than areas farther from these routes. Results vary somewhat with habitat quality, cover availability, traffic volume, season and some other variables. In addition to displacement from habitat by motorized routes, Mace et al (1996) found a relationship between mortality of grizzlies and human activities. From 1988-94, humans killed eight marked grizzly bears in the study area. These deaths were directly influenced by road access through illegal killing and through management removal of bears conditioned to human foods in developed areas.

For these reasons, management of motorized access has long been an emphasis for grizzly bear recovery. The primary focus of access management currently involves providing adequate secure (or core) habitat. Secure habitat is defined as any area >500 meters from an open or restricted (i.e. gated or administrative) motorized access route during the non-denning season and >10 acres in size (Interagency Grizzly Bear Committee 2003, page 146). The purpose of managing for secure habitat is to provide adequate area for bears to meet their biological requirements with low levels of disturbance and interaction with humans. Such areas are especially important to the survival and reproductive success of grizzly bears, especially adult females (Interagency Grizzly Bear Committee 2003, page 43).

The most current direction for access management in grizzly bear habitat on the Gallatin National Forest comes from the Forest Plan Amendment for Grizzly Bear Habitat Conservation for the Greater Yellowstone Area National Forests (USDA Forest Service 2006, pages A-2, A-3). It specifies that within each BMS in the recovery zone, there will be no decrease in secure habitat. Temporary decreases in secure habitat would be allowed, provided that: 1) only one project affecting secure habitat can occur in a subunit at any one time, 2) a project may temporarily decrease secure habitat by up to 1% of the area of the largest subunit within that Bear Management Unit, 3) secure habitat must be restored within one year of the project's completion, and 4) projects must be implemented within 3 years to qualify as temporary.

The Yellowstone Grizzly Bear Recovery Zone was divided into Bear Management Units to be used for habitat evaluation and population monitoring (USFWS 1993, page 17). Bear Management Units were further subdivided into Bear Management Subunits (BMS's). The project area lies within the Henry's Lake #2 BMS. Portions of this BMS have high densities of motorized access routes resulting from access on private lands and past timber harvest activities. As a result, the Henry's Lake #2 BMS was identified in the Grizzly Bear Conservation Strategy as a subunit needing improvement in motorized access values (Interagency Grizzly Bear Committee 2003, page 41).

The project area is characterized by an abundance of open and restricted motorized access routes, most of which were originally constructed to facilitate timber harvest but which are now used primarily for recreational and administrative uses other than timber harvest. Open and total motorized access values are both high, and secure habitat is found in only a few small, scattered pieces within the project area. The project area provides many of the elements necessary for quality habitat, but grizzly bears likely make less use of this habitat than would otherwise be expected if the effects of motorized access were not considered.

Effects of motorized access

Approximately 4 miles of temporary roads would be constructed to facilitate timber harvest under Alternative 2. None of this temporary road would be constructed within grizzly bear secure habitat, although due to the 500 meter buffer around motorized access routes (that excludes these areas from designation as secure habitat) some of the few existing pieces of secure habitat within the project area would be temporarily reduced in size by the construction and use of temporary roads for access to Units 7, 12, and 21. This would result in a very small (0.1%) reduction in the amount of core habitat available to grizzly bears in the Henry's Lake #2 BMS during project implementation under Alternative 2 (Table 1). Large pieces of secure habitat in this subunit are found on its west side and would be unaffected (Figure 1). Grizzly bear home ranges are large, and the large pieces of secure habitat on the west side of the BMS are in close enough proximity to be available for use by any bears that might be displaced by project activities over the life of the project. Additionally, secure habitat temporarily reduced by project activities would be restored within one year of completion of those activities, and implementation of project activities temporarily reducing secure habitat would last no longer than 3 years. Therefore, the project would be in compliance with Forest Plan direction for access management and temporary reductions in secure habitat.

Under alternative 3, there would be slightly fewer temporary roads constructed compared to Alternative 2 and there would be no measurable effect to secure habitat (Table 1).

Under Alternatives 2 and 3, most temporary roads would be constructed within areas where total road densities already exceeded 2 miles/mile^2, although there would be a small increase (approximately 1.0%) in the area where TMARD exceeded 2 miles/mile^2. These temporary changes would occur on the east side of the Henry' Lake #2 BMS, where grizzly bear habitat use would likely be compromised under any alternative by high levels of motorized access. Public motorized use would be restricted during the period of operation, so there would be no change in open motorized access route densities under any alternative.

Small changes in motorized access values along with related vegetation management activities under Alternatives 2 and 3 could lead to some increased potential for displacement of bears from the project area relative to the no action alternative. Most of the habitat in the project area would already be heavily affected by motorized access, and the small changes in TMARD resulting from the project under Alternatives 2 and 3 would have relatively little influence on how grizzly bears currently use the habitat in this area or grizzly bear mortality risk. Under alternative 2, secure habitat affected by project activities would be restored within one year of completion of these activities, and would not last longer than three years. Blocks of secure habitat approximately 9,600, 19,300, 860, and 450 acres in size would be available adjacent to the project area (Figure 1). Vegetation in these areas contains many similar elements as those found in the project areas such as mixed conifer forests and open meadows. Higher elevation areas within secure habitat also contain large whitebark pine stands that provide important fall food sources for grizzly bear during years of high cone production. In contrast, although scattered individual whitebark pine trees are present in the project area, there are no significant cone-producing stands because the project area is below the lower elevation limit where whitebark pine competes well with other species. Therefore, the effects of these changes in motorized access values along with other project activities would be of limited duration rather than permanent.

Habitat Alteration

The most important foods available to grizzly bears in the Greater Yellowstone Area (GYA) are meat (primarily ungulate carrion and elk calves), whitebark pine nuts, army cutworm moths, and cutthroat trout (Interagency Grizzly Bear Committee 2003, page 45-46). Conservation efforts for grizzly bears in the GYA are currently focused on the management and monitoring of these food sources, because they are so important that bear-human conflicts and bear mortality both increase during years of low availability of one or more of these sources (Interagency Grizzly Bear Committee 2003, pages 45-46). Army cuttworm moths are utilized by bears primarily in the eastern portion of the ecosystem and cutthroat trout are important primarily around Yellowstone Lake in Yellowstone National Park. Therefore, meat and whitebark pine nuts are probably the most important foods available to grizzly bears in the northwestern portion of the ecosystem, where the project area is located. There are no whitebark pine stands located within any treatment unit because the elevation is too low. Therefore, there will be no effect to this food source. Elk are the most abundant ungulate in the project area. The project is not expected to appreciably affect availability of elk under any alternative (see specialist report on elk habitat).

