CHAPTER 4. CONSULTATION AND COORDINATION

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Distribution of the Environmental Impact Statement ___

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been made available for review at public libraries and at Forest Service offices and on the Gallatin Nation Forest web site. Copies have been sent to the agencies, State and local governments, and organizations listed above.

Glossary

Active Crown Fire: A **crown fire,** also called **running** an**d continuous crown fire,** is one in which the entire **fuel complex** becomes involved, but the crowning phase remains dependent on heat released from the **surface fuels** for continued spread. This type of fire is very difficult to suppress, flame lengths are usually over 6 feet, fire intensities are high.
Active Crown Fire: A **crown fire,** also called **running** an**d continuous crown fire,** is one in which the entire **fuel complex** becomes involved, but the crowning phase remains dependent on heat released from the **surface fuels** for continued spread. This type of fire is very difficult to suppress, flame lengths are usually over 6 feet, fire intensities are high.

Available Canopy Fuel: The mass of **canopy fuel** per unit area consumed in a crown fire. There is no post-frontal combustion in canopy fuels, so only fine canopy fuels are consumed. It is assumed that only the foliage and a small fraction of the branchwood is available.

Available Fuel: The total mass of ground, surface and canopy fuel per unit area consumed by a fire, including fuels consumed in postfrontal combustion of duff, organic soils, and large woody fuels.

British Thermal Unit (BTU): A unit of heat equal to 252 calories; quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.

Canopy Base Height: The lowest height above the ground at which there is a sufficient amount of **canopy fuel** to propagate fire vertically into the canopy. Canopy base height is an effective value that incorporates ladder fuels such as shrubs and understory trees. See also **fuel strata gap** and **crown base height**.

Canopy Bulk Density: The mass of **available canopy fuel** per unit canopy volume. It is a bulk property of a stand, not an individual tree.

Canopy Closure: The degree to which the canopy, forest layers above one's head, blocks the sunlight or obscures the sky. It can only be determined from measurements taken under the canopy as openings in the branches and trees must be accounted for.

Canopy Fuels: The live and dead foliage, live and dead branches, and lichen of trees and tall shrubs which lie above the **surface fuels.** See also **available canopy fuel**.

Chain (CH): Measure of length equivalent to 66 feet, 100 links or 20.1 meters.

Commercial Thinning (com)
Removal of forest components that have a commercial value (e.g. sawtimber or post poles or biomass). Removal may involve use of wheeled or tracked vehicles for skidding

and loading of trees. Other means of felling and removal may involve a feller buncher or similar type of equipment. Expected tree spacing post thinning would be approximately 13 feet between tree crowns.

Condition Class: Three ***Condition Classes*** have been developed to categorize the current condition with respect to each of the five historic Fire Regime Groups. Current condition is defined in terms of departure from the historic fire regimes, as determined by the number of missed fire return intervals- with respect to the historic fire return interval- and current structure and composition of the system resulting from alterations to the disturbance regime. The relative risk of fire-caused losses of key components that define the system increases for each respectively higher numbered condition class, with little or no risk at the Class 1 level.
Condition class 1 – Fire regimes are within a historical range and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within a historical range.
Condition class 2 – Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range.
Condition class 3 – Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.

Conditional Surface Fire: A potential type of fire in which conditions for sustained active crown fire spread are met but conditions for crown fire initiation are not. If the fire begins as a surface fire then it is expected to remain so. If it begins as an **active crown fire** in an adjacent stand, then it may continue to spread as an active crown fire. Conditional surface fire is based more on higher flame lengths and rates of spread than a surface fire. Under desirable conditions: higher wind speeds, higher temperatures, lower relative humidity, and steeper slope could push a surface fire up to passive to active crown fire.

Continuous Crown Fire: See **active crown fire**.

Crown Base Height: The vertical distance from the ground to the bottom of the live crown of an individual tree. See also **canopy base height.**

Crown Bulk Density: The mass of available fuel per unit crown volume. Property of an individual tree, not a whole stand. See also **canopy bulk density.**

Crown Diameter: The length passing through the center of a tree's crown, from one side to the other.

Crown Fire: Any fire that burns in **canopy fuels.**

Crown Fire Hazard: A physical situation (fuels, weather, and topography) with potential for causing harm or damage as a result of crown fire.

Crowning Index: The open (6.1-m/20 ft) windspeed at which **active crown fire** is possible for the specified **fire environment**.

Dead and Down Material Cleanup: Includes hand piling dead and down material 3" diameter and less. The piles would be burned in the fall with snow cover on the ground or in the spring when soil moisture is higher.

Defensible Space: Defensible space is the area between a house and an oncoming wildfire where the vegetation has been modified to reduce the wildfire threat and to provide an opportunity for firefighters to effectively defend the house. Sometimes, a defensible space is simply a homeowner's properly maintained backyard. (NRCG-Living with Fire)

Duration of Fire: The length of time that combustion occurs at a given point. Relates closely to downward heating and fire effects below the fuel surface as well as heating of tree boles above the surface.

Ecosystem Process: The actions or events that link organisms and their environment, such as predation, mutualism, successional development, nutrient cycling, carbon sequestration, primary productivity, and decay. Natural disturbance processes often occur with some periodicity. (From Webster's dictionary, adapted to ecology)

Fire-Adapted Ecosystem: An eco-system with the ability to survive and regenerate in a fire-prone environment.

Fire Behavior: The manner in which a fire reacts to the influences of fuel, weather and topography.

Firebreak: A natural or constructed barrier to stop or check fires that may occur, or to provide a control line from which to work.

Fire Environment: The characteristics of a site that influence fire behavior. In fire modeling, the fire environment is described by surface and canopy fuel characteristics, windspeed and direction, relative humidity, and slope steepness.

Fire Event: See **Wildland Fire**. For the purposes of fuels analysis it is a wildfire, with a probability of occurrence, that is modeled using representative weather inputs (usually the 90^{th} percentile) for the purpose of effects analysis to compare alternatives.

Fire Exclusion: The policy of suppressing all wildland fires in an area.

Fire Frequency (Fire Return Interval): A general term referring to the recurrence of fire in a given area over time. Sometimes stated as number of fires per unit time in designated area; also used to refer to the probability of an element burning per unit time. How often fire burns a given area; often expressed in terms of fire return intervals (e.g., fire returns to a site every 5-15 years).

Fire Groups:
Fire groups are defined as the dominant tree species and associated vegetation that responds in a similar fashion to wildland fire. The frequency and severity of a wildfire that typically occurred are key factors in identifying each fire groups. These are definitions of fire groups from "Fire Ecology of Montana Forest Habitat Types East of the Continental Divide, *Fisher and Clayton, 1983.*"

Fire Group Seven consists of cool habitat types usually dominated by lodgepole pine *(Pinus contorta).* PICO climax type. Fire hazard is moderate for dense to open advanced immature and mature stands. The hazard increases as stands become over mature and ground fuels build up from downfall and established of shade tolerant species. Typical sources of deadfall in this fire group are snow mortality, mountain pine beetle attacks, wind throw of live trees and dwarf mistletoe-related mortality. If wildfires were not suppressed in this fire group stands would seldom reach a near-climax condition. Periodic wildfires would recycle the stands before a substantial amount of mature Lodgepole pine died out. *Fischer and Clayton 1983 (pages 45-55)*

Fire Group Eight consists of dry, lower Subalpine habitat types where spruce or Subalpine fir is the climax species. Commonly a mixture of Douglas fir, Lodgepole pine and Engelmann spruce. Fire group eight usually produces a large amount of undergrowth commonly shrubs and forbs. In Subalpine fir habitat types, the live fuels can contribute to considerable increase in fire hazard during dry conditions. Dense understories develop and provide fuel ladders to the overstory tree crown, increasing chances of ground fires to climb to crown fires. *Fischer and Clayton 1983(pages 56-61)*

Fire Group Nine consists of a moist, lower Subalpine habitat type. These habitats occur at the moist and wet, lower elevations of the HBFR area. These habitats include the spruce and Subalpine fir with an abundant under story vegetation with dead down woody fuel exceeding 20 ton per acre. Historically, a mixed severity, mosaic burn occurred every 120 years, while severe or stand-replacing fire occurred in these habitats every 250 years on average. *Fischer and Clayton 1983 (pages 62-66)*

Fire Hazard: A fuel complex, defined by volume, type, condition, arrangement and location, that determines the ease of ignition and the resistance to control. A physical situation (fuels, weather, and topography) with potential for causing harm or damage, as a result of wildland fire.

Fire Intensity: See **frontal fire intensity**. Contrast with **fireline intensity**.

Fire Intensity Level (FIL): A measure of fire behavior used in the Interagency Initial Attack Assessment Model (IIAA) (a NFMAS term). It is based on the calculated flame length.

FIL 1: 0-2 feet
FIL 2: 2-4 feet
FIL 3: 4-6 feet
FIL 4: 6-8 feet
FIL 5: 8-12 feet
FIL 6: greater than 12 feet

The NFDRS Burning Index (BI) is calculated flame length x 10. FIL is used in the IIAA model as an indicator of fire danger for dispatch purposes, to categorize rate of spread, and in the assessment of fire effects. Each FIL has an associated suppression cost.

Fire Regime: Five combinations of fire frequency, expressed as fire return interval and fire severity, are defined (Table 1) to create the map of historic natural fire regimes. **Groups I** and **II** include fire return intervals in the 0-35 year range. **Group I** includes ponderosa pine, other long needle pine species, and dry site Douglas fir. **Group II** includes the drier grassland types, tall grass prairie, and some chaparral ecosystems. **Groups 3** and **IV** include the fire return intervals in the 35-100+ year range; and **Group V** is the long interval (infrequent), stand replacement fire regime.

Table 1

Fire Regime Group	Frequency (Fire Return Interval)	Severity
I	0-35 year	low severity
II	0-35 year	stand replacement severity
3	35-100+ year	mixed severity
IV	35-100+ year	stand replacement severity
V	>200 years	stand replacement severity

Fire Return Interval: Number of years between fires at a given location.

Fire Risk: Applies to the probability of an ignition occurring as determined from historical fire record data.

Fire Severity: A qualitative measure of the immediate effects of fire on the ecosystem. Relates to the extent of mortality and survival of plant and animal life both above and below ground and to loss of organic matter.

Fireline Intensity: The rate of heat release in the **flaming front** per unit length of fire front (Byram, 1959); can be converted to flame length. ($FL = 0.45*(I^{0.46})$). This expression is commonly used to describe the power of wildland fires.

Flame length: Measured in feet, helps predict initial attack methodology in fire suppression. Also helps figure the safety of direct or indirect attack for fire fighters or equipment. Flame length also helps predict the potential of fire moving up into the canopy of the trees. Flame length can also be defined as the length of the flame of a spreading surface fire within the flaming front. Flame length is measured from midway in the action flaming combustions zone to the average tip of the flames. Flame lengths of 0-4 feet can be directly attacked by wildland fire fighters. Flame lengths of 4 to 8 feet should be attached with indirect hand or hose control line and/or with equipment (engines, dozers); above 8 feet aerial support is needed to suppress the fire. Flame lengths above 4 feet will lessen the safety of firefighters and make suppression more difficult.

Flaming Front: The zone at a fire's edge where solid flame is maintained.

Foliar Moisture Content: Moisture content (dry weight basis) of live foliage, expressed as a percent. Effective foliar moisture content incorporates the moisture content of other canopy fuels such as lichen, dead foliage, and live and dead branchwood.

Fuel Break: A natural or manmade change in fuel characteristics which affects fire behavior so that fires burning into them can be more readily controlled.

Fuel Characteristics: Factors that make up fuels such as compactness, loading, horizontal continuity, vertical arrangement, chemical content, size and shape, and moisture content.

Fuel Complex: The combination of ground, surface, and canopy fuel strata.

Fuel Continuity: The degree or extent of continuous or uninterrupted distribution of fuel particles in a fuel bed thus affecting a fire's ability to sustain combustion and spread. This applies to aerial fuels as well as surface fuels.

Fuel Loading: Weight per unit area of fuel often expressed in tons per acre or tons per hectare. Dead woody fuel loadings are commonly described for small material in diameter classes of 0 to 1/4-, 1/4 to 1-, and 1 to 3-inches and for large material in one class greater than 3 inches.

Fuel Model: A set of surface fuel bed characteristics (load and surface-area-to-volume-ratio by size class, heat content, and depth) organized for input to a fire model. Standard fuel models (Anderson, 1982) have been stylized to represent specific fuel conditions.

Fuel model 10. Fire burns with more intensity in this fuel model than the other timber litter models. Dead and down fuels include greater quantities of 3 inch or larger wood

resulting from over maturity or natural events that create a large load of dead material on the forest floor. Fuel build up in the form of ladder fuels that cause this fuel model to go from surface to crown fire. Crowning, spotting and torching of individual trees are more frequent in fm 10 which can lead to a faster rate of spread, higher flame length and larger acreage burned. Forest types in this fuel model can have a tight closed canopy with dead and down fuel loadings averaging 18 ton/acre. (Anderson, page 13)

Fuel model 8 areas support a slow-burning, lower intensity ground fire with low flame lengths which are less likely to move into the crowns of the trees. Trees are spaced father apart with an open canopy. This fuel model has minimal dead and down material, averaging 7 tons/acre. (Anderson, page 11)

Fuel Strata Gap: The vertical distance between the top of the **surface fuel** stratum and the bottom of the **canopy fuel** stratum.

Fuel Stratum: A horizontal layer of fuels of similar general characteristics. We generally recognize three fuel strata: ground, surface, and canopy.

Ground Fire: A slow-burning, smoldering fire in **ground fuels**. Contrast with **surface fire**.

Ground Fuels: Fuels that lie beneath surface fuels, such as organic soils, duff, decomposing litter, buried logs, roots, and the below-surface portion of stumps. Compare with **surface fuel**s.

Independent Crown Fire: A **crown fire** that spreads without the aid of a supporting **surface fire**.

Intermittent Crown Fire: A **crown fire** that alternates in space and time between active crowning and surface fire or passive crowning. See also **passive crown fire**.

Ladder Fuels: Shrubs and young trees that provide continuous fine material from the forest floor into the crowns of dominant trees.

Liberation Cut (lib): To remove the Dwarf Mistletoe infected overstory that remains. Areas that are heavily infected with Dwarf Mistletoe would be top priority for removal in this stand type. The **commercial product** would be post/pole and small sawlog. After treatments these stands would be an intermediate size/age stand with approximately 13' between tree crowns.

Litter: The top layer of the forest floor (01 soil horizon); includes freshly fallen leaves, needles, fine twigs, bark flakes, fruits, matted dead grass, and a variety of miscellaneous vegetative parts that are little altered by decomposition. Litter also accumulates beneath rangeland shrubs. Some surface feather moss and lichens are considered to be litter because their moisture response is similar to that of dead fine fuel.

Live Canopy Base Height: Is measured in feet is the height of the lower canopy of the trees. It is used in the equation for prediction if fire will climb up into the canopy and become a crown fire.

Mean Fire Return Interval: The arithmetic average of all fire intervals in a given area over a given time period.

Mechanical Harvest: Is use of machinery to implement a liberation cut (lib), a thin from below (tfb) or a commercial thin (com). The material identified for removal that meets specifications for a commercial product would be felled, skidded to landings, and hauled off site for commercial production. The stems boles and branches from the harvested trees left onsite would be machine piled. Following harvest the understory would be thinned to reduce ladder fuels. See also Thin from Below, Liberation Cut and Commercial Thin.

Mixed Severity Fire Regime: Regime in which fires either cause selective mortality in dominant vegetation, depending on different species' susceptibility to fire, or vary between understory and stand replacement.

Passive Crown Fire: A crown fire in which individual or small groups of trees torch out, but solid flaming in the canopy cannot be maintained except for short periods. Passive crown fire encompasses a wide range of crown fire behavior from the occasional torching of an isolated tree to a nearly active crown fire. Also called torching and candling. The increased radiation to surface fuels from passive crowning increases flame front spread rate, especially at the upper end of the passive crown fire range. Embers lofted during passive crowning can start a new fire downwind, which make containment more difficult and increases the overall rate of fire growth. Passive crowning is common in many forest types, especially those with an understory of shade-tolerant conifers. See also **intermittent crown fire**.

Percent Cover: Percentage of ground area that is directly covered with tree crowns. Generally, the crown area of a tree is computed using the formula for a circle as a function of crown radius or it is estimated in the field either visually or with a densiometer.

Plume-Dominated Fire: A fire for which the power of the fire exceeds the power of the wind, leading to a tall convection column and atypical spread patterns. Contrast with **wind-driven fire**.

Prescribed Burn/Prescribed Fire: Any fire ignited by management actions to meet specific objectives. A written approved prescribed fire plan must exist and NEPA requirements must be met, prior to ignition. This term replaces management ignited prescribed fire.

Predicted Spread Rate (ROS): is defined in chains per hour (Ch/Hr) 1 chain equals 66 feet. ROS is the rate the fire increases its horizontal dimensions. It can be surface or

crown ros. ROS is driven by flame length, wind speed, amount and continuity of fuels for the fire to consume and topography. Heat intensity (BTU's) can play a role in heat transfer and supporting the fire. Predicted ROS is used for estimating the type of equipment and forces to use in suppression tactics. For example, one 3- person engine crew can fight a fire in fuel model 8 with flame lengths under 4 feet (direct hand or hose lay control line) at 15 chains per hour. In fuel model 10, one 3-person engine crew can fight fire with flame lengths over 4 feet (indirect hand and hose lay control line) 8 chains per hour.

Prescription: Measurable criteria that define the conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and other required actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social or legal considerations.

Probability: A number representing the chance that a given event will occur. The range is from 0% for an impossible event, to 100% for an inevitable event.

Purpose: An intended result, something for which an effort is being made (objective).

Risk: The possibility of meeting danger or suffering harm. When used relative to wildland fires, it refers to the probability of escape resulting in financial and ecological loss. Alternative management scenarios generate different degrees of risk and ultimately a different set of economic outcomes (Hesslin and Rideout, 1999).

Running Crown Fire: See **Active crown fire.**

Severity: See **Fire severity**.

Site Characteristics: The characteristics of a location that do not change with time: slope, aspect, elevation.

Slash Conifers, Lop & Scatter: Small conifer trees would be felled with a chainsaw to reduce fuel continuity in clumps and reduce competition. The material would be cut to lengths shorter than 8' and have enough branches removed so the conifers are on the ground (lopping). The material would be scattered to reduce fuel continuity.

Stand Replacement Fire Regime: Regime in which fires kill or top-kill above ground parts of the dominant vegetation, changing the above ground structure substantially. Approximately 80 percent or more of the above ground dominant vegetation is either consumed or dies as a result of fires. Applies to forests, shrublands, and grasslands.

Stems Per Acres (stems/acre): The number of trees in an acre. Each tree is equal to one stem.

Structure Ignition Zone: see **Home Ignition Zone**.

Surface Fire: A fire spreading through surface fuels. A surface fire is one that burns in the surface fuel layer, which lies immediately above the ground fuels but below the canopy, or aerial fuels. Surface fuels consist of needles, leaves, grass, dead and down branch wood and logs, shrubs, low brush, and short trees. Surface fire behavior varies widely depending on the nature of the surface fuel complex.

Surface Fuels: Needles, leaves, grass, forbs, dead and down branches and boles, stumps, shrubs, and short trees.

Surfacing Index: The Surfacing Index is the open windspeed at which an **active crown fire** can be expected to drop to the surface, either due to insufficient **mass-flow rate** through the canopy or insufficient contribution of **surface fuels** to **fireline intensity**.

Thin From Below (tfb): Treatments would leave the larger & healthier Lodgepole pine (LPP) and other species when present. The treatment would begin to address the larger ladder fuels. Areas that are heavily infected with Dwarf Mistletoe would be top priority for removal in this stand type. The crown to crown spacing would be approximately 13'x13'.

Threat: An indication of something impending. An expression of intention to inflict injury or damage.

Torching Index: The open (6.1-m/20 ft.) windspeed at which crown fire activity can initiate for the specified **fire environmen**t.

Understory Thinning: The focus of this treatment would be to reduce ladder fuels by slashing less desirable trees less than 4" in diameter. Natural fuels (fuels on the ground prior to this treatment) would be reduced to 10 to 15 tons per acre. Gallatin Forest Plan direction for Snags (FP Amendment 14) and Down Woody Debris (FP Amendment 15) would be followed.

Value: See also **Values at Risk:** The monetary worth of something.

Values at Risk: Include property, structures, physical improvements, natural and cultural resources, community infrastructure, and economic, environmental, and social values. They may be on or off-site values.

Wildfire: An unwanted wildland fire. This is not a separate type of fire.

Wildland Fire: Any non-structure fire, other than prescribed fire, that occurs in the wildland. This term encompasses fires previously called both wildfires and prescribed natural fires.

Wildland Urban Interface: The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Wind-Driven Fire: A wildland fire in which the power of the wind exceeds the power of the fire, characterized by a bent-over smoke plume and a high length-to-width ratio.

Wind Reduction Factor: The ratio of the midflame windspeed to the open (6.1-m/20 ft.) windspeed. For convenience of measurement, eye-level winds are usually substituted for midflame winds.

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APPENDIX A. Detailed Description of Treatments

Table 1: Detailed Description of Treatments

Existing condition of the vegetation	**Desired Future Condition of the Vegetation**	**Implementation Method Proposed**	**Resulting Fuel Condition**
Generally open grassland or transition forest /grassland		**Prescribed Burning (BB)**	
Predominantly grass with less than 40% crown cover with trees	**Maintain these as open habitats on the landscape.** Spring or fall burning. Strive for approximately 40-60% of the area to be black after burning.	Prescribed burning. Includes hand fireline and fuelbreak construction.	Maintain Fuel Model 2
Forest with small trees less than 6" in diameter		***Mechanical cutting of Small trees (PCT)***	
These are areas with past harvest in the upper slopes and divide between Bozeman Creek and Hyalite Creek. There may be commercial products in some of the stands.	Thin to *8 trees per acre or approximately 15-20 feet between trees. These areas can be managed in a clumpy fashion with break in the fuel continuity between clumps. Fuel loading: 10-15 T/ac. ≥ 3 "; 5 T/ac. <	Small tree thinning. (PCT) Mechanical pile (<35% slopes) and burn. Many fuel treatment options are available depending on products and market. Mechanical processing may be most efficient as far as economics and	Fuel Model 8 or 184 Elevated canopy base height Reduced canopy bulk density. Reduced canopy

Existing condition of the vegetation	**Desired Future Condition of the Vegetation**	**Implementation Method Proposed**	**Resulting Fuel Condition**
	3"; Slash height < 1.5 – 2.0 ft.	production. Cutting with chainsaws, hand pile and burning may be the most costly and labor intensive. Whole tree yarding, selling post and poles, selling chips for pulp or hog fuel are some options. Mechanized equipment could be utilized during harvest for fuel treatments such as excavator or grapple piling, cut and trample with the feller bunchers, or cut-to-length forwarders that also trample slash. Other machines are available that can chop, crush and shred otherwise un-merchantable material to reduce fuels. Again follow up burning is desirable. Limit the treatment to areas that can be reached from the existing roads.	closure. Reduced surface and ladder fuels.

Existing condition of the vegetation	**Desired Future Condition of the Vegetation**	**Implementation Method Proposed**	**Resulting Fuel Condition**
Forest Types with trees generally over 6" in diameter.		**Commercial thin (CT)**	
DF 13 or Predominantly Douglas fir trees with lodgepole pine, alpine fire or spruce Trees over 6 inches in diameter at dbh or 4-1/2 feet above the ground. LPDF13 or Mixed species composition Douglas Fir and Lodgepole Pine generally over 6" dbh Canopy closure - dense > 70% shade from the dominant tree class	Thin to 80-100 ft basal area. Spacing - 18-25 ft. between boles or more to achieve 10-15 ft. crown separation. Leave 35%-50% of the overstory canopy. Fuel loading: 10-15 T/ac. ≥ 3 "; 5 T/ac. < 3"; Slash height < 1.5 – 2.0 ft. Forest stands with insect and disease infestation could have a patchy appearance to select the healthier trees to remain on site.	Less than 35% slope = ground based harvest system More than 35% slope either cable or helicopter logging system. Small trees would be treated by burning; slashed and piled then burned; or removed from the site and utilized as biomass. Remove natural and activity related fuels where fuel loads exceed the desired fuel loading using various methods such as: whole tree yard; yard unmerchantable material, understory burn or jackpot burn or machine pile or handpile and burn. Utilize mechanized equipment as described above for PCT. Machine pile	Fuel Model 8 or 184 Elevated canopy base height Reduced canopy bulk density. Reduced canopy closure. Reduced surface and ladder fuels.

Existing condition of the vegetation	**Desired Future Condition of the Vegetation**	**Implementation Method Proposed**	**Resulting Fuel Condition**
		slopes <35% to treat fuels, regardless of the harvest method.	
DF12 – same as above except the canopy closure ranges from 40-69% which means there are fewer large trees to remove but possible more small trees or ladder fuels. DF11- canopy closure 11-39% species mix is the predominately Douglas fire.	Same as above.	Same as above or possibly underburn only. Underburn only	Same as above
LP 13 – Predominantly Lodgepole Pine trees with alpine fire or spruce Trees over 6 inches in diameter at dbh or 4-1/2 feet above the ground. Canopy closure - dense > 70% shaded from the dominant tree class **LP12 –** same as above except canopy closure 40-69%. **LP11** - same as above except canopy closure 10-39%.	Thin: Spacing, 15-18 ft. between boles or more to achieve 10-15 ft. crown separation. Stands with mountain pile beetle or ≥ 40% mistletoe affected would leave 10-20% of the overstory canopy in clumps. Allow for openings for natural regeneration; 70- 90-ft basal area. Leave 50% overstory canopy. The thinning could be uniform or patchy in appearance	Less than 35% slope = ground based harvest system More than 35% slope either cable or helicopter logging system. Small trees would be treated by burning; or slashed and piled then burned; or removed from the site and utilized as biomass. Remove natural and activity related fuels where fuel loads	Same as above.

Existing condition of the vegetation	**Desired Future Condition of the Vegetation**	**Implementation Method Proposed**	**Resulting Fuel Condition**
	depending upon health of the residual stand and visual considerations. Fuel loading: 10-15 T/ac. ≥ 3 "; 5 T/ac. < 3"; Slash height < 1.5 – 2.0 ft. **LPP treatments in general:** whether healthy or not – healthy maybe leave 10-20% overstory canopy because of it's juxtaposition w/ other treatments, or critical position (topography) in reducing fire behavior and effects to other adjacent stands; it's ability to act as a fuel break.	exceed the desired fuel loading using various methods such as: whole tree yard; yard unmerchantable material, understory burn or jackpot burn, machine pile or handpile and burn. Utilize mechanized equipment as described above in PCT. Machine pile slopes <35% to treat fuels, regardless of harvest method.	
SAF – Subalpine fir forest usually has a Lodgepole Pine component. Most LPP is dead or has a high mistletoe infection rate with high fuel loading.	Treat if critical area to fuelbreak or to change fire behavior, or unhealthy. In heavily diseased stands, leave 10-20% overstory canopy in clumps. Where healthy and critical to Fire behavior and effects	Less than 35% slope = ground based harvest system More than 35% slope either cable or helicopter logging system. Small trees would be treated by burning; or slashed and piled then burned; or	Same as above.

Existing condition of the vegetation	**Desired Future Condition of the Vegetation**	**Implementation Method Proposed**	**Resulting Fuel Condition**
	try the clump thinning. Leave 60-80 ft ba.; which leaves 25-50% of stand. Fuel loading: 10-15 T/ac. ≥ 3 "; 5 T/ac. < 3"; Slash height < 1.5 – 2.0 ft.	removed from the site and utilized as biomass. Remove natural and activity related fuels where fuel loads exceed the desired fuel loading using various methods such as: whole tree yard; yard unmerchantable material, understory burn or jackpot burn; machine pile or handpile and burn. Utilize mechanized equipment as described above in PCT. Machine pile slopes <35% to treat fuels regardless of the harvest method.	

Table 1

Unit Number	Treatment Acres By Unit By Alternative				
	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
1	CT 42	CT 42	BB 42	CT 42	--
1A	--	--	--	--	CT 32
1B	--	--	--	--	CT 21
2	--	CT 214	--	CT 18	--
3	BB 681	BB 681	BB 670	BB 681	BB 876
4	CT 188	CT 188	BB 195	CT 188	--
5	--	CT 81	--	PCT 80	--
6	--	--	--	CT 9	--
7	CT 135	CT 137	BB 135	CT 134	--
7A	--	--	--	--	CT 21
7B	--	--	--	--	BB 68
7C	--	--	--	--	BB 48
8	CT 10	CT 91	BB 81	CT 81	BB 79
9	CT 66	CT 64	--	CT 67	CT 51
10	CT 19	CT 128	BB 13	CT 129	CT 128
11	CT 103	CT 103	BB 69	CT 98	--
11A	--	--	--	--	CT 105
11B	--	--	--	--	CT 70
12	CT 83	CT 83	BB 33	CT 73	--
13	CT 218	CT 236	BB 291	CT 281	--

Unit Number	Treatment Acres By Unit By Alternative				
	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
13A	--	--	--	--	CT 57
13C	--	--	--	--	CT 148
14	--	CT 109	--	CT 109	CT 50
15	--	CT 169	BB 165	CT 92	--
16	CT 208	CT 208	BB 54	CT 208	--
16A	--	--	--	--	CT 149
16C	--	--	--	--	CT 29
17	CT 48	--	BB 48	CT 81	CT 79
18	--	CT 73	BB 71	CT 105	--
19	--	CT 248	BB 168	--	BB 82
20	--	CT 240	--	CT 185	CT 23
21	--	CT 243	BB 240	CT 224	--
21B	--	--	--	--	CT 2
21C	--	--	--	--	CT 24
22	CT 427	CT 427	BB 392	CT 544	--
22C	--	--	--	--	BB 63
22I	--	--	--	--	CT 120
22K	--	--	--	--	CT 89
22L	--	--	--	--	CT 58
22N	--	--	--	--	CT 20
22O	--	--	--	--	CT 3
22P	--	--	--	--	CT 4
22Q	--	--	--	--	CT 13

Unit Number	Treatment Acres By Unit By Alternative				
	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
23	--	--	BB 60	--	--
24	BB 129	BB 129	BB 129	--	--
25	--	BB 250	BB 79	CT 39	CT 39
25A	--	--	--	--	BB 101
26	CT 119	CT 119	PCT 114	CT 96	CT 103
27	--	CT 115	--	CT 126	--
27A	--	--	--	--	CT 98
28	CT 76	CT 76	BB 76	CT 76	--
28B	--	--	--	--	CT 38
28C	--	--	--	--	CT 40
29	CT 136	CT 143	BB 33	CT 142	--
30	--	CT 41	--	CT 42	--
31	CT 48	CT 48	--	--	--
32	PCT 574	PCT 574	PCT 574	PCT 574	PCT 574
33	PCT 543	PCT 543	PCT 543	PCT 535	PCT 543
34	--	--	BB 146	--	--
35	--	--	BB 466	--	--
36	--	--	BB 98	CT 121	--
36B	--	--	--	--	CT 74
36C	--	--	--	--	CT 11
36D	--	--	--	--	CT 47
37	--	--	--	CT 127	CT 31
38	--	--	--	CT 92	CT 104

Unit Number	Treatment Acres By Unit By Alternative				
	Alternative 2	**Alternative 3**	**Alternative 4**	**Alternative 5**	**Alternative 6**
39	--	--	--	**CT 154**	**CT 150**
40	--	--	--	**BB 260**	**BB 258**
45A	--	--	--	--	**CT 8**
45B	--	--	--	--	**CT 12**
45C	--	--	--	--	**CT 4**
	--	--	--	--	
Acreage Subtotal by Treatment	**CT = 1,926 ac.** **PCT=1,150 ac.** **BB= 850 ac.**	**CT= 3,621 ac.** **PCT=1,150 ac.** **BB= 1,100 ac.**	**CT = 0 ac.** **PCT =1,250 ac.** **BB = 2046 ac**	**CT= 3,708 ac.** **PCT= 1,156 ac.** **BB = 950 ac.**	**CT= 2045 ac.** **PCT= 1,117 ac.** **BB = 1,575 ac.**
Temporary Road to Be Constructed	**7.2 miles**	**13.5 miles**	**0 miles**	**6.9 miles**	**7.1 miles**

Table 2: Bozeman Municipal Watershed Alternative 2

Alternative 2

Unit Number	Acres by Logging Method				
	skyline	heli/cable	Helicopter	Tractor	total
1	0	0	42	0	42
4	0	0	188	0	188
7	0	0	135	0	135
8	0	0	10	0	10
9	0	0	66	0	66
10	0	0	19	0	19
11	1	0	102	0	103
12	59	0	11	13	83
13	125	0	19	74	218
16	56	0	3	149	208
17	0	0	48	0	48
22	230	0	121	76	427
26	21	0	0	98	119
28	40	6	30	0	76
29	28	78	3	27	136
31	19	0	29	0	48
total	579	84	826	437	1926

Table 3 Bozeman Municipal Watershed Alternative 3

Alternative 3

Unit Number	Acres By Logging Method					
	skyline	heli/cable	heli/tractor	helicopter	tractor	Total
1	0	0	0	42	0	42
2	0	0	0	218	0	218
4	0	0	0	188	0	188
5	0	0	0	81	0	81
7	0	0	0	137	0	137
8	0	0	0	91	0	91
9	0	0	0	64	0	64
10	0	0	0	128	0	128
11	1	0	0	102	0	103
12	59	0	0	11	13	83
13	142	0	0	0	94	236
14	60	0	0	0	49	109
15	0	49	46	58	16	169
16	56	0	0	3	149	208
18	25	0	0	48	0	73
19	108	0	0	80	60	248

Alternative 3						
Unit Number	Acres By Logging Method					
	skyline	heli/cable	heli/tractor	helicopter	tractor	Total
20	145	0	0	73	22	240
21	17	5	0	126	86	234
22	230	0	0	121	76	427
26	21	0	0	0	98	119
27	104	11	0	0	0	115
28	70	6	0	0	0	76
29	35	81	0	0	27	143
30	38	3	0	0	0	41
31	19	0	0	29	0	48
total	1130	155	46	1600	690	3621

Table 4: Bozeman Municipal Watershed Alternative 5

Alternative 5						
Unit number	Acres By Logging Method					
	skyline	heli/cable	heli/tractor	helicopter	tractor	total
1	0	0	0	42	0	42
2	0	0	0	18	0	18
3	0	0	0	0	0	0
4	0	0	0	188	0	188
5	0	0	0	0	0	0
6	0	0	0	9	0	9
7	0	0	0	134	0	134
8	0	0	0	81	0	81
9	0	0	0	67	0	67
10	0	0	0	129	0	129
11	0	0	0	98	0	98
12	0	0	0	73	0	73
13	58	0	0	131	91	281
14	0	0	0	74	35	109
15	0	0	0	75	17	92
16	56	0	0	3	149	208
17	25	0	0	55	0	81
18	25	0	0	80	0	105
19	0	0	0	0	0	0
20	77	0	0	108	0	185
21	8	0	0	131	86	224
22	158	0	0	329	58	544
25	0	0	0	0	39	39
26	0	0	0	0	96	96

Alternative 5						
Unit number	Acres By Logging Method					
	skyline	heli/cable	heli/tractor	helicopter	tractor	total
27	0	0	0	126	0	126
28	36	0	0	40	0	76
29	0	0	0	115	27	142
30	0	0	0	42	0	42
31	0	0	0	0	0	0
32	0	0	0	0	0	0
33	0	0	0	0	34	34
36	0	0	0	121	0	121
37	0	0	0	127	0	127
38	0	0	0	92	0	92
39	4	0	0	0	150	154
total	447	0	0	2487	774	3708

Table 5: Bozeman Municipal Watershed Alternative 6

Alternative 6						
Unit number	Acres By Logging Method					
	skyline	heli/cable	heli/tractor	helicopter	tractor	total
1A	0	0	0	0	32	32
1B	0	0	0	0	21	21
3	0	0	0	0	0	0
7A	0	0	0	21	0	21
7B	0	0	0	0	0	0
7C	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	51	0	51
10	0	0	0	128	0	128
11A	0	0	0	105	0	105
11B	0	0	0	70	0	70
13A	0	0	0	57	0	57
13C	0	0	0	0	148	148
14	0	0	0	50	0	50
16A	0	0	0	0	149	149
16C	29	0	0	0	0	29
17	0	0	0	69	0	69
19	0	0	0	0	0	0
20	0	0	0	0	23	23
21B	0	0	0	0	2	2
21C	0	0	0	0	24	24
22C	0	0	0	0	0	0

Alternative 6

Unit number	Acres By Logging Method					
	skyline	heli/cable	heli/tractor	helicopter	tractor	total
22I	120	0	0	0	0	120
22K	89	0	0	0	0	89
22L	58	0	0	0	0	58
22N	0	0	0	0	20	20
22O	0	0	0	0	3	3
22P	0	0	0	0	4	4
22Q	0	0	0	0	13	13
25	0	0	0	0	39	39
26	0	0	0	0	103	103
27A	0	0	0	98	0	98
28B	38	0	0	0	0	38
28C	0	0	0	40	0	40
33	0	0	0	0	0	0
36B	0	0	0	74	0	74
36C	0	0	0	11	0	11
36D	47	0	0	0	0	47
37	0	0	0	31	0	31
38	104	0	0	0	0	104
39	0	0	0	0	150	150
40	0	0	0	0	0	0
45A	0	0	0	0	8	8
45B	12	0	0	0	0	12
45C	0	0	0	0	4	4
total	497	0	0	805	743	2045

APPENDIX B

Best Management Practices and Streamside Management Zone Guidelines

Gallatin National Forest – Best Management Practices

Skid Trail Placement and Slope Limitations:

- Require a systematic skid trail pattern during logging. Mechanical ground-based skidding and harvesting equipment may be used off of skid trails only to the degree necessary to harvest the available timber and only when soil moisture conditions are favorable. (See below for details.)

- Use ground-based harvest systems only on slopes having sustained grades less than 35 percent.

- Maintain an average of at least 75 feet between skid trails in partial cuts and an average of at least 100 feet in clearcuts. Skid trails may be closer than this spacing where converging so long as overall spacing averages 75 and 100 feet, respectively.

- Minimize or eliminate any elongated exposures of mineral soil up and down slope from mechanical harvesting operations on slopes greater than 15%.

- Avoid placing skid trails or temporary roads over convex knobs or along narrow, rocky ridges (areas least able to recover from disturbance) to the extent possible.

Restrictive Soil Moisture Conditions:

- Ground based skidding equipment may travel off of the established skid trails but only to the extent reasonably necessary to harvest timber based on the sale administrator's judgment and only when the top 6 inches of soil will not form a ribbon between your thumb and forefinger and will not readily form a ball when squeezed firmly†.
  † Criteria integrates soil texture and soil moisture effects.
- Feller/buncher/mechanical harvesters may be used off established skid trails **except** during periods of wet soil conditions when the soil can be ribboned easily between your thumb and forefinger†. Repeat passes over the same ground should be minimized.
  † *Criteria integrates soil texture and soil moisture effects.*

- In some limited instances, soils may be too dry to allow ground-based, mechanical skidding or harvesting equipment to operate off of established skid trails. Ground-based, mechanical skidding or harvesting equipment will not be

allowed off established skid trials under extremely dry conditions on sandy or shallow soils along ridges and associated convex slopes.

Winter Harvesting Restrictions:

- Tractor harvesting over snow or frozen ground in the winter will be limited to periods when there is a minimum of 6 inches of settled snow covering the ground or the top three inches of mineral soil is either frozen or dry. Harvesting must not be conducted when ponding occurs at the soil surface due to partial thawing of a surface frost layer.