Despite the importance of meat and whitebark pine, grizzly bears are an omniverous species that also utilize a wide variety of plants. Riparian vegetation and plant roots are of lower forage value than ungulate meat or whitebark pine nuts but are also utilized by grizzly bears throughout the spring, summer, and fall because they are widely available. Some increased grass, forb and shrub production may occur under Alternatives 2 and 3 in areas where the forest canopy is opened, although many stands may not be opened enough to stimulate growth of palatable forage plants given the amount of thinning proposed. Berry bushes also provide a seasonal food source as well. Huckleberries, buffalo berries,

choke cherries, and others are found in the project area and are known to be utilized by bears. While project activities may damage some individual bushes, the thinning proposed under Alternatives 2 and 3 would be expected to favor these species by opening the canopy. Overall effects on grizzly bear forage under Alternatives 2 and 3 are expected to be slightly beneficial.

Summary: All alternatives would be in compliance with all Forest Plan direction for grizzly bear habitat, including motorized access management. The effects of Alternatives 2 and 3 on grizzly bear mortality risk and habitat displacement are expected to be very limited. Small increases in grizzly bear forage could result from vegetation treatments proposed under Alternatives 2 and 3. Therefore, this issue can be dismissed due to minor effect and effective mitigation/design features (EA Chapter 2.4.3).

Table 1. Motorized access values in the Henry's Lake BMS under the no action alternative along with alternatives 2 and 3. OMARD values were not shown because they did not change among alternatives.

Alternative	Secure	TMARD (> 2 mile/mile^2)
No Action	45.7%	28.3%
Alternative 2	45.6%	29.1%
Alternative 3	45.7%	29.1%

II. Bald Eagle

Issue: Bald eagles may be affected by a variety of human activities that cause disturbance or alter habitat. Responses to such activities can range from abandonment of nest sites to temporary avoidance of human activities. Timber harvest, mechanical thinning and prescribed burning are activities capable of causing disturbance to bald eagles in nesting areas.

Discussion: Bald eagle populations in the United States have increased substantially over the past several decades. As a result, bald eagles were removed from the list of threatened species earlier in 2007 and are now protected by the Bald and Golden Eagle Protection Act. "Take" of bald eagles is prohibited under this act, which defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb." The definition of disturb was to "agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior (U.S. Fish & Wildlife Service 2007, page 2)."

Additionally, the bald eagle is listed as a Forest Service sensitive species and a management indicator species (MIS). Sensitive species are those identified by the Regional Forester for which population viability is a concern , and proposed Forest Service programs or activities are to be reviewed to determine how an action will affect sensitive species (Forest Service Manual 2670.32). MIS are those species whose habitat is most likely to be affected by Forest management activities, and will be monitored to determine population change (USDA Forest Service 1987, page II-18).

Bald eagles in Montana have mirrored the national increasing population trend. Only 12 breeding areas were known in Montana during 1978 (Montana Bald Eagle Working Group 1994, page 6), while in 2006 there were nearly 400 known territories across the state. The Forest Service has monitored breeding bald eagles on Hebgen and Earthquake Lakes for many years. The number of known territories associated with these lakes has increased from one in 1977 to eight in 2006 (USDA Forest Service, unpublished data).

In Montana, nest sites are generally distributed around the periphery of lakes and reservoirs $\geq$ 80 acres (32.4 ha) in surface area as well as in forested corridors within one mile (1.6 km) of major rivers (MTBEWG 1994, page 2). Nests are most commonly constructed in multi-layered, mature or old- growth stands containing large diameter trees of a variety of species including Douglas-fir (*Pseudotsuga menziesii*) and spruce (*Picea spp.*). Bald eagles are opportunist feeders and will prey on fishes, waterfowl, lagomorphs and some ground dwelling mammals, as well as ungulate carrion. In the Hebgen Lake area, fish made up the majority of prey items observed obtained by breeding pairs (Stangl 1994, page 73). An available prey base may be the most important factor determining the nesting habitat suitability (MTBEWG 1994, page 2), the nesting density (MTBEWG 1994, page 2) and the productivity (MTBEWG 1994, page 2) of bald eagles. Ungulate carrion is a major winter food source. The combination of a forested lakeshore with suitable nesting trees and a robust supply of prey (fish and waterfowl) make Hebgen Lake highly suitable for bald eagle breeding.

There is one known bald eagle territory within the project area. The Moonlight territory is located along the lakeshore in the north end of the project area. This territory was first detected in 1990 (Stangl 2000), and has been monitored annually since then. Productivity of this territory has been among the highest of the 8 territories monitored on Hebgen Lake, with successful chick production during 15 of 17 years (USDA Forest Service, unpublished data) despite close exposure to high levels of recreational activity on Hebgen Lake during the summer months. However, in 2007 this territory was not active and it is unknown whether they did not nest, or if they built a new nest in some other location. Efforts to locate a potential alternative nest during the summer of 2007 were made in the vicinity but none were located.

Disturbance from human activities: Bald eagles may be affected by a variety of recreational, research, resource, and urban development activities (MTBEWG 1994, page 4). Responses of eagles may range from abandonment of nest sites to temporary avoidance (temporal and spatial) of human activities. Responses may also vary depending on type, intensity, duration, timing, predictability and location of human activities. Individual pairs may respond differently to human disturbances in that some bald eagles are more tolerant than others (MTBEWG 1994, page 4).

Bald eagles may be affected by a variety of human activities that cause disturbance (Montana Bald Eagle Working Group 1994, page 4). Responses of eagles may range from abandonment of nest sites to temporary avoidance (temporal and spatial) of human activities. Responses may also vary depending on type, intensity, duration, timing, predictability and location of human activities. Individual pairs may respond differently to human disturbances because some bald eagles are more tolerant than others (Montana Bald Eagle Working Group 1994, page 4). Generally, eagles are most sensitive to human activities during the nest building, egg laying, and incubation periods, which is normally from February 1 to May 30. Human activities during this time are more likely to cause nest abandonment and reproductive failure (Montana Bald Eagle

Working Group, page 22). Once young have hatched, a breeding pair is less likely to abandon the nest. However, eagles may leave the nest due to prolonged disturbances, exposing young to predation and adverse weather conditions (Montana Bald Eagle Working Group 1994, page 4).

There are currently two sources of management direction for bald eagles. The U.S. Fish & Wildlife Service released National Bald Eagle Management Guidelines in 2007. These guidelines were prepared to help minimize the impacts of human activities on bald eagles, particularly where they may constitute disturbance as prohibited by the Bald and Golden Eagle Protection Act. The Gallatin Forest Plan (USDA Forest Service 1987, page II-19) indicates that general management direction for bald eagle habitat is provided by The Greater Yellowstone Bald Eagle Management Plan (GYBEMP). This document is more site specific and its guidelines are more restrictive of human activities than the National Guidelines. Because the Forest Plan specifically calls for their use, and because they are more site specific, these guidelines were generally used instead of the National Guidelines. The GYBEMP uses nest site management zones as one strategy to facilitate conservation of bald eagles (Greater Yellowstone Bald Eagle Working Group 1996, pages 22-24). Zone I is the area within 400 meters (1/4 mile) of an active nest where birds on the nest are likely to be especially sensitive to disturbance. The GYBEMP recommends that human activity not exceed minimal levels during the nesting season (approximately February 1-August 15), with light activity allowable during the rest of the year. Zone II is within 800 meters (1/2 mile) of the active nest and all alternate nests, and is typically heavily used for foraging and perching. The GYBEMP recommends that light human activity levels not be exceeded during the nesting season, with moderate use allowable during the rest of the year.