Large Rock Fragment Allowances in Soil Scarification (Ripping) Requirements:

- Landings will be scarified (ripped), in accordance with K-G.6.3.3#, in exposed mineral soil areas surrounding burn piles (assumes piling and burning of slash will occur on landings). This requirement may be waived on soils that have abundant, large rock fragments (greater than 35 percent 3 inch or larger rock fragments) in the top 6 inches of soil.

- Temporary roads will be scarified (ripped), in accordance with K-G.6.3.3#. This requirement may be waived on soils that have abundant, large rock fragments (greater than 35 percent 3 inch or larger rock fragments) in the top 6 inches of soil.

- Skid trails will need to be scarified (ripped) only in those areas where compacted mineral soil is exposed at the surface.

Logging Slash and Other Woody Debris:

- Leave 15 tons per acre of ¾ inch or larger clearing or logging slash, or other woody debris behind to protect the soil surface, slow surface runoff, return soil nutrients to the soil. Slash at an approximate rate of 15 tons per acre should be placed across skid trails in areas of steeper (>15%) slopes. *Note: This could be a range (5-15 ton/acre) if based of soil properties.*

- Some unmerchantable material adjacent to temporary roads, landings, and skid trails should be left standing during harvest so it can be used for slashing by the Forest Service at completion of the project.

- Leave a sufficient amount of smaller material out of the burn pile so the area burned can be slashed by the Forest Service at completion of the contract.

BEST MANAGEMENT PRACTICES FOR FORESTRY IN MONTANA
January 2004

I. DEFINITIONS

1. "Hazardous or toxic material" means substances which by their nature are dangerous to handle or dispose of, or a potential environmental contaminant, and includes petroleum products, pesticides, herbicides, chemicals, and biological wastes.

2. "Stream," as defined in 77-5-302(7), MCA, means a natural water course of perceptible extent that has a generally sandy or rocky bottom or definite banks and that confines and conducts continuously or intermittently flowing water.

3. "Streamside Management Zone (SMZ)" or "zone" as defined at 77-5-302(8), MCA means "the stream, lake, or other body of water and an adjacent area of varying width where management practices that might affect wildlife habitat or water quality, fish, or other aquatic resources need to be modified." The streamside management zone encompasses a strip at least 50 feet wide on each side of a stream, lake, or other body of water, measured from the ordinary high water mark, and extends beyond the high water mark to include wetlands and areas that provide additional protection in zones with steep slopes or erosive soils.

4. "Wetlands" mean those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, swamps, bogs, and similar areas.

5. Adjacent wetlands are wetlands within or adjoining the SMZ boundary. They are regulated under the SMZ law.

6. Isolated wetlands lie within the area of operation, outside of the SMZ boundary, and are not regulated under the SMZ law.

II. STREAMSIDE MANAGEMENT

The Streamside Management Law (77-5-301 through 307 MCA) provides minimum regulatory standards for forest practices in streamside management zones (SMZ). The "Montana Guide to the Streamside Management Zone & Rules" is an excellent information source describing management opportunities and limitations within SMZs.

3. ROADS

A. Planning and Location

1. Minimize the number of roads constructed in a watershed through comprehensive road planning, recognizing intermingled ownership and foreseeable future uses. Use existing roads, unless use of such roads would cause or aggravate an erosion problem.

2. Review available information and consult with professionals as necessary to help identify erodible soils and unstable areas, and to locate appropriate road surface materials.

3. Fit the road to the topography by locating roads on natural benches and following natural contours. Avoid long, steep road grades and narrow canyons.

4. Locate roads on stable geology, including well-drained soils and rock formations that tend to dip into the slope. Avoid slumps and slide prone areas characterized by steep slopes, highly weathered bedrock, clay beds, concave slopes, hummocky topography, and rock layers that dip parallel to the slope. Avoid wet areas, including moisture laden or unstable toe slopes, seeps, wetlands, wet meadows, and natural drainage channels.

5. Minimize the number of stream crossings and choose stable stream crossing sites.

6. Locate roads to provide access to suitable (relatively flat and well drained) log landing areas to reduce soil disturbance.

B. Design

1. Properly design roads and drainage facilities to prevent potential water quality problems from road construction.

2. Design roads to the minimum standard necessary to accommodate anticipated use and equipment. The need for higher engineering standards can be alleviated through proper road-use management.

3. Design roads to balance cuts and fills or use full bench construction (no fill slope) where stable fill construction is not possible.

4. Design roads to minimize disruption of natural drainage patterns. Vary road grades to reduce concentrated flow in road drainage ditches, culverts, and on fill slopes and road surfaces.

C. Road Drainage

Road Drainage is defined as all applied mechanisms for managing water in a non-stream crossing setting, road surface drainage, and overland flow; ditch relief, cross drains and drain dips).

1. Provide adequate drainage from the surface of all permanent and temporary roads. Use out sloped, in sloped or crowned roads, and

install proper drainage features. Space road drainage features so peak flow on road surfaces or in ditches will not exceed capacity.

a. Outsloped roads provide a means of dispersing water in a low energy flow from the road surface. Outsloped roads are appropriate when fill slopes are stable, drainage will not flow directly into stream channels, and transportation safety can be met.

b. For in-sloped roads, plan ditch gradients steep enough, generally greater than 2% but less than 8%, to prevent sediment deposition and ditch erosion. The steeper gradients may be suitable for more stable soils; use the lower gradients for less stable soils.

c. Design and install road surface drainage features at adequate spacing to control erosion; steeper gradients require more frequent drainage features. Properly constructed drain dips can be an economical method of road surface drainage. Construct drain dips deep enough into the subgrade so that traffic will not obliterate them.

2. Design all ephemeral draw culverts with adequate length to allow for road fill width. Minimum culvert size is 15 inch. Install culverts to prevent erosion of fill, seepage and failure as described in V.C.4 and maintain cover for culverts as described in V.C.6.

3. Design all relief culverts with adequate length to allow for road fill width. Protect the inflow end of all relief culverts from plugging and armor if in erodible soil. When necessary construct catch basins with stable side slopes. Unless water flows from two directions, skew ditch relief culverts 20 to 30 degrees toward the inflow from the ditch to help maintain proper function.

4. Where possible, install culverts at the gradient of the original ground slope; otherwise, armor outlets with rock or anchor downspouts to carry water safely across the fill slope.

5. Provide energy dissipaters (rock piles, slash, log chunks, etc.) where necessary to reduce erosion at outlet of drainage features. Crossdrains, culverts, water bars, dips, and other drainage structures should not discharge onto erodible soils or fill slopes without outfall protection.

6. Prevent downslope movement of sediment by using sediment catch basins, drop inlets, changes in road grade, headwalls, or recessed cut slopes.

7. Route road drainage through adequate filtration zones or other sediment-settling structures to ensure sediment doesn't reach surface water. Install road drainage features above stream crossings to route discharge into filtration zones before entering a stream.

D. Construction (see also Section V on stream crossings)

1. Keep slope stabilization, erosion and sediment control work current with road construction. Install drainage features as part of the construction process, ensuring that drainage structures are fully functional. Complete or stabilize road sections within same operating season.

2. Stabilize erodible, exposed soils by seeding, compacting, riprapping, benching, mulching, or other suitable means.

3. At the toe of potentially erodible fill slopes, particularly near stream channels, pile slash in a row parallel to the road to trap sediment (example, slash filter windrow). When done concurrently with road construction, this is one method that can effectively control sediment movement, and it can also provide an economical way of disposing of roadway slash. Limit the height, width and length of "slash filter windrows" so wildlife movement is not impeded. Sediment fabric fences or other methods may be used if effective.

4. Minimize earthmoving activities when soils appear excessively wet. Do not disturb roadside vegetation more than necessary to maintain slope stability and to serve traffic needs.

5. Construct cut and fill slopes at stable angles to prevent sloughing and other subsequent erosion.

6. Avoid incorporating potentially unstable woody debris in the fill portion of the road prism. Where possible, leave existing rooted trees or shrubs at the toe of the fill slope to stabilize the fill.

7. Consider road surfacing to minimize erosion.

8. Place debris, overburden, and other waste materials associated with construction and maintenance activities in a location to avoid entry into streams. Include these waste areas in soil stabilization planning for the road.

9. Minimize sediment production from borrow pits and gravel sources through proper location, development and reclamation.

10. When using existing roads, reconstruct only to the extent necessary to provide adequate drainage and safety; avoid disturbing stable road surfaces. Prior to reconstruction of existing roads within the SMZ, refer to the SMZ law. Consider abandoning existing roads when their use would aggravate erosion.

E. Maintenance

1. Grade road surfaces only as often as necessary to maintain a stable running surface and adequate surface drainage.

2. Maintain erosion control features through periodic inspection and maintenance, including cleaning dips and cross drains, repairing ditches, marking culvert inlets to aid in location, and clearing debris from culverts.

3. Avoid cutting the toe of cut slopes when grading roads, pulling ditches, or plowing snow.

4. When plowing snow, provide breaks in snow berm to allow road drainage.

5. Haul all excess material removed by maintenance operations to safe disposal sites and stabilize these sites to prevent erosion. Avoid side casting in locations where erosion will carry materials into a stream.

6. Avoid using roads during wet periods if such use would likely damage the road drainage features. Consider gates, barricades or signs to limit use of roads during spring break up or other wet periods.

7. Upon completion of seasonal operations, ensure that drainage features are fully functional. The road surface should be crowned, outsloped, insloped, or water-barred. Remove berms from the outside edge where runoff is channeled.

8. Leave abandoned roads in a condition that provides adequate drainage without further maintenance. Close these roads to traffic; reseed and/or scarify; and, if necessary, recontour and provide water bars or drain dips.

IV. TIMBER HARVESTING, AND SITE PREPARATION

A. Harvest Design

1. Plan timber harvest in consideration of your management objectives and the following:

a. Soils and erosion hazard identification.
b. Rainfall.
c. Topography.
d. Silvicultural objectives.
e. Critical components (aspect, water courses, landform, etc.).
f. Habitat types.
g. Potential effects on water quality and beneficial water uses.
h. Watershed condition and cumulative effects of multiple timber management activities on water yield and sediment production.
i. Wildlife habitat.

2. Use the logging system that best fits the topography, soil type, and season, while minimizing soil disturbance and economically accomplishing silvicultural objectives.

3. Use the economically feasible yarding system that will minimize road

densities.

4. Design and locate skid trails and skidding operations to minimize soil disturbance. Using designated skid trails is one means of limiting site disturbance and soil compaction. Consider the potential for erosion and possible alternative yarding systems prior to planning tractor skidding on steep or unstable slopes.

5. Locate skid trails to avoid concentrating runoff and provide breaks in grade. Locate skid trails and landings away from natural drainage systems and divert runoff to stable areas. Limit the grade of constructed skid trails on geologically unstable, saturated, highly erosive, or easily compacted soils to a maximum of 30%. Use mitigating measures, such as water bars and grass seeding, to reduce erosion on skid trails.

6. Minimize the size and number of landings to accommodate safe, economical operation. Avoid locating landings that require skidding across drainage bottoms.

B. Other Harvesting Activities

1. Tractor skid where compaction, displacement, and erosion will be minimized. Avoid tractor or wheeled skidding on unstable, wet, or easily compacted soils and on slopes that exceed 40% unless operation can be conducted without causing excessive erosion. Avoid skidding with the blade lowered. Suspend leading ends of logs during skidding whenever possible.

2. Avoid operation of wheeled or tracked equipment within isolated wetlands, except when the ground is frozen (see Section VI on winter logging).

3. Use directional felling or alternative skidding systems for harvest operations in isolated wetlands.

4. For each landing, provide and maintain a drainage system to control the dispersal of water and to prevent sediment from entering streams.

5. Insure adequate drainage on skid trails to prevent erosion. On gentle slopes with slight disturbance, a light ground cover of slash, mulch or seed may be sufficient. Appropriate spacing between water bars is dependent on the soil type and slope of the skid trails. Timely implementation is important.

6. When existing vegetation is inadequate to prevent accelerated erosion, apply seed or construct water bars before the next growing season on skid trails, landings and fire trails. A light ground cover of slash or mulch will retard erosion.

C. Slash Treatment and Site Preparation

1. Rapid reforestation of harvested areas is encouraged to reestablish protective vegetation.

2. When treating slash, care should be taken to preserve the surface soil horizon by using appropriate techniques and equipment. Avoid use of dozers with angle blades.

3. Minimize or eliminate elongated exposure of soils up and down the slope during mechanical scarification.

4. Scarify the soil only to the extent necessary to meet the resource management objectives. Some slash and small brush should be left to slow surface runoff, return soil nutrients, and provide shade for seedlings.

5. Carry out brush piling and scarification when soils are frozen or dry enough to minimize compaction and displacement.

6. Carry out scarification on steep slopes in a manner that minimizes erosion. Prescribed burning and/or herbicide application is preferred means for site preparation, especially on slopes greater than 40%.

7. Remove all logging machinery debris to proper disposal site.

8. Limit water quality impacts of prescribed fire by constructing water bars in firelines; not placing slash in drainage features and avoiding intense fires unless needed to meet silvicultural goals. Avoid slash piles in the SMZ when using existing roads for landings.

V. STREAM CROSSINGS

A. Legal Requirements

1. Under the Natural Streambed and Land Preservation Act of 1975 (the "310 law"), any activity that would result in physical alteration or modification of a perennial stream, its bed or immediate banks must be approved in advance by the supervisors of the local conservation district. Permanent or temporary stream crossing structures, fords, rip rapping or other bank stabilization measures, and culvert installations on perennial streams are some of the forestry-related projects subject to 310 permits. Before beginning such a project, the operator must submit a permit application to the conservation district indicating the location, description, and project plans. The evaluation generally includes onsite review, and the permitting process may take up to 60 days.

2. Stream-crossing projects initiated by federal, state or local agencies are subject to approval under the "124 permit" process (administered by the Department of Fish, Wildlife and Parks), rather than the 310 permit.

3. A short-term exemption (3a authorization) from water quality standards is necessary unless waived by the Department of Fish, Wildlife and Parks as a condition of a 310 or 124 permit. Contact the Department of Environmental Quality in Helena at 444-2406 for additional information.

B. Design Considerations (Note: 310 permit required for perennial streams)

1. Cross streams at right angles to the main channel if practical. Adjust the road grade to avoid the concentration of road drainage to stream crossings. Direct drainage flows away from the stream crossing site or into an adequate filter.

2. Avoid unimproved stream crossings. Depending on location, culverts, bridges and stable/reinforced fords may be used.

C. Installation of Stream Crossings (Note: 310 permit required for perennial streams)

1. Minimize stream channel disturbances and related sediment problems during construction of road and installation of stream crossing structures. Do not place erodible material into stream channels. Remove stockpiled material from high water zones. Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance. Time construction activities to protect fisheries and water quality.

2. Design stream-crossings for adequate passage of fish (if present) with minimum impact on water quality. When using culverts to cross small streams, install those culverts to conform to the natural stream bed and slope on all perennial streams and on intermittent streams that support fish or that provides seasonal fish passage. Ensure fish movement is not impeded. Place culverts slightly below normal stream grade to avoid outfall barriers.

3. Do not alter stream channels upstream from culverts, unless necessary to protect fill or to prevent culvert blockage. On stream crossings, design for, at a minimum, the 25-year frequency runoff. Consider oversized pipe when debris loading may pose problems. Ensure sizing provides adequate length to allow for depth of road fill.

4. Install stream-crossing culverts to prevent erosion of fill. Compact the fill material to prevent seepage and failure. Armor the inlet and/or outlet with rock or other suitable material where feasible.

5. Consider dewatering stream crossing sites during culvert installation.

6. Maintain a 1-foot minimum cover for stream-crossing culverts 15 to 36 inches in diameter, and a cover of one-third diameter for larger culverts, to prevent crushing by traffic.

7. Use culverts with a minimum diameter of 15 inches for permanent stream crossings.

D. Existing Stream Crossings

1. Ensure stream crossing culverts have adequate length to allow for road fill width and are maintained to preserve their hydrologic capacity. To prevent erosion of fill, provide or maintain armoring at inlet and/or outlet with rock or other suitable material where feasible. Maintain fill over culvert as described in V.C. 6.

VI. Winter Logging

A. General

1. Consider snow-road construction and winter harvesting in isolated wetlands and other areas with high water tables or soil erosion and compaction hazards.

2. Conduct winter logging operations when the ground is frozen or snow cover is adequate (generally more than one foot) to prevent rutting or displacement of soil. Be prepared to suspend operations if conditions change rapidly, and when the erosion hazard becomes high.

3. Consult with operators experienced in winter logging techniques.

B. Road Construction and Harvesting Considerations

1. For road systems across areas of poor bearing capacity, consider hauling only during frozen periods. During cold weather, plow any snow cover off of the roadway to facilitate deep freezing of the road grade prior to hauling.

2. Before logging, mark existing culvert locations. During and after logging, make sure that all culverts and ditches are open and functional.

3. Use compacted snow for road beds in unroaded, wet or sensitive sites. Construct snow roads for single-entry harvests or for temporary roads.

4. In wet, unfrozen soil areas, use tractors or skidders to compact the snow for skid road locations only when adequate snow depth exists. Avoid steeper areas where frozen skid trails may be subject to erosion the next spring.

5. Return the following summer and build erosion barriers on any trails that are steep enough to erode.

VII. HAZARDOUS SUBSTANCES

A. General

1. Know and comply with regulations governing the storage, handling, application (including licensing of applicators), and disposal of hazardous substances. Follow all label instructions.

2. Develop a contingency plan for hazardous substance spills, including cleanup procedures and notification of the State Department of Environmental Quality.

B. Pesticides and Herbicides

1. Use an integrated approach to weed and pest control, including manual, biological, mechanical, preventive and chemical means.

2. To enhance effectiveness and prevent transport into streams, apply chemicals during appropriate weather conditions (generally calm and dry) and during the optimum time for control of the target pest or weed.

Streamside Management Zone Guidelines

Stream Class Definitions

Class 1 streams support fish or surface flow during six months of the year or more and contribute surface flow to another stream, lake, or other body of water.

Class 2 streams normally do not have surface flow six months of the year, but do contribute surface flow to another stream, lake or other bodies of water or streams that normally do have surface flow six months of the year, but do not contribute surface flow to another stream, lake or other bodies of water.

Class 3 streams rarely contribute surface flow to other streams or other bodies of water, and normally do not have surface flow six months of the year or more. These streams are typically not connected to other streams.

A. SMZ Guidelines

1) Equipment operation would be prohibited within the 50 foot wide SMZ's. There are no known areas within this project area where SMZ's would be extended to 100 feet because of 35% slope.
2) SMZ boundaries would be clearly marked along on all stream segments.

3) Trees cut and removed within the 50 foot wide SMZ would be directionally fell and cabled out. There are no known areas within this project area where trees would be fully suspended across stream segments.
4) Bank-edge trees would be favored.
5) Trees leaning toward streams would be favored.
6) Sub-merchantable trees and shrubs would be retained and protected to the fullest extent possible.
7) Hardwoods and snags may be counted toward the retention tree requirements in approximately the same proportion as in the pre-harvest stand.
8) For Class 2 streams, retain at least 50% of trees greater than or equal to 8 inches DBH on each side of stream or 5 trees per 100 foot segment, whichever is greater. Note: Proposed buffers adjacent to fish bearing Class1 streams exceed what is required by SMZ compliance rules.
9) All trees that have fallen, through natural processes, across or in a Class 1 or 2 stream must be retained.

B. Modified SMZ Guidelines

1) No trees would be cut within 15 feet of the Ordinary High Water Mark (OHWM) along any fish bearing Class 1 or Class 2 stream segments within commercial and non-commercial treatment units. Removal of lower branches (or ladder fuels) of larger trees within this 15 foot no cut zone would be allowed if removal would not result in mortality to that tree. This mitigation measure is designed to protect streambanks, provide thermal regulation overhead cover, augment debris recruitment, and reduce or prevent sediment delivery.
2) Retain all bank-edge trees maintaining stable stream banks and trees leaning toward streams that can provide large woody debris within commercial and non-commercial treatment units.
3) A fisheries biologist or trained fisheries technician would be present during marking of all commerical or non-commerical treatment unit boundaries adjacent to streams and marking of leaning leave trees outside the 15 foot no cut zone.
4) This fisheries biologist or trained fisheries technician would be given the descretion to widen the 15 foot no cut zone to insure stream bank stability in those situations where 15 feet was deemed inadequate.

C. No Cut or Treatment Buffers

No trees would be removed or fuels treated within designated buffers adjacent to stream channels as measured from the ordinary highwater marks. Width of these buffers vary depending on proposed treatment and location.

D. Riparian Treatment Strategies

Class 1 Fish Bearing Streams
Above Intakes and Leverich Creek

Helicopter Logging – 100 foot no cut buffer
Ground Base Logging, Slashing or Piling (Cable, Tractor or Excavator) - 100 foot no cut buffer
Prescribed Burning - 50 foot no burn buffer

Below Intakes

Helicopter Logging – Not Applicable
Ground Base Logging, Slashing or Piling (Cable, Tractor or Excavator) – Not Applicable
Prescribed Burning - Not Applicable

Class 1 Non-Fish Bearing Streams

Above Intakes and Leverich Creek

Helicopter Logging – Modified SMZ Guidelines
Ground Base Logging, Slashing or Piling (Cable, Tractor or Excavator) - 100 foot no cut buffer
Prescribed Burning - 50 foot no burn buffer

Below Intakes

Helicopter Logging – Modified SMZ Guidelines
Ground Base Logging, Slashing or Piling (Cable, Tractor or Excavator) – Modified SMZ Guidelines
Prescribed Burning - 50 foot no burn buffer

Class 2 Streams

Above Intakes and Leverich Creek

Helicopter Logging – Modified SMZ Guidelines
Ground Base Logging, Slashing or Piling (Cable, Tractor or Excavator) - 100 foot no cut buffer
Prescribed Burning – No burn buffer

Below Intakes

Helicopter Logging – Modified SMZ Guidelines
Ground Base Logging, Slashing or Piling (Cable, Tractor or Excavator) – Modified SMZ Guidelines
Prescribed Burning – No buffer

Class 3 Streams

Above Intakes and Leverich Creek

Helicopter Logging – Not Applicable
Ground Base Logging, Slashing or Piling (Cable, Tractor or Excavator) – Not Applicable
Prescribed Burning – Not Applicable

Below Intakes

Helicopter Logging – Not Applicable
Ground Base Logging, Slashing or Piling (Cable, Tractor or Excavator) – SMZ Guidelines
Prescribed Burning – No buffer

APPENDIX C – RESPONSE TO COMMENTS

Following is the Forest Service response to substantive comments on the Draft EIS for the Bozeman Municipal Watershed project. These comments were received from individuals, agencies, and special interest organizations. The following list of letters is numbered and each comment is identified by listing the letter number and page of the letter that contained the comment.

1. United States Department of the Interior.
2. Kenneth Zahn
3. Phil Knight
4. Greater Yellowstone Coalition and the Wilderness Society. Scott Brennan and Patricia Dowd.
5. Alliance for the Wild Rockies. Michael Garrity.
6. Native Ecosystems Council. Sara Jane Johnson
7. United States Environmental Protection Agency

Other letters, cards, and emails were received but are not listed here. The response to their comments is included in the following responses. All comment letters, cards, and emails are available for review at the Forest Service Office.

BMW – Response to Comments

General Comments	Response
Purpose and need "It is clear that a federally funded project is being proposed for the primary purpose of compensating for the City of Bozeman's lack of adequate planning in the design and updating of -- and current ongoing operation of -- its water treatment plant (to accommodate the need for ash or sediment filtration) and to provide alternative water sources and storage capacity in the event of the temporary loss of water from Bozeman and Hyalite Creeks." (2 – p.2)	Please note the Purpose and Need section of Chapter 1 in the FEIS. The Background section of Chapter 1 notes the type of filtration system employed in the City of Bozeman water treatment plant and notes its potential inadequacy in case of a severe wildfire with dramatically increase sedimentation. However, The need is because of the condition of the vegetation and the potential for reducing risk of wildfire, not because of the condition of the water treatment plant.
Alternatives "Simply discussing alternatives related to City options in a "Cumulative	Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that

Impacts" section, as suggested in the DEIS will not be sufficient as to coordination process, given the CEQ Memo and the document's stated purpose and need and project scope." (2 – p.3) "Develop and discuss in a Supplement to the DEIS for public review a new alternative that discusses (1) the City alternatives of drilling backup water supply wells that can be tapped for a 3-7-day period should sediment or ash loads charge the drainages of the 2 creeks after an unplanned burn, (2) logging only those areas of the Forest that are South of the intakes, and providing a sufficiently-wide buffer break zone for access to and optimum management of wildfires that may start on either side." (2 – p.3,4)	were not developed in detail (40 CFR 1502.14). Four alternatives were considered, but dismissed from detailed study (FEIS Ch I-**). During scoping, comments were submitted that asked the Forest Service to consider an alternative that improved water treatment facilities such as building sediment traps, upgrades to treatment plant, and wells. These options are not within the decision authority for the Forest Service nor do they meet the purpose and need of this project. Therefore, this sort of alternative was judged to be outside the scope of the decision.
Maps are inadequate "Figures 2.1, 2-2, 2-3, & 2-4 are completely inadequate portrayals of the proposed preferred and rejected alternatives." (2 – p3) ". The most notable characteristic of the DEIS is the lack of maps. Even the maps for the proposed alternatives are small and difficult to read." (6 – p.1) "The information in the DEIS includes a wide variety of sizes of analyses areas. Please provide a clear description of both the project area (map and acres) and cumulative effects area (map and acres in the FEIS." (6 – p.3) "It would be helpful, however, if the maps were larger and identified specific treatment units, and more clearly showed road locations relative to surface waters, as well as boundaries for the Bozeman municipal watershed and the water supply diversion locations." (7 – p.2)	The maps showing the alternatives in Chapter 2 of the FEIS have been improved to include the treatment unit numbers. In addition, larger scaled maps are available on the Gallatin web site. Larger maps are also available at the Bozeman Ranger District office.

Schedule and prioritize activities "There are no time schedule projections for sequence of treatment unit activities for Alternative 5;" (2 – p.4) "As noted in our November 2005 scoping comments, we strongly recommend a prioritization system that ensures the maximum effectiveness of fuel reduction activities in the watershed." (4 - p.1)	The project is expected to take at least 5-8 years or more to implement. The time schedule for putting the various treatments in place will depend on various factors such as contracting for the thinning and temporary road construction, availability of funding for prescribed burning, coordinating seasons of operation, etc. As stated in Chapters 1 and 2, the highest priority for treatment of stands is in the lower reaches of the drainages, closes to the Forest boundary and closest to the water treatment facility and water inlets.
Water supply "Far better to develop alternative water supplies for Bozeman (wells) and upgrade the treatment plant as soon as possible." (3 – p.3)	The City of Bozeman has plans to install a new filtration plant within the next 5-6 years.
HFRA "By political intent and design HFRA is grossly inconsistent with existing statutes governing national forest system lands, and the Forest Plan. A significant Plan amendment is required for this HFRA project." (5 – p.1)	The Forest Service decided early in the process that we would not pursue this project under the HFRA regulations.
Forest plan direction/references "Speaking of the GFP, we could not detect any existence of such in the BMWP. For example, there is no table provided that identifies the treatment units within each management area (MA). There is no discussion of how each MA will be managed as per the GFP. The FEIS needs to demonstrate that the GFP is indeed being implemented." (6 – p.2) "The GFP issue above clearly indicates that the agency is implementing a new fuels reduction program that is outside the GFP. There has been no	Discussion of Gallatin Forest Plan MA direction is included in the FEIS (Ch I-18). Fuels reduction is clearly within the guidance of the Forest Plan. FP Goals include: Use prescribed fire to accomplish vegetative management objectives (p. II-2), FP Objectives include: Prescribed fire will be used to carry out vegetative management activities (p. II-6), and Treatment of natural fuel accumulations to support hazard reduction and management area goals will be continued. All fuel reduction activities associated with the proposed action comply with the pertinent MA direction.

programmatic analysis or Forest Plan amendment that changes the management emphasis of the affected lands to fuels management at great cost to wildlife and other resources." (6 – p.3) "If the Gallatin NF considers specific requirements of the Forest Plan to be germane to the proposed action, we suggest adding brief excerpts from the Plan as sidebars in the FEIS, or in the very least identifying where one can access the 1987 Forest Plan." (7-p.3)	
Roads and future management "The long term impacts of roads that will be in place, regardless of whether or not they are closed or put in cold storage, needs to be fully addressed and defined to the public as a part of the agency's demonstration of the value of this project. This analysis should include what the future management needs of treated areas will be, and what role the new roads will play in this ongoing management." (6 – p.4) ıe impact of new road construction needs to be mapped so that the public can understand the tradeoffs that will be required *for* this project. Please include a colored map that displays where current unroaded areas, including IRAs are located, and how these areas will be impacted by new roads." (6 – p.7)	The Gallatin National Forest recently completed its Travel Management Plan. This plan designates the management of all roads In this plan, several project roads and trails are targeted to be closed. An Interdisciplinary Team was recently established to start planning for the implementation of these closures including the NEPA process. Several of the proposed roads to be closed are located within the BMW project area. Some of these roads would be used first to implement this proposal and be closed at the end as part of this project. All temporary roads that are needed for this project will be closed following the thinning activities. No temporary roads are needed for the prescribed burning activities.

Fire and Fuels Comments	**Response**
Risks of burning "The obvious risks of uncontrolled burns resulting from escape of a	The Specialist Fuels Report goes into greater detail as to why Alt. 4 may not be a viable alternative. The actual feasibility of doing so many prescribed burns in a 5-10 year

prescribed burn (Alt 4) are not addressed here, and are completely inadequate in the discussion of Affects in Chapter 3 for Alt # 4." (2 – p.3)	timeframe is not realistic and may not meet objectives anyway. The analysis for Alt. 4 did a unit by unit comparison of common factors to determine feasibility of prescribed burning. The factors used included: • Does not incorporate pretreatment (thinning, harvest) prior to prescribed burn treatment. However this does not preclude slashing of non-commercial small trees as pre-treatment to burning. • Prescription (Rx) burn windows are minimal on any given year. • Risk and Consequences of escape can be high due to WUI in area and possibly large areas burned at one time trying to take advantage of Rx burn windows. • Treatment cost can be high due to the extra effort in trying to hold given that a burn may be conducted on the 'dry' or 'hot' end of the prescription window. • Access can be difficult for burn preparation, holding and monitoring. • Overall effectiveness is limited without pre-treatment on many units. Objectives would not be met. • Burning without pre treatment (harvest) may create greater mortality and stressed trees leading to greater fuel loading in the area. • Cost vs. Benefit. Given the proximity to the WUI and the fuel loadings that have resulted from many decades of fire suppression the use of fire alone on many of the units presents and unacceptable risk and is not a responsible option at this time. The result of this analysis for Alt. 4 was that over half of the units would be dropped for consideration for prescribed burning. **Alt. 4 Units dropped**: 6, 8, 10, 12, 15-18, 21, 23, 25, 28, 29 and 34-36. Unit 1 drops stand 508-02-024. **Ads Unit 40** - stands 508-02-

	171,172,173,099,046,167,168,169,100,101. It is not the intent of the DEIS to address all the risks of prescribed burning. Prior to implementation, the risks and consequences of escape are addressed in great detail in a site-specific document for each prescribed burn that is planned. This document called a "Prescribed Fire Plan" requires line officer approval and signature.
Timber harvest and fire probability "The chances of a fire burning much of the two the drainage in the next few years is extremely small based on historic fire regimes and probability estimates. Bozeman may well have developed alternative water sources such as wells by then." (3 – p.1) "There is little evidence that thinning and large tree removal will in any way reduce the severity or likelihood of forest fire in the drainage." (3 – p.2) "Any plan for thinning must consider how effective the thinning will be over time, and how a thinner forest type will be maintained." (3 – p.2) "Since the scientific literature suggests that your proposed logging activities will actually <u>increase</u> the rate of fire spread, you need to reconcile such findings with the contradictory assumptions expressed in the DEIS." (5 – p.3)	True, the probability estimates are small. However, the historic fire regimes in most of the area are near or past their fire return interval. 77% of the area is in Condition Class 2 or 3, which means fire regimes have been moderately altered to significantly altered from their historic range. Fire return intervals have departed from historic frequencies by at least one to multiple fire return intervals. The result is moderate to dramatic changes in fire size, intensity and severity, and landscape patterns. (Spec. report p 4-5; FEIS Ch 3- 7-8) What this means is the forest is at a point where it is ready to recycle. But when it does the resulting fire behavior and effects may be uncharacteristic of what it may have done historically. There are many recent examples of uncharacteristic fire behavior in municipal watersheds that had detrimental effects, such as the Haymen fire in Colorado in 2002. (Graham 2004, p 35) The National Fire Plan urges us to protect municipal watersheds. The treatments are designed with ecological restoration in mind as an added benefit, so when the inevitable fire does occur, it will burn less intense, less severe and more characteristic of the historic fire regime. The primary purpose is protection of Bozeman's drinking water. Treatments would occur over a 5-10 year period, which means

	only a few hundred acres at a time would be treated. It seems prudent to treat a few hundred acres at a time which accomplishes forest restoration, restores ecological process and changes fire behavior to lessen its effects vs. allowing wildfires to possibly treat thousands of acres in a short time frame with severe effects. (Specialist Fuels report p 28, FEIS Ch 1, p 11-13) This proposal does not claim to reduce the likelihood of any fire in the drainages; however, it does try to reduce the severity of future fires in the drainages. It is important to realize that reducing crown fire potential is probably the most important factor with this proposal to prevent detrimental effects from high severity fire such as increased sediment into the watershed. The most effective strategy for reducing crown fire occurrence and severity is to (1) reduce surface fuels, (2) increase CBH, (3) reduce CBD, and (4) reduce continuity of the forest canopy (Graham et al, 2004 p 23-24). Treatments (thinning) in this proposal have been designed to affect those changes. (Specialist Fuels report p 23) The best success in modifying fire behavior to reduce severity and intensity is when the thinning is accompanied by surface fuel treatment, either by piling and burning the residual slash or understory burning (Graham et al, 1999). Treatments will be periodically visited and put on a maintenance schedule for prescribed burning or other fuel treatments to maintain effectiveness of the original treatment. Effectiveness is about 20-40 years for treatments in forest types of this area (Fuels Spec. report p 24-26). True, thinning can increase the rate of spread. Thinning creates more open stands that tend to allow higher wind speeds at the surface that tend to dry fuels more compared to dense stands. However, this forest structure historically played an important role in

	maintaining fire-dependent forest types (Graham et al, 2004 p12). The goal for the treatments would be to convert or maintain the stands in a slower spreading fuel type by doing follow up fuel treatments as described above. More importantly, fire models show crown fire acres were reduced, and the proportion of surface fire to crown fire acres increased. This shows a potential decrease in severe fire effects and increases firefighter safety (FEIS Ch 3, pp 7, 15, 17, 19, 21, and 25; Spec. report p 23). Fuel treatments that create more open stands can facilitate suppression by providing safer access and egress for firefighters, as well as provide more tactical options such as direct attack and burning out (Omi, Martinson, 2002 p.25). Air support is more effective as water and retardant can reach the ground easily. Resistance to control is decreased with less fuel, and line production is increased and made safer. (Spec. report p 23-24) In the pre-treatment condition of this landscape with steep, complex terrain; large expanses of contiguous, dense, heavy fuels; sometimes inaccessible with few roads; and conditions for crown fire potential leaves suppression forces with no relatively "easy" place to build fire line. When fires begin to exhibit behavior of torching and spotting this becomes very dangerous; and in the pre-treatment condition it leaves few places for firefighters to 'make a stand' to fight the fire, or to egress to safety. Therefore, placing many treatments across the landscape that begins to incrementally reduce fire size, reduce crown fire acres and increase the proportion of surface fire acres would be a benefit. (Spec. report p 24)
Climate change "Logging such as that proposed for the Bozeman municipal watershed contributes to deforestation and thus to climate change, increasing the	The current pre-treatment condition of the forest in the proposal is conducive to extreme fire behavior. Locally, we have been in extended drought for about nine years. The forests are hot and dry during the summer and fall months despite the forest cover. There are

likelihood of just the sort of fires that the project is designed to control." (3 – p.1)	numerous local examples of extreme fire behavior on the Gallatin National Forest in recent years. Closest to the project area are the Purdy fire 2001, Fridley fire 2001, Big Creek 2006. Collectively, these three fires alone burned about 44,000 acres in only a few short days during the hottest, driest time of the year. The treatments proposed are thinning that retain 50% of forest cover (not deforestation), followed by prescribed burning treatments. Burning is called 'prescribed' because it is conducted at a time when land managers choose to burn. Factors such as temperature, fuel moisture, wind and relative humidity are monitored for times conducive to controlling the fire vs. wildfire that burns uncontrollably at the hottest, driest times. The goal is to change fire behavior from crown fire to surface fire by thinning dense forest canopy, removing ladder fuels and treating surface fuels. Treatments would enhance firefighter safety, as surface fire is much safer to engage and control than crown fire. Allowing fires to burn in the municipal watershed is not a responsible option at this time. Treatments have been placed strategically with point protection of the water intakes and private land boundaries in mind. Also treatments on ridge tops are designed to limit fire size and fire spread from one drainage to another.
Reduce risk of wildfire "To further reduce the risk of fire carrying between the Hyalite Creek and Bozeman Creek drainages we strongly recommend that more intensive commercial thinning, the removal of ladder fuels, and prescribed burning be carried out on the heavily roaded and intensively managed divide between the two drainages. Without prescribed burning, the current prescription of	Many of the stands in the area mentioned do not have trees of commercial value. These stands are regeneration from past timber harvest and are single storied, small diameter stands with dense canopy cover. The current prescription of precommercial thinning and pile burning is the right prescription given the current stand conditions. Any commercial products will be utilized where available. Prescribed burning will be explored as an option. Pile burning is the first choice because the area has good access and terrain is flatter

precommercial thinning and pile burning does not provide sufficient risk reduction for fire carrying between the two watersheds. (4 – p.3)	which is conducive for using mechanized equipment for the thinning and piling treatments.
Risk of crown fire "The NEPA documents claims that there is a risk of crown fire being started elsewhere and causing substantially damage these watersheds. The NEPA document should substantiate these statements, particularly that management of wildlands forest has the potential to decrease threat to the wildlands-urban interface and municipal watershed." (5 – p.2)	In response to Jack Cohen's writings on home ignitability, the proposed project is not designed to address private property and structures. The Forest Service (FS) has no jurisdiction on private land. Homeowners are not required to do fuels reduction on their land. The project is designed to lower the potential for risk of crown fire and wildland fire spread. (FEIS Ch 1, p 12-13) A structure can be threatened by wildland fire in three ways: direct exposure to flames, radiated heat, and airborne firebrands (Cohen 1999, p 2). The proposed treatments are meant to lower the potential risk of crown fire and fire spread by reducing surface fuel loading, ladder fuels and by reducing tight canopy closure in tree crowns. One benefit of the treatments is to reduce the potential for airborne firebrands that may threaten homes immediately downwind of the project area. To reduce the threat of ignition from firebrands, fuels need to be reduced both near and at some distance from the structure. Firebrands that result in ignitions can originate from wildland fires that are at a distance of 1 kilometer or more. To be effective, given no modification of home ignition characteristics, wildland vegetation management would have to significantly reduce firebrand production and potentially extend for several kilometers away from homes (Cohen 1999, p 4, 5). For this area BehavePlus fire behavior model runs estimated a spotting distance of approximately 3/10 to 6/10 of a mile for firebrands in the project area for the current condition. The estimated distance for spotting was one of the criteria used to define treatment boundaries. (FEIS Ch 3 p 9; Spec. report p 15) The FS has current direction from the National

	Fire Plan, the Cohesive Strategy, HFI and HFRA to focus attention and effort on protecting communities including municipal watersheds. However, the FS is only responsible for potential fuel reductiontreatments on public lands in the WUI areas. The FS does have responsibility to collaborate and cooperate with private landowners in the WUI. Through education and encouragement of private landowners to treat fuels on their property and make their homes fire safe, we can work towards a common goal. (Spec. report p 6, FEIS Ch1-12) The current fuel situation in the WUI, the terrain, prevailing winds and long term drought are conditions that pose a concern for a potential wildfire to spread either from the Forest to private lands or from private lands onto the Forest. It would be irresponsible to allow a fire spreading from the Forest to threaten private property. Conversely, a fire spreading from private land onto the forest would be unacceptable given the current situation. The WUI for this analysis area is along the northern boundary where private land meets National Forest Land in both Hyalite Creek and Bozeman Creek; and along the northwest boundary adjacent to the ridge between Hyalite Creek and Cottonwood Creek. The common goal would be to reduce fuels in the WUI. This will begin to reduce conditions for initiation and spread of crown fire, which will lessen the fire behavior potential of a fire spreading from or to national forest system (NFS) lands. A Community Wildfire Protection Plan (Gallatin County, 2006) further defines the WUI in this area to include the entire analysis area. (Spec. report p 6-7)
Thinning and fire risk "The NEPA document should additionally recognize research suggesting that thinning	See response to "Timber Harvest and Fire Probability" above. As mentioned above, the thinning treatments need to be followed up with surface fuel treatments to be effective. There is

has the potential to augment fire risk." (5 – p.2)	no dispute with the research you have cited (Huff et al 1995). However, Graham et al. (1999) mentions throughout this paper the effects of thinning to reduce fuels and decrease fire intensity when followed up with surface fuel treatment. The following is from pg. 18: "Thinnings in general will lower crown bulk densities and redistribute fuel loadings significantly, thus decreasing fire intensities **if surface fuels are treated** (Agee 1993, Alexander 1988, Alexander and Yancik 1977). These removals have been shown to be effective in reducing crown fire potential, especially around homes (Coulter 1980, Dennis 1983, Rothermel 1991, Schmidt and Wakimoto 1988). Because of drier fuels (fuels are more exposed to wind and heat) and increased wind speeds that occur in thinned stands, it is critical that they be treated to minimize fire intensity. In California, plantations where surface fuels ere treated had substantially less damage from wildfires compared to untreated plantations that burned completely and severely (Weatherspoon and Skinner 1995)." And from page 20: "Fire intensity in thinned stands is greatly reduced if thinning is accompanied by reducing the surface fuels created by the cuttings. Fire has been successfully used to treat fuels and decrease the effects of wildfires especially in climax ponderosa pine forests (Deeeming 1990; Wagel and Eakle 1979; Weaver 1955, 1957). In contrast, extensive amounts of untreated logging slash contributed to the devastating fires during the late 1800s and early 1900s in the inland and Pacific Northwest forests. These catastrophic fires led to both laws and policies governing the treating of slash after timber harvesting (Brown and Davis 1973, Deeming 1990). These initiatives led to several methods, in addition to fire, for treating fuels including cutting, scattering, piling, clearing, crushing, and disking (Brown and Davis 1973).

	These examples from Graham et al. which include many citations from other research are clearly counter to the idea that thinning has the potential to augment fire risk.
Community protection "In proposing to protect private property and human health and safety from wildland fire destruction, please examine the concepts of Community Protection Zone and Home Ignition Zones (Nowicki, 2002)."… "the imperative to separate the problem of the wildland fire threat to homes from the problem of ecosystem sustainability due to changes in wildland fuels." (5 – P.4)	The concepts of the Community Protection and Home Ignition Zones (Nowicki, 2002) are parallel with the purpose and need and proposed action for the proposal. The proposal has several objectives, #1 of which is to protect the municipal watershed by changing potential fire behavior through fuel treatments. Many of the treatments happen to be in wildland urban interface (WUI) areas, i.e. close to the private boundary and homes. So there is a dual benefit of protecting the WUI and protecting the municipal watershed by doing treatments. Many of the treatments are placed near the water intakes to the treatment plant; designed to protect the intakes from severe fire effects if all vegetation is quickly removed from a wildfire. This could result in the intakes being plugged up from sediment and ash. Protection from home ignitability can be easily translated to protection of the water intakes in this example. Another objective is to reduce firebrand production at a considerable distance from homes and the community. The Forest Service often has no control of the fuel treatments in the home ignition zone (see response to "Risk of Crown Fire" above & FEIS Ch 1-12). Reducing firebrands leads to increased firefighter and public safety and reduces the extent of large, severe wildfires that impact the watershed and the WUI (see FEIS, Ch1-13 and 1-14). There are no objectives with this proposal that address ecosystem sustainability. Ecosystem sustainability is another side benefit of doing treatments that move towards getting the area back to more characteristic fire regimes.
Bias for logging "We believe that the DEIS is biased in	This is a fuel reduction project designed to change fire behavior from intense crown fires to surface fires in order to meet objectives.

favor of logging. We've perceived what is little more than a propaganda piece designed to misinform people into believing that nothing about logging could be bad for the drinking water, that fire can be completely controlled if enough "treatment" is carried out, and that nothing about wildland fire is good for the ecosystem (unless it's "prescribed"). (5 – p.3)	Objectives such as preventing detrimental effects from high severity fire such as increased sediment and ash in the watershed; and providing for increased firefighter and public safety during fire events would be accomplished through fuel treatments such as thinning. Selection and crown thinning would not be utilized in this proposal. Treating the entire fuel profile, canopy fuels (tree spacing); ladder fuels; and surface fuels after the thinning is the most effective strategy for reducing potential crown fires. Follow up treatment of surface fuels after the thinning activities would take place.(Fuels Specialist Report, pages 23-26 the and several citations from Graham et al 1999 and 2004 that is responsive to this comment).
Desirability of wildfire "Another aspect of your NEPA document that is biased is the assumption that nothing about wildland fire is desirable from a human standpoint." (5 – p.5)	On the contrary, the Introduction and Existing Condition in the Fire/Fuels Specialist Report pgs. 1-4, and the FEIS Existing Fuels Condition discussion (FEIS Ch 1-7,8) discusses the natural processes of fire and how fire exclusion has disrupted the disturbance regimes. This has contributed to the current fuel conditions and increased biomass that have led to more uncharacteristic fires. The natural cleansing and renewal process that natural fire disturbance brings has been mostly eliminated. The treatment proposals of thinning and prescribed fire are designed to mimic that process. "Thinning mimics mortality caused by inter-tree competition or surface fires (Graham et al. 1999, pg. 3). The FEIS (Ch 3-13) explains why using natural fire as an ecological process in not a management option in this area at this point in time. Fire suppression is the first option at this time due to concern for protecting the municipal watershed.

Fire history methodology "In response to these scientific concerns, we ask that the FS disclose what fire history methodology it uses, acknowledge the limitations of the fire history methodology, and disclose what project-area data it's relying upon." (5 – p.6)	(See FEIS Ch1-9 and 1-10 for fire history; see also Spec Rpt p 5). The studies by Losensky (1993) use the fire-scar method as well as stand age to help estimate fire return intervals. In the Methods section, Losensky discloses the limitations that lead to uncertainty and variance in the data. The actual date of a fire event is subject to some uncertainty. Fire scar counts may be in error as a result of false or missing rings or rings masked by pitch or rot. Counts on dead trees or stumps are also dependent on identifying the year the tree died or was harvested. Aging a fire event from the origin of a stand has even more uncertainty. Not only must an estimate be made of the years taken to grow to the sampling height on the tree but also an estimate of the time delay after the fire until a new stand was established. For these reasons fire events based on fire scars may vary plus or minus two to three years while those based on stand age may vary 5 to 10 years. True, there probably is no research method free of uncertainties and biases. However, finding trends vs. more exact numbers seems more important. The abstract cited in the comment letter references a study in the ponderosa pine type, historically, a low severity fire regime. There is no ponderosa pine in the proposal area and most of the fire regimes are mixed and stand replacement severity. The data shows, (FEIS Ch. 3-7), that much of the area has fire regimes that have been altered. This means one or more fire return intervals have been missed, and to give the benefit of the doubt, the trend is towards the high end of the return intervals if they have not been missed. This is evident by the fact that few large fires have impacted the area since the late 1800's. In addition to the above data, we can access our fire occurrence records that date back to 1940. This data can be queried for various items in tabular format such as fire size, location, fire cause and cost, etc. Also the data can be displayed in GIS to show distribution of fires

	across the landscape. Along with the occurrence data is a separate GIS layer showing fire perimeters on the landscape of all large fires, > 10 acres, on the Gallatin National Forest.

Forest Vegetation Comments	**Response**
Roadless and roadless logging "I am opposed to any proposal that would allow commercial logging to occur in the inventoried roadless area. No new roads, temporary or permanent, should be built in the inventoried roadless area not anywhere else in the Bozeman Creek drainage." (3 – p.2) "We request that you limit activities in inventoried roadless areas within the Bozeman Municipal Watershed to those consistent with the Roadless Rule, and that you limit harvest to "generally small diameter timber, those trees less than 7 inches in diameter." " -- we request that no new temporary roads, permanent roads or trail-road hybrids (recently described as "troads" by agency personnel) be built in inventoried roadless areas within the watershed." (4 – p.2)	For this project, our first priority is to reduce the possibilities that a moderately severe wildfire will dramatically increase sediments to either Hyalite or Bozeman Creek. In order to accomplish this objective as successfully as conditions will allow, thinning of forested stands will roughly follow the following prescription: 1) thin small diameter trees (less than 7 inches dbh) from the lower forest canopy (thin from below). This action helps reduce the probability that a crown fire will occur from a surface fire within the stand. 2) thin in the overstory canopy such that distance between tree crowns is about 13 feet. This type of thin will remove trees much greater than 7 inches dbh in the overstory canopy in order to reduce the probability of crown fire spreading from crown to crown and equally important, in reducing the likelihood of Douglas-fir beetle or mountain pine beetle killing many of the larger trees. These two beetles are attacking forests throughout the interior west where forests average over 100 years in age, exceed 10 inches dbh and exceed 100 square feet of basal area per acre. In stands that are highly susceptible, these insects can kill up to 70% to 80% of the large trees. If we were to thin only those trees less than or equal to 7 inches dbh, we would be addressing only part of the problem in trying to reduce effects from wildfire. Additionally, at this time, no new roads are being proposed in the

	roadless areas. If any thinning is to (as per the above thinning prescription) occur in these roadless lands, helicopter logging within ½ to ¾ of a mile to an existing road will be employed.
Forest restoration "Given that the purpose of the BMW Project is to "maintain a high-quality, long term water supply for Bozeman" by reducing the risk of erosion caused by severe and extensive wildfire in the municipal watershed, we request that the Forest Service adopt a forest restoration framework for all project-related activities." (4 - p.1)	The process the Gallatin National Forest is presently using to identify areas where we believe management might best be applied weighs both ecological issues (for example where might forests be managed to assure sustainable issues for both plants and animals) as well as social issues (for example how to best to protect homes and people during times of wildfire). We agree an important element in management of any area is the need to ensure activities are directed in ways that help change an area such that we can maintain as resilient an ecosystem as money will allow. We believe that the best way to manage our lands is to create sustainable ecosystems that in the future prevent many of the issues we are seeing today from ever developing (for example dealing with a forest that is more prone to large scale disturbances such as broad hot wildfire and large severe insect outbreaks that most likely were less common historically).
Diameter of trees harvested "The absence of any restrictions or guidelines for the size classes to be harvested is a serious shortcoming in the Draft EIS. Because the largest trees in the forest are usually the most fire-resistant, and very ecologically valuable, we request you develop and implement protections for large diameter trees. We also request that you ensure an appropriate percentage of each diameter class, including all trees over 7 inches in diameter in inventoried roadless areas, be retained throughout the project implementation." (4 – p.3) "It would be helpful if the FEIS identified the extent to which existing large diameter trees would be harvested	Thinning some larger trees based on spacing of 13' X 13' between crowns is prescribed for two reasons. The first reason is to reduce the likelihood that a crown fire will carry through these stands should such a crown fire begin in these stands or from adjacent stands. Understory thinning alone, will not reduce the likelihood of crown fire carrying through a stand of trees should one occur adjacent or in the stand itself. The second reason in removing some larger trees is to reduce the probability of mortality possible from either the Douglas-fir beetle or mountain pine beetle. Both beetles favor older and larger trees and given the favorable conditions that currently exist with warmer average temperatures and

and/or retained with the action alternatives… The alternatives descriptions in the DEIS do not describe measures that would be taken to retain large healthy. trees, particularly trees of desired or threatened species such as, whitebark pine during thinning and timber harvest treatments." (7-p.15)	forest stands exceeding 80-100 square feet of basal per acre, continued mortality of larger trees can be expected (as is beginning to occur throughout both drainages). Increased mortality to these larger trees will only increase the odds of a more severe wildfire occurring within the two drainages. The number of larger trees to be left depends on each stand's characteristics, but the silvicultural prescription is to focus on leaving the largest and healthiest trees in the stand when spacing at 13' X 13' between tree crowns. We are not proposing to thin any whitebark pine stands. Such an activity may be proposed in a future proposal (if for instance 100% of the existing stands are killed from either mountain pine beetle or whitepine blister rust), but given the high elevation of these stands and the generally low fuels present, treating such stands will occur only if it would improve the survivability of this hard hit species.
Insects and disease "The NEPA document must thoroughly access the current levels of infection of mountain pine beetle and other insect and disease organisms within the cutting units as well as within the analysis area".	We completely agree that it is important to address the present situation of insect numbers throughout the analysis area, including the proposed thinning/burning areas. However, we disagree that even if we are within the historical norm of insect caused mortality for this area, that any actions to reduce further mortality from insects is NOT warranted. It is well accepted that some amount of insect/disease caused mortality to trees is likely critical to the health of forest ecosystems. Where we part company on this issue seems to be at what scale should this issue be addressed and whether or not every square mile of National Forest should have insect/disease killed trees present at some agreed upon historical level even in an area where much of Bozeman receives its drinking water. Because of the considerable amount of roadless and wilderness lands within the Gallatin National Forest (where insects and disease will be allowed to operate freely without management

	intervention) and the high importance we place on these two drainages for the drinking water of Bozeman, reducing insect caused mortality we believe is an acceptable goal in managing this area. We believe that increasing the number of dead trees (caused by whatever agent) within an analysis area such as the Bozeman and Hyalite drainages, increases the probability that a more severe fire will occur. A main goal for this project is to reduce this probability.
Ecosystem management "Emphasizing individual tree health subverts the goal of ecosystem management integrity and long-term sustainability of forests and their myriad biotic components." (5 – p.1)	As described in the FEIS (Chapter 1-11,12,13) the purpose and need for action is to reduce the potential severity and extent of future wildland fires in the watersheds, improve evacuation corridors for these areas in case of wildfire and improve the fuel conditions near the wildland/urban interface (WUI). We are emphasizing thinning of commercial and non-commercial stands of timber and prescribed burning tinber stands to reduce fuels. No where in the FEIS is it suggested that we are emphasizing individual tree health to meet the purpose and need for this project.
Long-term program "Since the proposed action is only the first round of the set of actions, it's clear that you are proposing a long-term program of fire risk reduction/vegetation manipulation, with the first set of actions alone being of very little value. Unfortunately, this kind of "program" is not consistent with what the Forest Plan has in mind for these watersheds." (5 – p.3)	We disagree that planning for forest management in an area like Bozeman Creek and Hyalite Creek is inconsistent with the Gallatin Forest Plan. There are several examples of Gallatin Forest Plan direction for action to address fire and watershed concerns(see pages II-1,5., II-2,16.,17, II-5 i., II-6 m., II-24-10., II-28,4-5, 3-25 under fire where the management area directions for most management areas are similar to the direction cited here).
Mechanical manipulation "And any forest condition that is maintained through repeated mechanical manipulation is not maintaining ecosystem function. The proposed management activities would not	There is no doubt that managing a forested landscape using only mechanical manipulation (thinning for example) without considering processes, structure and function might create a forest that is unsustainable in maintaining a

be integrated well with the *processes* that naturally shaped the ecosystem and resulted in a range of natural structural conditions." (5 – p.5)	"healthy" forest ecosystem. However, because we are aware of such issues, our future management plans will consider other methods of treatment beyond only mechanical manipulation. Prescribed fire will be a tool that most certainly will be used more commonly when fuel levels allow for burns that are more easily controlled. To do such burning will require fuel loadings within the lower bounds of natural and an understory of trees that is minimal. In order to for stands to reach the lower fuel and understory levels, mechanical manipulation will be necessary. Once such levels are reached, prescribe burning will likely be used to keep cost lower and to reintroduce a natural process that has been excluded.
Old growth "Please disclose how any stands proposed for "treatment" compare to Forest Plan or Regional old-growth criteria." (5 – p.7) "The DEIS makes a claim that mature forest habitat has increased over historic conditions in the project area. Could you please provide the data for this claim for this project area?" (6 – p.6)	Please see FEIS Ch. III-212, 218, 223, 230, 236, 242, 243, 248, 249, 252-255 for the analysis and discussionAs discussed in the FEIS , in Compartment 508 there are 5,620 acres of old growth. In Alternative 3 (this alternative proposes treating the most old growth of any of the alternatives in Compartment 508), 420 acres would be thinned and or burned (this equates to about 2% of the existing old growth being treated. After treatments, we estimate that 30% of the forested lands in Compartment 508 will be old growth). In Compartment 509 there are 5,773 acres of old growth. In Alternative 5 (this alternative proposes treating the most old growth of any of the alternatives in Compartment 509), 600 acres would be thinned and or burned (this equates to about 3% of the existing old growth being treated. After treatments, we estimate that 25% of the forested lands in Compartment 509 will be old growth). And in Compartment 510, the greatest amount of old growth that is proposed for thinning is 14 acres (in Alternatives 4, 5 and 6). This equates to less than 1% of the existing old growth being after treatment. After treatment, old growth in the 510

	Compartment will be 35%. All stands proposed for treatment were evaluated against Region 1's definition for old growth as defined for eastern Montana in the Green et al. report (Old-Growth Forest Types Of The Northern Region). In general, Douglas-fir stands need 5 trees/acre >= 19" with a minimum basal area per acre of at least 60 ft2 and minimum age of the large trees >= 200 years. Lodgepole pine forests need 12 trees/acre >=10" with a minimum basal area per acre of at least 50 ft2 and minimum age of the large trees >=150 years. Subalpine fir forests need 10 trees/acre >=13" with a minimum basal area per acre of at least 60 ft2 and minimum age of the large trees >=160 years. Whitebark pine forests need 11 trees/acre >=13" with a minimum basal area per acre of at least 60 ft2 and minimum age of the large trees >=150 years. Jack Losensky (1993, 2002) addresses the question of historic structure for eastern Montana and fire history around the project area (specifically Finnegan Ridge/Spansih Breaks and Squaw Creek Drainage). This publication leads us to the conclusion that mature forest habitat has increased over historic conditions.
Timber age class ". As per the timber age classes defined in the DEIS, could you please define the specific ages that are included in each age class, from pole to old growth? Also, please define the dbhs of these age groups." (6 – p.3)	Seedlings 0-0.9" dbh and approximately <20 years old, Saplings 1"-4.9" and around 20 to 40 years, Pole 5"-8.9" for all species other than lodgepole pine (which is defined as stands with a dbh of the larger trees averaging 5"-6.9"). Age for pole stands are highly variable. Where harvest has occurred, age can be as little as 40 years and where no harvest has occurred age for Pole stands can be close to 150 years. Mature forest is usually defined as that which is greater than 8.9" (for species other than lodgepole pine) and 6.9" (for lodgepole pine) and age-wise is generally less than the age that is defined for old growth. Old growth is

	defined from the Green et al. report that is used as the standard for Region 1. General Old Growth characteristics are: In general, Douglas-fir stands need 5 trees/acre >= 19" with a minimum basal area per acre of at least 60 ft2 and minimum age of the large trees >= 200 years. Lodgepole pine forests need 12 trees/acre >=10" with a minimum basal area per acre of at least 50 ft2 and minimum age of the large trees >=150 years. Subalpine fir forests need 10 trees/acre >=13" with a minimum basal area per acre of at least 60 ft2 and minimum age of the large trees >=160 years. Whitebark pine forests need 11 trees/acre >=13" with a minimum basal area per acre of at least 60 ft2 and minimum age of the large trees >=150 years.

Water and Fish

Comment	**Response**
Correction "…the USGS station number for the streamflow gage on Hyalite Creek should be 06050000. (1- p.1)	The streamgage USGS station number and high peak flow date were changed in the Affected Environment section for Issue #02-Water Quality
Reduce road related sediment "Because forest roads on steep slopes can cause excessive erosion and sedimentation, we request that the Forest Service avoid building any temporary or permanent roads on slopes greater than 30 degrees. Causing more sedimentation through poorly placed roads would defeat the purpose of the project." (4 – p.3)	FEIS, Appendix B Best Management Practices 3 ROADS A. Planning and Location #4 includes the BMP to avoid steep slopes in road location. The temporary road locations for Alternative 6 all comply with this BMP and will be obliterated after use.
Post fire planning "We also encourage the Forest Service	The City of Bozeman Water Facility Master Plan in the Affected Environment section for Issue #02-Water Quality lists options the City

and City to develop a post-fire plan now for addressing sediment and other fire-related issues that could impact our drinking water." (4 – p.3)	of Bozeman has in the event operational changes are required due to precipitation events following wildfires. Further information is available in the Master Plan which is available at http://www.bozeman.net/bozeman/engineering/documents/Water Facility Plan.pdf
Sediment sources ", the Final EIS should identify and prioritize existing sources of sedimentation in the watershed and propose specific remedies for reducing or eliminating these existing sources of sediment." (4 – p.3)	Existing sources of sediment for Hyalite Creek and Bozeman Creek are listed in the Hyalite Creek section of the Affected Environment section for Issue #02-Water Quality. These include primarily natural streambank sources and road sediment sources. The Gallatin NF is planning to decommission approximately 10-15 miles of project roads in the Hyalite drainage as well as stabilize cut slopes along the Hyalite Road #62.
Monitoring "Because this proposed project is in the City of Bozeman's watershed, the Forest Service should develop and describe a very specific monitoring plan as well as an explanation of how this monitoring will be funded." (4 – p.4)	Water Quality monitoring for the BMW project is listed in the Features Common to All Alternatives section in Chapter 2 for Water Quality. The BMW monitoring will consist of at least 1 formal BMP review. Monitoring also consists of continuous measurements of turbidity and water chemistry parameters as detailed in the City of Bozeman Water Facility Plan at: http://www.bozeman.net/bozeman/engineering/documents/Water_Facility Plan.pdf
Impacts to fish and water "We request a careful analysis of the impacts to fisheries and water quality, including considerations of sedimentation, increases in peak flow, channel stability, risk of rain-on-snow events, and increases in stream water temperature." (5 – p.1)	Sedimentation – Nearly the entire analysis for water quality and fisheries was based on sedimentation. See FEIS Ch 3-34 thru 46 and 3-60 thru 76. Additional in stream sediment data is presented for Leverich Creek (FEIS Ch 3-57). Increases in Peak Flows – Potential analysis of peak flow increases was evaluated on pages 3-38, 3-41, and 3-43. Potential water yield increases were calculated for both current conditions and for each alternative. Both Hyalite and Bozeman Creeks were estimated to have 0.4% and 1.2% water yield increase potential with a total water yield % cumulative

"An aspect of your DEIS that is extremely narrow and biased is the assumption that a wildland fire could only be catastrophic to the water. The FS is misplacing the threats to clean water solely onto vegetative conditions, instead of correctly identifying the true threats to watershed health." (5 –p.5) "Our goals for the area include fully functioning stream ecosystems that include healthy, resilient populations of native trout. ….We request the FS design a restoration/access management plan for project area streams that will achieve recovery goals." (5 – p.7)	increase of 2.2% for each drainage. This is too low of increase to be measurable or pose peak flow increase problems. Risks of Rain-on-Snow Events – Rain on snow event risk was not specifically disclosed in the EIS since robust rain on snow events high discharge events on the Gallatin NF are uncommon and the BMW would have little effect on rain on snow event increase potential. Channel Stability – Channel instability can be caused by increased peak flows (see above), rain-on-snow events (see above) and riparian harvesting. No riparian harvesting is proposed within Alternatives 2 thru 5. The Gallatin NF operates under a Settlement Agreement with the Madison Gallatin Chapter of Trout Unlimited that timber harvesting would not occur within 100 feet of stream courses unless there are benefits to riparian dependent resources. Therefore, no streamside trees providing stream bank or channel stability would be removed under the action alternatives. Increases in Stream Water Temperatures – No streamside trees providing shade to stream would be removed under the action alternatives. Stream water temperatures would remain the same. As a result, the effects analysis in the FEIS centered around sediment delivery. The Gallatin National Forest recently completed its Travel Management Plan. In this plan, several project roads and trails were targeted to be closed. An Interdisciplinary Team was recently established to start planning for the implementation of these closures including the NEPA process. Several of the proposed roads to be closed are located within the BMW project area. Some of these roads would be used first to implement this proposal and be closed at the end as part of this project. The Gallatin NF is currently cooperating with the City of Bozeman and consultants in Bozeman and Hyalite Creek Source Water Protection Planning and grant applications

	which will include many water quality protection and stream ecosystem protection components.
Watershed baseline "It is extremely important the FS disclose the environmental baseline for watersheds. Generally, this means their condition before development or resource exploitation was initiated." (5 – p.8)	The environmental baseline for water quality, water yield, and sediment is disclosed in numerous places in the FEIS including Ch 3-27 (streamflows and water yield), 3-28 (channel stability), and 3-29 to 31 for several watershed baseline factors. Sediment yield environmental baseline is shown on 3-35.
Water monitoring "We also believe that some level of water monitoring should be carried out in the Bozeman and Hyalite Creek watersheds …" (7. sum p.3)	Water Quality monitoring for the BMW project is listed in the Features Common to All Alternatives section in Chapter 2 for Water Quality. The BMW monitoring will consist of at least 1 formal BMP review. Monitoring also consists of continuous measurements of turbidity and water chemistry parameters as detailed in the City of Bozeman Water Facility Plan at: http://www.bozeman.net/bozeman/engineering/documents/Water_Facility Plan.pdf
Stream crossings "It is not clear to us if the new temporary roads include new stream crossings." (7- sum p.3)	The preferred Alternative 6 in the FEIS does not include any perennial road stream crossings. Stream crossing BMP's are outlined in the BMP Appendix B.
Road condition information "Additional information on road conditions in the Bozeman Municipal Watershed ….should be provided in the FEIS" (7 – sum p. 4)	Road milage and road condition relative to the Gallatin NF Travel Plan are discussed for the Hyalite drainage in the FEIS Ch 3-28 and included in the sediment analysis for Bozeman, Leverich, and Hyalite Creeks. The Gallatin Travel Plan also has extensive road length and road condition information. FEIS, Appendix B contains mititigation measures relative to road maintenance. In general the roads used for the BMW project access will have improved drainage and maintenance than other roads in the project area.
Watershed classification ". As you know Hyalite Creek is	See FEIS Ch 3- 28 to 30 for a description of Montana Water Quality Standard descriptions for Bozeman Creek and Hyalite Creek.

classified A-1, and Bozeman (Sourdough) Creek is classified A-Closed in accordance with Montana Water Quality Standards (ARM 17.30.621). A-Closed watersheds are particularly sensitive and have to be protected so waters can be maintained for drinking, culinary, and food processing purposes after simple disinfection (i.e., no filtration)…. No change is allowed from naturally occurring turbidity or dissolved oxygen or temperature,- and no increases are allowed above naturally occurring concentrations of sediment, suspended sediment, settleable solids, oils or floating solids which are likely to create a nuisance or render the waters." (7 – p.3)	
Sediment exceeds standard "We would be very concerned about the exceedances in Montana Water Quality Standards for sediment with Alternative 3, and about potential fisheries impacts to Leverich Creek and failure to meet MOUCA with Alternatives 2 and 3." (7 – p.4)	Projected sediment levels are very close to sediment standards for Alternative 2 in Leverich Creek and Alternative 3 in Hyalite Creek, and exceeding standards in Alternative 3 for Leverich Creek. The development of the preferred alternatives for both the DEIS and FEIS included project changes and mitigation to reduce the potential sediment yields to well within standards (FEIS Ch 3-87).
DEQ limited segment "It is important to note that "reasonable soil, land and water conservation practices" are differentiated from BMPs, which are generally established practices for controlling nonpoint source, pollution. BMPs are largely practices that provide. a degree of protection for water quality, but may or may not be sufficient to achieve Water Quality Standards and protect beneficial uses." (7 – p.5)	FEIS Ch. 3-36 and 37 discusses Forest Plan standards and sediment compliance for Hyalite, Bozeman, and Leverich Creeks for each alternative. The BMP's (FEIS,Appendix B) and mitigation measures are designed to achieve Water Quality Standards and protect beneficial uses.
Watershed restoration "We are concerned, however, about the limited funding available to implement	The Gallatin has had an active watershed rehabilitation program with over 400 miles of road decommissioning since 1990, and over 100 miles of road decommissioning since

such road related watershed restoration work. It is important that the project be consistent with the TMDLs and Water Quality Plans being prepared by the State for impaired waters." (7 – p.5) TMDL's mitigation or restoration activities should be included to reduce existing sources of pollution to offset or compensate for pollutants generated during project activities (7 – p.5).	2005. If current funding levels continue sufficient funding will be available to decommission several of the "green" project roads (10-15 miles) in Hyalite Creek. The Gallatin NF has and will continue to participate and coordinate with staff from the EPA and Montana DEQ in preparation and implementation of TMDL's for both the East Gallatin TMDL (Bozeman Creek) and Lower Gallatin TMDL (Hyalite Creek). The TMDL's and schedules are discussed on page 3-28 and 3-30 of the DEIS. Projected project impacts (see sediment modeling on pages 3-35 to 3-46) include some short term sediment increases due to project activites. These increases are mitigated to the reasonable extent possible (Appendix C) and will be further compensated with addition road decommissioning. Total sediment impacts, however, will not necessarily result in a total compensation of all sediment increases during project implementation due to the inherent desyncronization of project implementation and restoration.
BMPs and mitigation "It is important that mitigation measures effectively protect soils and avoid sediment production and transport when carrying out logging activities in a municipal watershed.) (7 – p.6)	See the FEIS Appendix B (Best Management Prectices) for soil and sediment mitigation.
Road restoration "It is not clear to us why all 34 acres of temporary. roads will not be restored?... We. are concerned about the large road maintenance backlog on National Forests and the many miles of Forest roads in need of maintenance."(7-p.7)	The 21 miles of temporary road restoration are to meet the soil quality standards set for this project area (FEIS Ch.3-326). Further road restoration work in the drainages is being examined in a separate EA for the entire Gallatin Forest.
Additional road information "Additional information on road conditions in the Bozeman Municipal	Road milage and road condition relative to the Gallatin NF Travel Plan are discussed for the Hyalite drainage on 3-28 and included in the sediment analysis for Bozeman, Leverich, and

Watershed project area (i.e., road drainage, erosion, sediment production and transport), and the Gallatin NF's ability to adequately maintain roads and improve degraded road conditions in the area should be provided in the FEIS." (7 – p.7)	Hyalite Creeks. The Gallatin Travel Plan also has extensive road length and road condition information. Appendix B contains mititigation measures relative to road maintenance. In general the roads used for the BMW project access will have improved drainage and maintenance than other roads in the project area.
Road/stream crossings "Information on road stream crossings should be provided in the FEIS. Reducing proximity of roads to streams and minimizing road stream crossings are critical to reducing impacts of roads to water quality and aquatic habitat." (7 – p.8)	The preferred Alternative 6 in the FEIS does not include any perennial road stream crossings. Stream crossing BMP's are outlined in the BMP Appendix B.
Grazing allotment "Is the grazing allotment adequately managed and monitored to be consistent with the A-1 and AClosed Water Quality Standards classifications for the Hyalite and Bozeman Creek public water sources for the City of Bozeman?" (7 – p.9)	See FEIS Ch 3-29 for a description of the Hyalite Grazing allotment. The revised AMP and riparian exclosure fence in Lick Creek and virtual elimination of riparian grazing in Buckskin Creek and other AMP improvements have reduced water quality effects of the allotment to very minor and probably un-measurable.
RHCAs "We note that INFISH riparian harvest conservation areas (RHCAs) are much more protective of water quality and riparian and wetland areas than the Montana SMZ rules. Adequate RHCAs are important to maintain the health of watersheds, riparian, and aquatic resources and sustain aquatic and terrestrial species and provide water of sufficient quality and quantity to support beneficial uses. Wherever possible we recommend use of more protective INFISH RHCAs." (7 – p.9**)**	The SMZ rules only pertain to commercial timber harvesting not prescribed burning. The two mitigation measures listed on page 2-19 in the DEIS were combined. INFISH RHCA's do not pertain to the Gallatin NF. INFISH was established to protect bull trout habitat west of the Continental Divide. Mitigation Measure # 3 under Amphibian Species (FEIS Ch 2-15) states that prescribe burn would be ignited in a manner that would prevent head fires within riparian areas adjacent to other ephemeral or intermittent draws. Ignition would not occur within these riparian areas, but fire would be allowed to back down hill and creep around. It is believed that these mitigation measures are adequate to protect the mentioned resources and at the same time minimize sediment

	deliver to nearby fish bearing streams. The Gallatin NF has evaluated prescribed burns for several years in BMP project reviews as summarized at FEIS Ch 3-42. No areas of accelerated sheet or rill erosion from prescribed burns have been document on the GNF in any of these reviews as prescribed burns are generally much shallower than wildfires with much quicker vegetative response. The 50' no burn buffer zone has proved to be adequate for several prescribed burns in the Northern Gallatin range included burns in Hyalite Creek and Bozeman Creek as mentioned on page Ch 3-42 of the FEIS.
Wetlands review "We recommend that treatment units be reviewed in the field to assure identification of wetlands, and marking of wetland locations on the Sale Area Map and in the field so that timber contractors will be able to avoid wetlands. We support use of buffers around wetlands and BMPs that are protective of wetlands such as no heavy equipment operation in wetlands." (7 – p.10)	Wetlands are discussed on page Ch 3-29 of the FEIS. All wetland areas will be avoided in any ground disturbing activities in the BMW project.
Monitoring and water quality "We did not see any water quality or aquatic monitoring proposed in the Hyalite or Bozeman Creek watershed to document that water quality will not be degraded from logging and road building…., we believe it would be prudent to carry out some level of water quality monitoring to validate that such requirements can be met." (7 – p.11)	No quantitative monitoring was proposed within the project area. Sediment core samples taken along Leverich Creek could be retaken if it is thought sediment levels have significantly increased as a result of this project. The Gallatin NF does have a BMP monitoring process of which the BMW project would be subject (FEIS Ch 3-57). Water Quality monitoring for the BMW project is listed in the Features Common to All Alternatives section in the FEIS Ch II-**) for Water Quality. The BMW monitoring will consist of at least 1 formal BMP review. Monitoring also consists of continuous measurements of turbidity and water chemistry parameters as detailed in the City of Bozeman Water Facility Plan at: http://www.bozeman.net/bozeman/

	engineering/documents/Water_Facility Plan.pdf
Air quality/burning "We recommend that the FEIS more clearly describe and quantify proposed burning activities, particularly the amount of pile burning that would occur with the action alternatives… It is important to disclose that even though prescribed burns will be scheduled during periods of favorable meteorological conditions for smoke dispersal, the weather can change causing smoke not to disperse as intended." (7 – p.12, 13)	The amount of pile burning is disclosed by alternative (FEIS Ch 3-234 to 3-240) for machine pile, handpile, prescribed burn, and commercial thin understory burns. The machine pile and handpile treatments will use pile burning techniques to reduce project fuels. Conservative (relative low dispersion condition) meteorology was used in the smoke modeling to estimate $PM_{2.5}$ levels by distance from the unit.
Air quality monitoring "Please check the data and revise as necessary, and identify the air monitoring stations and program (if other than MDEQ that reported the data." (7 – p.13)	The Bozeman ambient air quality monitoring section has been updated in the FEIS.

Wildlife

Comment	**Response**
Biological Assessment "A PROJECT-SPECIFIC Biological Assessment (BA) in conformance with the Endangered Species Act Sec 7, as well as ground surveys within each ground-disturbing activity area for historical and archeological resources followed by National Historic Preservation Act (NHPA) consultation with the SHPO under Sec 106 FOR THIS PROPOSED PROJECT were needed before the draft EIS was circulated to the public (not after), so	Potential effects to threatened and endangered species were analyzed and disclosed in the DEIS for each alternative, as required under the NEPA. The Biological Assessment is a document that describes potential effects of the *selected action* for consultation purposes between the action agency, (e.g. US Forest Service) and the US Fish and Wildlife Service. Since the final project design was not approved by the deciding officer at the time the DEIS was published, there was no BA to include. In accordance with the Endangered Species Act, a BA was prepared for the final project design and consultation for the project has occurred

their conclusions could be outlined in the DEIS and assessed by the public." (2-p.4)	with the US Fish and Wildlife Service. The BA and response letter from the USFWS are included in Appendix D of the FEIS.
Population viability ". Considering potential difficulties of using population viability analysis at the project analysis area level (Ruggiero, et. al., 1994), the cumulative effects of carrying out multiple projects simultaneously across the Gallatin NF makes it imperative that population viability be assessed at least at the forestwide scale (Marcot and Murphy, 1992)." (5 – p.7) "The wildlife sections invariably fall back to the claim that even though local populations will be impacted, there will no Forest-wide trends triggered with respect to viability. The problem is that there was no analyses provided as to what the Forest-wide trends of these species are." (6 – p.2)	Population viability analysis, as required by the NFMA for Management Indicator Species, was addressed in the FEIS for Northern Goshawk on p. 3-199 and 3-200. The viability analysis referenced for goshawk (Samson 2006a) was conducted for the entire Northern Region, and used methods similar to those described by Marcot and Murphy (1992). Population trends for American marten were discussed on p. 3-392, and for elk on p. 3-403 and 3-404. Population trends for grizzly bear and bald eagles are stable to increasing in the Greater Yellowstone area, as evidenced by the recent US Fish and Wildlife Service de-listing of these species (see pp. 3-355 and 3-376). Population trend data for MIS species are collected at least at the forest-wide scale or larger; e.g. across southwest Montana or the Greater Yellowstone Ecosystem. Cumulative effects analyses for MIS species considered landscape scale habitat and effects patterns, although the cumulative effects analysis areas varied in size and geographic area for different species.
Wildlife analysis "All of the wildlife analyses are so vague that it is impossible for the reader to determine how the project will actually impact wildlife. It seems that at a minimum, in order to meet the disclosure requirements of the National Environmental Policy Act (NEPA), the wildlife reviews should include criteria for habitat management, and provide tables of how each alternative will meet these criteria." (6 – p.2)	Wildlife analyses in the DEIS were detailed and site specific, providing both quantitative and qualitative assessments of potential impacts for each alternative. Impact assessments were measurable with estimates of both acres and proportions of important habitats lost or modified by proposed treatment. Wildlife analyses included evaluation of how habitat management criteria would be met by each alternative where such criteria were available. Wildlife analyses in the DEIS were adequate for the decision-maker and the general public to understand how the project would impact wildlife, and therefore there were no changes to the FEIS based on this comment.