Although the nest stand would be outside of any treatment unit, action alternatives 2 and 3 both propose vegetation treatments in adjacent stands within zones I and II of the Moonlight territory. To minimize the potential for disturbance to nesting bald eagles, no project activities would be allowed within Zone I of the Moonlight nest (or any other active nests that might be located). This would prevent disturbance to nesting eagles in the area closest to the nest where they are most sensitive to disturbance. In Zone II of an active nest, only light activities such as sale preparation would allowed during the nesting season (February 1-August 15). Vehicle activity on the Hebgen Lake Road #167 would be exempted from these restrictions because this is an open public road which receives a high volume of use, and these eagles are apparently tolerant of vehicle activity on this road. Application of these mitigation measures would limit disturbance to nesting eagles and would be consistent with management guidelines from the GYBEMP.

Habitat alteration: Project activities could potentially alter bald eagle breeding habitat through changes in forest structure. The GYBEMP contains guidelines for habitat alteration within bald eagle territories (Greater Yellowstone Bald Eagle Working Group 1996, page 24). Within Zone I, the GYBEMP recommends restricting habitat alterations to projects that would maintain or enhance bald eagle habitat. For Zone II, habitat alterations are to be designed to insure preferred nesting and foraging habitat are not degraded. Additionally, the National Guidelines contain relevant recommendations for timber harvest and forestry work (U.S. Fish & Wildlife Service 2007, page 13). It recommends avoid clear cutting or removal of overstory trees within 330 feet of the nest at any time.

The Moonlight nest stand would be outside of any treatment unit under all alternatives. Part of unit 10 (understory thinning) and a very small part of unit 12 (commercial thinning) would be within zone I of the Moonlight nest. Portions of commercial harvest units 11, 12, and 9; 10 (understory thinning); and 13 (prescribed burning) would be within Zone II. Commercial harvest, understory thinning, and prescribed burning would all be consistent with recommendations for bald eagle nesting habitat within Zones I, II, and III. All treatments would be designed to reduce the risk of crown fire in treated stands, which would help maintain bald eagle nesting habitat components in those areas in the event of a wildfire. Currently, no harvest is planned within 330 feet of the Moonlight nest. If new nests are discovered, no removal of overstory trees would be allowed within 330 feet of the nest as recommended by the National Guidelines (U.S. Fish & Wildlife Service 2007, page 13). Surveys would be conducted during the 2008 breeding season to further determine if the Moonlight territory eagles have built a new nest away from the known nest site. If new nests are detected in treatment units, the nest tree would be protected from harvest along with enough adjacent trees to protect the nest tree from windthrow if necessary. Understory thinning would have no effect on bald eagle habitat, as the availability of nest and perch trees in the overstory is the key consideration for bald eagles and understory thinning would have no effect on this habitat component. With the implementation of the mitigation measures described above, the effects of vegetation treatments on bald eagles would be discountable.

Summary: With implementation of design features/mitigation measures in EA 2.4.3, all project alternatives would be consistent with the National Guidelines and GYBEMP recommendations. Disturbance or take of bald eagles as defined by the Bald and Golden Eagle Protection Act would not occur. Effects of the project on bald eagles are expected to be discountable, and this issue can be dismissed due to effective mitigation.

III. Trumpeter Swan (*Cygnus buccinator*)

The trumpeter swan is the largest waterfowl species in the world. Its nesting habitat includes marshes, shallow lake waters, beaver ponds, and occasionally oxbows or slow-moving river backwaters (Clark et al. 1989:59). Breeding habitat is typically secluded, and must provide a large enough open water body for take-off and landings. Wintering habitat includes slow-moving rivers and streams that remain ice-free and provide emergent vegetation year-round (USDA 1989:28). The project area does not contain suitable breeding or wintering habitat for trumpeter swans; therefore, the proposed action would have no impact on this species.

IV. Harlequin Duck (*Histrionicus histrionicus*)

Harlequin ducks nest along remote, swift-moving, clear mountain streams with dense shrub habitat along the stream banks. Breeding habitat is typically located away from concentrated human use areas (Clark et al. 1989:61). There is no potential nesting habitat in the project area, and no breeding harlequin ducks have ever been documented in the project area. Neither streamside vegetation, nor stream form or function would be adversely affected by proposed actions associated with this project. Therefore, the project would have no impact on harlequin ducks or their breeding habitat.

V. Peregrine Falcon (*Falco peregrinus*)

The peregrine falcon was delisted; i.e. removed from the Endangered Species List, in August 1999 and is now treated as a Forest Service sensitive species. Since delisting, the peregrine falcon population has steadily increased in Montana, and on the Gallatin Forest. The peregrine is a predatory bird that feeds almost exclusively on other avian species. Peregrines nest in cliff and rock formations typically associated with hydrographic features such as rivers and lakes. Riparian habitat and open meadows are preferred hunting areas. There are no known occupied peregrine nest sites within or near the project area. High quality nesting habitat; e.g. large cliff face associated with major hydrographic features, is lacking in the project area. Although the project area may provide foraging opportunities for peregrines, foraging habitat is not limited in the vicinity of known occupied nests. Proposed actions would not adversely affect nesting or foraging habitat in the project area, therefore, the project would have no impact on peregrine falcons or their breeding habitat.

VI. Flammulated Owl (*Otus flammeolus*)

Flammulated owls are small, migratory owls that inhabit dry, open forest types. These birds show a strong preference for yellow pines, particularly Ponderosa pine (*Pinus ponderosa*) for nesting habitat, although Douglas fir and aspen (*Populus tremuloides*) may be used as well (McCallum 1994:22). Yellow pines, including Ponderosa pine, do not occur within the project area. Douglas fir and aspen are present, but the mature open structure preferred by flammulated owls is a relatively minor habitat component in the proposed treatment units. Nesting flammulated owls have not been documented anywhere on the Gallatin Forest, and habitat conditions are marginal here. The species is not suspected to occur in the project area. Therefore, the project would have no impact on flammulated owls or their breeding habitat.