Old growth habitat "The inventory of old growth habitat was vague, and there was no map. We would like to know the acres of each old growth type. It is also important to show which old growth stands will be logged with the -project via a map." "It was unclear as to how the old growth program for this project is related to the MIS for Douglas-fir old growth. How is the old growth management of Douglas-fir habitats being coordinated with the goshawk?" (6 – p.3) e would like to have the FEIS include an analysis of how the management of old growth *in this* landscape will ensure viability of associated species; since the agency has failed to demonstrate through monitoring that the Forest Plan old growth standard will ensure viability needs of associated species, implementation of this Plan standard cannot substitute for a NEPA analysis of old growth habitat in the project area." (6 – p.6)	The Northern Region Overview provides a comprehensive review of the best available scientific information about the ecological status of the northern goshawk. This document summarizes pertinent information on goshawk habitat requirements and concludes that "no evidence exists that the goshawk is dependent on large, unbroken tracts of 'old growth'… or specifically selects for 'old growth' forest" (USDA Forest Service 2007:10). A draft of this document was considered for the goshawk analysis in the BMW DEIS, while the final version of the Regional overview was followed for the BMW FEIS. Mature and old growth stands deemed suitable as nesting habitat for goshawks were evaluated for possible impacts from proposed treatment methods under each alternative (Ch. 3-200 through 3-208). A landscape scale viability analysis for goshawk was presented in the FEIS (Ch 3-199 and 3-200).
Goshawk "The location of the four "potential" goshawk home ranges, including any known or estimated postfledging family areas, should be provided as a map so the public can understand how these territories will be impacted by the project… We request that the goshawk territories be analyzed as per the southwest goshawk guidelines by Reynolds et al. (1992)." (6 – p.3) 'The Forest's new management approach to the goshawk is an 'inhouse evaluation (USDA 2007)…. . The various other management approaches for the goshawk therefore need to be included in the analysis." (6 – p.4) "For the goshawk, mitigation for	We intentionally refrain from disclosing site-specific locations of reproductive areas for rare and/or sensitive species, due to concerns for disturbance that could result in reproductive failure. Without pinpointing nest locations, the FEIS gave a detailed description of each known or 'suspected' goshawk home range and post fledging family area, as well as a disclosure of potential impacts to key habitat features (Ch 3-194 through 3-208). Reynolds et al. (1992) guidelines were considered in the Northern Region Overview for goshawks, and some recommendations put forth in the southwest guidelines were incorporated into the Northern Region project analysis process for goshawks. Reynolds et al. (2006) reviewed their 1992 management recommendations, and while they believe the

known postfledging areas is planned for avoiding disturbances. Since only one of the four possible postfledging areas has been identified, how will these other areas be mitigated as per nesting disturbance?" (6 – p.5) ". Since goshawk field surveys conducted in 2004-2005 failed to locate any known nest sites, how reliable is this survey work believed to be? Is this level of survey work adequate to ensure that nesting goshawks are protected in huge projects such as the BMWP?" (6 – p.6)	approach and procedures presented in the 1992 recommendations can be adapted to other geographic regions, they also recognize that specific forest conditions among geographic regions differ. If Reynolds et al. (1992) were the only source used to evaluate goshawk habitat, then desired conditions for nesting habitat (maintain at least 180 acres) would be achieved for all home ranges under all alternatives. However, using Reynolds (1992) to analyze impacts to the PFA in NGHR1, (the known occupied area), habitat conditions would not meet the recommendations presented in the southwest guidelines under any alternative, including the No Action alternative. The resident goshawks in NGHR1 have established a nest site in an area that includes a larger proportion of young forest, open forest and non-forest than recommended by Reynolds et al (1992). Therefore, the BMW analysis for goshawks followed the Northern Region Overview guidelines for project analyses, including a review of multiple goshawk studies in addition to work published by Reynolds et al (1992). The Forest's new management approach, (i.e. USDA 2007), is an in-house evaluation, which provides a compilation of the best available scientific information for the northern goshawk. The bibliography for this document (Northern Region Overview – northern goshawk) is extensive, with over 70 literature citations, including those referenced by the comment. We know of no other "various management approaches for the goshawk" that need to be included in the analysis. Mitigation was not recommended in the DEIS for 'suspected' goshawk PFAs, since occupation by nesting goshawks could not be verified for the suspected sites, and without a nest location, a PFA cannot be established. Repeat visits to the two 'suspected' nest areas were made in 2006, and again in 2007-2008. No goshawks were confirmed to be nesting in

	the 'suspected' areas in subsequent visits. The fourth potential nest territory in the project area is in an area historically occupied by nesting goshawks. No treatment is proposed within the PFA for this nest area under any alternative, so no mitigation was needed. Goshawk field surveys conducted in 2004 and 2005 were in the general vicinity of the BMW project, but since no treatment units were defined at that time, the surveys were conducted in suitable habitat within (and near) the project area. Survey efforts in 2004-2005 were considered very reliable, but were also part of separate goshawk survey efforts and not specific to the BMW project. Subsequent surveys within proposed treatment units during 2006 did detect a previously unknown goshawk nest site. Additional surveys are planned prior to project implementation to confirm continued occupation of the known nest site, as well as to attempt to locate any newly occupied, or previously undiscovered nest areas that could be affected by approved fuel treatments.
Big game "There was no map of big game security areas, or demonstration of how these areas will be impacted by the various alternatives. In fact, the actual change in security is not clearly defined for each alternative. This is particularly relevant to the roadless areas and IRAs that will be impacted by the project." (6 – p.4) The agency needs to provide a map of the Gallatin Range landscape to show how recent fires have affected big game security…" (6 – p.5)	A geographic description and numerical analyses for big game security habitat were included in the DEIS, which demonstrated how security areas would be impacted by the various alternatives. The analysis disclosed which proposed treatment units would affect big game security habitat for each alternative. Changes in security habitat were presented in terms of acres lost as well as proportional changes in security habitat for the project area (Ch. 3-341 through 3-346). A map was not presented in the DEIS, since the analysis for security habitat was done using an ocular method, with the Forest Travel Plan map providing the baseline for roads. In response to this comment, a GIS exercise was conducted for the FEIS to attempt to more accurately quantify impacts to security habitat and also to produce geospatial relationships (Project Record). Results from this exercise showed slightly different levels of security habitat than

	originally reported in the DEIS, so the analysis of big game security habitat was expanded beyond the project area boundary in the FEIS (Ch. 3-407 through 3-413). No new roads would be constructed in roadless areas (FEIS, Ch. 3-151). Since elk security habitat is by definition relative to distance from open roads, there would be no reduction in elk security habitat within inventoried roadless areas for the BMW project. However, timing restrictions were recommended as possible mitigation for disturbance impacts in security habitat during hunting season. The comment requests a landscape assessment of how fires in the Gallatin Range have affected big game security habitat. Since big game security habitat is based on distance from roads, wild fires would not necessarily change the amount of security habitat unless new roads were built through the burn area. Cumulative effects analyses for big game were confined to the BMW project area for reasons described under Spatial Analysis Boundary (FEIS, Ch. 3-404). A landscape scale analysis of elk security habitat is provided in the Gallatin National Forest Travel Management Plan (FEIS, Ch.3-409).
Lynx ". There was no map of lynx habitat analysis units. Surely there is not just one LAU that is over 100,000 in size? This is far beyond the home range size of a lynx….Natural fire is a benefit to the lynx. What is the Forest-wide management plan in regards to the lynx to ensure that natural fires are going to be a part of lynx management, since this particular area is being excluded for lynx management." (6 – p.4) "We are concerned that proposed fuel reduction activities to be implemented with all the action	Lynx Analysis Units (LAUs) on the Gallatin Forest are typically larger than LAUs elsewhere in Montana. LAUs do not depict actual lynx home ranges, but their size generally approximates the scale of area used by an individual lynx. LAUs are typically larger in less contiguous, poorer quality or naturally fragmented habitat. Larger units will generally be identified in the southern portions of the Northern Rocky Mountains Geographic Unit (FEIS, Ch 3-172). The process used for mapping LAUs on the Gallatin Forest was reviewed by the Lynx Biology Team and resulting changes in LAU delineation were consulted upon with the USFWS (USFS letter to USFWS dated October 3, 2005).

alternatives would have potential adverse effects on habitat of wildlife, including the threatened Canada lynx ." (7 – p.16)	Natural fire can be beneficial to lynx. Forest-wide management for lynx follows Northern Rockies Lynx Management Direction to conduct fire use activities to restore ecological processes and maintain or improve lynx habitat (USDA 2007:Attachment 1, p.2). Within WUI, there are Forest-wide limits on the amount of lynx habitat that can be impacted through fuel reduction projects. Prescribed fires also may be used in some areas to initiate forest regeneration in order to create better quality foraging habitat for lynx. Potential adverse effects of proposed fuel treatment on lynx habitat are disclosed in the FEIS (Ch. 3-176 through 3-190). Effects to lynx will be summarized in a Biological Assessment and reviewed in consultation with the US Fish and Wildlife Service.
MIS/Sensitive species he two forest owls that may occur, or do occur in this area have no habitat management plans in place, even though they are sensitive and/or vulnerable species (Great Gray Owl and Flammulated Owl). If there are no management plans in place for these species, how can the agency claim you are meeting the mandates of the National Forest Management Act to maintain viable populations? (6 – p.5) "In addition to a lack of management direction for sensitive species, the Gallatin Forest has no management direction for any MIS. Without any management plans, how can the agency ensure that these species will be maintained at viable levels in areas where intensive and extensive management is planned, such as the BMWP?" (6 – p.5) "What type of surveys were conducted for the flanunulated and great *gray owls in* this project area?" (6 – p.7)	Great gray owls are neither MIS nor sensitive species for the Gallatin Forest, but are addressed in the FEIS under Migratory Birds as a species of concern (Ch. 3-381). Great gray owls prefer more open forest structure for nesting and foraging (Ch. 3-382). Based on habitat preferences cited in scientific literature, the project analysis concluded that commercial timber harvest could increase suitable nesting habitat for great gray owls, while prescribed burns could create additional foraging opportunities (Ch. 3-384). Therefore, we believe the NFMA mandate to maintain viable populations is met for the project, since proposed actions could have positive effects on habitat. Forest Plan direction for MIS is to monitor for population trends. Neither the great gray nor flammulated owl is designated as a MIS for the Gallatin Forest. Flammulated owls are currently on the sensitive species list for the Gallatin Forest, although nesting pairs have not been documented anywhere on the Forest, and habitat conditions here are considered marginal

	(FEIS Ch. 3-416). Like great grays, flammulated owls select mature, open forest structure for nesting (Ibid), and therefore could also potentially benefit from fuel reduction treatments. Surveys were conducted for flammulated owls along Bozeman Creek and Hyalite roads during May-June 2005 (FEIS Ch. 3-416). The surveys used digital play back of the male territorial call. These surveys generally followed field methods prescribed for flammulated owls through the Northern Region Landbird Monitoring Program (NRLMP). However, since neither Hyalite nor Bozeman Creek drainages were identified as high quality nesting habitat through the 2005 NRLMP protocol, methods were abbreviated in terms of recording vegetative conditions and GPS locations of survey points relative to transects that were on scheduled survey routes identified through the NRLMP protocol. (Project record, wildlife field survey notes). No surveys were conducted for great gray owls, since they are neither a sensitive nor a MIS for the Gallatin Forest.
Snag habitat " What data is available to demonstrate that the GFP snag direction has been effective in maintaining viable populations of associated species? What is the expected level of decline in snags with forest thinning and a reduction of insects and disease?" (6 – p.5) /hat are the current snag levels within. all the existing harvest units in this project area?" (6 – p.7)	Snag retention standards in the Gallatin Forest Plan were derived from research findings by Jack Ward Thomas (Thomas, et al. 1979). This research indicates that 225 snags per 100 acres would be required to meet the needs of primary cavity nesters at 100% of maximum potential population in mixed conifer habitats. For lodgepole pine and subalpine fir communities, Thomas et al (1979) reported a requirement of 180 snags per 100 acres. The Gallatin Forest plan standard to retain a minimum of 30 snags per 10 acres equates to 300 trees per 100 acres, which exceeds the target numbers reported by Thomas et al (1979) to meet the needs of primary cavity excavators at 100% of maximum potential populations. Since publication of Thomas et al (1979)

	further research (Bull et al 1997) suggests that additional snags may be required to fully meet the needs of snag-dependent species for various life requirements. Based on this new information, we have expanded the snag analysis in the FEIS (Ch. 3-381) and added mitigation measures for snag retention that go above and beyond our existing Forest Plan standards (FEIS Ch 2-22 to 2-23). The Montana Natural Heritage Program and Montana Fish Wildlife and Parks produce a list of Montana's Species of Concern; i.e. species that are at risk or potentially at risk. The SOC list is based at least partly on population trend data. Of the 60 bird species on this list, there are only 3 snag dependent species known or suspected to occur on the Gallatin National Forest: black-backed woodpecker, flammulated owl and great gray owl. These species were all individually addressed for the BMW project: Issue #14 – Black-backed woodpecker, Issue #18 – Migratory birds (great gray owl), and Issue #21 – Other sensitive species (flammulated owl). Gallatin Forest Plan snag retention standards would be applied in thinning units (FEIS Ch. 3-382 to 3-383), and additional mitigation measures for snag retention are prescribed (FEIS Ch. 2-22 to 2-23). Most existing snags would be left intact unless there is a concern for human safety. There is some level of decline expected in the number of replacement snags produced in proposed thinning units currently affected by insects and/or disease. The number or proportion of future snags available in thinned areas under Alternative 1 (No Action) relative to Action Alternatives is difficult to estimate. However, natural snag recruitment is expected to continue throughout the project area, and many additional snags would be created in proposed burn units. Snags are currently abundant throughout the project area. The number of snags in any given

	treatment unit is constantly changing, as old snags fall and become downed logs, and new snags are created through natural mortality. Snag analyses are presented in Issue #18 Migratory Birds, in the FEIS (Ch. 3-381 through 3-388).
Black-backed woodpecker "There are no habitat criteria for the black-backed woodpecker for the project area or analysis. Simply saying that there is plenty of habitat elsewhere is not an analysis. Please define how the agency intends to maintain this species within this specific project area, and why this plan is believed to be biologically valid. (6 – p.6)	The USDA Forest Service Northern Region conducted an overview of scientific literature pertaining to Black-backed woodpeckers, similar to the document produced and cited herein for goshawk (USDA 2007). The overview for black-backed woodpecker was not complete at the time the DEIS was published for BMW. However, the final was consulted for the FEIS (Ch. 3-347). The overview provides guidelines for project-level analyses. The first step recommended is to determine whether the project has the potential to impact either post-fire or beetle-infested habitat. Only a very small amount (~25 acres) of post-fire habitat exists in the project area (FEIS, Ch. 3-348). None of this habitat would be impacted by proposed fuel reduction treatment. At the time the analysis was conducted for the DEIS, the majority of insect-infested habitat in the project area was affected by spruce budworm (not a major food item for black-backs) and occurred more extensively on City of Bozeman land than on NFS land (Ibid). More recently (i.e. within the past year), the mountain pine beetle infestation has increased and spread within the project area. Since mountain pine beetle is a more important food item for black-backed woodpecker, the FEIS contains a more in depth analysis of potential impacts relative to insect-infested habitat (FEIS, Ch. 3-351).
Grizzly bear "This project demonstrates the problem with delisting of the grizzly bear. It has not even been a year since delisting and the agency has big plans to road and log roadless lands in occupied grizzly	No new roads would be constructed in Inventoried Roadless Areas under any of the action alternatives. The Grizzly Bear Management Plan for Southwestern Montana (ICST 2003: Appendix K) gives specific recommendations for habitat management

bear habitat. Since there are no Gallatin Forest Plan for management of the grizzly bear in this occupied habitat outside the PCA, this project clearly threatens the viability of this species in this landscape." (6 – p.6)	outside the PCA. These recommendations are addressed in the FEIS for the grizzly bear issue. All action alternatives would meet the recommendations for habitat management outside the PCA. Aside from no longer needing to consult with the US Fish and Wildlife Service, nothing in the proposed fuel treatments would differ if the Yellowstone grizzly bear were still listed as threatened.

Recreation and Roadless

Comment	**Response**
Roadless and roadless logging "I am opposed to any proposal that would allow commercial logging to occur in the inventoried roadless area. No new roads, temporary or permanent, should be built in the inventoried roadless area not anywhere else in the Bozeman Creek drainage." (3 – p.2)	No new roads, whether temporary or permanent, are proposed in the Gallatin Fringe inventoried roadless area (IRA). Alternative 4 proposed only prescribed burning in the Gallatin Fringe IRA and no commercial logging. Alternative 6 proposes to helicopter thin 200 acres within the Gallatin Fringe IRA. These alternatives provide a range of alternatives for the responsible official to choose from. In addition to lessen the visual impact of harvest in the IRA, three design features are included for harvest in the IRAs. These features are designed to lessen the visual impact by retaining large trees, and minimizing stump heights and scattering slash. The intent is to maintain a more natural appearing landscape and undeveloped character. A map showing the boundary of the IRA is included in the FEIS,Ch.2-14.
Recreational closures "Because of the high recreational value and use of the Bozeman Creek and Hyalite Creek drainages, we urge the Forest Service to protect existing trails,	Fuels management activities in Bozeman Creek will affect only 4 miles of trail in the lower portion of the drainage. Mitigation will require that the route be open for public recreation use on weekends (except for

especially the Bozeman Creek Trail, for current recreational use and to avoid logging-related trail closures." (4 – p.3)	possible short term closures for prescribed burning operations). Alternative access routes into the drainage will remain open if the lower trail is closed for any operations. Temporary closures of some areas and access routes throughout the project area will still allow for alternative public recreational access.
Roadless "The description of why the new road construction in Inventoried Roadless Areas does not violate the 2000 Roadless Area Rule was somewhat perplexing. This needs to be expanded in the final EIS…" "There was no analysis of why the unroaded areas adjacent to IRAs were not considered for inclusion into an IRA. By stating that this would not meet the purpose of the project is simply a means of avoiding taking a hard look at all alternative actions the agency could take." (6 – p.2)	No new roads, whether temporary or permanent, are proposed in the inventoried roadless area (IRA). A map showing the boundary of the IRA will be included in the FEIS. The FEIS evaluates the effects to roadless character based on potential changes to wilderness attributes. The National Forest Management Act requires Forests to reevaluate roadless lands, assessing their suitability for designation as wilderness, when they revise their Forest Plans. This area along with other will be evaluated when the Gallatin NF revises its Forest Plan, to determine if they should be added to the roadless inventory. The FEIS evaluates the effects to unroaded areas and determined that all alternatives do not change the ability of the unroaded area to be considered for wilderness potential during forest plan revision. The unroaded area is not adjacent to the IRA. This was a mis-statement in the DEIS. The unroaded area is a separate parcel – isoloated from other IRAs. It was not considered as an IRA during the development of the forest plan because the lands were in checkerboard ownership. However, since that time the agency has acquired the checkerboard lands. .

Soils

Comment	Response
Soil mitigation EPA sum 2	This comment refers to details given on pages 6-8 of the EPA response (7- p.6). It is addressed there.
BMPs and mitigation "It is important that mitigation measures effectively protect soils and avoid sediment production and transport when carrying out logging activities in a municipal watershed.) (7 – p.6)	Meeting the Region One Soil Quality standards should adequately protect soils in the project area. However, given the project's context in a municipal watershed, the EPA recommended consideration of additional measures. Following are these measures and the response. Using historic skid trails where feasible: Though this is desirable, and there are many areas of previous harvest, field review shows most previous logging is greater than 40 years old, and skid trails are difficult to trace, so are not practical to designate unless obvious on the ground and useful to current operating systems. Placing restrictions on skidding with tracked machinery in sensitive areas: Current SWCP's prohibit tractor use in wet areas. Sensitive landslide-prone areas were removed from the project proposal early in the analysis. Using slash mats to protect soils: This is a good practice. Unfortunately there is insufficient slash generated in the harvest to provide enough to protect soils. Hence the specification of "sacrifice" skid trails in a restricted density. Constructing water bars: This is specified in current SWCP's for conduct of logging. Creating brush sediment traps: This is a good

	suggestion, but is not used in this project. Brush is not a large component of proposed units. Adding slash to skid trail surfaces after recontouring and ripping: This is a good suggestion and will be added to recommended recontouring practices for this project. Assuring that adequate coarse woody debris is left on-site: The Gallatin Forest Plan specifies requirement (15 tons/ac) addresses this concern. Seeding/planting of forbs, grasses, or shrubs to reduce soil erosion and hasten recovery: Generally, we seed with native species of grasses to hasten recovery. We believe that enough native shrubs and forbs remain in the soil to provide for their recovery. Recontouring, slashing, and seeding of temporary roads and log landing areas following use: Recontouring specifications generally include slashing and seeding of temporary roads. Landings are ripped and seeded as necessary to prevent soil erosion and to encourage revegetation.

Weeds

Comment	Response
Weeds "Please include in your analysis the possible effects of noxious weed introduction on Sensitive plant	Effects of noxious weeds on sensitive plants can be related to control measures taken to control weeds and also competition for

populations, vulnerable plant communities, and other components of biodiversity. Please include in the analysis the results of monitoring of noxious weed infestations and treatment efficacy from past management actions in the Forest." (5 – p.7)	growing space caused by the weeds themselves. To reduce the potential effects of control measures on sensitive species, noxious weed control follows guidance outlined in the Gallatin National Forest's Noxious and Invasive Weed Treatment Project EIS (Weed EIS) (2005) and Record of Decision. The Weed EIS contains specific resource Protection Measures on pages 2-18 through 2-23. Protection of sensitive plants and their habitat is included there on page 2-20 (Item 19). The Weed EIS Chapter 3.0 pages 3-1 through 3-12 describes many of the threats associated with noxious weeds including those on sensitive plant populations and the diversity of life. Chapter 4 of the Weed EIS describes direct, indirect and cumulative effects of weeds and weed treatments on plants and animals. Findings in the Weed EIS indicate that about 500,000 acres of the Forest are at high risk to invasion by weeds and that once lands are converted to noxious weeds they may never be converted back to their original condition (Weed EIS page 4-8). It is evident that noxious weeds can have a large impact on native plant and animal life especially sensitive species. Vulnerable plant communities occur on those areas of the landscape most susceptible to weeds. Specific effects on each plant community were not estimated because it would take an exorbitant amount of time to inventory them all and not enough is known about how each community reacts to each weed. Instead we estimated the amount of area most vulnerable to weeds based on aspect, elevation and proposed activities. Additional effects related to the effects of weeds on the diversity plant and animal life have been added to the cumulative effects discussion for noxious weeds in the EIS. The Forest Service maintains a national database of weed inventories on each national

	forest (TERRA). As weed sites are inventoried they are entered into this data base. Control activities are also tracked annually in a Forest Service data base (FACTS). However, until 2007 there was no formal monitoring requirement that tracked the efficacy of treatments. Starting in 2007 there was a standard in the Forest Service's accomplishment database (FACTS) that tracks the effectiveness of weed treatments. Until we have a few years of data entered we really will not know what the trends are. We try to treat all inventoried weeds either annually or every two or three years depending upon their species and location. Because we visit these sites often enough we know in general if treatments are working by doing a walk through and visual inspection. We know that treatment efforts, usually with herbicides, are almost always immediately effective. However, because seeds can remain viable in the soil for many years, only repeated treatments and monitoring over several years can determine the efficacy. We just do not have that information at this time.
"EPA, however, does encourage prioritization of management. techniques that focus on non-chemical treatments first, with reliance on chemicals being the last resort, since weed control chemicals can be toxic and have the potential to be transported to surface or ground water following application." (7-p.15)	The Gallatin National Forest's Noxious and Invasive Weed Treatment Project EIS (Weed EIS) (2005) Pages 2-21 through 2-22 include protection measures for aquatic resources. These are also identified in the Record of Decision for the Weed EIS on ROD pages 14-15. Weed EIS pages 2-4 through 2-11 describes the methodology and strategies for implementing weed suppression on the Forest and includes taking an integrated approach to weed management. Implementation of weed suppression efforts in the BMW project would follow these strategies. The Affected Environment of the Final BMW EIS identifies techniques that would be considered for weed suppression and discusses the merits of non chemical treatments.

APPENDIX D. Biological Assessment (BA) and Biological Opinion (BO) for Lynx and Grizzly Bear

1. **Biological Assessment for Terrestrial Species (lynx)**
2. **Supplemental Biological Assessment (lynx)**
3. **Biological Opinion (lynx), Fish and Wildlife Service**
4. **Second Supplement to Biological Assessment (grizzly)**
5. **Biological Opinion (grizzly), Fish and Wildlife Service**

BIOLOGICAL ASSESSMENT

FOR

TERRESTRIAL WILDLIFE SPECIES

Bozeman Municipal Watershed
Fuel Reduction Project

Bozeman Ranger District
Gallatin National Forest

Prepared By:

_/s/ ***Bev Dixon***_____ ___July 9, 2008_____
Name Date

SUMMARY

Determination of Effects

Implementation of the proposed Federal action is *likely to adversely affect* the Canada lynx. The project would *not result in adverse modification of proposed critical lynx habitat*.

CONSULTATION REQUIREMENTS

In accordance with the Endangered Species Act (ESA), its implementation regulations and FSM 2671.4, the Gallatin National Forest is required to request formal consultation with the FWS with respect to the determination of potential effects on the Canada lynx.

Need For Re-Assessment Based On Changed Conditions

The Biological Assessment findings are based on the best current data and scientific information available. A revised Biological Assessment must be prepared if: (1) new information reveals effects, which may impact threatened, endangered, and proposed species or their habitats in a manner or to an extent not considered in this assessment; (2) the proposed action is subsequently modified in a manner that causes an effect, which was not considered in this assessment; or (3) a new species is listed or habitat identified, which may be affected by the action.

INTRODUCTION

The purpose of this Biological Assessment is to review the possible effects of the proposed federal action on threatened, endangered, and proposed species and their habitats. Threatened, endangered, and proposed species are managed under the authority of the Federal Endangered Species Act (PL 93-205, as amended) and the National Forest Management Act (PL 94-588). Section 7 of the Endangered Species Act directs federal agencies to ensure actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of their critical habitats (16 USC 1536).

This Biological Assessment analyzes the potential effects of the proposed federal action on threatened, endangered, and proposed species known or suspected to occur in the proposed action influence area (Table 1).

Table 1. Threatened, Endangered and Proposed Species Known or Suspected to Occur Within the Influence Area of the Proposed Action.

Species	Status	Occurrence
Canada Lynx (*Lynx canadensis*)	Threatened	Unknown

PROPOSED PROJECT

Proposed Project

This project is focused on the two primary drainages, Bozeman Creek and Hyalite Creek, that make up the majority of the Bozeman Municpal Watershed (BMW) resources (Figure 1). The City of Bozeman water treatment plant is located just outside the National Forest boundary on Bozeman Creek. Two water diversion dams that channel water to the treatment plant, one each on Bozeman and Hyalite Creeks, are approximately one mile inside the Forest boundary. The proposed treatment units are all inside the wildland urban interface (WUI), as delineated in the Gallatin County Community Wildfire Protection Plan (Figure 2).

Objectives for this project include:

- Begin reducing the potential severity and extent of future wildland fires in the Bozeman Municipal Watershed by restoring and changing vegetative and fuel conditions in order to reduce the risk of excess sediment and ash reaching the municipal water treatment plant because of a wildfire
- Treat vegetation and fuel conditions along road corridors that will provide for firefighter and public safety by beginning to modify potential fire behavior.
- Reduce vegetation and fuel conditions in the WUI to reduce potential fire spread and intensity between National Forest System lands and adjacent private lands.

Primary methods proposed to achieve these objectives include partial harvesting and thinning in mature stands, mechanical and hand thinning and piling of younger trees,

prescribed burning after thinning, and prescribed burning in more open stands.

Detailed description of proposed treatment methods

Thinning and partial harvest in mature stands: This treatment involves harvesting in mature stands of timber, cutting smaller diameter trees and leaving larger ones to reduce the fuel loading and break up the vertical and horizontal composition of the fuels. Fuel treatment could be whole tree yarding, pile burning and/or jackpot or understory burning. Generally speaking, between 30-50% of the overstory canopy would remain after treatment. A 300-foot buffer around Hyalite and Bozeman Creeks would allow only hand piling for residual fuel treatment.

Thinning of smaller diameter trees: Units identified for small tree removal are either multi-storied or primarily small trees. The majority of trees to be removed are smaller than 6 inches in diameter, although there may be some commercial product removed as well. Mechanical or hand cutting and piling smaller, younger trees would be used to reduce the density of these stands.

*Prescribed burning in thinned stands***:** In stands where excess residual fuels remain after helicopter or ground-based logging, fuels would be treated with prescribed or pile burning. Slash could be pre-treated by mechanical trampling prior to burning.

Prescribed burning: Stands that are naturally more open and thus low risk of severe fire would be maintained with prescribed burning to reduce ground cover and smaller trees, in order to maintain a more open condition with less chance of rapid fire spread. Spring or fall burning would be used.

Ridgeline fuelbreaks: Several fuelbreaks are incorporated into and adjacent to proposed treatment units along prominent ridgelines. Fuel treatments would extend up to and include the ridgetop, with a higher percentage of trees removed (70-80%) along the ridgeline. These would be considered "shaded fuelbreaks", with 20-30% of the tree cover left on site. Fuelbreaks would not result in linear openings along the ridgetops, but rather would result as a gradual increase in thinning intensity from about 50% cover removal on side slopes increasing to 70-80% reduction along the ridgelines.

Table 2. Summary of the features of the Bozeman Municipal Watershed Fuel Reduction Project, Bozeman Ranger District, Gallatin National Forest. (See Map – Figure 3)

UNIT NUMBER	SILVICULTURE TREATMENT (ACRES)	FUEL BREAK TYPE (ACRES)	TOTAL ACRES
1A	Commercial Thin/Burn (32)		32
1B	Commercial Thin/Burn (21)		21
3	Prescribed Burn (864)	Hand Thin (12)	876
7A	Commercial Thin / Burn (21)		21

7B	Prescribed Burn (68)		68
7C	Prescribed Burn (48)		48
8	Prescribed Burn (55)	Machine Thin (24)	79
9	Commercial Thin / Burn (48)	Machine Thin (3)	51
10	Commercial Thin / Burn (115)	Machine Thin (13)	128
11A	Commercial Thin / Burn (105)		105
11B	Commercial Thin / Burn (51)	Machine Thin (19)	70
13A	Commercial Thin / Burn (57)		57
13C	Commercial Thin / Burn (117)	Machine Thin (31)	148
14	Commercial Thin / Burn (49)	Machine Thin (1)	50
16A	Commercial Thin / Burn (111)	Machine Thin (38)	149
16C	Commercial Thin / Burn (29)		29
17	Commercial Thin / Burn (50)	Machine Thin (19)	69
19	Prescribed Burn (82)		82
20	-Fuelbreak only-	Machine Thin (23)	23
21B	Commercial Thin / Burn (2)		2
21C	Commercial Thin / Burn (24)		24
22C	Prescribed Burn (63)		63
22I	Commercial Thin / Burn (120)		120
22K	Commercial Thin / Burn (89)		89
22L	Commercial Thin / Burn (58)		58
22N	Commercial Thin / Burn (20)		20

22O	Commercial Thin / Burn (3)		3
22P	Commercial Thin / Burn (4)		4
22Q	Commercial Thin / Burn (13)		13
25	Commercial Thin / Burn (19)	Machine Thin (20)	39
25A	Prescribed Burn (97)	Machine Thin (4)	101
26	Commercial Thin / Burn (101)	Machine Thin (2)	103
27A	Commercial Thin / Burn (88)	Hand Thin (10)	98
28B	Commercial Thin / Burn (37)	Hand Thin (1)	38
28C	Commercial Thin / Burn (27)	Hand Thin (13)	40
33	Commercial Thin / Burn (22)		22
36B	Commercial Thin / Burn (64)	Machine Thin (10)	74
36C	Commercial Thin / Burn (3)	Machine Thin (8)	11
36D	Commercial Thin / Burn (34)	Machine & Hand Thin (13)	47
37	Commercial Thin / Burn (31)		31
38	Commercial Thin / Burn (104)		104
39	Commercial Thin / Burn (150)		150
40	Prescribed Burn (253)	Hand Thin (5)	258
45A	Commercial Thin / Burn (8)		8
45B	Commercial Thin / Burn (12)		12
45C	Commercial Thin / Burn (4)		4
999	Precommercial Thin / Burn (1104)	Machine & Hand Thin (12)	1116
fuel break outside treatment unit		Machine Thin	61

fuel break outside treatment unit	Hand Thin	11
fuel break outside treatment unit	Machine and Hand Thin	14
PROJECT TOTAL		**4844**

PROJECT AREA

The project area is located in Gallatin County approximately 10 miles south of Bozeman, Montana. The project is at T3S, R5E and R6E in the lower third of Bozeman Creek and Hyalite drainages (Figure 1). The Bozeman Ranger District of the Gallatin National Forest administers National Forest System (NFS) lands within the project area. Proposed treatments are within the WUI as designated in the Gallatin County Community Wildfire Protection Plan (Figure 2). Proposed treatment units are concentrated in the lower reaches of the watershed, near the Forest boundary (Figure 3).

SPECIES ASSESSMENT

Canada Lynx (*Lynx canadensis*)

Population and Habitat Status

On March 24, 2000 the U.S. Fish and Wildlife Service (USFWS) published its determination on the status for the contiguous U.S. distinct population segment of the Canada lynx. The lynx has since been listed as a "threatened" species in the contiguous United States.

Lynx habitat requirements

Lynx generally occur in cool, moist coniferous forest, above the dry montane types and below the alpine zone. Primary lynx habitat in Montana east of the Continental Divide consists of subalpine fir (*Abies lasiocarpa*) as the dominant tree species, intermixed with Engelmann spruce (*Picea engelmannii*) and lodgepole pine (*Pinus contorta*). Secondary habitat includes aspen (*Populus tremuloides*), willow (*Salix spp.*), and moist, cool, Douglas-fir (*Pseudotsuga menziesii*) stands (Ruediger et al. 2000:1-3).

Lynx are physiologically adapted to key in on one particular prey species, the snowshoe hare (*Lepus americanus*). Prey availability appears to be a primary limiting factor for lynx in the Northern Rockies. The main cause of lynx mortality is starvation (USDA 2007*a*: 141). Research in the Northern Rockies has shown that winter snowshoe hare habitat is often found in the stand initiation, understory re-initiation, and old forest multi-

storied structural stages (Ibid.:145). Snowshoe hares select densely stocked forest stands with a high proportion of horizontal cover within approximately ten feet of the ground (Hodges 2000:184). These forest types provide hares with security cover from predators, and contain abundant food in the form of stems and branches accessible to hares from the ground in summer and from snow accumulation in winter.

Lynx denning habitat is typically associated with mature forest of complex structure, particularly in the form of coarse woody debris on the forest floor. Dead and down material and overhead cover produced by older forest provide security and escape cover for lynx kittens (Ruediger et al. 2000:1-4).

Affected Environment

Based on the Feb. 28, 2008 publication of a proposed rule to revise designated critical habitat for lynx, the BMW project is within proposed critical habitat. There is no additional direction, or change in direction, for lynx habitat management within proposed critical habitat other than that contained in the NRLMD.

In general, lynx habitat on the Gallatin National Forest is defined as moist coniferous forest in the elevation range between 6,000 and 8,800 feet with habitat types where spruce or subalpine fir are the indicated climax species. Moist Douglas fir types intermixed with spruce/subalpine fir habitat types are also considered suitable lynx habitat. Lodgepole pine is often the dominant cover type for lynx habitat in early to mid seral stages.

Snowshoe hare habitat in the project area is represented by densely stocked sapling to pole age conifer stands. Older, multi-storied stands with dense conifer regeneration and/or a dense shrub component in the understory provide good snowshoe hare habitat as well. Mature to old growth forests also provide habitat for alternate prey species such as red squirrels (*Tamiasciurus hudsonicus*) and grouse (*Dendragapus* spp., *Bonasa* spp.).

Lynx denning habitat within the project area is best represented by mature stands of spruce/subalpine fir, lodgepole pine, moist Douglas fir, and mixed conifer. Denning habitat was modeled using GIS by selecting mature (predominantly large trees, at least 9-inch dbh), coniferous forest habitat with at least 70% canopy closure for Douglas fir and lodgepole pine cover types. Spruce and subalpine fir cover types were also selected for mature size class, but because these types tend to produce more large woody debris, canopy closure of at least 40% was considered to provide denning habitat. Estimates of denning habitat based on this modeling scheme are probably conservative, since various environmental conditions (e.g. fire, wind events, insects and disease) can produce large amounts of down woody debris (hence, suitable lynx denning habitat) in younger and more open stands of conifer trees.

The project is located within the North Gallatin Lynx Analysis Unit (LAU). LAUs are intended to provide the fundamental scale with which to evaluate and monitor the effects of management actions on lynx habitat. LAUs do not depict actual lynx home ranges, but

their size generally approximates the scale of area used by an individual lynx. LAUs should be in contiguous lynx habitat and contain habitat components necessary for year-round use. LAUs are typically larger in less contiguous, poorer quality or naturally fragmented habitat. Larger units will generally be identified in the southern portions of the Northern Rocky Mountains (Ruediger et al. 2000:7-2 through 7-4). LAUs on the Gallatin Forest are typically larger than those identified for northwest Montana, since habitat here is more naturally fragmented.

The North Gallatin LAU covers an area of about 103,334 acres at the north end of the Gallatin Range, on the west side of the Gallatin Crest (Figure 4). It extends from Hyalite Peak at the south end, along the Hyalite/Storm Castle Creek divide, and continues northwest along the Storm Castle/Bear Creek divide to the Gallatin River canyon. Roughly 66% of the LAU (67,910 acres) provides lynx habitat in the form of moist, cool coniferous forest types, plus small inclusions of important non-forest types such as sage fields and willow/riparian habitat. The remainder of the LAU that does not provide lynx habitat consists of dry forest types and large open areas of meadow, rock or water, including alpine habitat above tree line. Of the existing lynx habitat in the LAU, about 33,103 acres (49%) provides denning habitat and 5,249 acres (8%) is young, densely stocked conifer regeneration foraging habitat. Foraging habitat is available in the understory of mature, multi-layered stands as well, but this habitat component is extremely difficult to quantify. Roughly 6,652 acres (10%) of the lynx habitat within this LAU is currently in an unsuitable condition, due to fires or timber harvest actions that have removed all or most of the cover from an affected area. The rest of the lynx habitat in the LAU (22,908 acres; 33%) is considered suitable, and might provide denning and/or foraging opportunities, but otherwise basically provides security cover for travel or resting purposes.

Issue Statement

Fuel reduction treatments in lynx habitat can reduce security cover, remove coarse woody debris, which is a key component of lynx denning habitat, and alter the preferred habitat of their primary prey species, snowshoe hare.

Lynx Management Direction

In January 2000 the *Canada Lynx Conservation Assessment and Strategy* (LCAS) was published, which established early conservation measures for lynx habitat. Current guidance for management of lynx habitat is provided by the Northern Rockies Lynx Management Direction (NRLMD) Record of Decision (ROD). Publication of the NRLMD ROD in 2007 amended the Gallatin Forest Plan to formally incorporate management direction for the conservation of lynx. Where there is overlap between the LCAS and the NRLMD, the NRLMD provides agency direction, whereas the LCAS may provide additional references for those areas not specifically covered in the NRLMD. The NRLMD ROD contains standards and guidelines specific to vegetation management and other Forest Service land management activities, and incorporates terms and conditions issued by the US Fish and Wildlife Service in their Biological Opinion for the

NRLMD FEIS. Management direction is contained in Attachment 1 of the ROD, noted below as (ROD:A1; p#). Following is a list of pertinent direction from the NRLMD:

NRLMD Items Pertinent to the BMW Project

NOTE:
Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). (ROD:A1; p.2)

Standard VEG S1:
If more than 30 percent of the lynx habitat in an LAU is currently unsuitable; i.e. stand initiation structural stage, that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects. *In addition, fuel treatment projects may not result in more than 3 adjacent LAUs exceeding the standard* (ROD:A1; p.3)

Standard VEG S2:
Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS lands within an LAU in a ten-year period (ROD:A1; p. 3)

Standard VEG S5:
Precommercial thinning projects that reduce snowshoe hare habitat may occur from the stand initiation structural phase until the stands no longer provide winter snowshoe hare habitat only within 200 feet of structures, for research, based on new information, or for conifer removal to improve rare habitats such as aspen or whitebark pine (ROD:A1; p. 3-4)

Standard VEG S6:
Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forest may occur only within 200 feet of improvements, for research, or incidental to salvage harvest (ROD:A1; p.4)

Guideline VEG G4:
Constructing permanent firebreaks on ridges or saddles should be avoided (ROD:A1; p.4).

Guideline VEG G5:
Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU (ROD:A1; p. 5)

Guideline VEG G10:

Fuel treatment projects within the WUI should be designed considering Standards VEG S1, S2, S5 and S6 to promote lynx conservation (ROD:A1; p. 5).

Guideline VEG G11:
Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees. If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future (ROD:A1; p. 5).

Guideline GRAZ G1:
In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating (ROD:A1; p. 5)

Guideline HU G9:
On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives (ROD:A1; p. 7).

Methodology for Analysis

Effects to lynx were evaluated relative to project compliance with direction contained in the NRLMD. A Forest-wide lynx habitat data layer was used to model lynx habitat capability in the project area. GIS technology was used to quantify potential impacts to lynx denning habitat and snowshoe hare habitat (i.e. lynx foraging habitat), as well as potential for proposed treatment to convert suitable lynx habitat to an unsuitable condition (Figure 5). Site visits were made to the project area for ground verification to further refine GIS data.

Effects Analysis

Spatial boundary: The spatial boundary used for analysis of direct and indirect effects for the proposed action is the project area, which includes roughly 21,824 acres of National Forest System lands, City of Bozeman lands and private land (inside the forest boundary) that contain and surround the proposed fuel reduction treatment units. Approximately 63% (13,716 acres) of the project area is lynx habitat. The project area is composed of all timber subcompartments that contain proposed treatment units. Timber compartments and subcompartments are ecologically based units, defined by hydrologic and topographic features that are biologically meaningful to lynx and other wildlife. Although direct and indirect effects are analyzed and disclosed for the project area, habitat standards contained in the NRLMD are often specified for the LAU, which is generally a much larger scale than the project area. Therefore, project compliance with applicable direction will often be evaluated and presented relative to the entire LAU. The

LAU serves as the spatial boundary used in consideration of potential cumulative effects for lynx.

Direct and Indirect Effects

The proposed action would affect a total of approximately 2,673 acres of lynx habitat in some way. This number includes burning and thinning in both young and mature stands, which could affect snowshoe hare habitat, lynx denning habitat, and/or habitat connectivity.

Unsuitable Habitat (VEG S1, VEG S2)
Lynx habitat in an unsuitable condition includes habitat in the stand-initiation phase, having recently experienced some form of disturbance, either natural or man-caused, that severely reduced or eliminated forest cover. Such areas do not provide suitable foraging or denning opportunities for lynx, nor do they provide sufficient cover for travel or resting purposes. Lynx habitat in the project analysis area that is currently in unsuitable condition is primarily due to past timber harvest activity, where stands have not yet regenerated to the point where they provide adequate lynx cover or foraging habitat. For the entire LAU, currently unsuitable habitat is again primarily due to past timber harvest activity, although some wild fires have also contributed to unsuitable habitat in the LAU. The North Gallatin LAU is currently well below the 30% maximum for unsuitable habitat (VEG S1). Including both burned and logged areas, currently unsuitable habitat is at approximately 10% for the entire LAU. This total includes roughly 6,652 acres of currently unsuitable lynx habitat across the entire LAU, of which, about 564 acres is located within the project area.

Prescribed prescribed burning would convert some additional lynx habitat to an unsuitable condition. Many of the prescribed burn treatments involve scattered dry, open forest slopes that do not provide lynx habitat. Prescribed burns in lynx habitat are expected to produce a mosaic pattern, so that not all habitat within a treatment unit would be rendered unsuitable. It is estimated that burn prescriptions would result in approximately 20-40% tree mortality. However, since it is difficult to predict how burn patterns will actually look after implementation, it was assumed for analysis purposes that all lynx habitat within prescribed burn units would be converted to an unsuitable condition. Prescribed burning proposed for the project could produce a maximum of about 409 additional acres of lynx habitat altered to an unsuitable condition.

In addition to prescribed burning, the proposal includes heavy thinning treatment to produce fuelbreaks along prominent ridges. Prescriptions for these ridgeline fuelbreaks call for 70% or more of the woody vegetation to be removed. Such heavy removal of forest cover would meet the NRLMD definition of unsuitable habitat. Ridgeline fuelbreaks could produce a maximum of about 209 acres of additional unsuitable lynx habitat. Added to the existing 546 acres of unsuitable habitat in the project area, the combined burning and ridgeline fuelbreaks would bring the total unsuitable lynx habitat within the project area to 1,164 acres (8% of lynx habitat in the project area).

Although the majority of currently unsuitable lynx habitat in the LAU is due to past timber harvest, only a small amount (494 acres) has been due to vegetation management actions within the past ten years (VEG S2). This recent logging has converted less than one percent of lynx habitat in the LAU to an unsuitable condition within the past ten years. Fuel reduction treatments proposed involve thinning of both commercial and non-commercial products, but in most cases would still leave enough trees standing to provide adequate cover to maintain travel and resting habitat for lynx. Only the ridgeline fuelbreaks would contribute additional unsuitable habitat through mechanical means, while prescribed prescribed burning would also convert some lynx habitat to an unsuitable condition. Even using the conservative assumption that burns would convert entire treatment units to an unsuitable condition, combined effects of burning and fuelbreaks would add about 618 acres to the existing 494 for a total of 1,112 acres (again, roughly 8% of lynx habitat in the project area) converted in a ten-year period.

Foraging Habitat (VEG S5, VEG S6, VEG G5, VEG G10)
The proposed action would reduce snowshoe hare habitat through burning and thinning. Small tree (i.e. pre-commercial) thinning reduces stem density in the younger stands that often provide high-quality snowshoe hare habitat. Reductions in stem density alter food and cover availability so that these stands have little or no value for snowshoe hares. Understory thinning in older, multi-storied stands with dense understory vegetation has a similar effect. Standards VEG S5 and VEG S6 apply to thinning in young stands and reduction of snowshoe hare habitat in multi-storied stands respectively. Under the NRLMD, such actions are allowed in lynx habitat for fuel reduction projects in WUI, up to a maximum of 6 percent (cumulatively) of lynx habitat on the administrative unit (NRLMD ROD:A1; p. 3-4). Six percent of lynx habitat on the Gallatin National Forest is roughly 52,200 acres (USDA 2007a:453).

Impacts to early succession foraging habitat under this proposal would be largely due to pre-commercial thinning operations, which would affect an estimated 296 acres of this habitat component, leaving about 959 acres (7% of lynx habitat in the project area). These estimates are based on GIS analyses. A stratified sample of pre-commercial thinning units, and other potential early succession lynx foraging habitat in the project area were visited in the field to verify whether they are currently providing suitable lynx foraging habitat. Stands were evaluated in terms of stem density, horizontal cover, degree of self-pruning, and presence/abundance of hare pellets. GIS data were updated based on field surveys. However, not all potential early succession foraging stands were visited, so model results are subject to some degree of error.

Foraging habitat could also be impacted in mature stands prescribed for commercial thinning and/or prescribed burning since treatment methods are intended to help manage fire behavior by reducing fine fuels, reducing ladder fuels and breaking up the forest canopy. It would be very difficult, if not impossible to model or predict where this habitat component occurs with remotely sensed data, because remotely sensed data generally do not provide good information on understory structure or composition. Mature stands proposed for treatment were not evaluated in the field to determine whether the understory contains lynx habitat, since the importance of this habitat

component, and subsequently VEG S6, are based on relatively new information. In 2008, field crews will attempt to ground truth a sample of mature stands proposed for treatment, in order to evaluate the degree to which mature, multi-storied stands are providing snowshoe hare habitat in the project area.

Since field data were not available at the time of this analysis, an assumption was made that any treatment in mature stands of lynx habitat would reduce the multi-storied snowshoe hare habitat component. GIS analysis was used to estimate the potential loss of foraging habitat in mature stands. Based on this analysis, the project could affect up to 1,401 acres, including 66 acres of spruce/fir cover type. Total acres of treatment that could conceivably alter snowshoe hare habitat (i.e. lynx foraging habitat) in both young and multi-storied mature stands would be 1,697 acres, which would be far below the 52,200 acre (6%) limit for the entire Gallatin Forest.

Removal of larger trees reduces overstory and horizontal cover for both lynx and snowshoe hares in the short term. However, openings in the canopy created by removal of larger trees would allow more sunlight to penetrate to the ground, which could stimulate understory re-growth and eventually produce multi-storied snowshoe hare habitat over time.

Guideline VEG G10 requires the agency to show consideration of Standards VEG S5 and VEG S6 when using the exceptions for these standards relative to fuel reduction projects in WUI. Implementation of the proposed action for the BMW project would require invoking the exemptions for VEG S5 and VEG S6 to allow for treatment in young and multi-storied snowshoe hare habitat. All of the thinning units are designed to meet the Purpose and Need of the project. Treatment units are designed and strategically located to limit fire spread and to change fire behavior to reduce severe impacts to the watershed. Thinning treatments reduce crown fire potential and stand replacement fire potential by treating canopy density and removing ladder fuels. Following up with surface fuels treatment such as prescribed burning treats the entire fuel profile. Thinning small trees removes the ladder fuels which prevents fire spreading from the surface fuels to the crowns of mature trees. Thinning some of the large trees reduces the continuous dense canopy and separates the crowns. This reduces the chance of crown fire spread, and is necessary to meet the Purpose and Need to begin reducing the potential severity and extent of future wildland fires in the municipal watershed (Brickell 2008).

VEG G5 presents guidance to provide habitat for red squirrels or other alternate prey species in each LAU. Red squirrels are associated with coniferous forest, and squirrel densities are generally highest in mature stands with closed canopy, since these types provide the greatest abundance of cones for food. Also, dense mature forest types typically produce greater amounts of coarse woody debris, which provides security cover for squirrels (Reudiger et al 2000:1-9). Proposed fuel treatments would likely retain tree species composition; however, since these treatments are prescribed for fuel reduction with objectives to open forest canopy and reduce dead and down fuel loads, forest structure preferred by squirrels would not be retained or encouraged by project treatment prescriptions. Although the fuel treatments prescribed for the project area may reduce

optimal red squirrel habitat, some high quality squirrel habitat will be retained in the project area, and such habitat is abundant throughout the North Gallatin LAU.

Burn prescriptions could have positive results in habitat for grouse, which are another alternate prey species for lynx. Aspen, which provides habitat for blue and ruffed grouse (USDA 1991:102-4), is a minor habitat component in the project area, but small amounts are included in some treatment units. Burning would reduce conifer encroachment within and near aspen stands, and could also release decadent aspen clones to stimulate new growth. Burn prescriptions in moist forest types could enhance habitat for spruce grouse, since they prefer forested areas with multiple small openings and sparse ground cover (Ibid:101). Burning in cooler moist types would be expected to produce smaller openings due to higher fuel moisture content, and would also clean up smaller fuels on the ground.

Denning Habitat

Prescribed burning and commercial thinning both have the potential for direct effects by altering existing lynx denning habitat in the project area. Prescribed burning could convert relatively large areas of lynx denning habitat to a completely unsuitable condition. However, prescribed burns typically produce a mosaic pattern, and patches left unburned could still contain suitable denning habitat for lynx. Burn prescriptions are designed to produce roughly 20-40% mortality of canopy trees. Since it is impossible to predict the exact pattern a prescribed burn will produce on the ground, it was assumed for analysis purposes that all lynx denning habitat within a prescribed burn treatment unit would be converted to an unsuitable condition.

Over time, indirect effects would occur as burned areas recover. In the short-term (15-20 years), indirect effects of prescribed burning could produce optimal lynx habitat, as trees regenerate to produce high quality foraging habitat in burned areas, which would be in close proximity to denning habitat retained in unburned patches. In addition, trees killed by the burn would begin to fall, contributing coarse woody debris for denning habitat. Over the long-term (20-40 years), most of the dead trees produced by the burn would come down, creating structure for future denning habitat as new trees mature. This recruitment of large woody material would be consistent with the expected availability of such material under natural disturbance regimes. Where prescribed fires result primarily in understory burns, regrowth over time could produce the multi-storied stand structure that can become important snowshoe hare habitat.

Commercial thinning treatments could have direct effects that alter lynx habitat so that it no longer provides the structure favorable for denning habitat. Unlike burning, mechanical thinning can be designed to maintain suitable patches (at least 5 acres in size) of denning habitat within a treatment unit. Even with harvest prescriptions designed to leave residual clumps of denning habitat, it is difficult to predict what the end result would be, so to err on the conservative side, it was assumed that existing denning habitat within commercial thinning units would be lost. Indirect effects of commercial thinning could continue to impact lynx denning habitat over time, since materials removed as commercial product would not be available to contribute coarse woody debris as trees die and fall. On the other hand, commercial thinning could also provide a favorable habitat

matrix where larger canopy openings allow regeneration of conifer seedlings that could provide good foraging habitat in close proximity to denning habitat maintained within or adjacent to thinned units. Thinning prescriptions could also eventually produce multi-storied stands with dense understory cover that provide important showshoe hare habitat.

Prescribed burning (underburn) after commercial thinning could also affect lynx denning habitat if the fire is hot enough to consume large woody debris. However, since the intent of an underburn is not to kill the residual live trees, but rather to burn up lighter fuels on the ground, consumption of large woody material is not generally a problem. Burning of slash piles after thinning would remove woody debris that would otherwise contribute to lynx denning habitat.

Collectively, proposed treatment (burning and thinning) would reduce the availability of denning habitat by about 1,133 acres, leaving roughly 42% of the lynx habitat in the project area to provide denning opportunities.

Habitat Connectivity

Habitat connectivity is important in terms of providing adequate cover to allow for lynx to move within and between LAUs. Since lynx are primarily associated with boreal forest in Canada and Alaska, whereas the subalpine and montane forest of the western US is more peripheral habitat for lynx, it may be important to maintain habitat continuity that facilitates north-south movement patterns, in order to promote the continued influx of animals from Canada (Ruediger et al. 2000:1-12). The North Gallatin LAU is important for lynx habitat connectivity on the Gallatin Forest, due to its location at the north end of the Gallatin mountain range. This area is important for maintaining habitat connectivity to allow for wildlife movement in a north-south manner between the Gallatin Range and the Bridger, Bangtail and Crazy Mountains, which provide corridors for eventual connectivity with lynx habitat in northwest Montana and all the way to Canada. In recognition of the important role this LAU plays in terms of providing habitat connectivity, there has been a "linkage area" identified at the very north end of the LAU, near Bear Canyon.

Linkage areas are identified where factors placing habitat connectivity at risk, such as highways or private land developments, are currently separating large contiguous blocks of lynx habitat. The linkage area identified for the North Gallatin LAU emphasizes the importance of maintaining habitat to facilitate movement across Interstate 90 and adjacent private land development for animals dispersing between the Gallatin Range and the Bridgers, Bangtails, and Crazy Mountains. The linkage area is located in the Bear Canyon vicinity, since this is the area in closest proximity to both the Interstate, and to contiguous lynx habitat to the north. The BMW project site is not considered part of the linkage area for the LAU.

Although the project area is not in a linkage area for movement between LAUs, the proposed treatments could affect habitat connectivity and lynx movement patterns within the North Gallatin LAU. The proposed action would concentrate treatment in multiple contiguous large units in the project area. Substantial amounts of cover could be

removed for lynx and their prey species, which could affect distribution of snowshoe hares, red squirrels and other lynx prey species. Presence and abundance of prey species, combined with availability of security cover, are key factors in lynx habitat use patterns. Not all cover would be affected in the project area, and some degree of habitat connectivity would remain. The project area does contain lynx habitat, but its location in the lower elevation range of the LAU results in a greater proportion of non-lynx habitat; e.g. dry Douglas fir forest and large open meadows, than at higher elevations, were subalpine fir, spruce and lodgepole pine forest types prevail. Habitat connectivity at higher elevations in the LAU remains largely intact, and would not be affected by the proposed action.

Riparian habitat can be important in terms of providing habitat connectivity for lynx. Riparian habitat in the project area and throughout the LAU is generally in good condition, with healthy riparian vegetation that provides good cover for lynx, and contributes to overall habitat connectivity. The primary purpose of the project is to protect the municipal water supply, which comes from Hyalite and Bozeman Creek drainages. Reducing fuel accumulations in these watersheds is expected to lower the risk of an extensive fire event. Large-scale fires can dramatically increase the ash and sediment load delivered to streams, impairing water quality and degrading the overall health of riparian systems. Therefore, the proposed action could help maintain healthy riparian vegetation in the project area.

Forested ridges and saddles in the project area and throughout the LAU provide secure travel corridors and contribute to habitat connectivity. Portions of major ridgelines such as the Gallatin Crest occur in alpine habitat above treeline and do not provide lynx habitat. The proposed action involves some element of fuel reduction on or near forested ridgelines and saddles, including ridgeline fuelbreaks that would remove a greater proportion of the woody vegetation along strategic sections of ridgeline. The NRLMD recommends against constructing permanent fire breaks on ridges or saddles (VEG G4). The rationale for including these ridgeline fuelbreaks is that they would benefit the fire suppression effort by creating strategic locations to make a stand in order to defend and hold a fire. Fuelbreaks provide for quicker access and ease of line construction for equipment and hand crews. Air operations such as retardant and water delivery would be more effective in reaching the ground to knock down flames in these more open ridgetops (Brickell 2008).

Lynx appear to favor gentle terrain where available. In rugged mountain habitat, lynx often utilize benches, plateaus, valleys and gentle rolling ridges (Reudiger et al. 2000:3-2). Most of the pre-commercial thinning units are located in gentle terrain along the divide between Bozeman Creek and Hyalite. This area could be important for maintaining habitat connectivity in the project area and in the North Gallatin LAU. The area was heavily logged in the past, and currently provides some of the better quality lynx foraging habitat in the project area. Pre-commercial thinning could occur in stands currently providing suitable lynx foraging habitat; e.g. dense seedling/sapling stands. In addition, heavy thinning in sapling/pole stands could substantially reduce the amount of security cover available for lynx to move through when traveling within the LAU or

between the North Gallatin and other LAUs. Thinning in older pole-size stands could stimulate additional conifer regeneration in openings if enough seed source is available. However, thinning in younger sapling/pole age stands likely would not result in conifer regeneration due to lack of seed source. If conifer regeneration does result after treatment in older stands, these sites could eventually provide high quality lynx habitat with a mosaic of foraging and denning habitat as trees mature.

Road construction associated with timber harvest can affect lynx habitat connectivity. New roads built to access harvest units would be temporary and designed for effective closure upon completion of harvest activities (HU G9). Public motorized use of project roads would be prohibited, and non-motorized use would be discouraged by project operations. Some temporary roads designed to access treatment units are partially located along forested ridgelines or through saddles that could be important for lynx habitat connectivity.

Cumulative Effects

The proposed action would increase unsuitable lynx habitat in the LAU through prescribed burning and ridgeline fuelbreaks by up to 618 acres. Although this would increase the number of acres of currently unsuitable habitat in the LAU, the relative proportion would increase only slightly from 10 % to 11% for the LAU, which is still well below the maximum allowed of 30% total (VEG S1). The project would also contribute to the amount of unsuitable habitat resulting from management actions in a ten-year period. Assuming all prescribed burning and ridgetop fuelbreaks in lynx habitat (up to 618 acres) was completed in 2009, the total during a ten-year timeframe would increase from 494 to 1,112 acres, but still would be just below 2% for the LAU; again, well below the maximum standard of 15% (VEG S2). There are no other ongoing or reasonably foreseeable land management activities on federal lands that would further increase unsuitable habitat within the North Gallatin LAU.

Denning habitat would be reduced by 1,133 acres due to prescribed burning and commercial thinning, lowering the proportion from 49% currently available to 47%, which would be well-distributed throughout the LAU (VEG G11).

Standards VEG S5 and VEG S6 provide direction that strives to limit actions that could reduce snowshoe hare habitat and thereby impact lynx foraging opportunities. All proposed treatment methods (pre-commercial thinning, commercial thinning and burning) have the potential to affect lynx foraging habitat in the project area. Under the NRLMD, fuels treatments within the WUI in lynx habitat are exempted from vegetation standards VEG S1, S2, S5, and S6 if the cumulative amount of fuels treatments in lynx habitat not meeting those standards is limited to 6% or less of the total available lynx habitat across the Forest. There are approximately 870,000 acres of lynx habitat on the Gallatin National Forest. Fuels treatment could therefore occur on up to 52,200 acres of lynx habitat under the exemptions provided for VEG S5 and S6 (USDA 2007*a*: 453). The project contains a total of approximately 1,697 acres of treatment that could potentially alter snowshoe hare habitat. Added to the Lonesome Wood project on

Hebgen Lake District (Decision April 18, 2008) which could alter 175 acres of snow shoe hare habitat, collective acreage of exceptions to standards VEG S5 and VEG S6 are currently at 1,872 acres for the Gallatin Forest. This acreage is in compliance with Terms and Conditions 1 and 2 of the Incidental Take Statement (FWS 2007) and with the management direction in the ROD (Attachment 1, p. 1-8).

Other factors that have likely affected lynx foraging habitat in the LAU include recent past wildfires such as the Purdy Fire in the Little Bear/Wilson Creek area (burned roughly 2,500 acres of lynx habitat in 2001), and the Homecoming fire in Hyalite (burned about 25 acres in 2005 - within the project area). These fires burned through conifer regeneration stands with good lynx foraging habitat as well as mature stands that potentially contained lynx foraging habitat in the understory. Not much timber harvest has occurred in the LAU in recent years, but some stands harvested 15 years ago or more have yet to successfully regenerate to a condition that currently provides good lynx foraging habitat. On the other hand, most of the existing young seral stage stands that currently provide high quality lynx foraging habitat in the LAU are the result of past timber management practices. These young stands are concentrated in the Little Bear/Wilson Creek area (outside the project area) and the Hyalite/Moser Creek areas (within the project area).

Livestock are present on grazing allotments within the project area. Livestock browsing, grazing and/or trampling can affect snowshoe hare habitat if it alters the structure or composition of native plant communities (Ruediger et al. 2000:7-10). Forest Plan livestock utilization standards are designed to minimize forage competition between livestock and wildlife. Compliance with utilization standards would mitigate potential impacts to herbaceous forage that may be used by snowshoe hares. However, livestock may also be attracted to increased forage in treatment units. Livestock presence in openings created by fire or timber harvest could delay successful regeneration of shrubs and conifers, which are important snowshoe hare habitat components. This issue should be managed accordingly through Allotment Management Plans (GRAZ G1).

Table 3. Summary of Project Compliance with applicable Northern Rockies Lynx Management Direction.

Standard and Guidelines (Listed on p. 10-11 of BA)	**Project Compliance** (Yes or No)	**Reference Page in BA**
VEG S1	Yes	Pgs. 12-13 and 18
VEG S2	Yes	Pgs. 13 and 18-19
VEG S5	Yes*	Pgs. 13-14 and 19
VEG S6	Yes*	Pgs. 13-14 and 19
VEG G4	No – rationale provided	Pgs. 17-18
VEG G5	Yes	Pg. 15
VEG G10	Yes	Pgs. 14-15
VEG G11	Yes	Pg. 19
HU G9	Yes	Pg. 18

*Exemptions for fuel reduction projects in WUI apply.

Table 4. Applicable terms and conditions from the Biological Opinion for the Northern Rockies Lynx Management Direction.

Term and Condition	Compliance
List term and condition	*Yes or no and explain if necessary*
Fuels management projects conducted under the exemptions from standards VEG S1, S2, S5 and S6 in occupied habitat shall not occur in greater than 6% of lynx habitat on any Forest	Yes: Combined with Lonesome Wood project (Hebgen Lake District 4/18/08) total Gallatin Forest acres using exemption for VEG S5 and S6 would be at 1,872 acres or 0.2% of lynx habitat on the GNF
Fuels management projects conducted under the exemptions from standards VEG S1, S2, S5 and S6 in occupied habitat shall not result in more than 3 adjacent LAUs not meeting the VEG S1 standard of no more than 30 percent of an LAU be in stand initiation structural stage.	Yes
In occupied lynx habitat, precommercial thinning and vegetation management projects allowed per the exception listed under VEG S5 and S6, shall not occur in any LAU exceeding VEG S1, except for protection of structures.	Yes: Including project implementation the North Gallatin LAU would contain approximately 11% of lynx habitat in a condition currently unsuitable for lynx. Standard VEG S1 would be met and the exceptions listed under VEG S5 and VEG S6 could occur.

Summary

The Record of Decision (ROD) for the Northern Rockies Lynx Management Direction (NRLMD) became effective July 16, 2007 (USFS 2007) and incorporates Terms and Conditions (T&C's) of the Biological Opinion and Incidental Take Statement (FWS 2007).

This project would treat up to 1,697 acres of lynx habitat which may provide snowshoe hare habitat. Treatment of these acres would result in adverse effects to lynx because the treatments would render these acres of little to no value as snowshoe hare habitat. These acres will be treated to reduce hazardous fuels within the WUI. The management direction in the ROD for Standards VEG S1, VEG S2, VEG S5 and VEG S6 states that the Standards apply "…except for fuel treatment projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation:

Fuel treatment projects within the WUI that do not meet Standards VE S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest)." *In addition, fuel treatment projects may not result in more than three adjacent LAUS exceeding the standard."* (The standard referred to in the last sentence is VEG S1.)

The total cumulative acres treated on the Forest since the ROD became effective, including this project, are 1,872 acres or 0.2%. This acreage is in compliance with Terms and Conditions 1 and 2 of the Incidental Take Statement (FWS 2007) and with the management direction in the ROD.

Determination of Effects

I have determined implementation of the proposed Federal Action *may affect, is likely to adversely affect* the Canada lynx. My determination is based on the following rationale:

1. Snowshoe hare habitat in the structural reinitiation and old, multi-storied stages would be treated.
2. Treatment of snowshoe hare habitat would be in compliance with applicable guidance from the Northern Rockies Lynx Management Direction.

The Bozeman Municipal Watershed Fuels Reduction project would *not result in adverse modification of proposed critical lynx habitat* for the following reasons:

1. The Incidental Take Statement (ITS) places limits on the amount of lynx habitat that could be treated on the Gallatin National Forest that would result in adverse effects to lynx habitat.
2. The FWS determined in a Biological Opinion (BO) that the acreage that could be treated in ways that would adversely affect lynx habitat would not result in jeopardy to the continued existence of lynx, and that the NRLMD is compatible with recovery needs for lynx.
3. This project is in compliance with the limits identified in the ITS for cumulative acres treated that would result in adverse effects to lynx for the Gallatin National Forest, and
4. A monitoring system has been established in compliance with the BO terms and conditions to annually report to the FWS acres treated subject to the ITS.

LITERATURE CITED

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SUPPLEMENT TO

BIOLOGICAL ASSESSMENT

BOZEMAN MUNICIPAL WATERSHED

FUEL REDUCTION PROJECT

BOZEMAN RANGER DISTRICT

GALLATIN NATIONAL FOREST

Prepared by:

__*Bev Dixon*_____

SUMMARY
Determination of Effects
Implementation of the proposed Federal action ***may affect, likely to adversely affect*** designated critical habitat for Canada lynx.
Consultation Requirements

In accordance with the Endangered Species Act (ESA), Section 7 of the ESA requires Federal agencies to ensure that actions they fund, authorize, or carry out are not likely to jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat. Activities that, when carried out, funded or authorized by a Federal agency, may affect critical habitat include, but are not limited to:

1. Actions that would reduce or remove understory vegetation within boreal forest stands
2. Actions that would cause permanent loss or conversion of the boreal forest, and
3. Actions that would increase traffic volume and speed on roads that divide lynx critical habitat.

Need For Re-Assessment Based on Changed Conditions

A revised (e.g. supplemental) Biological Assessment (BA) must be prepared if a new species is listed, or habitat identified, which may be affected by the action.

Background

The Bozeman Ranger District of the Gallatin National Forest first requested formal consultation with the US Fish and Wildlife Service (Service) on the BA for the Bozeman Municipal Watershed (BMW) fuel reduction project on July 9, 2008, because the project determination was ***may affect, likely to adversely affect*** lynx, based on adverse impacts to lynx foraging habitat. At that time, it was noted that the project would "not result in adverse modification of *proposed* critical habitat." We received a letter from the Montana Field Office dated August 8, 2008, in which the Service determined that the effects of the project were adequately analyzed in the first-tier biological opinion for the Northern Rockies Lynx Amendment, and that the project conforms to the incidental take provisions. On March 27, 2009, the final rule designating revised critical habitat in the Federal Register became effective (USDI 2009). The BMW project falls within Unit 5, Greater Yellowstone Area, of designated critical habitat, and includes actions that would reduce or remove understory vegetation within boreal forest stands. In accordance with Section 7 of the ESA, this supplement to the BA for the BMW project serves to meet the consultation requirements for designated critical habitat.

PROPOSED PROJECT

The BMW project is proposed to treat vegetation and fuel conditions in the Wildland Urban Interface (WUI) in order to reduce the potential severity and extent of future wildland fires in the Bozeman Municipal Watershed. The project is focused on the two primary drainages, Bozeman Creek and Hyalite Creek that supply over 90% of the municipal water supply for the city of Bozeman, Montana. The project includes thinning and partial harvest in mature stands, thinning of smaller diameter trees, and prescribed burning in thinned stands. Slash could be pre-treated by mechanical trampling prior to burning. Please refer to the original BA (dated 7/9/08) for more details regarding proposed treatment.

Project Area

The project is located in Gallatin County approximately 10 miles south of Bozeman, Montana. Proposed treatments are within the WUI as designated in the Gallatin County Community Wildfire Protection Plan. The project is located within the North Gallatin Lynx Analysis Unit (LAU). The North Gallatin LAU covers an area of about 103,334 acres at the north end of the Gallatin Range, on the west side of the Gallatin Crest. This LAU represents less than 2% of the land mass contained in the GYA Unit (9500.5 mi^2, 6,080,320 acres) of designated critical lynx habitat. The North Gallatin LAU is approximately 66% (67,910 acres) mapped lynx habitat, with about 34% (35,424 acres) in matrix habitat. Table 1 displays a breakdown of lynx habitat components and acreage for the North Gallatin LAU.

Table 1. Habitat Components for North Gallatin LAU

LAU Acres	Matrix Habitat	Lynx Habitat	Denning Habitat	Stand Initiation Foraging	Multi-Storied Foraging	Other Habitat	S In U
103,334	35,424	67,910	33,103	5,249	8,414 to 35,058	22,908	6,

Note: Multistoried foraging habitat shows an estimated range for this component based on a combination of GIS modeling and limited ground-truthing for horizontal cover in mature lynx habitat within the BMW project area. Acres displayed for multistoried foraging overlap with acres shown for denning and other habitat.

EFFECTS ANALYSIS

Primary Constituent Elements (PCE)

The Final Rule (USDI 2009:8638) identifies the PCEs, or those physical and biological features that are essential to the conservation of the species, and that may require special management considerations or protections as follows:

1. Boreal forest landscapes supporting a mosaic of differing successional stages and containing:
    a. Presence of snowshoe hares and their preferred habitat conditions which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface;

b. Winter snow conditions that are generally deep and fluffy for extended periods of time;
c. Sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and
d. Matrix habitat (habitat types that do not support snowshoe hares), that occurs between patches of boreal forest such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

Methodology

Effects analyses were conducted in terms of how proposed treatment would affect the various PCEs. Quantitative analyses were based on a combination of GIS-based modeling and ground verified habitat assessment. At the LAU scale, ground verification of lynx habitat components and/or PCEs is difficult to achieve, because it is not feasible to complete enough site visits over 100,000+ acres to accumulate adequate data to produce a statistically reliable estimate of lynx habitat conditions on the ground, particularly considering the dynamic nature of lynx habitat. Therefore, GIS modeling was the primary tool used to quantify lynx habitat PCEs at the LAU scale. Ground verification efforts were concentrated in proposed treatment units within the project area. This strategy allows for more accurate quantification of effects due to project activities, but can result in greater error at the LAU scale.

On the Gallatin Forest, the GIS coverage for lynx habitat was created using TSMRS (Timber Stand Management Record System) data for information regarding elevation, habitat type, forest cover, dominant tree species, dominant size class, and percent canopy cover. Based on these factors, we identified primary lynx habitat as cool, moist coniferous forest in the elevation range between 6,000 and 8,800 feet, with habitat types where spruce or subalpine fir are the indicated climax species. Moist Douglas fir types, aspen, willow and sage intermixed with spruce and/or subalpine fir habitat types were identified as secondary lynx habitat. Lodgepole pine is often the dominant cover type for lynx habitat in early to mid seral stages. Drier forest types and non-forest habitat were mapped as "non-lynx" habitat, and would represent matrix habitat (PCE 1d) within the designated critical habitat unit.

PCE 1a, snowshoe hare habitat (i.e. lynx foraging) has two components: Young, densely stocked conifer regeneration that protrudes above average winter snow depths in a stand initiation phase shortly after a disturbance; and multistoried mature stands with conifer boughs touching the snow surface. Young forest stands can be readily identified in TSMRS data by structural stage and canopy cover. However, since the TSMRS database covers a large geographic area and resources for database maintenance and update are limited, early succession cover types tend to be misrepresented more than mature cover types because the younger cover types change more quickly. Therefore, proposed treatment units that could affect this habitat component were visited at the project area to determine whether they are currently providing suitable lynx foraging habitat.

The other component of PCE 1a, multistoried foraging habitat, does not lend itself well to modeling. GIS modeling is primarily based on remotely sensed landscape data such as aerial photography or satellite imagery. This type of data is poorly suited to identification of multistoried lynx foraging habitat, because the important feature of this habitat component is the availability of horizontal cover in the understory, which provides food and cover for the snowshoe hare. Remote sensed data generally create an image of the landscape as seen from above, and cannot penetrate through canopies of mature forest habitats to reveal understory structure. For GIS modeling purposes, it was assumed that any mature, relatively closed-canopy lynx habitat could potentially provide multistoried lynx foraging habitat. Since research (Squires and DeCesare 2008) has shown that snowshoe hares, and therefore lynx, select for a high level of horizontal cover in multistoried stands, and not all mature stands contain this structure in the understory, the above assumption clearly results in an overestimate of the multistoried lynx foraging habitat component for PCE 1a.

Since the June 2008 consultation for lynx on this project, we completed a field survey of potential multistoried lynx foraging habitat that would be affected by proposed treatment in the project area. This survey was conducted during the summer of 2008, using horizontal cover boards and methodology designed by Squires and DeCesare (2008), and following an interim survey protocol recommended by Bertram and Claar (2008). Squires and DeCesare (2008) indicate a minimum average cover board reading of 48% for summer lynx foraging habitat. Since our surveys were conducted during summer months, 48% was the minimum cutoff we used to indicate adequate horizontal cover to produce multistoried lynx foraging habitat. Bertram and Claar (2008) recommended that at least 20% of the acreage in question be surveyed at a rate of 1 survey plot per 10 acres. For the BMW project area, GIS analysis estimated a maximum of 1,401 acres of proposed treatment in potential multistoried lynx habitat under the assumption all mature stands with relatively closed canopy were multistoried. Twenty percent of 1,401 acres produced 280 acres to be surveyed, at 1 plot per 10 acres for a total of 28 sample plots. We used GIS to produce UTM coordinates of random points within treatment units to be surveyed. GPS units were then used to navigate to survey locations on the ground.

We selected 31 sample points to get good representation of stands that could be affected by proposed treatment. Of these, 27 points were actually visited and measured for horizontal cover on the ground. The remaining 4 points were unsurveyed due to time and access constraints. Of the 27 points where plot surveys were conducted, only 8 met the minimum average requirement of 48% horizontal cover for summer lynx foraging habitat. The 8 points that met the minimum horizontal cover criteria for lynx foraging habitat were representative of approximately 288 acres of potential multistoried foraging habitat. The remaining 19 points that were below the minimum horizontal cover requirements were representative of approximately 903 acres of potential habitat. The 4 points that were not surveyed were representative of approximately 210 acres of potential habitat.

We then used the field survey data to extrapolate to the entire LAU for estimating the amount of multistoried foraging habitat within the LAU. It should be noted that the

BMW project area occurs at lower elevation within the LAU, and that in general, this area contains warmer, drier conditions than the LAU as a whole. Therefore, the BMW project area likely produces less of the understory growth that provides horizontal cover conditions preferred by snowshoe hares and lynx. Given this factor, and a small overall sample size (27 points) on which to base estimates for the entire LAU, it was determined that the BMW field data were not highly representative of the entire LAU, so a range of potential acreage for the multistoried component of PCE 1a was deemed the best way to characterize availability of this component at the LAU scale. The range was determined by using the BMW project area sample as a low estimate, and using the GIS querie that assumes all mature closed canopy lynx habitat to be multistoried foraging habitat for the high estimate. The BMW sample was applied as a proportion; e.g. 288 acres of potential habitat had sample plots at or above the minimum criteria for horizontal cover, out of a total of 1,191 acres of potential habitat with survey plots, for a result of 24% (288/1191) of the acres sampled meeting the minimum criteria. When applied at the LAU scale, the range of predicted acreage for multistoried lynx foraging habitat is 8,414 – 35,058 acres (8,414 = 24% of 35,058).

PCE 1b includes winter weather that produces deep, fluffy snow conditions for extended periods of time. While factors such as wind and sun exposure can obviously affect such conditions, in general, deep, soft snow is prevalent across the North Gallatin LAU throughout most of the winter season.

PCE 1c includes sites for denning that have abundant coarse woody debris. This habitat component is relatively common, and certainly not limiting within the North Gallatin LAU. Recent wildfires and insect infestations will add to this habitat component over time. Denning habitat was modeled using GIS by selecting mature stands with predominantly large trees (>= 9" dbh) with at least 70% canopy closure for Douglas fir and lodgepole pine dominated sites, and at least 40% canopy closure for spruce and subalpine fir dominated sites. Field experience has confirmed that these conditions generally provide abundant coarse woody debris throughout forested habitat across the Bozeman Ranger District. Estimates of denning habitat based on these modeling parameters are probably conservative, since various environmental factors (e.g. fire, wind, insects, disease, and natural forest succession) can produce large amounts of down woody debris in younger and more open stands as well.

PCE 1d includes matrix habitat (e.g. deciduous forest, dry conifer types, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of lynx habitat such that lynx are likely to travel through such habitat while moving between patches of boreal forest within a home range. These habitat types are easily identified and accurately represented with TSMRS data.