VII. Western Big-eared Bat (*Corynorhinus townsendii*)

The western big-eared bat occurs in a variety of habitats, although its distribution is strongly correlated with the availability of suitable caves for roosting. Caves and abandoned mine shafts serve as daytime roosts and winter hibernacula (Kunz and Martin 1982). Females congregate in the warmer areas of the roost to form maternal colonies in spring (Finch 1992:17). There are no large caves or abandoned mine shafts in the project area that would provide suitable roosting habitat for bats. With no high-quality roosting habitat available, it is unlikely that western big-eared bats inhabitat the project area. Therefore, the project would have no impact on western big-eared bats or their roosting habitat.

VIII. Wolverine

Wolverine presence has not been documented within the project area in recent years, although they are known to regularly occur in the higher elevations of the Henry's Lake Mountains. Copeland and Whitman (2003) noted that wolverine presence in southern latitudes (e.g. Montana) appears to be restricted to high elevation habitats. In a study of wolverines in northwest Montana, Hornocker and Hash (1981:1291) found that large areas of mature forest and associated ecotonal habitats of open, rocky and alpine area accounted for the majority of wolverine locations. Habitat types used most frequently in this study included subalpine fir (*Abies lasiocarpa*) and associated seral species. Hornocker and Hash (1981:1299) also reported that wolverines seemed reluctant to traverse large openings such as recently harvested or burned areas. The wolverine is typically associated with vast, remote, undisturbed areas of limited

human intrusion. However, they are known to cross through human developments and high human use areas during long-range movements (Hash 1987).

Wolverines are considered habitat generalists in the summer, using a foraging strategy typical of opportunistic omnivores (Banci 1994:113). Summer habitat use is influenced by food availability, temperature regulation and breeding activities. Food is most available in spring and summer with a wider variety of potential food sources including carrion, small mammals, insects and insect larvae, eggs and berries (Hornocker and Hash 1981:1298). Wolverines remain active year-round, and in winter adapt their foraging strategy to that of scavenger. As scavengers, winter wolverine foraging habitat becomes more of an association with other species; i.e. food sources for wolverines will be somewhat dictated by the distribution of big game species.

Across the wolverine's range including all of North America and Eurasia, the majority of known natal den sites involve areas of deep snow accumulation, with snow tunnels often forming part of the den infrastructure (Copeland 1996). Den sites located in forested habitat have typically been associated with spruce (*Picea* spp) habitats. Natal dens are those where kits are born, whereas maternal den sites are used after parturition, but prior to weaning of kits. Dens used by wolverine families after kits are weaned are referred to as rendezvous sites. Magoun and Copeland (1998) reported that nearly all verified reproductive den sites have been found at higher elevations. North-facing slopes in alpine cirque basins are commonly selected for. Den sites involve extensive snow tunnel systems, often associated with large rocks or fallen trees, and sometimes lead to adjacent tunnel systems in boulder talus piles.

The project area includes a considerable amount of late-successional (i.e. mature and over-mature) coniferous forest. However, the project area is at lower elevation than that typically used by wolverines for denning habitat. Lower to mid-elevation tree species such as Douglas fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*) dominate forest cover types in the project area. The project area contains no high quality wolverine reproductive denning habitat, as it lacks high elevation characteristics.

Since there is little habitat in the project area that provides the characteristics of known wolverine reproductive habitat, the primary value of the project area for wolverines is in providing habitat connectivity for movement, including dispersal, and potentially as a winter foraging area. Thinning of forested stands as proposed under alternatives 2 and 3 would not affect the ability of wolverines to travel through them, as forest cover would be retained. The project area would not provide quality foraging opportunities for wolverines either. The project area is important moose winter range, but moose occur at much lower numbers and densities here compared to typical deer and elk winter ranges. Therefore, carrion would not be predictably available in the area.

Black-backed Woodpecker (*Picoides articus*)

Black-backed woodpeckers occupy forested habitats that contain high densities of recently dead or dying trees, which provide an insect prey base. Black-backed woodpeckers are typically found in three types of forested habitat: post fire areas that have burned within 1 to 6 years, areas with extensive insect outbreaks causing widespread tree mortality, and a natural range of smaller disturbances scattered throughout the forest such as wind throw, ice damage or other

occurrences that produce small patches of dead trees. Their diet determines much of their habitat use. Wood-boring beetles (*Buprestidae, Cerambycidae, Siricidae* spp) and bark beetles (*Scolytidae*) are fed upon by black-backed woodpeckers, with wood-boring beetle larvae making up the bulk of the diet (Dixon and Saab 2000). Wood-boring beetles generally use trees that are already dead, primarily recently killed trees such as those produced by wildfire. Some genera of woodborers actually find burning or recently burned habitat by sensing heat or smoke (USDA 2007:5). Bark beetles, on the other hand, will attack and kill live trees. Wood-boring beetles will use trees killed by bark beetles. Wood-boring beetles and their larvae are much larger than bark beetles, and are present for a longer period; they are therefore the preferred prey of black-backed woodpeckers (USDA 2007:6). Wood-boring beetles are most abundant in recently burned forest. In unburned forests, wood -borers and bark beetles are found primarily in areas that have undergone natural disturbance, such as wind-throw, as well as in structurally diverse old-growth forest (Hoffman, 1997).

Hutto (1995:1050) stated that it would be difficult to find a forest bird species more restricted to a single habitat type in the northern Rockies than the black-backed woodpecker is to early post fire conditions. Habitat relationships developed from USDA Forest Service Northern Region landbird monitoring point count data also show this close association between black-backed woodpeckers and post-fire habitats (USDA 2007). Post fire habitats probably contain the highest concentrations of wood-boring beetles for the longest period of time (USDA 2007). Saab and Dudley (1998) found black-backed woodpeckers associated with high-intensity, stand-replacement fires.

Habitat for black-backed woodpeckers is abundant and well distributed at both the Regional (i.e., the 12 National Forests within the Northern Region of Montana and Idaho) and Gallatin National Forest scales. Samson (2006) showed that over 1.1 million acres of black-backed woodpecker habitat were created by fire in the Northern Region during 2000-2003, with an additional 1.1+ million acres of insect infested habitat also available. The Gallatin National Forest was estimated to have approximately 76,850 acres of black-backed woodpecker habitat as of 2003, compared to the approximately 29,400 acres needed at the regional level to maintain a viable population. Additionally, availability of black-backed woodpecker habitat is expected to continue increasing as large stand replacement fire and bark beetle outbreak frequency increases (Gallant et al. 2004, Hessburg and Agee 2003, Hessbrug et al. 2004). For example, the Gallatin National Forest has had numerous large fires since 2003 including the Derby, Jungle, Big Creek, Passage Falls, South Pine, and Madison Arm fires. Surveys conducted by the Forest Service Region 1 Forest Health Protection Group detected approximately 10,000 acres of Douglas fir, 18,000 acres of lodgepole pine, and 31,000 acres of whitebark pine infested with bark beetles across the Gallatin National Forest during 2005-2006 survey efforts (Gibson and Aquino 2007, page 23). Population viability of black-backed woodpeckers does not appear to be a concern at this time.