Effects Assessment

PCE 1a: Snowshoe Hare Habitat

The proposed action would reduce snowshoe hare habitat through thinning and burning. Small tree thinning reduces stem density in the younger stands that often provide high-quality snowshoe hare habitat. Reductions in stem density alter food and cover availability so that these stands have little or no value left for snowshoe hares. Understory thinning in older multistoried stands with dense understory vegetation would have a similar effect. Under the Northern Rockies Lynx Management Direction (Standards VEG S5 and VEG S6), exceptions are allowed for understory thinning of snowshoe hare habitat for fuel reduction projects in WUI, up to a maximum of 6 percent (cumulatively) of lynx habitat on the administrative unit. Six percent of lynx habitat on the Gallatin National Forest is roughly 52,200 acres (USDA 2007:453). Thinning and burning operations in this proposal would reduce stand initiation stage snowshoe hare habitat by approximately 296 acres. Multistoried snowshoe hare habitat would be reduced by an estimated 498 acres (a change from 7/9/08 BA due to subsequent field verification). Both of these types were ground verified in proposed treatment units within the project area. Field reconnaissance did not include a 100% ground-truth of all proposed treatment units in potential snowshoe hare habitat, but rather used a stratified sample of young and mature stands, with plot locations randomly selected within proposed treatment units using GIS. All proposed treatment units in potential early succession snowshoe hare habitat were visited. Most proposed treatment units in potential multistoried snowshoe hare habitat were visited. Approximately 210 acres of proposed treatment in potential multistoried snowshoe hare habitat were not sampled due to time and access constraints. To err on the conservative side for analysis purposes, these units were assumed to contain multistoried snowshoe hare habitat. The figure presented for impacts to the multistoried component of PCE 1a includes the 288 acres for which sample points contained a minimum plot average of 48% horizontal cover, plus the 210 acres of proposed treatment that were not sampled. Based on these estimates and calculations, the proposed action would affect up to 794 acres of PCE 1a.

PCE 1b: Winter Snow Conditions

The project design does not contain any prescriptions for winter logging. Winter logging is typically an agency requirement of the timber purchaser, used to mitigate for potential resource effects such as soil erosion, water quality, etc. Although there is no requirement for winter logging in this proposal, there is no restriction against it. The purchaser may choose to operate in winter, although it is generally not in their interest to do so. Winter logging is considerably more costly due to road plowing, snow clearing at log decks, and wear and tear on equipment. It is unlikely that winter logging would occur for this project, but since it is not prohibited, and could be an option if the purchaser gets behind schedule or for other reasons, it is recognized here that the proposed action could have some very minor effect on winter snow conditions. If the purchaser decides to conduct winter logging, resulting snow compaction would be restricted to designated access roads and skid trails. At the LAU scale, winter logging for this project would have a very minor impact on overall snow conditions. Burning would occur in spring or fall, and would have no effect on snow conditions.

PCE 1c: Denning Habitat

Prescribed burning and commercial thinning both have the potential to reduce existing lynx denning habitat in the project area. Broadcast burning could convert relatively large areas of denning habitat to a temporarily unsuitable condition. However, prescribed burns typically produce a mosaic pattern, where unburned patches could still provide suitable denning habitat. Burn prescriptions are designed to produce roughly 20-40% mortality of canopy trees. Since it is impossible to predict the exact pattern a prescribed burn will produce on the ground, it was assumed for analysis purposes that all lynx denning habitat within a broadcast burn treatment unit would be converted to a temporarily unsuitable condition. Over time, indirect effects would occur as burned areas recover. In the short-term (15-20 years) broadcast burning could produce optimal lynx habitat, as trees regenerate to produce high quality foraging habitat in burned areas, which would be in close proximity to denning habitat retained in unburned patches. In addition, trees killed by the burn would begin to fall, contributing coarse woody debris for denning habitat.

Commercial thinning could also alter habitat so that it no longer provides the structure favorable for denning. Unlike burning, mechanical thinning can be designed to maintain suitable patches (at least 5 acres in size) of denning habitat within a treatment unit. Even with harvest prescriptions designed to leave residual clumps of denning habitat, it is difficult to predict what the end result would be, so to err on the conservative side, it was assumed that existing denning habitat within mechanical thinning units would be lost.

Collectively, proposed treatment (thinning and burning) would reduce lynx denning habitat by about 1,133 acres. It should be noted that roughly 370 acres of this habitat was also counted under PCE 1a – multistoried snowshoe hare habitat.

PCE 1d: Matrix Habitat

The proposed action includes roughly 2,171 acres of proposed treatment in drier forest types, which do not provide suitable lynx habitat, but that occurs between patches of suitable habitat, such that lynx may travel through during normal movement within a home range. Proposed treatment would result in temporary alteration of matrix habitat, and would not pose barriers to lynx movement. Habitat connectivity would be maintained within the project area and throughout the LAU.

Table 2. Summary of Proposed Treatments in Critical Habitat

PCE	LAU Acres	Treatment Ac	% LAU Affected
1a: Snowshoe hare habitat	13,663 – 40,307[1]	794	2% to 6%[1]
Young	5,249	296	6%
Multistoried	8,414 – 35,058[1]	498	1% to 6%[1]

1b: Snow Conditions	*	*	*
1c: Denning Habitat	33,103	1,133	3%
1d: Matrix Habitat	35,424	2,171	6%

[1]Range of numbers for snowshoe hare habitat based on different estimates for multistoried component as described under Methodology above.
*Snow condition acreages not estimated

Determination of Effect

I have determined that implementation of the federal action, as proposed, ***may affect, and is likely to adversely affect*** designated critical habitat for lynx. This determination is based on the following factors:

1. Actions would reduce snowshoe hare habitat within designated critical lynx habitat
2. Actions are within the NRLMD exceptions for fuel treatment in WUI
3. The US FWS determined in a Biological Opinion that management within the exceptions for fuel treatment in WUI as stated in the NRLMD is compatible with recovery needs for lynx

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United States Department of the Interior

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File: M.19 Gallatin National Forest
Bozeman Municipal Watershed Fuel Reduction

August 8, 2008

José Castro, District Ranger
Bozeman Ranger District
Gallatin National Forest
3710 Fallon St., Suite C
Bozeman, Montana 59718

Dear Mr. Castro:

On July 11, 2008, the U.S. Fish and Wildlife Service (Service) received the biological assessment for the proposed Bozeman Municipal Watershed Fuel Reduction Project, on the Bozeman Ranger District, Gallatin National Forest. The project is located in Gallatin County approximately 10 miles south of Bozeman, Montana. Proposed activities are focused on the two primary drainages that make up the majority of the Bozeman Municipal Watershed resources: Bozeman Creek and Hyalite Creek.

On March 23, 2007, the Service issued a biological opinion on the effects of amending Land and Resource Management Plans (Plans) of 18 National Forests with the Northern Rockies Lynx Amendment for Canada lynx. The biological opinion was identified as the first-tier of a tiered consultation framework, with subsequent projects that may affect lynx as implemented under the amended Forest Plans being the second-tier of consultation. Second-tier opinions would be issued as appropriate, where proposed actions would result in adverse effects to lynx that were not fully analyzed in the first tier biological opinion.

In the amendment, a limited range of fuel or timber management projects that would be conducted within the wildland urban interface, and limited pre-commercial thinning for other resource benefits, fell under exceptions or exemptions from amendment standards VEG S1, S2, S5, and S6. In our first-tier biological opinion, we were able to analyze the effects of such projects on lynx and also provide an incidental take statement for these activities because the Forest Service provided explicit estimates on the number of acres that would be impacted under the exceptions and exemptions. Thus, the incidental take statement exempted incidental take for those management projects.

The proposed Bozeman Municipal Watershed Fuel Reduction Project falls within the range of fuel or timber management projects analyzed in our first-tier biological opinion. The Service has reviewed your biological assessment and finds that the effects of this project were adequately analyzed in the first-tier biological opinion and that the project conforms to the incidental take

statement, because (1) this proposed site-specific project falls within the scope of the first-tier biological opinion, (2) the effects of this proposed action are consistent with those anticipated in the first-tier biological opinion, (3) the acres of lynx habitat treated under exemptions or exceptions to standards in this proposed action are within levels anticipated in the first-tier incidental take statement, and (4) the appropriate terms and conditions associated with the reasonable and prudent measures identified in the first-tier biological opinion are adhered to.

The Service notes that guideline VEG G4 from the amendment would not explicitly be met for the proposed action. This guideline recommends against constructing permanent fire breaks along forested ridges or saddles. The concern for removal of forested cover from ridgelines and saddles is related to the tendency for lynx to use these features for movement. The Forest provided additional information regarding this guideline and the proposed action and noted that the project prescriptions for ridgeline fuelbreaks call for heavy thinning, but not clear-cutting and some seed source would be left so that the fuelbreaks would not really be "permanent" fire breaks as regeneration could occur over time. Not all forested ridges and saddles in the project area would be affected. Habitat connectivity and alternate travel routes along forested ridges and saddles would be maintained for lynx within the project area. Habitat connectivity is not limiting in the North Gallatin LAU, where forested ridgelines and saddles are relatively common features that provide secure travel routes for lynx. Based on these factors, we agree with the conclusion that the proposed ridgeline fuelbreaks (not meeting guideline VEG G4) in this case, are not likely to adversely affect lynx. Further, the acres treated to create these fuelbreaks fall within the range of acres treated for fuel management projects analyzed in the first-tier biological opinion as discussed above.

The Service bases our conclusion on the information and analyses contained in the biological assessment for this project and in our March 23, 2007 biological opinion. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation.

We appreciate your efforts to ensure the conservation of threatened and endangered species as part of your responsibilities under the Endangered Species Act, as amended. If you have questions or comments related to this issue, please contact Katrina Dixon or me at 406-449-5225.

Sincerely,

R. Mark Wilson
Field Supervisor

***SECOND* SUPPLEMENT TO**

BIOLOGICAL ASSESSMENT

(GRIZZLY BEAR)

BOZEMAN MUNICIPAL WATERSHED

FUEL REDUCTION PROJECT

BOZEMAN RANGER DISTRICT

GALLATIN NATIONAL FOREST

Prepared by:

/s/ *Bev Dixon* November 12, 2009

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_____

Name_____

SUMMARY

Determination of Effects

Implementation of the proposed Federal action ***may affect, likely to adversely affect*** grizzly bears or their habitat.

Consultation Requirements

In accordance with the Endangered Species Act (ESA), Section 7 of the ESA requires Federal agencies to ensure that actions they fund, authorize, or carry out are not likely to jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat.

Need For Re-Assessment Based on Changed Conditions

A revised (e.g. supplemental) Biological Assessment (BA) must be prepared if a new species is listed, or habitat identified, which may be affected by the action.

Background

The Bozeman Ranger District of the Gallatin National Forest first requested formal consultation with the US Fish and Wildlife Service (Service) on the BA for the Bozeman Municipal Watershed (BMW) fuel reduction project on July 9, 2008, because the project determination was ***may affect, likely to adversely affect*** lynx, based on adverse impacts to lynx foraging habitat. On March 27, 2009, the Final Rule designating revised critical habitat for lynx became effective (75 Fed. Reg. 2009:8616). At that time, a Supplemental BA was sent to the US Fish and Wildlife Service for consultation on project effects to lynx critical habitat.

Grizzly bears were not included in the original or first Supplemental BA for the BMW project, because the Service had designated grizzly bears in the Greater Yellowstone Ecosystem as a Distinct Population Segment (DPS) and removed this segment from the Endangered Species List in April 2007. On September 21, 2009, an order was issued by the US District Court for the District of Montana, Missoula Division, (*Greater Yellowstone Coalition v. Servheen,* 07-cv-00134-DWM), which enjoined and vacated the delisting of the Greater Yellowstone Area (GYA) grizzly population. In compliance with this order, we are again treating the Yellowstone grizzly population as threatened under the ESA, and providing a Biological Assessment of potential impacts from the BMW project on grizzly bears or their habitat.

PROPOSED PROJECT

The BMW project is proposed to treat vegetation and fuel conditions in the Wildland Urban Interface (WUI) in order to reduce the potential severity and extent of future

wildland fires in the Bozeman Municipal Watershed. The project includes thinning and partial harvest in mature stands, thinning of smaller diameter trees, and prescribed burning in thinned stands. Slash could be pre-treated by mechanical trampling prior to burning. Please refer to the original BA (dated 7/9/08) for more details regarding proposed treatment.

Project Area

The project is located in Gallatin County approximately 10 miles south of Bozeman, Montana. Proposed treatment is focused in two primary drainages, Bozeman Creek and Hyalite Creek, which supply over 90% of the municipal water supply for the city of Bozeman, Montana. The project is located well outside the GYA Recovery Zone for grizzly bears, but in an area considered to be occupied by grizzlies (South of I-90 on the Gallatin National Forest). See Figure 1for project area vicinity and location relative to the GYA Recovery Zone.

SPECIES ASSESSMENT: Grizzly Bear (*Ursus arctos*)

Population and Habitat Status

The grizzly bear was listed as a threatened species under the ESA in the lower 48 states in 1975 (40 Fed. Reg. 1975:31736). The Grizzly Bear Recovery Plan (USDI 1982, revised 1993) delineated grizzly bear recovery zones in 6 mountainous ecosystems in the U.S., including the Greater Yellowstone Area. The GYA grizzly bear recovery zone covers parts of Montana, Idaho and Wyoming, and includes portions of six national forests (including the Gallatin), two national parks, state and private lands, and lands managed by the BLM. Grizzly bears also frequently use areas outside the designated GYA recovery zone.

The GYA grizzly bear population met population objectives, and was petitioned for delisting by the Service in 2005. A Final Rule designating GYA grizzlies as a DPS and removing this segment was published in March 2007. However, a recent court order vacated the delisting and remanded the decision back to the Service. Therefore, as of the date of the court decision (September 21, 2009), GYA grizzly bears are again listed as threatened under the ESA.

Overall, general habitat conditions in the GYA are excellent. Within the recovery zone, there are large blocks of undisturbed and secure habitat, with low open road and total motorized access route densities in the majority of the subunits. On the Gallatin National Forest outside the recovery zone, 43 percent of the area considered occupied is in Wilderness, Wilderness Study Areas, or has poor topography for motorized access. Another 20 percent of the occupied habitat outside the recovery zone occurs in areas considered “lightly motorized”, while only about 37 percent of the occupied habitat outside the recovery zone has moderate to high levels of motorized use.

Whitebark pine (*Pinus albicaulus*) habitat is an important component for grizzly bears in the GYA. It not only provides a seasonally vital food source, whitebark pine nuts, but

also occurs at high elevations, in relatively remote areas, where human disturbance tends to be less than found at lower elevations. Whitebark pine habitat has undergone declines in recent years, and is expected to continue to decline due to factors including white pine blister rust, mountain pine beetle, and possible encroachment from other conifer species due to past fire exclusion.

Affected Environment

None of the proposed actions (prescribed burns, forest thinning) are located within the GYA recovery zone, but are located in what is considered to be occupied grizzly bear habitat. No grizzly bear occurrences have recently been documented within any of the proposed treatment sites. The project area does not contain any known grizzly bear den sites, and there have been no grizzly bear mortalities recorded within the project area. Although there are occasional documented reports of grizzly bear occurrence in the Hyalite and Bozeman Creek drainages, grizzly bear use in these areas is very low relative to use levels within the recovery zone, perhaps due to much higher levels of human use in closer proximity to the population center at Bozeman.

The project area provides potential spring and summer habitat in lower elevation riparian communities, moist sites that produce succulent forage, berry patches, insect concentrations and small mammal communities. Treatment units are located in lower elevation habitat than that typically used by grizzly bears in fall. Denning habitat is also typically found at higher elevations, in much more remote settings.

The project area contains habitat such as hiding/thermal cover and a wide variety of food items for grizzly bears. Cover is important for providing security while feeding, resting or traveling. Blanchard (1983) reported that radio-collared grizzly bears in the Yellowstone Ecosystem were located in forested habitats 90% of the time, and locations in the open were generally within 325 feet of forested cover. Grizzly bear foraging habitat includes a broad spectrum of land types. Since grizzly bears are omnivorous, vegetation makes up a large part of their diet. Important vegetative diet items include succulent plants, berries, roots, tubers and whitebark pine seeds.

Within the project area, moist, cool sites typically provide the best vegetative forage values for bears, since these habitats produce more succulent and thus more easily digestible plant foods. Forested habitat types as well as open meadows and riparian areas can all provide important foraging options for bears. Whitebark pine grows at higher elevations, and is a very minor habitat component in the project area. An analysis of foraging value within the project area was conducted by quantifying the availability of habitats most likely to produce important plant foods. Based on these conditions, it was determined that roughly 95% of the project area includes habitat types capable of producing some vegetative forage for bears.

Other important grizzly bear foods include protein sources such as meat from animal and fish carcasses (taken either through direct predation or scavenged) and insects. The project area contains a small amount of big game winter range. Winter-killed ungulate carcasses could provide spring feeding opportunities for bears. Small mammals, such as rodents, are abundant in the project area, and could provide a potential food source for bears, although small animals typically make up a relatively small portion of a bear's diet. Insects are present throughout the project area and provide a good food source for bears in areas where insects are concentrated; e.g. ants/termite colonies in tree stumps and fallen logs, ant mounds, etc. There are no known army cutworm moth concentration sites in the project area. Streams also provide good protein sources for bears when fish are concentrated during spawning runs. Although some fish spawning occurs in streams within the project area (lower reaches of Bozeman Creek and Hyalite, Leverich Creek, and some small tributaries) stream segments within the project area do not produce the size or numbers of fish preferred by bears.

Human access is an important factor in grizzly bear habitat quality. Whether roads themselves have negative effects on bear habitat is debatable. Some studies (Elgmork 1978, Jonkel 1982) have indicated that grizzly bears avoid roads and areas of high road density, while others (Erickson 1977) noted the use of roads by bears for travel. However, roads and trails allow for easier human access into grizzly bear habitat, which can result in disturbance, displacement, or even mortality of bears. Access routes may also provide travel corridors for bears to move into human developments, where their presence likely will not be tolerated. The project area (i.e. the area containing and surrounding collective treatment units) currently has relatively high road densities at 1.28 mi/mi^2. This figure includes all roads open to motorized use including private roads, administrative roads, and roads closed to passenger vehicles but open to use by ATVs and/or motorcycles. There are a few single-track trails open to motorcycle use in the project area. Adding these trails, the total open motorized route density in the project area is currently 1.36 mi/mi^2.

Applicable Direction

Land management direction specific to grizzly bear habitat is contained in the Gallatin Forest Plan, Appendix G: Grizzly Bear Standards and Guidelines (USDA 1987), Appendix H: US Fish and Wildlife Service Biological Opinion (USDI 1986), Forest Plan Amendment No. 19 (USDA 1996) and the Biological Opinion on Amendment No. 19 (USDI 1995). This direction pertains to land management activities *within* the grizzly bear recovery zone (or specific to Management Situation 1 and 2, which collectively cover the same geographic area as the recovery zone).

There is limited Forest Plan direction specific to grizzly bear habitat management *outside* the recovery zone. However, the Gallatin National Forest Travel Management Plan (USDA 2006) provides direction pertaining to the construction and use of roads for projects both within and outside the recovery zone, and includes a guideline (G-3 p. I-13) to consider applying temporary localized restrictions to prevent conflicts with threatened and endangered species. In addition, a forest-wide Special Order (#07-11-00-01)

regulates the storage of food and other attractants on National Forest System lands within the entire Gallatin Forest boundary, for the purpose of minimizing adverse interactions between humans, bears and other wildlife. Also, the US Fish and Wildlife Service has issued two Biological Opinions, each with terms and conditions that apply to Gallatin National Forest management actions outside the grizzly bear recovery zone. These opinions were issued in response to Biological Assessments prepared by the Gallatin Forest for: Effects of the Gallatin Forest Plan on Grizzly Bears that Occur Outside the Greater Yellowstone Area Recovery Zone (2004) and The Gallatin National Forest Travel Management Plan (2006).

Methodology for Analysis

Proposed treatment units were evaluated for their ability to provide security cover by examining aerial/ortho photos. Field visits to a few selected units indicated that cover determinations based on photo interpretation were generally accurate (estimate 80-85% accuracy). The Forest Timber Stand Management Record System (TSMRS) database was used to help verify hiding cover estimates based on best strata codes that reflect dominant tree species, size class and canopy cover. Strata codes in TSMRS are not 100% ground verified and some of the data in this field are more than ten years old. Accuracy estimates for this data set (strata codes) is 70-80%. TSMRS strata codes and best habitat type codes were used to evaluate forage availability for grizzly bears within the project area. Strata types can indicate the presence of important vegetation types such as whitebark pine and wet to moist meadows. Habitat type codes reflect understory plant composition and can be used to predict the occurrence of important grizzly bear foods such as berries, grasses and forbs. Habitat typing is a complex system that requires a higher level of plant identification skills than strata typing. Not all habitat type codes in the TSMRS database are 100% ground verified, and some of these data are more than ten years old. Due to the higher degree of complexity involved with habitat typing, it is estimated that the accuracy level of this data set within TSMRS is approximately 50-60%. GIS technology was used to estimate motorized route densities within the project analysis areas. Pertinent literature was reviewed to obtain additional information on grizzly bear habitat use and possible impacts associated with timber harvest and prescribed burning.

Effects Analysis

The spatial boundary used for analysis of direct and indirect effects for the proposed action is the project area, which includes roughly 21,824 acres of National Forest System lands, City of Bozeman lands and private land (inside the forest boundary) that contain and surround the proposed fuel reduction treatment units. The project area is composed of all timber subcompartments that contain proposed treatment units. Timber compartments and subcompartments are ecologically based units, generally defined by hydrologic and topographic features that are biologically meaningful to grizzly bears and other wildlife. See Figure 2 for location of treatment units and project analysis area.

The spatial boundary typically used in consideration of potential cumulative effects for grizzly bears is the subunit of a Bear Management Unit (BMU). BMUs represent the spatial scale of the life range for a female grizzly bear in the GYE. The BMU subunit provides additional landscape resolution by accounting for seasonal heterogeneity of grizzly bear use patterns within a BMU. The subunit represents the most energetically efficient area for a bear, and is correlated to the annual home range size of an adult female grizzly bear in the GYE. BMUs and subunits are delineated for land within the grizzly bear recovery zone. There are no BMUs or subunits defined for habitat outside the recovery zone, because there are not enough locations of grizzly bears, particularly females, to provide sufficient data to delineate biologically meaningful bear use areas. Since no grizzly bear subunits have been defined for the project area, this analysis combined multiple timber compartments (Compartments 506, 507, 508, 509, 510, 517, 216, 217, 218, and 219) for a cumulative effects spatial analysis boundary. This area was chosen because it contains all proposed treatment units for the BMW project, plus additional habitat at the north end of the Gallatin Range, in an area that is outside the recovery zone, but considered occupied by grizzly bears. Grizzly bear subunits delineated for the Gallatin National Forest inside the recovery zone range in size from 83,200 to 202,240 acres, and average around 138,880 acres. The cumulative effects analysis area used for the BMW project is approximately 133,183 acres in size, so is roughly equivalent to the average size of a subunit within the PCA. Figure 2 shows location of treatment units, project analysis area, and cumulative effects analysis area.

Direct and Indirect Effects

Noise and human presence associated with fuel treatments could have disturbance and/or displacement effects on grizzly bears and their prey species. Grizzly bear use in the project area is rare, and probably limited to occasional appearances by transient animals. Prey species such as big game animals could be displaced from the project area, thus impacting food availability for bears. Disturbance factors would come from increased human presence in the project area, noise from equipment used for temporary road construction, timber felling and hauling, slashing and burning.

Prescribed burns would likely occur in spring or fall, while mechanical thinning treatments could occur during summer, fall and perhaps even winter months. Spring activities would likely have the greater disturbance impact on grizzly bears, since bears can be in a weakened condition upon den emergence. Energy budgets are low, and forced movement to avoid human disturbance can be costly for bears in the spring. Cubs of the year are most vulnerable in spring, although the project is not located within the traditional home range of any known reproductive female grizzlies. The breeding season for bears occurs during spring/early summer, and disturbance factors that cause displacement could affect reproductive efforts of individual bears. Disturbance from summer activities could also disturb grizzly bears, but this is a time when recreational activities are already high in the project area, and bears may already be avoiding the area. Fall activities could affect potential bear use of the project area during years of natural food shortages, when bears range more widely in search of food. Winter logging is not anticipated for this project due to high costs, but is not precluded. If project activities

were to be performed in winter months, they are not expected to affect grizzly bears, since bears would be denning. Due to the bear's preference for higher elevation, relatively undisturbed areas for den sites, suitable denning habitat is located a considerable distance from the project area.

Helicopters would be used to extract merchantable products from some commercial thinning units, and also for aerial ignitions in prescribed burn units. Helicopter use for the project would involve repeated, low-elevation (< 500m AGL) flights and occasional landings over an extended period of time (up to 5 consecutive years). Further, helicopters would be used in this project as a tool to extract merchantable timber from, and ignite prescribed burns in, inventoried "roadless" areas (IRA). Roadless areas have the same general characteristics as "core" habitat identified within the grizzly bear recovery zone. Core habitat provides secure areas for bears to be relatively free from the chronic disturbances associated with roads. Female grizzly bears select home ranges with a large percentage of core habitat, suggesting that areas relatively free of intense human disturbance are particularly important for this cohort. Helicopter use in core (or roadless) habitat could result in more pronounced disturbance response from grizzly bears since bears are not conditioned to expect disturbance from motorized equipment or vehicles in core habitat (MT/ID Level 1 Team, 2009:8).

The proposed action includes approximately 843 acres of helicopter logging units, of which roughly 200 acres occur within the IRA. Based on an analysis of average helicopter flight time, yarding capacity, and timber volume per helicopter logging unit, we estimate a minimum of 107 days of helicopter use for logging (assuming near perfect conditions), and a maximum of 144 days (assuming non-optimal conditions). About 1,325 acres of prescribed burn are proposed in the IRA. It is likely that helicopter ignition would be used for burn units inside the IRA, whereas burn units outside the IRA are more likely to use hand ignition. Helicopter use associated with aerial ignition for prescribed burn units is estimated at 10 to 15 days for this project. Aerial ignition for prescribed burning requires on average only about 2-3 hours of helicopter time per day. Figure 3 shows helicopter logging units both within and outside the IRA, and prescribed burn units that would likely employ helicopter ignition. Figure 4 shows the entire project with various harvest and burn prescriptions.

Roads and road densities can influence grizzly bear use of otherwise suitable habitat through a number of mechanisms, including: avoidance and/or displacement of grizzly bears away from roads and associated activity; changes in bear behavior including altered habitat use patterns and habituation to human activities; habitat alteration and/or loss; and direct bear mortality due to collisions with vehicles, poaching and legal killing of bears associated with increased human access (e.g. defense of life or management removals). Adverse impacts of roads on grizzly bears have been documented through research, and such negative impacts associated with road use and high road densities can influence grizzly bear populations and habitat use patterns (USDI 2006).

Road densities are relatively high in the project area due to existing roads, and would be driven higher by new roads constructed and roads reopened for project activities. Roads

constructed for the BMW project would be designed with minimum handbook standards necessary to accomplish the task, temporary in nature, and effectively gated to restrict public motorized use during project implementation. Once the project is complete, temporary roads would be permanently and effectively closed and re-vegetated (USDA 2006:1-31). The selected alternative includes 7.1 miles of new road construction, plus 3.1 miles of existing road reopened for a total of 10.2 miles of additional open road in the project area. Open road density would temporarily increase from 1.28 mi/mi^2 to 1.59 mi/mi^2. Including motorized use on single track trails, the total motorized access route density in the project area would increase temporarily from 1.36 mi/mi^2 to 1.68 mi/mi^2. Although motorized access appears excessive for the project area, it should be noted that the project area of 21,824 acres (roughly 32 square miles) is a much smaller area than that typically found within the average annual home range of a female grizzly bear in the GYA. The Cumulative effects analysis area provides a more appropriate scale for evaluating motorized access route density.

There is currently limited management direction specific to grizzly bear habitat outside the recovery zone. However, the effects of roads and road use outside the grizzly bear recovery zone were analyzed in the 2006 Biological Opinion and Incidental Take Statement on the Gallatin National Forest Travel Management Plan (US Fish and Wildlife Service 2006). This project will not impart effects of roads or road use in addition to those already covered in the Travel Plan Biological Opinion. Consultation on the effects of roads is complete and therefore the roads are considered as part of the environmental baseline for grizzly bears.

In addition to disturbance effects, the project would also result in the alteration of habitat. Proposed treatment would reduce the amount of hiding and thermal cover available for bears, but would also increase, at least temporarily, the amount of forage available in the project area. Cover is not limited in the project area, and is also readily available in adjacent forested areas, including upper Bozeman Creek and Hyalite, Bear Canyon and South Cottonwood drainages. Within the project area, approximately 18,313 acres (84% of the project area) currently provides hiding and/or thermal cover for grizzly bears and their prey species. Proposed fuel treatment would affect about 3,888 acres of hiding and/or thermal cover, reducing the proportion of available cover in the project area from 84% to 66%.

Foraging habitat would also be affected by proposed fuel treatment. Generally speaking, fuel reduction practices tend to improve foraging opportunities for bears. Thinning forest habitat allows more light to penetrate to the ground, which stimulates production of vegetative food sources such as berries, forbs and grasses. Fire is a natural disturbance process in the northern Rockies. Stand replacement fires change forest composition to concentrate biomass at the ground level, providing increased forage in the form of herbaceous plants (Lyon et al. 2000). Blanchard and Knight (1996) reported that grizzly bears benefited from increased production of forbs, tubers and roots after the 1988 fires in the GYA. Burning can negatively affect grizzly bear foraging opportunities by removing down logs that contain insects upon which the bears feed. On the other hand, burns create more snags and eventually add downed woody material, which can attract

insects to the burn area. Fuel treatments not only have the potential to improve vegetative forage for bears, but are also expected to increase forage availability for prey species such as ungulates.

Moist, cool sites in the project area provide the best vegetative forage values for bears, since these habitats produce more succulent and thus more easily digestible plant foods. Approximately 4,410 acres of proposed treatment would have the potential to increase forage availability for bears. The remaining units involve treatment in drier, less productive habitats that generally do not produce good vegetative forage. Whitebark pine is a key food source for GYA grizzly bears. However, it occurs at relatively high elevations and is a very minor habitat component in the project area. None of the proposed fuel treatment would affect whitebark pine habitat.

Cumulative Effects

Cumulative effects were considered over a larger geographic area to assess potential impacts at a spatial scale that approximates the size of an average annual home range for female grizzly bears. Since there are no BMUs or subunits delineated outside the recovery zone, an area of roughly 133,183 acres surrounding the project was used to evaluate potential cumulative effects.

Cumulative effects to habitat in the analysis area are primarily a result of timber harvest and fuel reduction projects, livestock grazing and wildfire on public and private lands where cover has been reduced and vegetative forage conditions altered. Other factors include recreation, facilities maintenance and road maintenance or closures that typically do not further alter habitat, but can have disturbance impacts. Such actions have occurred in the past and are likely to continue to be implemented in the analysis area. Forested cover is currently present on about 55% of the cumulative effects analysis area. Large scale fires (Fridley and Big Creek) in the past ten years have been the primary factor to influence forest structure and the resulting matrix of cover and forage availability in the analysis area. Proposed fuel reduction treatment for the BMW project would further reduce the proportion of cover in the analysis area from 55% to 52%.

Road construction and reconstruction proposed for the project would increase total open road density in the analysis area from the current level of 0.67 mi/mi^2 to 0.71 mi/mi^2, and increase total motorized access route density from the existing 0.80 mi/mi^2 to 0.84 mi/mi^2. The Grizzly Bear Management Plan for Southwestern Montana states that maintaining habitat at or below 1 mi/mi^2 road density is the approach preferred by Montana Fish Wildlife and Parks personnel for managing grizzly bear habitat (ICST 2003, Appendix K:33). Since project roads are temporary and to be closed and re-vegetated upon completion of project implementation under the Gallatin Forest Travel Management Plan, effects from increased motorized access route density would be temporary in nature. The Gallatin Forest Travel Management Plan identified many miles of old project roads in the analysis area that are no longer needed for resource management. Implementation of the Travel Plan officially closes these roads to motorized travel and authorizes physical closure where necessary. Some new motorized

routes or route connectors are also authorized in the Travel Plan. The combined effects of Travel Plan decisions resulted in a net decrease in motorized access route density in the cumulative effects analysis area for the BMW project. Changes associated with the Travel Plan are reflected in access route densities presented above.

Cumulative effects also result from human activities within the analysis area that contribute noise and other disturbance effects. Such actions include recreation, administrative functions and facilities maintenance and/or improvements. These actions contribute disturbance impacts from human presence (both motorized and non-motorized activities) and noise associated primarily with motorized recreation and use of heavy equipment for management actions. The project occurs in an area that receives some of the highest levels of recreation use in the Northern Region of the Forest Service. The highest concentrations of human use in Bozeman Creek occur within the first 3-5 miles past the trailhead, which is where treatment units are located. In Hyalite, human use is widely dispersed throughout the entire drainage, including along the project area, but is probably most concentrated in the mid-upper drainage, in the vicinity of Hyalite reservoir. It is likely that infrequent grizzly bear use in the project area, and the cumulative effects analysis area overall, is largely due to the close proximity to the city of Bozeman and associated high levels of recreation and other human use. In 2007, the Gallatin Forest implemented a forest-wide Food Storage Order that requires forest users to keep food and attractants unavailable to bears. This practice should help minimize human conflicts with bears and reduce overall cumulative effects to grizzly bears on National Forest System lands.

Reasonably foreseeable future (non-federal) actions that have the potential for cumulative effects include similar fuel reduction projects on City of Bozeman and/or private land in Bozeman Creek and lower Hyalite Creek drainages. Although such projects have been discussed, they are still mostly conceptual.

Determination of Effect

The project is located a considerable distance outside of the grizzly bear recovery zone, but in an area considered to be occupied habitat. The proposed action would meet Forest Plan direction for fuel management projects, and would comply with all applicable terms and conditions listed in Biological Opinions for Gallatin Forest management actions outside the recovery zone and for the Gallatin Forest Travel Management Plan (USDI 2004, 2006). However, proposed fuel treatment has the potential to affect grizzly bears through habitat alteration and disturbance impacts. The project is located in an area that is already impacted by high motorized access route densities (Hyalite) and high levels of human activity year round (Hyalite and Bozeman Creek). Concentrated human use in the project area may be responsible for the very low levels of documented grizzly bear use, and bears may be avoiding the area due to chronic disturbance. It is the existing high levels of use, coupled with the relatively large geographic impact of the project (total of approximately 4,850 acres of proposed treatment), addition of 11.4 miles of open road, expected duration of the project (up to 5 years) and repeated, low-level use of helicopters

in roadless areas, that leads me to conclude that the proposed action ***may affect, and is likely to adversely affect*** grizzly bears.

Recommendations for Removing, Avoiding, or Compensating Adverse Effects

As per the Gallatin National Forest Travel Management Plan, roads constructed for project activity will be designed with minimum handbook standards necessary to accomplish the task, temporary in nature, and effectively gated to restrict public motorized use. Once the activity is complete, these roads will be permanently and effectively closed and re-vegetated.

All activities associated with project implementation are to be in compliance with the Forest-wide Food Storage Order.

Helicopter flight paths to and from the project area will either avoid, or be at least 500 m above ground level around known grizzly bear use areas (south of the Sentinel in the Gallatin Range and south of Lone Mountain in the Madison range; i.e. over the grizzly bear recovery zone).

Timber sale contract will include a clause providing for immediate modification, or if needed, suspension or cancellation of any or all contract activities when such action is necessary to prevent conflict between humans and grizzly bears.

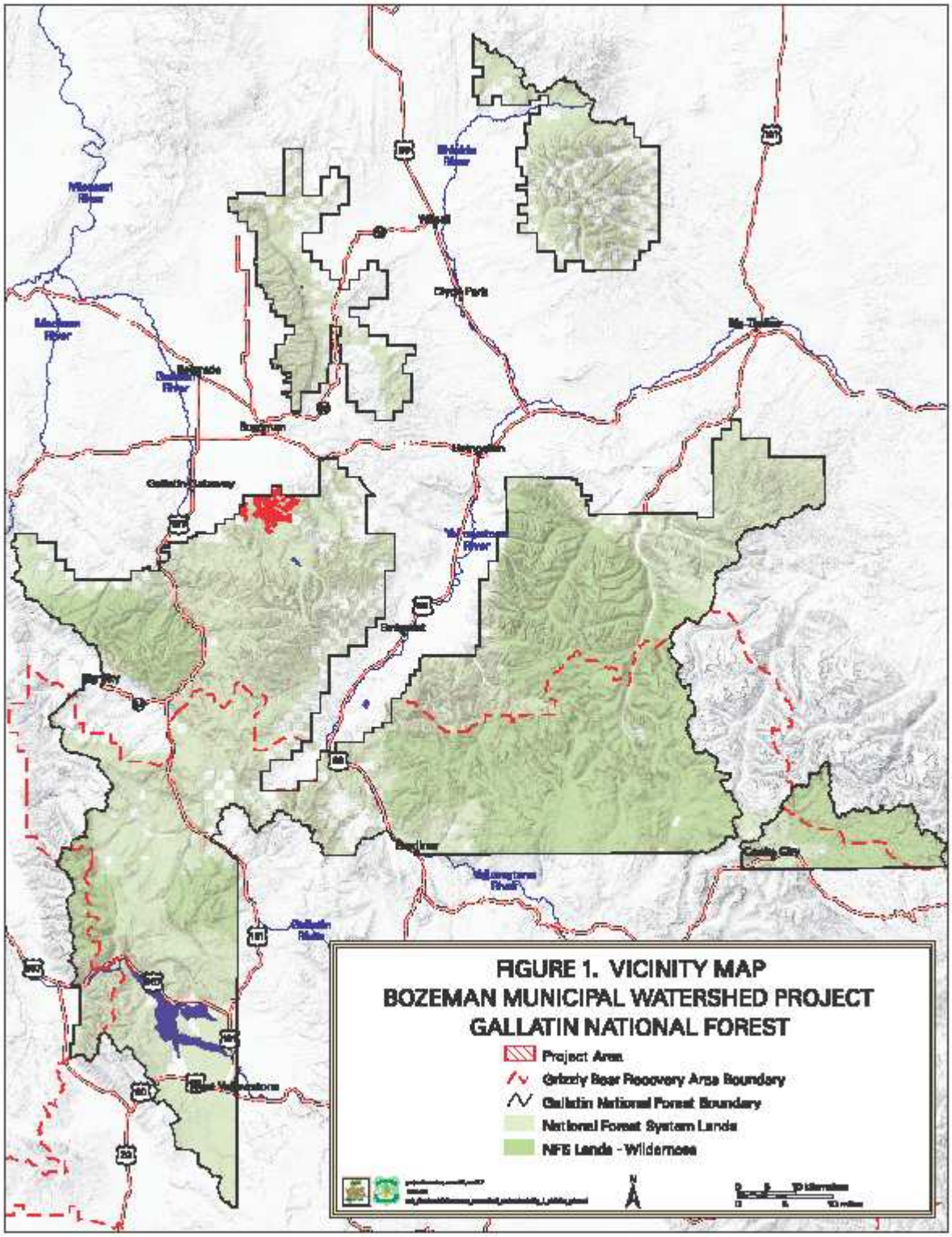
FIGURE 1. VICINITY MAP
BOZEMAN MUNICIPAL WATERSHED PROJECT
GALLATIN NATIONAL FOREST
Project Area
Grizzly Bear Recovery Area Boundary
Gallatin National Forest Boundary
National Forest System Lands
NFS Lands - Wilderness

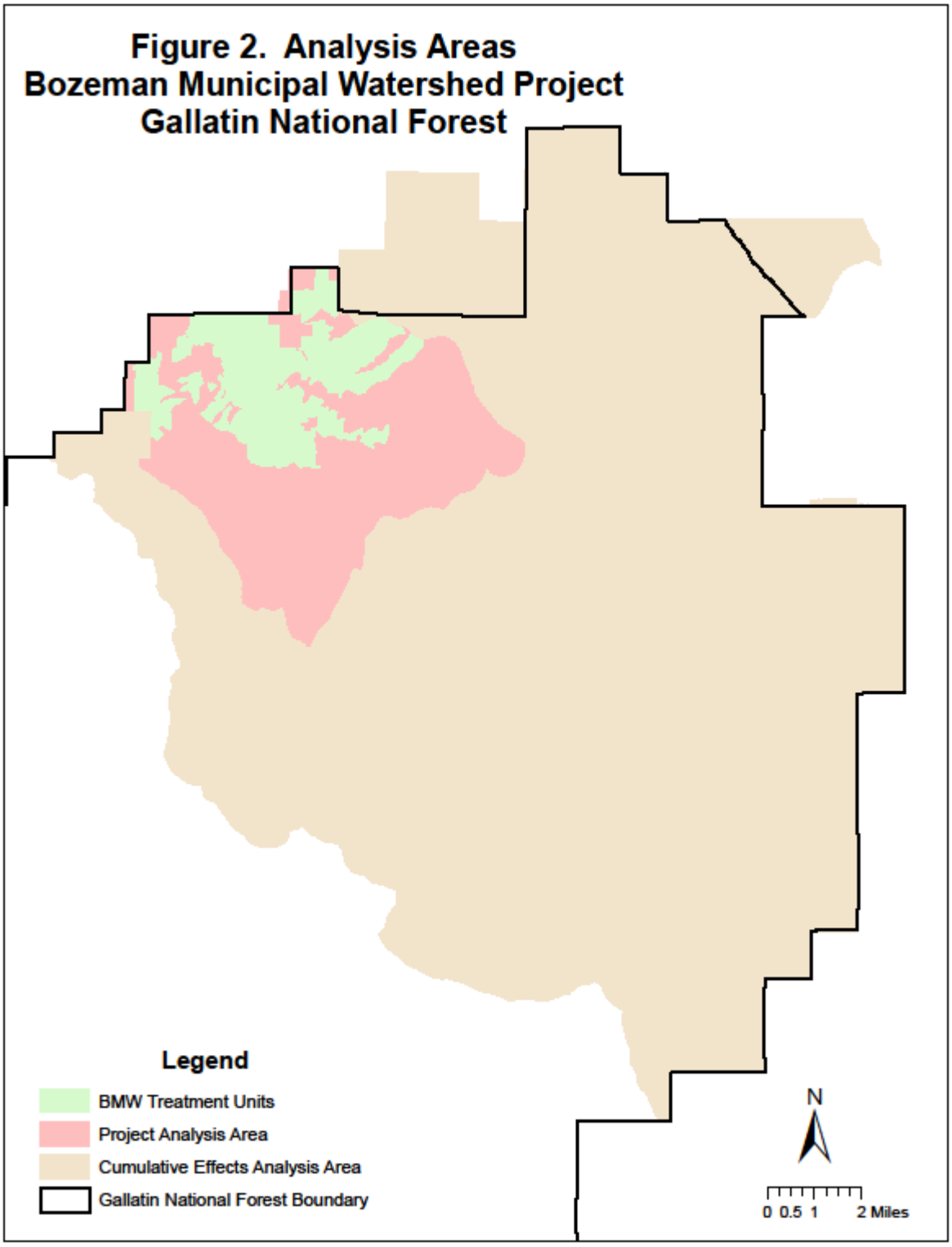
Figure 2. Analysis Areas
Bozeman Municipal Watershed Project
Gallatin National Forest
Legend
BMW Treatment Units
Project Analysis Area
Cumulative Effects Analysis Area
Gallatin National Forest Boundary
N
0 0.5 1 2 Miles

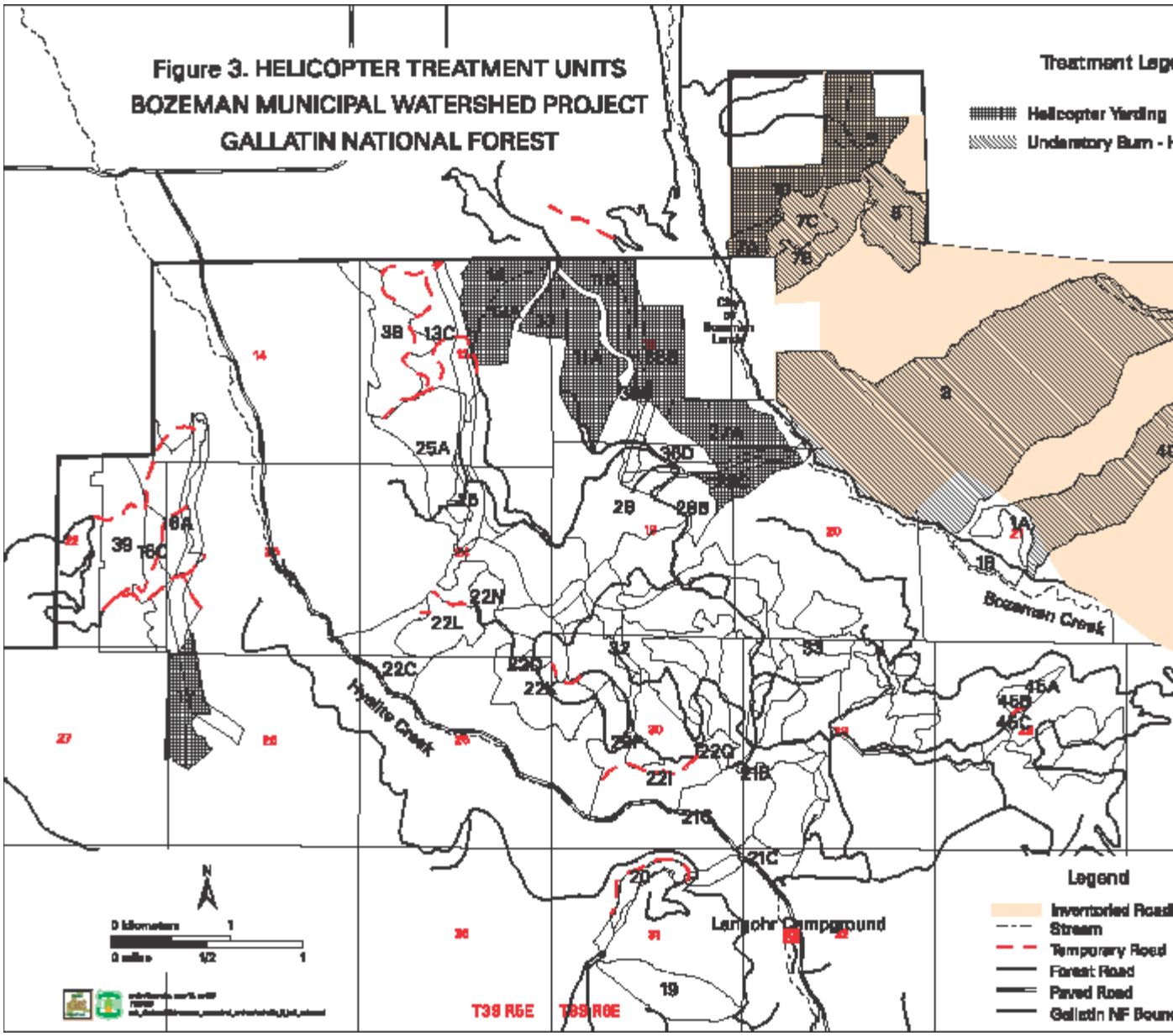
Figure 3. HELICOPTER TREATMENT UNITS
BOZEMAN MUNICIPAL WATERSHED PROJECT
GALLATIN NATIONAL FOREST
Treatment Lege
Helicopter Yarding
Understory Burn - H
Bozeman Creek
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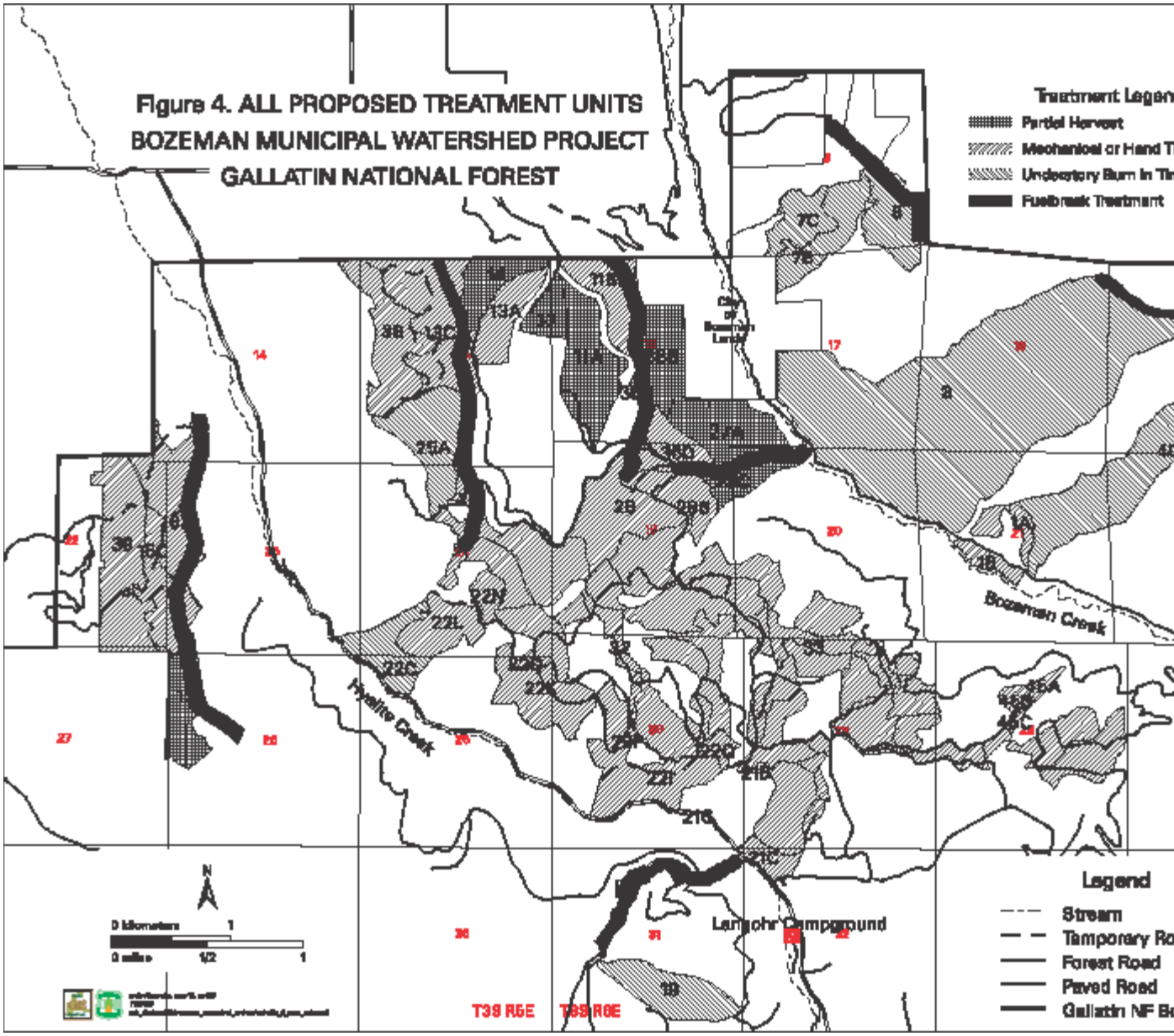
Figure 4. ALL PROPOSED TREATMENT UNITS
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United States Department of the Interior

FISH AND WILDLIFE SERVIC
ECOLOGICAL SERVICES MONTANA FIELD OFFICE
585 SHEPARD WAY
HELENA, MONTANA 59601 PHONE (406) 449-5225, FAX (406) 449-5339

File: M19 Gallatin National Forest
December 24, 2009 (Bozeman Municipal Watershed Fuel Reduction)

José Castro, District
Ranger Gallatin
National Forest
Bozeman Ranger
District 3710 Fallon
St., Suite C
Bozeman, Montana
59718

Dear Mr. Castro:

The U.S. Fish and Wildlife Service (Service) has reviewed the supplement to the biological assessment regarding the effects of the Bozeman Municipal Watershed Fuel Reduction Project (BMW) on the threatened grizzly bear (*Ursus arctos horribilis*). The project is located in Gallatin County approximately 10 miles south of Bozeman, Montana on the Bozeman Ranger District, Gallatin National Forest (Forest). Proposed activities are focused on the two primary drainages that make up the majority of the Bozeman Municipal Watershed resources: Bozeman Creek and Hyalite Creek. Your November 12, 2009 letter requesting formal consultation and the accompanying biological assessment for the project was received in this office on November 18, 2009.

We previously completed formal consultation on the effects of the BMW on Canada lynx on August 8, 2008 and on designated critical habitat for Canada lynx on November 4, 2009. Since those consultations, on September 21, 2009, a court order enjoined the Service from removing the Yellowstone DPS from the list of threatened species. The final rule designating the Yellowstone DPS and removing the Yellowstone grizzly bear DPS from the list of threatened species was vacated and remanded to the Service. Therefore, Yellowstone Grizzly Bear Ecosystem (YGBE) grizzly bears are once again listed as a threatened species. Since the original August 2008 consultation, the proposed action has not changed and the biological assessment supplement only analyzes the effects of the proposed action on grizzly bears. The attached biological opinion on grizzly bears was prepared in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).
A complete project file of this consultation is on file at the Service's Montana Field Office.

If you have questions or comments related to this issue, please contact Katrina Dixon or me at
(406) 449-5225.

Sincerely,

for: R. Mark Wilson Field Supervisor
enclosure

cc: AES, R-6, MS 60120 (Attn: Sarena Selbo) Montana Department of Fish, Wildlife, and Parks, Helena, MT (Attn: Director) File: 7759 Biological Opinions - 2009

ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

BIOLOGICAL OPINION

on the

Effects of the Bozeman Municipal Watershed Fuel Reduction Project

on Grizzly Bears

Gallatin National Forest

Agency:	U.S. Department of Agriculture U.S. Forest Service Gallatin National Forest Bozeman, Montana
Consultation Conducted by:	U.S. Fish and Wildlife Service Montana Field Office Helena, Montana
Date Issued:	December 24, 2009

Table of Contents

I. INTRODUCTION

In this biological opinion, the U.S. Fish and Wildlife Service (Service) analyzed the proposed Bozeman Municipal Watershed Fuels Reduction (BMW) Project on the Gallatin National Forest (Forest), Montana and the potential effects of implementation of the project on grizzly bears (*Ursus arctos horribilis*). Formal consultation was initiated on November 18, 2009, the date the Service received the biological assessment supplement (U.S. Forest Service 2009) for grizzly bears.

Section 7(b)(3)(A) of the Endangered Species Act of 1973, as amended (Act) requires that the Secretary of Interior issue biological opinions on federal agency actions that may adversely affect listed species or critical habitat. Biological opinions determine if the action proposed by the action agency is likely to jeopardize the continued existence of listed species or destroy or adversely modify critical habitat. Section 7(b)(3)(A) of the Act also requires the Secretary to suggest reasonable and prudent alternatives to any action that is found likely to result in jeopardy or adverse modification of critical habitat, if any has been designated. This biological opinion addresses only impacts to federally listed species and does not address the overall environmental acceptability of the proposed action.

Consultation History

The Service first consulted with the Forest on the BMW Project in 2008. On August 8, 2008, we provided the Forest with a formal consultation letter for the likely to adversely affect determination for Canada lynx (U.S. Fish and Wildlife Service 2008).

Since that time, revised critical habitat was designated for Canada lynx, with an effective date of March 27, 2009. Therefore, the Forest prepared a supplement to the original biological assessment to include an effects analysis and determination for lynx critical habitat. The Forest determined that the BMW Project would likely adversely affect designated critical habitat for lynx and on November 4, 2009 the Service completed a biological opinion on the effects of the BMW project on designated Canada lynx critical habitat (U.S. Fish and Wildlife Service 2009).

On September 21, 2009, a court order enjoined the Service from removing the Yellowstone DPS from the list of threatened species. The final rule designating the Yellowstone DPS and removing the Yellowstone grizzly bear DPS from the list of threatened species was vacated and remanded to the Service. Therefore, Yellowstone Grizzly Bear Ecosystem (YGBE) grizzly bears are once again listed as a threatened species. Therefore, the Forest prepared another supplement to the original biological assessment to include an effects analysis and determination for grizzly bears. The biological assessment supplement found the proposed action likely to adversely affect grizzly bears and we received the request for formal consultation on the effects of the BMW project on grizzly bears on November 18, 2009 (U.S. Forest Service 2009). A complete project file of this consultation is on file at this office.

II. DESCRIPTION OF THE PROPOSED ACTION

The proposed action is located in Gallatin County approximately 10 miles south of Bozeman, Montana. Proposed treatments are within the Wildland Urban Interface (WUI) as designated in the Gallatin County Community Wildfire Protection Plan.

The proposed BMW project will treat vegetation and fuel conditions on approximately 4,844 acres in the WUI in order to reduce the potential severity and extent of future wildland fires in the Bozeman Municipal Watershed. The project focuses on the two primary drainages, Bozeman Creek and Hyalite Creek that supply over 90 percent of the municipal water supply for the city of Bozeman, Montana. The project includes thinning and partial harvest in mature stands, thinning of smaller diameter trees, and prescribed burning in thinned stands. Slash could be pre-treated by mechanical trampling prior to burning. For more details related to the proposed treatments, refer to the original biological assessment (U.S. Forest Service 2008).

III. STATUS OF THE SPECIES /CRITICAL HABITAT DESCRIPTION

Species/Critical Habitat Description

Grizzly bears are among the largest terrestrial mammals in North America. South of the United States - Canada border, adult females range from 250-350 pounds and adult males range from 400 to 600 pounds. Grizzly bears are relatively long-lived, living 25 years or longer in the wild. Grizzly bears are omnivorous, opportunistic feeders that require foods rich in protein or carbohydrates in excess of maintenance requirements in order to survive seasonal pre-and postdenning requirements. Grizzly bears are homeo-hypothermic hibernators, meaning their body temperature drops no more than five degrees C during winter when deep snow, low food availability, and low ambient air temperatures appear to make winter sleep essential to grizzly bears' survival (Craighead and Craighead 1972a, 1972b). Grizzly bears excavate dens and require environments well covered with a blanket of snow for up to five months, generally beginning in fall (September-November) and extending until spring (March-April) (Craighead and Craighead 1972b; Pearson 1972).

Listing history The grizzly bear was listed as a threatened species under the Act in the lower 48 states on July 28, 1975 (40 FR 31736). The Service identified the following as factors establishing the need to list: (1) present or threatened destruction, modification, or curtailment of habitat or range; (2) overutilization for commercial, sporting, scientific, or educational purposes; and (3) other manmade factors affecting its continued existence. The two primary challenges in grizzly bear conservation are the reduction of human-caused mortality and the conservation of remaining habitat (U.S. Fish and Wildlife Service 1993).

The grizzly bear recovery plan (Recovery Plan) was completed on January 1982 and was revised in 1993 (U.S. Fish and Wildlife Service 1993). The 1993 revised Recovery Plan delineated grizzly bear recovery zones in 6 mountainous ecosystems in the U.S. The Recovery Plan details recovery objectives and strategies for the grizzly bear recovery zones in the ecosystems where grizzly bear populations still persist. These recovery zones are the Northern Continental Divide (NCDE), Yellowstone Grizzly Bear (YGBE), Cabinet-Yaak (CYE) and Selkirk (SE) Ecosystems. The Recovery Plan also includes recovery strategies

for the North Cascades Ecosystem in Washington, where only a very few grizzly bears are believed to remain, and for the Selway-Bitterroot ecosystem of Idaho and Montana, where suitable grizzly bear habitat still occurs.

Based on the best scientific and commercial information available, the Service delisted the Yellowstone grizzly bear DPS, effective April 30, 2007. The Service had determined that the grizzly bear population in the Yellowstone Grizzly Bear Ecosystem had achieved recovered status. The Service also determined that the DPS had sufficient numbers and distribution of reproductive individuals so as to provide a high likelihood that the species will continue to exist and be well distributed throughout its range for the foreseeable future. The Service held that the State and Federal agencies' agreement to implement the extensive Conservation Strategy and State management plans would ensure that adequate regulatory mechanisms remain in place and that the Yellowstone grizzly bear population will not become an endangered species within the foreseeable future. On September 21, 2009, a court order enjoined the Service from removing the Yellowstone DPS from the list of threatened species. The final rule designating the Yellowstone DPS and removing the Yellowstone grizzly bear DPS from the list of threatened species was vacated and remanded to the Service.

Life History

Grizzly bears are large animals with great metabolic demands requiring extensive home ranges. The search for energy-rich food appears to be a driving force in grizzly bear behavior, habitat selection and intra/inter-specific interactions. Grizzly bears historically used a wide variety of habitats across the North America, from open to forested, temperate through alpine and arctic habitats, once occurring as far south as Mexico. They are highly dependent upon learned food locations within their home ranges. Adequate nutritional quality and quantity are important factors for successful reproduction. Diverse structural stages that support wide varieties of nourishing plants and animals are necessary for meeting the high-energy demands of these large animals. Grizzly bears follow phenological vegetative, tuber or fruit development, would seek out concentrated food sources including carrion, live prey (fish, mammals, insects), and are easily attracted to human food sources including gardens, grain, compost, bird seed, livestock, hunter gut piles, bait and garbage. Bears that lose their natural fear and avoidance of humans, usually as a result of food rewards, become habituated and may become food-conditioned. Grizzly bears will defend food and have been known to charge when surprised. As a result of real or perceived threats to human safety or property, both habituation and food conditioning increase chances of human-caused grizzly bear mortality. Nuisance grizzly bear mortalities can be a result of legal management actions, defense of human life or illegal killing.

Adult grizzly bears are normally solitary, except females with cubs or during short breeding relationships. They will tolerate other grizzly bears at closer distances when food sources are concentrated and siblings may associate for several years following weaning (Jonkel and Cowan 1971; Craighead 1976; Egbert and Stokes 1976; Glenn et al. 1976; Herrero 1978). Across their range, home range sizes vary from about 50 square miles or more for females to a few hundred square miles for males. Overlap of home ranges is common. Grizzly bears

may have one of the lowest reproductive rates among terrestrial mammals, resulting primarily from the late age at first reproduction, small average litter size and the long interval between litters. Mating occurs from late May through mid-July. Females in estrus will accept more than one adult male (Hornocker 1962), and can produce cubs from different fathers the same year (Craighead et al. 1995). Age of first reproduction and litter size may be nutritionally related (Herrero 1978; Russell et al. 1978). Average age at first reproduction in the lower 48 states for females is 5.5 years and litter size ranges from one to four cubs that stay with the mother up to two years. Males may reach physiological reproductive age at 4.5 years, but may not be behaviorally reproductive due to other dominant males preventing mating.

Habitat fragmentation is significant to large carnivores requiring wide vegetative and topographic habitat diversity (Servheen 1986). Loss and fragmentation of habitat is particularly relevant to the survival of grizzly bears. Large expanses of unfragmented habitat are important for feeding, breeding, sheltering, traveling and other essential behavioral patterns. Grizzly bears occur at low densities, have low reproductive rates, exhibit individualistic behavior and are largely dependent on riparian habitats also used extensively by people; thus, grizzly bear populations are susceptible to human influences. Grizzly bears may avoid key habitats due to human generated disturbances, or become habituated and food conditioned, which may ultimately lead to the animal being destroyed. Historically, as human settlements, developments, and roads increased in grizzly bear habitat, grizzly bear populations became fragmented. As fragmented population segments become smaller and/or isolated, they are more vulnerable to extinction, especially when human-caused mortality pressures continue. Linkage zones are rather recent concepts in broad management direction for grizzly bears and other large-ranging species (Servheen and Sandstrom 1993). Linkage zones, or zones of habitat connectivity within or between populations of animals, foster the genetic and demographic health of the species. Bader (2000) displayed potential secure areas that are spatially distributed within known male and female grizzly bear dispersal distances and he believes that the available information shows that effective linkages are possible for grizzly bear use and these linkage areas would increase persistence probabilities.

Natural mortality is known to occur from intra-specific predation, but the degree this occurs in natural populations is not known. Parasites and disease do not appear to be a significant cause of natural mortality (Jonkel and Cowan 1971; Kistchinskii 1972; Mundy and Flook 1973; Rogers and Rogers 1976). As animals highly dependent upon learned habitat, displacement into unknown territory (such as subadult dispersal) may lead to submarginal nutrition, reduced reproduction or greater exposure to adult predatory bears or human food sources (which can lead to human-caused mortality). Starvation and loss in dens during food shortages have been surmised, but have not been documented as a major mortality factor. Natural mortality in rare, relatively secretive animals such as grizzlies can be extremely difficult to document or quantify.

Human-caused mortality has been slightly better quantified, but recent models speculate that reported mortality may be up to 50 percent of actual mortality (McLellan et al. 1999). Between 1800 and 1975, grizzly populations in the lower 48 states declined drastically. Fur

trapping, mining, ranching and farming pushed westward, altered habitat and resulted in the direct killing of grizzly bears. Historically, grizzly bears were targeted in predator control programs in the 1930's. Predator control was probably responsible for extirpation in many states that no longer support grizzlies. More recent human-caused mortality in Montana includes legal hunting (canceled in 1991), management control actions, defense of life, vehicle and train collisions, defense of property, mistaken identity by black bear or other big game hunters, poaching and malicious killing. Grizzly bears normally avoid people, possibly as a result of many generations of bear sport hunting and human-caused mortality. Avoidance of roads can lead grizzly bears to either avoid essential habitat along roads, or could put them at greater risk of exposure to human-caused mortality if they do not avoid roads.

Population Dynamics and Status and Distribution

The grizzly bear originally inhabited a variety of habitats from the Great Plains to the mountains of western North America, from central Mexico to the Arctic Ocean. With the advent of Euroamerican colonization in the early nineteenth century, grizzly bear numbers were reduced from over 50,000 to less than 1,000 in North America south of the Canadian border. Today, the grizzly bear occupies less than two percent of its former range south of Canada (U.S. Fish and Wildlife Service 1993). In the conterminous 48 States, only five remaining areas have either remnant or self-perpetuating populations. These remaining populations are principally located in mountainous regions in Washington, Idaho, Wyoming and Montana and are often associated with National Parks and wilderness areas.

Status of grizzly bears in the YGBE The 9,209 square mile YGBE recovery zone includes portions of Wyoming, Montana and Idaho, portions of six National Forests (Beaverhead-Deerlodge, Bridger-Teton, Custer, Gallatin, Shoshone, and Targhee), Yellowstone and Grand Teton National Parks, John D. Rockefeller Memorial Parkway, portions of adjacent private and state lands and lands managed by the BLM. Grizzly bears also frequently use areas outside the defined YGBE recovery zone.

Population recovery criteria are measured within the recovery zone and an adjacent 10-mile buffer. A large proportion of the Yellowstone grizzly bear population occurs within the recovery zone. A large proportion of the grizzly bears in the YGBE recovery zone occur on protected lands in Yellowstone National Park, but grizzly bears also inhabit large areas outside the park boundary. Yellowstone and Grand Teton National Parks make up 39.4 percent of the YGBE recovery zone. Private holdings and other ownership make up 2.1 percent of the recovery zone and the remaining 58.5 percent occurs on Forest Service. National Park Service and National Forest lands support roughly 89 percent of the currently known distribution of the grizzly bears in the YGBE recovery zone. Grizzly bears also frequently occur in and use areas adjacent to the recovery zone.

The YGBE recovery zone is subdivided into smaller units to facilitate both the assessment of projects and recovery objectives. Eighteen bear management units (BMU) were formally delineated throughout the YGBE. BMUs were designed to:

- Assess the effects of existing and proposed activities on grizzly bear habitat without having the effects diluted by consideration of too large an area;

- Address unique habitat characteristics and grizzly bear activity and use patterns;

- Identify contiguous complexes of habitat which meet year-long needs of the grizzly bear; and

- Establish priorities for areas where land use management needs would require cumulative effects assessments.

Three demographic criteria that were formerly in the 1993 Grizzly Bear Recovery Plan (U.S. Fish and Wildlife Service 1993) have been reevaluated and updated. The second criterion pertaining to the distribution of females with offspring remains unchanged while the first and third criteria pertaining to the minimum allowable number of females with cubs of the year and sustainable mortality limits have been revised and updated to reflect current methods based on the best available science (U.S. Fish and Wildlife Service 2007). The current demographic recovery criteria to be appended to the 1993 Recovery Plan are:

- Demographic Recovery Criterion 1 – Maintain a minimum of 48 females with cubs of the year in the GYA, as indicated by the model-averaged Chao2 estimate for that year. The number of females with cubs of the year cannot drop below 48 for any 2 consecutive years;

- Demographic Recovery Criterion 2 – Sixteen of 18 bear management units within the recovery zone must be occupied by females with young, with no two adjacent bear management units unoccupied, during a 6-year sum of observations. This criterion is important as it ensures that reproductive females occupy the majority of the recovery zone and are not concentrated in on e portion of the ecosystem;

- Demographic Recovery Criterion 3 – For independent females (at least 2 years old), the current annual mortality limit, not to be exceeded in 2 consecutive years and including all sources of mortality, is 9 percent of the total number of independent females. For independent males (at least 2 years old), the current annual mortality limit not to be exceeded in 3 consecutive years and including all sources of mortality, is 15 percent of the total number of independent males. For dependent young (less than 2 years old), the current annual mortality limit, not to be exceeded in 3 consecutive years and including only known and probable human-caused mortalities, is 9 percent of the total number of dependent young.

The first and third criteria were changed because the Service no longer considers the 1993 criterion to represent the best scientific and commercial data available. There is now a method called the Chao2 estimator to calculate the total number of independent females from sightings and resightings of females with cubs. This then allows calculation of total population size instead of the minimum population size as used in the 1993 method. There is also a method to calculate the unknown and unreported mortalities and application of this method allows more conservative mortality management based on annually updated information rather than the estimate of unknown and unreported mortality as used in the 1993 recovery plan. Data on the reproductive performance of Yellowstone grizzly bears, survival rates of cub and yearling Yellowstone grizzly bears, the trajectory of the Yellowstone grizzly bear population under alternate survival rates, and the impacts of

spatial and environmental heterogeneity on the Yellowstone grizzly bear demographics has been improved and updated. See table 1 for recovery criteria information.

Table 1. 2008 Status of the Yellowstone Grizzly Bear Ecosystem in Relation to the Recovery Plan Criteria (Schwartz et al. 2009).

*threshold exceeded

Based on verified sightings of females with cubs of the year during 2008 and using the Chao2 method, it was determined that the minimum number of females with cubs of the year was 56. Using this number (56), the estimated Yellowstone grizzly bear population size for 2008 is 596.

Using the revised recovery criteria, it was determined that both independent female mortality and independent male mortality have exceeded the threshold for 2008. Neither of these was exceeded in 2007. The criteria states that independent female mortality can not be exceeded in 2 consecutive years and that independent male mortality can not be exceeded in 3 consecutive years. Because the thresholds were not exceeded in 2007, the revised demographic recovery criteria are met.

The overall habitat condition in the GYA is excellent. The YGBE recovery zone, for example, contains large amounts of secure habitat and very low total and open road densities in the majority of the subunits. In 2003, for the entire YGBE recovery zone, the mean secure habitat was 86.2 percent, the mean OMARD was 10.4 percent in Season one (March 1 - July 15) and
10.7 percent in season two (July 16 - November 30) and the mean TMARD was 5.3 percent (ICST 2003).

The YGBE grizzly bear population has increased from estimates as low as 136 individuals when listed in 1975 to more than 580 animals as of 2004; this population has been increasing since the mid 1990s and is increasing at 4 to 7 percent per year. The range of this population also has increased dramatically as evidenced by the 48 percent increase in occupied habitat since the 1970s. Yellowstone grizzly bears continue to increase their range and distribution annually and grizzly bears in the Yellowstone area now occupy habitats they have been absent from for decades. Currently, roughly 90 percent of females with cubs

Population Parameter	Target/Limit	2008 Number
Minimum number of females with cubs of the year	48	56
BMUs occupied by females with young	16	18
Independent female mortality limit is 9% of total number of independent females	23	30*
Independent male mortality limit is 15% of total number of independent males	24	41*
Dependent young mortality limit is 9% of total number of dependent young	17	8

occupy the Primary Conservation Area (PCA) and about 10 percent of females with cubs have expanded out beyond PCA within the ecosystem.

The Yellowstone Grizzly Bear Ecosystem supports a grizzly bear population which has sufficient numbers and distribution of reproductive individuals so as to provide a high likelihood that the species will continue to exist and be well distributed throughout its range for the foreseeable future. Based on the best scientific and commercial information available, the Service delisted the Yellowstone grizzly bear DPS, effective April 30, 2007. The grizzly bear population in the Yellowstone Grizzly Bear Ecosystem had achieved recovered status. The Service held that the State and Federal agencies' agreement to implement the extensive Conservation Strategy and State management plans would ensure that adequate regulatory mechanisms remain in place and that the Yellowstone grizzly bear population will not become an endangered species within the foreseeable future. However, on September 21, 2009, a court order enjoined the Service from removing the Yellowstone DPS from the list of threatened species. The final rule designating the Yellowstone DPS and removing the Yellowstone grizzly bear DPS from the list of threatened species was vacated and remanded to the Service. Therefore, the YGBE grizzly bear population is once again listed as a threatened species.

Status of grizzly bears in the NCDE The NCDE extends from the Rocky Mountains of northern Montana into contiguous areas in Alberta and British Columbia, Canada. The U. S. portion of the NCDE includes parts of five National Forests (Flathead, Kootenai, Helena, Lewis and Clark, and Lolo), four wilderness areas (Bob Marshall, Mission Mountains, Great Bear and Scapegoat) and one wilderness study area (Deep Creek North). National Forest System lands encompass 63 percent of the NCDE. Additionally, the NCDE recovery zone includes Glacier National Park, the Flathead Indian Reservation (Salish-Kootenai tribal land), the Blackfeet Indian Reservation, adjacent private and state lands, and lands managed by the U.S. Bureau of Land Management. Grizzly bears from this population also frequently use areas outside the defined NCDE recovery zone.

Recently, two population studies were designed with the objective to more reliably estimate the number of grizzly bears inhabiting the NCDE (U.S. Geological Survey 2004). The U.S. Geological Survey (USGS) DNA-based mark-recapture study in the greater Glacier area collected information from 1998 through 2000. The USGS also conducted an extensive DNA-based study to estimate the grizzly bear population size in 7.8 million acres of occupied grizzly bear range in and around the NCDE recovery zone. The Northern Divide Grizzly Bear Project identified 563 individual grizzly bears alive in the greater NCDE during the summer of 2004 through genetic analysis of noninvasive hair sampling at baited and unbaited barbed wired hair collection sites (U.S. Geological Survey 2008). A final total grizzly bear population estimate of 765 grizzly bears was reported based on the 563 grizzly bears detected in 2004 (Ibid.). Both the raw count of 563 grizzly bears and a total population estimate of 765 for 2004 illustrate the conservative nature of the recovery plan minimum population estimate of 304 grizzly bears in 2004. The DNA-based estimate is scientifically robust, and is more than two times the recovery plan estimate.

With the recent DNA-based population estimate, the methodology to estimate minimum

population size outlined in the 1993 recovery plan has become outdated (Servheen in litt. 2008). In an effort to apply the DNA-based population estimate for the year 2004 to the existing recovery plan criteria (U.S. Fish and Wildlife Service 1993), the Service has outlined an interim process (Servheen in litt. 2008). This interim process would remain in effect until such time as the five-year status review and the formal recovery plan revision are complete. Because the DNA-based population estimate is for the year 2004, the interim process makes some assumptions in order to be applicable to post-2004 grizzly bear populations, with the primary assumption being that grizzly bear populations do not increase or decrease rapidly. Since we have no information that any major changes in the number of grizzly bears has occurred since 2004 and assuming that grizzly bear populations increase or decrease slowly under most conditions, we will continue to use the 2004 population estimate of 765 grizzly bears post-2004, rather than use the minimum population estimate based on females with cubs.

We continue to use the 1993 Recovery Plan criteria, applying the conservative 4 percent total mortality limit and the 30 percent female mortality limits. However, we will now apply the criteria to the population estimate of 765 grizzly bears. As of 2008, the 6-year average of known human-caused total mortalities in the NCDE is 21. Using our criteria limits applied to the population estimate, we find that total known human-caused mortality is below the sustainable mortality level of no more than 30.6 per year. The 6-year average of known human-caused female mortalities in the NCDE is 9.5, above the sustainable mortality level of no more than 9.18 per year. This is an interim application of the DNA-based population estimate of 765 grizzly bears using the methods in the 1993 recovery plan to determine the sustainable mortality limits for the NCDE.

As noted in previous biological opinions (U.S. Fish and Wildlife Service 2005, 2006), 2004 human-caused grizzly bear mortality levels in the NCDE were unusually high. The 34 human-caused mortalities recorded included 22 females (5 adult, 5 sub-adults, 3 yearlings, 8 cubs - including those with unknown fate), 11 males (2 adults, 6 sub-adults, 1 yearling, 2 cubs), and 1 unknown (yet undetermined remains). The 2004 mortalities included 11 illegal kills – the highest in seven years (in 2003, 10 illegal kills were reported). Many of the unprecedented number of conflicts in 2004 can be attributed to a dramatic huckleberry crop failure, and resulting conflicts arising from attractants on private lands luring bears onto private property. Much of the recent grizzly bear mortality continues to be associated with conflicts arising from attractants on private lands. Notable is that annual human-caused grizzly bear mortality levels have decreased since 2004. The number of human-caused female mortalities was less than half of 2004 levels each year: 10, 4, 7 and 7 in 2005, 2006, 2007 and 2008, respectively (Servheen 2008).

Status of grizzly bears in the CYE and SE The Cabinet/Yaak Ecosystem in northwestern Montana and northeastern Idaho has over 1,900 square miles of forested and mountainous habitat occupied by grizzly bears. A minimum population estimate of 45 grizzly bears was made for the Cabinet-Yaak recovery zone in 2007 based on current and previous captures and sightings of unique individuals (Kasworm et al. 2008). Grizzly bears also occur to the north of the U.S.-Canada border, and interchanges of radio-collared bears across the border have been documented (U.S. Fish and Wildlife Service 1993).

The Selkirk Ecosystem of northwestern Idaho, northeastern Washington, and southeastern British Columbia includes about 1,080 square miles in the U.S. portion and about 875 square miles in the Canadian portion of the recovery zone. The Selkirk recovery zone is the only defined grizzly bear recovery zone that includes part of Canada because the habitat in the U.S. portion is not of sufficient size to support a minimum population. The habitat is contiguous across the border and radio-collared bears are known to move back and forth across the border. Therefore, the grizzly bears north and south of the border are considered one population (U.S. Fish and Wildlife Service 1993).

Neither the CYE nor the SE grizzly bear populations have attained the Recovery Plan criteria for females with cubs. With the small sample sizes available to calculate population trend, Kasworm et al. (2008) determined a high probability that the population is declining. The Service determined that the combined SE-CYE grizzly bear recovery zones were warranted endangered but precluded in 1999 and suggested that the two populations might be inter-connected (FR 26725-26733).

The most recent data indicate that population status is also below recovery goals in the CYE for the distribution of females with young in bear management subunits and exceeds the 6-year average of female mortality in the recovery zone (Kasworm et al. 2008). Montana Fish, Wildlife and Parks began augmenting the grizzly bear population in the Cabinet Mountains in 2005.