The project area does not contain any mesurable burned areas, which are the most important habitat for black-backed woodpeckers. There are some stands with light to moderate infestations of bark beetles. Project activities could reduce the amount of bark beetle infested trees in the project area. However, this would have no measureable effect on the availability of beetle-

infested trees to black-backed woodpeckers given the large amount of bark beetle activity currently occuring at the District, Forest, and Regional levels.

Table 1. Biological Evaluation determinations for sensitive wildlife species. Determinations are: NI (no impact) and MIIH (may impact individuals or habitat but will not likely cause a trend towards federal listing or cause a loss of viability to the population or species)." The rationale for these determinations is contained in the above report.

Species	Alt 1	Alt 2	Alt 3
Peregrine Falcon	NI	NI	NI
Bald Eagle	NI	MIIH	MIIH
Wolverine	NI	MIIH	MIIH
Flammulated Owl	NI	NI	NI
Trumpeter Swan	NI	NI	NI
Harlequin Duck	NI	NI	NI
Black-backed Woodpecker	NI	MIIH	MIIH
Western Big-eared Bat	NI	NI	NI
Grizzly Bear	NI	MIIH	MIIH

Elk (Pils 2007a)

Issue: The project may have the potential to cause disturbance and displacement of elk from summer habitat, and decreased elk security during the hunting season. Project activities may also alter the vegetation component of elk habitat. Combined effects of habitat alterations and disturbance factors could ultimately affect big game distribution patterns within and near the project area.

Discussion: Elk populations in Montana are managed by the Montana Department of Fish, Wildlife, and Parks (MFWP) to provide for a sustained yield of surplus animals for hunters, along with viewing opportunities for the public. While the Forest Service has no management authority for elk populations, it does have an important responsibility to provide habitat for elk. The Gallatin Forest Plan identifies elk as a management indicator species (MIS), or a species whose habitat is most likely to be affected by Forest management activities, for big game (USDA Forest Service 1987, pages II-18 and II-19). Populations are to be monitored for change to determine the effectiveness of Forest management activities.

The project area provides summer and fall range for elk. Elk typically migrate out of the project area to winter ranges in the Madison Valley during late fall and return in late spring. Although the project area provides all the habitat components (forage, water, and cover) of quality summer-fall elk habitat, it is characterized by high motorized access densities (see grizzly bear report) and numerous developed sites (recreation residences, campgrounds, etc) that likely compromise the area's habitat value for elk to some degree. There is a very large roadless area (including the Lionhead Recommended Wilderness Area) located directly adjacent to the project area that also provides high-quality habitat components with much lower levels of human access

and development.

The project area is within Hunting District 361, which is part of the Madison/Gallatin Elk Management Unit. MFWP data indicate that the Madison portion of this herd unit is currently exceeding State Elk Plan objectives (Montana Fish, Wildlife, & Parks 2004, pages 260-266).

Some disturbance and displacement of elk in the vicinity of active project operations would be expected. For several reasons, these effects are expected to be very minor. Elk would already be expected to exhibit some level of avoidance of these areas due to high human activity levels associated with developed sites and high levels of motorized access. There is an abundance of high-quality summer-fall habitat adjacent to the project area that would be available to any elk displaced by project activities. For example, the project area is adjacent to large blocks of roadless country with higher quality habitat in the Lionhead Recommended Wilderness Area.

The project would not measurably change elk vulnerability to hunting or security because there would no change in the amount of open roads. Alternatives 2 and 3 would both involve construction of temporary roads. However, no public motorized use of temporary roads during the hunting season or any other time would be allowed. They would also be physically closed upon completion of the project.

Under all Alternatives 2 and 3, proposed fuels treatments could affect the amount of forage available for elk. Elk can benefit from increased grass, forb and shrub production in areas where the forest canopy is opened. Both alternatives 2 and 3 would feature treatments to promote aspen regeneration. Aspen has long been known as is a favored browse species for elk. However, it should be noted that conifer removal (through mechanical thinning or fire) does not always improve forage conditions. Many stands, particularly in the lodgepole pine types, may not be opened enough to stimulate growth of palatable forage plants given the amount of thinning proposed. Overall, the treatments proposed under Alternatives 2 and 3 would cause a small increase in the availability of forage in the project area for elk.

While they would improve elk forage, alternatives 2 and 3 would also reduce available hiding cover in the project area. Some cover would still be retained in treatment units, but due to the more open nature of these stands they would be much less effective for use as cover by elk. However, cover is not currently limited in the project area. Even sapling stage forest can provide hiding cover if the trees are tall and dense enough. Under all project alternatives, an abundance of hiding cover would remain in the project area despite the proposed fuels treatments.

Summary: This issue can be dismissed due to minor effect (disturbance, displacement, and habitat alteration) and effective mitigation (secure habitat) identified in Features Common to Action Alternatives in the EA, Chapter 2.

Gray Wolf (Pils, 2007j)

Introduction and statement of the issue: Gray wolves may be affected by a variety of human activities that cause disturbance or alter habitat. Noise and human presence associated with timber harvest, mechanical thinning and prescribed burning associated with the proposed action could cause disturbance and/or displacement of gray wolves and/or their prey species from the project area. Gray wolves are currently protected as either threatened or endangered species

under the Endangered Species Act (ESA). In the Greater Yellowstone Area, wolves outside of National Parks and National Wildlife Refuge System lands are designated a "non-essential, experimental population" under Section 10 of the ESA. Wolves within the experimental population geographic area (including the Gallatin National Forest) are treated for management purposes as though they are proposed for listing. This special management designation has created significant public interest in federal actions that have the potential to affect the gray wolf or its habitat.

Discussion: The gray wolf historically occupied the Gallatin National Forest and therefore this area is considered part of the Gray Wolf Recovery Zone. Wolves were reintroduced into the Yellowstone area in 1995. As of the end of 2006, there were a minimum of 390 wolves in the Greater Yellowstone Area (U.S. Fish & Wildlife Service et al. 2007, page 1). Recovery criteria established for wolves in the Yellowstone area have been met since 2002. As a result, the U.S. Fish & Wildlife Service has proposed to remove the gray wolf in the Northern Rockies region, including the Yellowstone Area, from the list of federally threatened and endangered species (U.S. Fish & Wildlife Service 2007, page 6106).

There are no wolf territories with the project area. The nearest known wolf pack is the Cougar Creek pack's territory on the west side of YNP northeast of West Yellowstone, MT (U.S. Fish & Wildlife Service et al. 2007, Figure 3), approximately 10 miles east of the project area. There are no known wolf dens or rendezvous sites in or near the proposed treatment units. Wolves probably pass through on occasion, but do not regularly inhabit the project area. Because there are no wolf packs established in the project area, any disturbance effects from project activities would be limited to temporary displacement of animals passing through the area. These effects would be discountable, and this issue can be dismissed due to minor effect.

Migratory Birds (Pils 2007d)

*Introduction and statement of the issue***:** Migratory birds are a very diverse group, which includes raptors, waterfowl, shore birds, and songbirds. Migratory bird species are protected under the Migratory Bird Treaty Act (16 USC 703-711). A January 2001 Executive Order requires agencies to ensure that environmental analyses evaluate the effects of federal actions and agency plans on migratory birds, with emphasis on species of concern. With one exception (the osprey) the Montana Natural Heritage Program and "Species of Concern" list (Montana Natural Heritage Program 2007) were used to identify focal species for this analysis. Most species of concern are addressed in separate reports for sensitive species and management indicator species (bald eagle, trumpeter swan, harlequin duck, peregrine falcon, northern goshawk, black-backed woodpecker, and flammulated owl). Other species of concern that could be present in the project area include the following: great gray owl (*Strix nebulosa*), olive-sided flycatcher (*Contopus borealis*), and Swainson's hawk (*Buteo swainsoni*). Of these, the great gray owl is not a neotropical migrant in that it does not migrate to the tropics, but there is some movement between the US and Canada, so the great gray is considered here as a migratory bird species. The osprey was also included in this analysis because it is a migratory bird with numerous known nesting territories in the project area that could be affected by project activities.

Project alternatives involving commercial thinning, understory thinning, and prescribed burning have the potential to affect migratory birds, through habitat alteration as well as through

disturbance impacts that could affect survival and reproductive success.

Discussion: The Gallatin National Forest provides breeding habitat for dozens of migratory bird species. This extremely diverse group occupies all types of habitat in the project area, including ponds, streams, wetlands, riparian areas, grasslands, shrub lands, deciduous forest, coniferous forest, mixed forest, recently burned forest, and rock outcrops. Forested habitats provide trees, shrubs, snags, and surface vegetation for nesting birds. Open meadows provide habitat for ground nesters and shrub/foliage nesters. Portions of the Hebgen Lake shoreline and it's associated tributaries provide riparian habitat for a wide variety of birds. Cliffs and rock outcrops in the project area provide ledges, cracks and crevices as nesting areas for a number of bird species. Forage is abundant in the project area with birds, small mammals, fish and invertebrates providing prey species for many birds. Seeds, berries and other vegetative food sources are also abundant. The species of concern identified for this report (opsrey, great gray owl, olive-sided flycatcher, and Swainson's hawk) are generally associated with open forest, including burned forest, and grass/shrub types.

Habitat alteration effects: Great gray owls typically nest in the more open structure associated with relatively dry, montane coniferous or deciduous forest. Nest sites are generally located in close proximity to open areas used for hunting (Duncan and Hayward 1994:164). Great gray owls have been observed in the project area, and a comment received during the scoping phase for this project indicated that there may be a breeding pair in the general vicinity of the project area. Foraging habitat consists of relatively open, grassy areas including natural meadows, logged areas and open forest (Nero 1980, Mikkola 1983, Winter 1986). Olive-sided flycatchers are strongly associated with recently burned forest, but are also relatively common in logged areas, including clear-cuts and partial harvest treatments (Hutto and Young 1999:25). Swainson's hawks typically nest in lowland river bottoms (Montana Fish, Wildlife, & Parks 2006), habitat that is not generally found on NFS lands but occurs in the rural and agricultural land adjacent to the project area. Swainson's hawks feed on small mammals, birds and insects. They commonly hunt in agricultural fields, and might occasionally enter the project area in search of prey. Ospreys are fish-eating birds that nest in proximity to larger lakes and rivers supporting robust fish populations.

Habitat modification can alter the quality and quantity of habitat available for migratory bird species. While habitat alteration may have adverse impacts to bird species, other species may benefit from habitat modifications associated with fuel reduction treatments. For example, edge habitat created by thinning and burning is selected by some bird species. Also, timber harvest and burning can increase the availability of grasses, shrubs and/or fruit bearing plant species required by some birds.

Most of the species of concern listed above could benefit from some habitat alteration resulting from proposed fuel treatments. Great gray owls select open forest structure for nesting, and often hunt in open meadows. Commercial harvest could increase suitable nesting habitat for great grays, while prescribed burns could create additional foraging opportunities.

Olive-sided flycatchers are associated with recently burned forest, but are also relatively common in logged areas, including partial harvest treatments. Therefore, this species could be attracted by habitat alterations resulting from both prescribed burning and mechanical thinning. While olive-sided flycatchers appear to do well in timber harvest areas, breeding bird surveys

have identified significant population declines for this species between 1968 and 1991 (Hejl 1994). This apparent contradiction has lead Hutto and Young (1999:25) to question whether use of harvested forest habitat by the olive-sided flycatcher is the result of an "ecological trap" where the harvest units have the appearance of early post fire habitat, but do not provide the resources necessary for reproductive success. Swainson's hawks select open woodlands, fields and agricultural lands for nesting and hunting. Prescribed burning and mechanical thinning would create more and larger openings in the treatment units, which could provide additional foraging habitat by improving prey visibility.

Fuels reduction activities proposed are unlikely to alter habitat suitability of stands for nesting by opsreys because adequate forest cover and overstory would be retained. Six osprey nest territories were identified during surveys in 2006 and 2007 (Figure 1). Osprey nest trees would be protected from harvest under all alternatives. Foraging habitat would not be affected because ospreys forage exclusively in the lake and do not rely on forest stands at all.

Disturbance effects: Although most species of concern considered here might eventually benefit from some habitat alterations associated with proposed fuel reduction measures, adverse effects to these, and other species, could result from project impacts depending on the timing of the activity. Spring is the critical breeding time for migratory birds. Pair formation, nest construction, egg-laying, brooding and nestling care occur for most species during the period from about the end of March through the end of June. Throughout most of the USDA Forest Service's Northern Region, young birds have fledged, and the breeding season is over by about mid-July (Hutto et al. 1998:8). Project activities that occur during the breeding season could result in the physical destruction of nests, which would likely result in egg/nestling mortality.

Disturbance factors associated with project implementation could have impacts on all migratory bird species in the project area, including species of concern. Human disturbance associated with vegetation management activities can elicit behavioral responses from birds which can affect reproductive success and survival. Disturbance during the nesting season could cause reduced parental care and/or nest abandonment, which could affect nestling survival rates, and possibly result in reproductive failure for some breeding pairs. Disturbance outside the breeding season can influence a bird's energy balance, and consequently affect survival rates. Birds may change nest locations in response to human disturbance. Alternate nest sites may be less suitable in terms of security and thermal cover, availability of foraging habitat, perch sites, and other important habitat components (Knight and Gutzwiller 1995:52, 55, 73).

Nest sites of most migratory birds are very difficult to detect. Ospreys are an exception because their nests are large and located in highly visible locations near the tops of trees or poles. Six osprey nests in the project area have been identified. To limit the potential for disturbance to breeding ospreys, no commercial thinning, understory thinning, or prescribed burning would be allowed within 400 meters of an active osprey nest during the April 15-August 15 nesting season. (Map is in the Project Record.)

Summary: Project actions that are implemented during the breeding season would have disturbance impacts, and potential for occupied nest destruction, which could affect any migratory bird species in the activity area. Most project implementation would occur during late summer and fall, which would minimize disturbance effects and potential for direct bird mortality. Resulting habitat alterations could be attractive for migratory bird species of concern

such as the great gray owl, olive-sided flycatcher, and Swainson's hawk. Implementation of any of the alternatives evaluated would not likely have impacts notable at the population level for any of the migratory bird species considered in this report.

Northern Goshawk (Pils 2007f)

Issue: Commercial thinning and prescribed burning can alter goshawk nesting, post fledging and foraging habitat. Some habitat modifications resulting from such actions could have adverse impacts on goshawks, while others could actually improve goshawk habitat conditions. Pre-commercial thinning has the potential to impact primarily foraging habitat and consequently affect goshawk prey availability in the project area.

Discussion: The Northern goshawk is listed as a Management Indicator Species (MIS) for the Gallatin National Forest. MIS are those species whose habitat is most likely to be affected by Forest management activities, and will be monitored to determine population change (USDA Forest Service 1987, page II-18).

Goshawk population and habitat status: Samson (2006a) estimated that goshawks across the Northern Region (including Montana, northern Idaho, and parts of North and South Dakota) are part of one population. A 2005 survey provided estimates of goshawk occupancy and distribution during the breeding season across the Northern Region (Kowalski 2006). Results verified that goshawks are widely distributed across the Region and a baseline has been established for documenting goshawk presence. The frequency of goshawk presence in the accessible portion of R1 suggests the goshawk is relatively common and well-distributed (Kowalski 2006).

Additionally, Samson (2006a) estimated the amount of goshawk nesting, foraging, and post-fledging area (PFA) available at the regional and Forest Levels (Table 1). Samson (2006b) also estimated the amount of PFA habitat needed to maintain a viable population of northern goshawks in the region, and concluded that all12 National Forests in the region contain estimated PFA habitat amounts that exceed this threshold amount. The Gallatin National Forest was estimated to contain about 100,000 acres of PFA habitat (as of 3/2007) compared to the estimated minimum of 30, 147 acres needed at the regional level for viable population. He concluded that goshawk habitat is abundant and well-distributed across the Northern Region, and that the Gallatin National Forest has more than enough habitat to maintain a minimum viable population of goshawks.

There is one known historic goshawk territory in the project area that is no longer active. This territory was located in the Trapper Creek drainage upslope from any of the proposed treatment units. It was detected in 2000, but surveys of the nest stand and surrounding area were conducted in 2003, 2004, and 2007 and failed to detect any goshawks. This nest was located in a mixed lodgepole pine/Douglas-fir stand with a dense alder understory in many areas. Mortality of the larger diameter lodgepole pine overstory in this stand is currently occurring, which has led to considerable openness in the canopy. Therefore, stand conditions are not typical of what goshawks normally select for and may be the reason why this territory is no longer active. Field surveys were also conducted in the summers of 2004 and 2006 in the project vicinity in order to determine whether the project area was occupied by breeding goshawks and attempt to locate

any active nest sites. Surveys were conducted by using a broadcast caller to solicit a defensive response from breeding goshawks. Surveys were focused on goshawk nesting habitat within or near proposed treatment units. No goshawks were detected during survey efforts. All survey records were included in the project file.

Vegetation management is the primary human-related activity that impacts goshawk populations. It may improve or degrade habitat (Squires and Kennedy 2006). Commercial timber harvest and prescribed burning of mature trees can reduce suitable nesting habitat, and could even result in removal of nest trees or alternate nest trees in occupied goshawk breeding territories. Removing nest trees or modifying nest areas (e.g. reducing canopy, mature trees, snags and down wood) can alter the structure, function and quality of nesting and foraging habitat (Squires and Kennedy 2006). Reducing canopy cover in close proximity to occupied nest sites can increase solar radiation, reduce buffering from adverse weather, increase vulnerability to predators and ultimately affect nest success (USDI 1998, *cited in* Brewer et al. 2007). On the other hand, Reynolds et al (1992) and Graham et al. (1999) (*cited in* Brewer et al. 2007) have suggested that the use of controlled fire and thinning may improve habitat for goshawks by creating favorable conditions (e.g. promoting diameter growth in overstory trees, creating open understories) for goshawks and their prey. Thinning and burning prescriptions for this project call for reduction of forest biomass in treatment units. This might improve some foraging habitat for goshawks, but is not expected to improve nesting habitat, since canopy closure would not be maintained. PFAs contain a combination of nesting and foraging habitat, so some benefits could be realized, as long as treatments occur outside the nest stand, and retain sufficient cover to provide security for juvenile birds. Therefore, potential alteration of suitable nesting habitat has the most potential for affecting goshawks. Negative affects to foraging habitat and potential PFA's are not expected under any project alternative.

Project treatments involving overstory removal in potential nesting habitat could reduce the suitability of this habitat for goshawks. No known active goshawk territories would be affected under any alternative because none are known to exist in the project area despite survey efforts. An analysis of goshawk nesting habitat was conducted for the project area to determine potential effects of the project on unoccupied habitat. The project area was the analysis unit because it encompasses all proposed treatment units and is a large enough area (approximately 24,000 acres) to support multiple goshawk territories. Goshawk nesting habitat was modeled using SILC3 data as recommended by Brewer et al. (2007). Lodgepole pine, Douglas-fir, and Douglas-fir/lodgepole pine stands at least 40 acres or larger with canopy closure >45% and tree size class >9" DBH were considered to provide goshawk nesting habitat. Queries of the SILC3 database for these vegetation attributes were conducted using the GIS program ArcView 3.3. No stands of suitable nesting habitat were identified as a result. While the project area has an abundance of suitable lodgepole pine and Douglas-fir forest types, stands of suitable size had too little canopy closure and stands with enough canopy closure were lacking in size. Given the lack of known active goshawk nesting territories and suitable nesting habitat within the project area, no effects to goshawk nesting habitat are expected under any project alternative.

Effects of disturbance: At the local level, human disturbance near goshawk nests, particularly during incubation, can cause nest failure (Boal and Mannan 1994 *cited in* Brewer et al. 2007). Heavy equipment operation within 330 feet of a nest has been shown to result in the adults abandoning the nest area, even with 20-day old nestlings present (Squires and Kennedy 2006). If adults abandon a nest with eggs or nestlings present, the eggs or nestlings will die from exposure,

starvation or predation. On the other hand, Zirrer (1947 *cited in* Squires and Kennedy 2006) noted repeated re-nesting attempts by goshawks despite extreme disturbance. Also, in a status review of the northern goshawk, the US Fish and Wildlife Service determined that at the population level, human disturbance does not appear to be a significant factor affecting the long-term viability of goshawk populations (USDI 1998 *cited in* Brewer et al. 2007). This determination is consistent with research presented by Clough (2000) and McGrath (2003 *cited in* USDA 2007) where both studies reported goshawks in areas associated with roads.

There are no known active goshawk nesting territories within the project area. If any nests are detected prior to completion of the project, an approximately 300 acre buffer would be defined around active nests where no activity would be allowed from 4/15-8/15. This would minimize the potential for disturbance of nesting goshawks. Therefore, disturbance of goshawk breeding activities from project implementation is very unlikely to occur.

Summary: The northern goshawk and its habitat are abundant and well-distributed throughout the Northern Region of Montana and Idaho. The Gallatin National Forest contains abundant goshawk nesting, foraging, and PFA habitat. Currently, the project area contains no known active goshawk territories and no suitable nesting habitat. Therefore, no affects to goshawk nesting territories from alteration of habitat or disturbance related to project activities are expected under any alternative.

Pine Marten (Pils, 2007g)

Issue: Pine martens (or American marten) are strongly associated with old forest types for both denning and foraging habitat. Fuel treatment methods such as mechanical timber harvest and prescribed burning can alter the structure of habitat important for pine martens to unsuitable condition, thereby negatively affecting pine marten foraging and reproduction.

Discussion: The pine marten is listed as a Management Indicator Species (MIS) for the Gallatin National Forest. MIS are those species whose habitat is most likely to be affected by Forest management activities, and will be monitored to determine population change (USDA Forest Service 1987, page II-18).

Population and habitat status: Pine martens are broadly distributed throughout the mountainous, forested areas of the Northern Rockies and western Montana, including the Gallatin National Forest. They are known to occur throughout the project area as well. Marten are generally considered to be abundant where their habitat exists in Montana. Montana Fish, Wildlife, & Parks (FWP) administers a liberal trapping season for them in the western and central portions of the state, with a 2 ½ month season and no limit or quota for the number that may be harvested. FWP conducts snow-tracking surveys to monitor population trends for martens and other carnivores and prey species. Snow-track detection rates for marten are compiled by FWP administrative region. Detection rates for region 3 in southwest Montana including the Gallatin National Forest over the last 10 years show considerable variability, making inferences on population trends difficult from this data alone (Montana Fish, Wildlife, & Parks, unpublished data, 2007). However, the data show that martens are among the most common carnivores in southwest Montana and no obvious declines in population have been noted (i.e., detection rates for 2006-07 were the highest observed during the past 10 years).

Pine marten habitat is also abundant throughout the Northern Rockies and Gallatin National Forest. Samson (2006) estimated the amount of marten habitat available across the Northern Region (including Montana, northern Idaho, and parts of North and South Dakota) at approximately 6,915,950 acres. Marten habitat on the Gallatin National Forest was estimated at approximately 373,375 acres. Additionally, the threshold amount of habitat needed to maintain a minimum viable population of martens in the Northern Region was estimated at about 17,300 acres. Therefore, the amount of habitat available at the Forest and Regional levels far exceeds that necessary to sustain a minimum viable population.

Martens (also called American martens or pine martens) are found in coniferous habitat throughout the Gallatin Forest, especially in cool, moist types. Martens select for late-successional forest types with complex structure and abundant coarse, woody debris on and near the ground (Coffin et al. 2002). The marten's preferred prey species, red-backed voles (*Clethrionomys gapperi*) are most abundant in mature and old growth mesic forest habitat (Buskirk and Ruggiero 1994:7). Martens display a strong avoidance of open habitat, which may be evidence of evolutionary response to the threat of predation by other carnivores (Ibid:8). Coffin et al. (2002:30) also concluded that martens seldom use landscapes heavily impacted by logging and wildfire, but reported that martens will move through impacted areas to reach suitable habitat.

Habitat analysis: The project area is dominated by the mesic conifer habitat types preferred by martens (see Vegetation Report). The amount of marten habitat available in timber compartments 709 and 710 was estimated using queries of the Timber Stand Management Record System (TSMRS) database. Timber compartments 709 and 710 were used as the analysis unit because this is a relatively large area that would encompass the home ranges of several martens. Although there is considerable variation in marten home range size among different studies, in a study from southwest Montana that included a site near the project area, Coffin et al. (2002) reported that male martens in heavily logged (primarily clearcut) areas had much larger home range sizes (8,030 acres) than in less disturbed areas elsewhere in Montana. Even at the largest reported home range size for males, the analysis area is big enough to contain several male and female home ranges.

Marten habitat was identified by querying for stands with subalpine-fir/spruce, lodgepole pine, Douglas-fir, or lodgepole pine/Douglas fir cover type; sawtimber size class; >40% canopy cover; and >5,900’ elevation. Douglas fir cover types were included because all Douglas fir stands in this area are considered to be mesic rather than dry types. Stands with any type of harvest activity were then deleted under the assumption that these stands would not contain adequate woody debris. Using this method, approximately 13,915 acres of marten habitat were identified in the analysis area.

The commercial harvest, understory thinning, and prescribed burning proposed under Alternatives 2 and 3 would alter currently suitable foraging and denning habitat to an unsuitable condition due to reduction in large woody debris and simplification of forest structure. Because forest cover would be retained in all treatment units, martens would still be likely to travel through these areas. Under alternatives 2 and 3, there would be an approximate 10% and 9% reduction (respectively) in the amount of marten habitat available within the analysis area (Table

A). This would result in localized effects within the analysis area, and as a result some individual martens would likely expand their home ranges in order to meet their foraging requirements and find denning areas. The analysis area would likely support fewer martens over the long term, but adequate habitat would remain so that marten would still continue to be present throughout the analysis area under either alternative.

Table A. Acres of marten habitat to be treated by 3 methods under the project alternatives.

Suitable Habitat	Alt 1 (acres)	Alt 2 (acres)	Alt 3 (acres)
Proposed for harvest	0	770	730
Proposed for understory thin	0	480	460
Proposed for burning	0	180	80
Remaining suitable habitat post-treatment	13,915	12,485	12,645

Summary: Martens and their habitat are abundant and well-distributed at the Regional, Forest, and local scales. Localized effects to martens are expected to result from alternatives 2 and 3, but adequate habitat would remain to support martens throughout the project area. The project would have no measurable effect on pine martens at the Forest and Regional levels. This issue can be dismissed due to minor effect.

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