Status of the Selway-Bitterroot and North Cascades Ecosystems Grizzly bear recovery efforts in the Selway-Bitterroot Ecosystem and North Cascades Ecosystem are in the planning stages. In the North Cascades Ecosystem, most of the grizzly bear population occurs north of the Canada - U.S. border, but a few grizzly bears persist south of the border. Though suitable habitat remains, grizzly bears were extirpated from the Selway-Bitterroot Ecosystem decades ago. The Service released a final environmental impact statement and decision notice addressing the impacts of reintroducing grizzly bears into the Bitterroot Ecosystem in east central Idaho (U.S. Fish and Wildlife Service 2000).

Analysis of the Species/Critical Habitat Likely to be Affected

The biological assessment determined that the Bozeman Municipal Watershed Fuel Reduction Project would be likely to adversely affect individual grizzly bears. Therefore, formal consultation with the Service has been initiated and this biological opinion has been written to determine whether or not activities associated with this project are likely to jeopardize the continued existence of grizzly bears or result in the destruction or adverse modification of grizzly bear critical habitat. Grizzly bears are listed as threatened under the Act. Critical habitat has not been designated for this species; therefore none would be affected by the proposed action.

Other Listed Species

In addition to grizzly bears, other federally listed species that may be present in the project area include the threatened Canada lynx and designated Canada lynx critical habitat. The

effects of the proposed action on Canada lynx and designated lynx critical habitat have been previously analyzed and section 7 consultation has been completed.

IV. ENVIRONMENTAL BASELINE

Under the provisions of section 7(a)(2), when considering the "effects of the action" on listed species, the Service is required to consider the environmental baseline. Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all federal, state, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed federal projects in the action area that have undergone section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultation in progress.

Action area, as defined by the Act, is the entire area to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. Within the recovery zone, the spatial boundary of an action area typically used in an analysis of effects to grizzly bears is a Bear Management Unit (BMU) subunit or subunits if the project occurs within more than one subunit. Each subunit does not represent an actual home range of a grizzly bear, but allows for a spatial analysis of effects to grizzly bears over a landscape large enough to support a female grizzly bear. The proposed action is located outside of the recovery zone but within the distribution area of grizzly bears. No subunits have been established outside of the recovery zone. Therefore, for the purposes of this biological opinion, we have defined the action area to be multiple timber compartments (506, 507, 508, 509, 510, 517, 216, 217, 218, and 219) combined. This area most accurately reflects the potential area of impact to grizzly bears.

Status of the Species within the Action Area

As mentioned above, the action area is outside of the YGBE recovery zone but within the grizzly bear distribution area where grizzly bears may occur. The action area refers to the 10 timber compartments mentioned above and the project area refers to the area containing and surrounding collective treatment units. No grizzly bear occurrences have recently been documented within any of the proposed treatment sites (U.S. Forest Service 2009). No grizzly bear mortalities have been recorded within the project area. Occasional reports of grizzly bear occurrences have been documented within the action area in the Hyalite and Bozeman Creek drainages. However, grizzly bear use in these areas is very low relative to use within the recovery zone.

The action area does provide potential spring and summer habitat in the lower elevation riparian communities, moist sites with succulent forage, berry patches, insect concentrations and small mammal communities. Denning habitat within the action area is also present at the higher elevations in more remote settings. The project area does not contain any known grizzly bear den sites. The project is located in an area that is impacted by high levels of human activity year round.

Factors Affecting Species Environment within the Action Area

Motorized access has long been recognized as a major factor affecting grizzly bears. A moving windows analysis has not been completed for areas outside of the recovery zone. The action area has open road densities of .67 miles per square mile. The 21,824 acre project area has open road densities of 1.28 miles per square mile. This figure includes all roads open to motorized use including private roads, administrative roads, and roads closed to passenger vehicles but open to use by ATVs and/or motorcycles. When adding in single-track trails that are open to motorcycle use, the total open motorized route density for the project area is 1.36 miles per square mile.

A biological opinion on the effects of the Forest-wide Travel Management Plan, pertaining to the construction and use of roads, was completed on September 20, 2006. This opinion analyzed the effects of the Travel Plan on grizzly bears both within the recovery zone and the distribution area outside of the recovery zone. In other words, the Travel Plan biological opinion analyzed impacts on the entire Forest south of I-90. The biological opinion included an incidental take statement along with terms and conditions for the proposed action pertaining specifically to access management.

In the biological opinion, we analyzed the effects of motorized access during the grizzly bear non-denning period and assessed the level of incidental take of grizzly bears in 1995 and 2004 (USFWS 1995a, 2004). The Service anticipated that continued access on the Forest may incidentally take grizzly bears. However, we concluded that the proposed Travel Plan would lessen this potential for take.

High road densities and lack of core or secure areas exist across some areas within grizzly bear distribution outside the recovery zone. The Service believed that it was reasonable to assume that the level of permanent roads in areas outside the recovery zone would not substantively increase in the next decade, with some local exceptions. This assumption was based on recent history and trends in road building and decommissioning that consistently show fewer permanent roads on the landscape (U.S. Forest Service 2004a), the costs associated with permanent road construction and maintenance, the current Forest road system that in many cases is adequate for resource management, and upon discussions with interagency teams including representatives from the Service and the Forest Service (U.S. Forest Service unpublished meeting agendas and notes 20012004). However, high open and total road densities result in adverse effects to grizzly bears attempting to live in the areas outside of the recovery zone. These roads and any new roads constructed in the future may displace grizzly bears from key habitats and impair their ability to find food resources, breed and raise young, and find shelter.

Although a moving windows analysis has not been completed for access management in the action area outside of the recovery zone, the amount of secure habitat was calculated. All three analysis areas outside of the recovery zone would see an increase in secure habitat over the existing condition as a result of the proposed Travel Plan, moderating the impacts of higher road densities.

According to the Travel Plan, no new permanent roads that would increase OMARD or TMARD would be constructed within the recovery zone, but could occur outside of the recovery zone. We expected that some permanent construction of and motorized use of roads will likely result from site-specific projects and would increase the likelihood of disturbance and displacement in the analysis area. Also, temporary roads built for resource extraction such as timber harvest or mining may remain on the landscape for several years and receive a substantive amount of use. Such roads may impair grizzly bears through displacement from key habitats. The Service expected that temporary roading would occur on lands both within and outside of the recovery zone.

We anticipated that the Travel Plan and related access management, including non-motorized use, would result in some level of take due to displacement of grizzly bears, specifically female bears, from essential habitat and issued terms and conditions to minimize the impact of the incidental take.

V. EFFECTS OF THE ACTION

Under section 7(a)(2) of the Act, "effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, with the effects of other activities interrelated or interdependent with that action. Indirect effects are those caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). The effects of the action are added to the environmental baseline to determine the future baseline and to form the basis for the determination in this opinion. Should the federal action result in a jeopardy situation and/or adverse modification conclusion, the Service may propose reasonable and prudent alternatives that the federal agency can take to avoid violation of section 7(a)(2). The effects discussed below are the result of direct and indirect impacts of implementing the proposed project.

General Factors to Consider – Access Management

The Interagency Grizzly Bear Committee (IGBC) Taskforce provided standardized definitions for roads and standardized methods to measure road densities and define analysis areas as a result of grizzly bear research information on open and total road densities and grizzly bear core areas (IGBC 1994, 1998). The Service considers the management of roads one of the most important factors in grizzly bear habitat conservation and the IGBC Taskforce guidelines as the best direction with which to manage roads. This section provides a general discussion of direct and indirect effects of motorized access management on grizzly bears and on the environmental baseline as affected by road densities.

General Effects of Roads on Grizzly Bears

Research has confirmed the adverse impacts of roads on grizzly bears (Mace et al. 1996, Mace et al. 1999). Negative impacts associated with roads and excessive road densities influences grizzly bear population and habitat use patterns in numerous, widespread areas. The Grizzly Bear Compendium (IGBC 1987) summarized impacts reported in the literature

including:

- Avoidance/displacement of grizzly bears away from roads and road activity;

- Changes in grizzly bear behavior, especially habituation to humans, due to ongoing contact with roads and human activities conducted along roads;

- Habitat loss, modification, and fragmentation due to roads and road construction, including vegetative and topographic disturbances; and

- Direct mortality from road kills, legal and illegal harvest, and other factors resulting from increased human-bear encounters.

Mortality is the most serious consequence of roads in grizzly bear habitat. Mortalities can occur from illegal shooting or collisions with vehicles, or indirectly through habituation to human presence.

Grizzly Bear Mortality The specific relationship between roads and the mortality risk to grizzly bears is difficult to quantify. The level of human use of roads is one of several factors influencing the mortality risk associated with any road. Research supports the premise that forest roads facilitate human access into grizzly bear habitat, which directly or indirectly increases the risk of mortality to grizzly bears. Grizzly bears were increasingly vulnerable to illegal and legal harvest as a consequence of increased road access by humans in Montana (Mace et al. 1987) and in the Yellowstone region (Mattson et al. 1992). In southeastern British Columbia, McLellan and Shackleton (1988) reported roads increased access for legal hunters and poachers, the major source of adult grizzly mortality. McLellan (1989b) reported that 7 of 13 successful legal hunters interviewed had been on a road when they harvested their grizzly bear. McLellan and Mace (1985) found that a disproportionate number of mortalities occurred near roads. In the Yellowstone ecosystem, Mattson and Knight (1991) reported that areas influenced by secondary roads and major developments were most lethal to grizzly bears. Aune and Kasworm (1989) reported 63 percent of known, human-caused grizzly bear deaths on the east front of the Rocky Mountains occurred within 1 kilometer (0.6 miles) of roads, including 10 of 11 known female grizzly bear deaths. In Montana, Dood et al. (1986) reported that 48 percent of all known, non-hunting mortalities during the period of 1967 through 1986 occurred within 1 mile of roads. Grizzly bears were also killed by vehicle collision, the most direct form of road-related mortality (Greer 1985, Knight et al. 1981, Palmisciano 1986).

The presence of roads alone does not necessarily result in direct mortality of grizzly bears, but the proximity of the roads to human population centers, resulting high numbers of people using roads, and dispersed recreation in habitat around roads can pose considerable risks to grizzly bears. Social values and attitudes also contribute to the level of mortality risk to grizzly bears. Incidental or accidental human-caused grizzly bear mortality, combined with a few individuals intent on illegally shooting grizzly bears, can collectively result in serious, detrimental effects to grizzly bear populations. Access management can be instrumental to reducing mortality risk to grizzly bears by managing the present and anticipated future road use-levels resulting from the increasing human population in western

Montana.

Displacement and security Some grizzly bears, particularly subadults, readily habituate to humans and consequently suffer increased mortality risk. However, many grizzly bears under-use or avoid otherwise preferred habitats that are frequented by people. Such under-use of preferred habitat represents modification of normal grizzly bear behavior. Negative association with roads arises from the grizzly bears' fear of vehicles, vehicle noise and other human-related noise around roads, human scent along roads and hunting and shooting along or from roads. Grizzly bears that experience such negative consequences learn to avoid the disturbance and annoyance generated by roads. Some may not change this resultant avoidance behavior for long periods after road closures. Even occasional human-related vehicle noise can result in annoying grizzly bears to the extent that they continue to avoid roads.

All factors contributing to direct links between roads and displacement from habitat have not been quantified. As with mortality risk, the level of road-use by people is likely an important factor in assessing the potential displacement caused by any road. Contemporary research, however, indicates that grizzly bears consistently were displaced from roads and habitat surrounding roads, often despite relatively low levels of human use (Mattson et al. 1987, McLellan and Shackleton 1988, Aune and Kasworm 1989, Kasworm and Manley 1990, Mace and Manley 1993, Mace et al.1996).

Avoidance behavior is often strongest in adult grizzly bears, with males selecting for high quality habitats and absence of humans (Gibeau et al. 2002). Males that were found using high quality habitat near roads, did so during the night where hiding cover was available (ibid). However, adult females were more likely to avoid humans all together, rather than seek out the highest quality habitats. Mueller et al. (2004) reported all age and sex classes used habitats closer to high-use roads and development during the human inactive period. All bears showed a considerably greater avoidance of high-use roads and development during periods of high human activity. They did show however, that regardless of the time of day subadult bears were found closer to high-use roads than adult bears. Gibeau et al. (2002) also demonstrated that subadults were almost always closer to human activity than adults.

In Montana, Aune and Stivers (1982) reported that grizzly bears avoided roads and adjacent corridors even when the area contained preferred habitat for breeding, feeding, shelter and reproduction. McLellan and Shackleton (1988) found that grizzly bears used areas near roads less than expected in southeastern British Columbia and estimated that 8.7 percent of the total area was rendered incompatible for grizzly bear use because of roads. In Montana, Mace and Manley (1993) reported use of habitat by all sex and age classes of grizzly bears was less than expected in habitats where total road densities exceeded two miles per square mile. Twenty-two percent of the South Fork Study area exceeded two miles per square mile. Adult grizzly bears used habitats less than expected when open motorized access density exceeded one mile per square mile. Further, female grizzly bears in the South Fork Study area tended to use habitat more than 0.5 mile from roads or trails greater than expected. As traffic levels on roads increased, grizzly bear use of adjacent habitat decreased (Mace et al. 1996). In Yellowstone, Mattson et al. (1992) reported wary grizzly bears

avoided areas within 2 kilometers (1.2 miles) of major roads and 4 kilometers (2.4 miles) of major developments or town sites.

Mace et al. (1996) and other researchers have used 500 meters as the zone of influence around roads. Waller and Servheen (2005) also demonstrated avoidance of areas within 500 meters of US-2. Benn and Herrero (2002) set zones of influence of 500 meters and 200 meters around roads and trails, respectively. They reported that all 95 human-caused grizzly bear mortalities with accurate or reasonable locations that occurred in Banff and Yoho National Parks between 1971 and 1998 occurred within these zones of influence along roads and trails or around human settlements. Gibeau and Stevens (2005) documented bears further from roads when distant from high quality habitat, indicating avoidance behavior. Research suggests that grizzly bears benefit from road closures aimed at minimizing traffic on roads within important seasonal habitat, especially in low elevation habitats during the spring (Mace et al. 1999). When roads are located in important habitats such as riparian zones, snowchutes and shrub fields, habitat loss through avoidance behavior can be significant. Mace et al. (1996) found that most of the roads within grizzly bear seasonal ranges were either closed to vehicles or used infrequently by humans. Some grizzly bears avoided areas with a high total road density even when the roads were closed to public travel. If human-related disturbances such as high levels of road use continue in preferred habitats for extended periods of time, grizzly bear use of the area may be lost, particularly use by female grizzly bears. In the Swan Mountain study (Mace et al. 1996), female grizzly bear home range selection of unroaded cover types was greatest and as road densities increased, selection declined. Zager (1980) reported the avoidance of roads by females with cubs. Aune and Kasworm (1989) and McLellan (1989a) found that female cubs generally established their home range within or overlapping with their mother's home range, whereas males generally dispersed from their mother's home range. Long-term displacement of a female from a portion of her home range may result in long-term under-use of that area by female grizzly bears because cubs have limited potential to learn to use the area. In this way, learned avoidance behavior could persist for more than one generation of grizzly bears before grizzly bears again utilize habitat associated with closed roads. Thus, displacement from preferred habitats may significantly modify normal grizzly bear behavioral patterns.

Grizzly bears can also become conditioned to human activity and show a high level of tolerance especially if the location and nature of human use are predictable and do not result in overtly negative impacts for grizzly bears (Mattson 1993). In Glacier National Park, Jope (1985) suggested grizzly bears in parks habituate to high human use and showed less displacement, even in open habitats. Yonge (2001) found that grizzly bears near Cooke City, Montana, were willing to consistently forage in very close proximity to high levels of human use if cover was sufficient and energetically efficient feeding opportunities were present. Both Mattson (1993) and Yonge (2001) postulated that areas with higher levels of human activity might have a positive effect for bears by serving as a kind of refugia for weaker population cohorts (subadults and females with cubs) seeking to avoid intra-specific competition (adult males). However, Mattson qualified this observation by adding that the beneficial effects vary as to whether hunting is allowed, and how closely the human population is regulated. Further, food conditioned grizzly bears were much more likely to be

killed by humans.

Both Yonge (2001) and Mattson (1993) indicated that increases in human use levels can be deleterious if some human activities are unregulated, such as use of firearms, presence of attractants, nature and duration of human uses. Conversely, a level of coexistence between humans and grizzly bears can be achieved if such activities are controlled. Near Cooke City, Montana, the New World Mine reclamation project had minimal effects on grizzly bears, in part because reclamation activities were temporally and spatially predictable and people associated with the work were carefully regulated against carrying firearms or having attractants available to grizzly bears (Tyers, unpublished 2006). In the Swan Valley of Montana, raw location data from a small number of collared grizzly bears show nocturnal use of highly roaded habitat (C. Servheen, USFWS, pers. comm. 2005). The Swan Valley data have not been statistically analyzed and the study was not designed to determine the impact of roads on bears, sample size is very small, and perhaps most importantly, mortality rates for these grizzly bears are not yet known. However, these data indicate that some grizzly bears can apparently habituate to relatively high levels of human activity.

Low-elevation riparian habitats are of significant seasonal importance to grizzly bears. Grizzly bears typically use the lowest elevations possible for foraging during spring. Craighead et al. (1982) described the value of low-elevation habitats to grizzly bears. Montana Fish, Wildlife and Parks concluded that maximum numbers of grizzly bears can be maintained only if the species continues to have the opportunity to use both the temperate and subalpine climatic zones (Dood et al. 1986).

Research identified the following individual home-range selection patterns in local grizzly bear population segments: (1) some individual animals live almost exclusively (except for denning) in low elevation habitats; (2) other individuals maintain home ranges in more mountainous or remote locations; and (3) some individuals migrate elevationally on a seasonal basis (Servheen 1981, Aune and Stivers 1982).

Specific causes or factors involved in the selection or preferences for certain home ranges by grizzly bears are not well understood. Mace and Manley (1993) found that grizzly bear home ranges in the South Fork Study area included remote areas in high elevations. South Fork Study grizzly bear habitat-use data, road density analyses of the South Fork Study area, previous studies and CEM analysis (U.S. Forest Service 1994a, Mace et al. 1999) suggested that low-elevation habitats were not freely available to grizzly bears because of high road densities and associated human use in these areas. High road densities in low-elevation habitats may result in avoidance of or displacement from important spring seasonal habitat for some grizzly bears or high mortality risk for those individuals that venture into and attempt to exploit resources contained in these low-elevation areas.

Core areas The Service considers significant declines in expected use of habitat by grizzly bears a serious consequence of high road densities. Significant declines in grizzly bear use of MS-1 habitat (habitat areas key to the survival of the grizzly where seasonal or year-long activity, under natural, free-ranging conditions is common), especially those habitat components with high seasonal values, indicate that habitat needed for survival and recovery

is less available. Ideal grizzly bear habitat provides some areas isolated from excessive levels of human impact. Because grizzly bears can conflict with humans and their land uses, grizzly bear populations require a level of safety from direct human-caused mortality and competitive use of habitat such as settlement, roading, recreation, excessive logging, mining and livestock grazing.

Analysis in the South Fork Study area (Mace and Manley 1993, Mace et al. 1996) indicated the importance of unroaded habitat, especially for females with cubs. Mace and Manley (1993) reported adult females used habitat further than 0.5 mile from roads or trails more than expected; 21 percent of the composite home range had no trails or roads and 46 percent was unroaded (greater than 0.5 mile from a road). Substantive blocks of unroaded habitat were components of all adult female home ranges. Of the adult female locations within unroaded polygons, 83 percent occurred within 7 polygons that exceeded 2,260 acres in size. Based on grizzly bear habitat use data from the Yellowstone ecosystem, Mattson (1993) recommended that micro scale security areas in that region be an absolute minimum of 6 kilometers (3.6 miles) in diameter or 28 square kilometers (10 square miles) and should be secure for a minimum period of 5, or preferably 10, years.

The IGBC Taskforce (IGBC 1994) recognized the importance of secure areas to grizzly bears. The Taskforce defined "core areas" as those areas with no motorized access (during the nondenning period) or heavily used foot/livestock trails, providing some level of secure habitat for grizzly bears. Motorized use, such as snowmobiling or that associated with timber harvest, could occur within core areas during the denning (winter) period. The Taskforce recommended the establishment of core areas in all subunits, the size of core area should depend on ecosystem-specific habitat conditions, and that a core area remain intact on the landscape for at least 10 years. In the South Fork Study area of the NCDE, approximately 68 percent of the adult female composite home range was core area (U.S. Forest Service in litt. 1994, K. Ake, U.S. Forest Service, pers. comm. 2005).

Habituation to human attractants Continued exposure to human presence, activity, noise, and other elements can result in habituation, which is essentially the loss of a grizzly bear's natural wariness of humans. High road densities and associated increases in human access into grizzly bear habitat can lead to the habituation of grizzly bears to humans. Habituation in turn increases the potential for conflicts between people and grizzly bears. Habituated grizzly bears often obtain human food or garbage and become involved in nuisance bear incidences, and/or threaten human life or property. Such grizzly bears generally experience high mortality rates as they are eventually destroyed or removed from the population through management actions. Habituated grizzly bears are also more vulnerable to illegal killing because of their increased exposure to people. In the Yellowstone region, humans killed habituated grizzly bears over three times as often as non-habituated grizzly bears (Mattson et al. 1992).

Subadult grizzly bears are more often vulnerable to habituation and illegal killing or they conflict with people and are removed through management action. Subadult grizzly bears frequently traverse long distances or unknown territory, increasing the likelihood of

encountering roads, human residences or other developments where human food or other attractants are available, increasing the potential for habituation and/or conflicts with people. Between 1988 and 1993, six of seven grizzly bear management removals from the Flathead National Forest and surrounding area involved subadults (U.S. Forest Service 1994a, 1994b). In the Yellowstone ecosystem, roads impacted individual age and sex classes of grizzly bears differently. Subadults and females with young were most often located near roads, perhaps displaced into roaded, marginal habitat by dominant grizzly bears (Mattson et al. 1987, Mattson et al. 1992).

Effects Specific to the Proposed Action

Road Construction and Road Use

The proposed action includes 7.1 miles of new temporary road construction and 3.1 miles of existing road will be reopened for a total of 10.2 miles of additional open road in the project area during the life of the project. Within the action area, open road density would temporarily increase from .67 miles per square mile to .71 miles per square mile and total road density would temporarily increase from .80 miles per square mile to .84 miles per square mile. All newly constructed temporary roads would be designed with minimum handbook standards necessary to accomplish the task and will be effectively gated to restrict public motorized use. Upon completion of the project, temporary roads will be permanently closed and re-vegetated.

The 2006 biological opinion on the effects of the Travel Management Plan on grizzly bears (U.S. Fish and Wildlife Service 2006) provides an incidental take statement concerning the effects of roads on grizzly bears. In doing so, the effects of the existing forest roads and temporary project roads were analyzed and the effects of access management on the Forest, including the action area, were fully considered in the analysis in the 2006 biological opinion. The road use associated with this project would not impart any effects to grizzly bears in addition to those analyzed in the 2006 biological opinion and the proposed project would be in compliance with the incidental take statement of that opinion. Therefore, consultation on the effects of roads to grizzly bears is complete and the use of existing roads and construction and use of temporary roads will not be considered further.

Fuels Reduction

Based on the original biological assessment (U.S. Forest Service 2008), approximately 4,844 acres would be treated with commercial thin/burn, broadcast burn, fuelbreak, hand thin, machine thin and/or precommercial thin methods. These types of harvests would occur on 50 units with acres per unit varying from 2 to 1,116. The proposed action may require up to 5 consecutive years for completion. Such activities in grizzly bear habitat can result in a variety of effects, some adverse, others beneficial (IGBC 1987). Both short-term and long-term effects are anticipated as a result of disturbance and vegetation alteration.

Mechanized noise from saws, heavy equipment and log hauling may disrupt normal use of habitat by grizzly bears during the non-denning season. However, grizzly bear home ranges

are large and thus bears typically have options for foraging, unless the disturbance is widespread and long-term. Also, the action is located in an area that already receives high human use and low known grizzly bear use. With the exception of helicopter units discussed below, considering the amount of disturbance anticipated, disturbance and displacement of grizzly bears from fuel reduction activities would likely be minimal and would be short-term. In total, activities would occur over approximately five years, so not all project related activity would occur at the same time.

Helicopters would be used to extract merchantable products from some commercial thinning units, and also for aerial ignitions in prescribed burn units. Helicopter use will involve repeated, low-elevation (less than 500 meters AGL) flights and occasional landings over an extended period of time and up to five consecutive years. Helicopters will be used to extract timber from and ignite prescribed burns in inventoried "roadless" areas (IRA).

Helicopter logging will be used in twelve units on about 843 total acres. Of this, approximately 200 acres will occur within the IRA. Based on an analysis of average helicopter flight time, yarding capacity, and timber volume per helicopter logging unit, the Forest has estimated that helicopter units will take a minimum of 107 days and up to a maximum of 144 days to complete.

Helicopter logging in occupied grizzly bear habitat may elicit a response in grizzly bears. Effects may range from a simple awareness of the helicopter, short-term disturbance or flight response or displacement from an area. In timbered habitats, McLellan and Shackleton (1989) found that an overt avoidance or displacement response required high intensity helicopter activity, such as carrying equipment within 200 meters of a grizzly bear. The duration of the helicopter use will be extended (up to 144 days over 5 consecutive years) and multiple passes would occur per day. This type of activity may interfere with the normal behavior patterns of grizzly bears. The effects to grizzly bears of repeated, low altitude flight paths that follow open roads may partially offset the existing under-use of habitat in the immediate vicinity of the roads due to the "avoidance" by the grizzly bears of habitat in close proximity to open roads. Helicopter use during the denning period would have none to insignificant effects. In most cases, the effects of helicopter logging that occurs during the non-denning period in roaded habitat would have insignificant effects to grizzly bears as long as all roaded areas and roadless habitat effectiveness provide adequate secure habitat for grizzly bears. However, helicopter logging proposed in the Bozeman Municipal Watershed Fuel Reduction project will affect roadless areas, where grizzly bears are likely conditioned to expect less human-created disturbance. Such helicopter logging in this case may result in adverse effects similar to adverse effects caused by roads.

Helicopters will also be used to ignite approximately 1,325 acres of prescribed burn units within the IRA. Helicopter use associated with aerial ignition for prescribed burn units is estimated to take about 10 to 15 days total. This activity would require on average about 2 to 3 hours of helicopter time per day. This type of helicopter use, short in duration and low in frequency, would not likely result in significant affects to grizzly bears.

In addition to disturbance effects, the proposed action would also result in vegetation/habitat

alteration. As a result of the proposed action, an immediate net reduction in the amount of hiding and thermal cover available for grizzly bears will occur. A decrease in the amount of cover may result in different effects on grizzly bears and their habitat. If cover was limited in the project area, either by the amount or distribution, timber harvesting would likely result in negative impacts (Ruediger and Mealy 1978). Reduced cover may increase the visibility of grizzly bears, which may potentially increase their vulnerability to illegal human-caused mortality and/or contribute to displacement from preferred habitats. However, if cover is not limiting in a project area and units are designed to reduce line of sight distances, timber harvesting may have either no effect or a positive effect in those situations where food abundance or distribution is improved. Cover is not limited in the action area (U.S. Forest Service 2009). It was estimated that proposed fuel treatments would affect about 3,888 acres of hiding and/or thermal cover, reducing the cover in the action area by 3 percent (from 55 percent to 52 percent).

By removing or reducing overstory vegetation through harvesting, slashing and/or burning, grizzly bear food production may be increased (Ruediger and Mealey 1978). This includes foods such as berries and succulent forbs. In a study on use of harvested stands, Waller (1992) found that use of these stands increased during the berry season, due to some harvested stands having high berry production. If food production or distribution is improved but human activity is not controlled after the completion of harvest activities, negative impacts on grizzly bears may occur due to an increase in the potential for conflicts between humans and grizzly bears (Ruediger and Mealey 1978). Waller (1992) found that of the harvested stands that he studied, those with the highest grizzly bear use had limited access due to closed gates and/or over-grown roads. Grizzly bears within his study area that used harvested stands were found at higher elevations and spent little time in lower elevation stands where harvest was most common. Waller attributed this to human use of those lower, more accessible harvested stands. Waller also found that grizzly bears avoided stands where the vegetation had not recovered enough to provide security cover and preferred to use stands that were 30 to 40 years post-harvest.

Although cover will be reduced in many units, the amount of forage available will likely temporarily increase. Thinning forest habitat allows additional light to penetrate to the ground, which then stimulates production of vegetative food sources such as forbs, grasses and berry producing shrubs. Approximately 4,410 acres of proposed treatment will have the potential to increase forage availability for grizzly bears.

Zager (1980) found that differences of shrub responses depended on the type of treatment that occurred post-harvest. Among the key shrub grizzly bear foods on clearcut sites where slash was bulldozer-piled before burning, Zager found a consistent decline in canopy coverage when compared to old burns. This is likely due to the extreme heat created by burning slash piles which may kill rhizomes and root crowns and bulldozer use which may also destroy rhizomes and root crowns. In those areas where slash was either broadcast burned or not treated, key grizzly bear shrub foods were generally found throughout the sites, except on skid roads and other severely disturbed areas. On relatively mesic sites, globe huckleberry, mountain-ash and serviceberry generally increased in cover. The proposed

action would dispose of slash resulting from timber management activities by varying methods depending on the unit. Both mechanized piling then burning and broadcast burning of the slash would occur, potentially reducing canopy coverage in some, but not all treated areas in the long-term.

With the exception of helicopter logging discussed above, based on research, the temporary nature of timber harvest, and the location of the harvest, we do not anticipate adverse effects on grizzly bears from the remaining timber harvest actions. Grizzly bears would not be impacted to the level of significantly disrupting normal behavior patterns, including breeding, feeding and/or sheltering as a result of the remaining timber harvest activities.

Impacts to grizzly bears may occur indirectly through habituation to human presence. Food and odors associated with activities conducted under the proposed action have the potential to provide additional attractants for grizzly bears, leading to possible grizzly bear-human conflicts. Refer to the 'habituation and mortality' subsection in the 'General Effects of Roads on Grizzly Bears' section for further discussion on habituation. All activities associated with the project implementation will be in compliance with the Forest-wide Food Storage Order. With the Food Storage Order in place and enforced, the Service concludes that the proposed action would not result in habituation or grizzly bear mortality due to improper attractant storage.

Effects Summary for Grizzly Bears

Temporary increases in road densities and human use along roads as a result of harvest activities is considered a serious impact of timber harvesting. The impacts of new temporary road construction, use of historic road systems and the increase in human activity and traffic may displace grizzly bears in the project area from preferred use areas. The 2006 biological opinion on the effects of the Travel Management Plan on grizzly bears (U.S. Fish and Wildlife Service 2006) provides an incidental take statement concerning the effects of roads on grizzly bears. In doing so, the effects of the existing forest roads and temporary project roads were analyzed and the effects of access management on the Forest, including the action area, were fully considered in the analysis in the 2006 biological opinion. The road use associated with this project would not impart any effects to grizzly bears in addition to those analyzed in the 2006 biological opinion and the proposed project would be in compliance with the incidental take statement of that opinion

Timber harvest may impact grizzly bears in the short-term by affecting seasonal habitat use, which may result in the under-use of important food sources and/or displacement of grizzly bears to less secure habitat during the period of increased human activity and traffic. Mechanized noise from saws, heavy equipment, helicopters and log hauling may displace or disturb normal use of habitat by grizzly bears during the non-denning season. With the exception of helicopter units, considering the amount of disturbance anticipated, disturbance and displacement of grizzly bears from timber harvest activities would likely be minimal and would be short-term. High levels of concentrated human use also occur within the action area and may be contributing to disturbance effects on grizzly bears. Due to the duration and frequency of the helicopter logging and the temporary changes in access management,

helicopter logging may result in adverse effects of the road management activities and may interfere with the normal behavior patterns of grizzly bears.

Unit size ranges from 2 acres to 1,116 acres. The proposed action would result in a net reduction of approximately 3,888 acres of hiding and /or thermal cover due to fuel reduction activities spread across 50 units. Habitat alteration may result in a range of effects to grizzly bears. As a result of the proposed action however, early seral vegetation would likely dominate the treated sites and will in turn provide potential forage in the form of grasses and forbs. In some situations, timber harvest may result in a loss of important cover while in other situations, a reduction in overstory cover may improve food abundance or distribution. In this case, the remaining cover would be adequate. The proposed action reduces cover by only three percent of the action area overall. With the exception of helicopter logging discussed in the paragraph above, based on research, the temporary and short-term nature of timber harvest, and the location of the action, we do not anticipate adverse effects on grizzly bears from the remaining timber harvest actions per se; grizzly bears would not be impacted to the level of significantly disrupting normal behavior patterns, including breeding, feeding and/or sheltering as a result of timber harvest activities.

Impacts to grizzly bears may occur indirectly through habituation to human presence. With the Forest Wide Food Storage Order in place and enforced, the Service concludes that the proposed action would not result in habituation or grizzly bear mortality due to improper attractant storage.

VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The city of Bozeman and other small private land-owners have land in the action area. The City of Bozeman has had discussions on the options for fuel treatment on their land but no specific details have been determined. Many of the private land-owners have also expressed an interest in fuel reduction work on their lands but no proposals have been completed. Therefore, it is likely that future fuel reduction projects will occur in the action area but no details or proposals have come forth. Fuel reduction has the potential to impact grizzly bears in the same manner and described above. The YGBE recovery zone encompasses about 5.9 million acres (9,209 square miles). Three-quarters of the YGBE is either wilderness or National Park land and is essentially roadless or free of motorized use. These areas contain the highest quality grizzly bear habitat. Further, the National Forests in the YGBE contribute additional grizzly bear security core areas. Comprehensive management direction for grizzly bears occurs on federal lands and cooperation from Montana Fish, Wildlife and Parks and other state agencies for grizzly bear management relates to many issues on private lands. This management offsets or mitigates for many private land actions, providing for the overall health of the grizzly bear population.

VII. CONCLUSION

After reviewing the current status of the grizzly bear, the environmental baseline for the action area, the effects of the action and the cumulative effects, it is the Service's biological opinion that the effects of the Bozeman Municipal Watershed Fuels Reduction Project as proposed are not likely to jeopardize the continued existence of the grizzly bear. No critical habitat has been designated for this species therefore none will be affected. Implementing regulations for section 7 (50 CFR 402) define "jeopardize the continued existence of" as to "engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." Our conclusion that the proposed action is not likely to jeopardize the continued existence of grizzly bears is based primarily on the information presented in the original biological assessment prepared for the proposed project (U.S. Forest Service 2008), the supplemental biological assessment (U.S. Forest Service 2009), information in our files, and informal discussions between the Service, the Forest and other personnel.

It is our opinion that the proposed action would not appreciably reduce the likelihood of both the survival and recovery of the grizzly bears. Our rationale for this non-jeopardy conclusion is based on, but not limited to the following factors, as detailed earlier in this biological opinion:

Factors related to the project area:

- The proposed action is located outside of the YGBE recovery zone but within the distribution of grizzly bears.
- The construction and use of new temporary roads will result in temporary increases in road densities during harvest related activities (up to five years). The effects of these temporary roads were analyzed and the effects of access management on the Forest, including the action area, were fully considered in the analysis in the 2006 biological opinion on the Gallatin National Forest Travel Plan (U.S. Fish and Wildlife Service 2006). The road use associated with this project would not impart any effects to grizzly bears in addition to those analyzed in the 2006 biological opinion and the proposed project would be in compliance with the incidental take statement of that opinion
- All newly constructed temporary roads would be designed with minimum Forest handbook standards necessary to accomplish the task and will be effectively gated to restrict public motorized use. Such closures reduce disturbance and reduce risk of illegal shooting.
- Temporary roads constructed and used for project related activities would be permanently and effectively closed and re-vegetated following project treatments.
- Harvest, thinning, and prescribed burning activities will impact a total of approximately 3,888 acres. This affects approximately 3 percent of the cover in the 133,183 acre action area. Such activities may impact grizzly bears resulting in some under-use of important food sources and/or displacement of grizzly bears to less secure habitat. Disturbance and displacement of grizzly bears from these activities are likely to be minimal and would last no more than five grizzly bear non-denning seasons. Activities would be concentrated in areas each year rather than spread out across the entire action area for all five years.

- Due to the duration and frequency of the helicopter logging, the potential disturbance and displacement caused helicopter logging may interfere with the normal behavior patterns of grizzly bears.
- ⑩ While proposed activities may reduce some cover they may in turn increase the availability of forage. Factors related to the YGBE grizzly bear population:

- The Food Storage Order is in effect. This effective food storage order is in effect throughout the YGBE on National Forest lands and Yellowstone National Park. These agencies have been fairly successfully managing attractants on federal lands under the current food storage order.

- The best available information demonstrates that the YGBE grizzly bear population has expanded its range into areas outside the recovery zone. Female grizzly bears with young have been observed outside of the recovery zone, indicating that a number of females are able to establish home ranges and find the resources needed to survive and reproduce outside the recovery zone despite the lack of mandatory habitat protections.

- The Interagency Grizzly Bear Study Team (IGBST) is responsible for grizzly bear population monitoring in the YGBE. Using the Revised Demographic Recovery Criteria, the total grizzly bear population size for 2008 in the YGBE was 596 (Schwartz et al. 2009). Verified observation of female grizzly bears with young occurred in all 18 BMUs in 2008 and in at least 4 of the last 6 years (2003-2008).

- In part due to grizzly bear expansion into areas that had previously been unoccupied, the number of grizzly bear-human conflicts has increased. Much of the recent grizzly bear mortality is associated with conflicts arising from attractants on private lands. Despite the growth of the human population and the increase in the number of grizzly bear-human conflicts and grizzly bear mortalities the IGBST 2008 report indicates an increasing trend (Schwartz et al. 2009).

- The YGBE encompasses about 5.9 million acres (9,209 square miles), of which 36 percent (2.1 million acres or 3,315 square miles) is comprised of National Forest designated wilderness lands and 39 percent (2.3 million acres or 3,591 square miles) is comprised of Yellowstone and Grand Teton National Parks. These areas contain the highest quality grizzly bear habitat. Considering these lands only, three-quarters of the YGBE is essentially roadless or free of motorized use (75 percent). Further, the National Forests in the YGBE contribute additional grizzly bear core areas. For comparison, the action area of this project is approximately 133,183 acres. Of these acres, 4,844 acres would be treated. Displacement effects to grizzly bears would be limited to treatment sites or roads in or near grizzly bear habitat types, and a surrounding 500 meter buffer.

- While the proposed action would have adverse effects on a low number of individual grizzly bears using the project area, considering the size of the action area compared to the large size of the YGBE recovery zone, land management within the recovery zone, and the status of the grizzly bear population in the YGBE, we do not expect the level of adverse affects from the proposed action to appreciably diminish the numbers, distribution or reproduction of grizzly bears in the YGBE.

- Since the proposed action would not appreciably diminish the reproduction, numbers,

or distribution of grizzly bears in the YGBE, given the status of the grizzly bear population we conclude that it is not likely to reduce the likelihood of both the survival and/or recovery of the grizzly bear. We conclude that the proposed action would not affect the survival of grizzly bears, nor would it impede recovery.

Recovery zones were established to identify areas necessary for the recovery of a species and are defined as the area in each grizzly bear ecosystem within which the population and habitat criteria for recovery are measured. Areas within the YGBE recovery zone are managed primarily for grizzly bear habitat. The YGBE recovery zone is an area adequate for managing and promoting the recovery and survival of the YGBE grizzly bear population (USFWS 1993). The recovery zone contains large portions of wilderness and national park lands, which are protected from the influence of many types of human uses occurring on lands elsewhere. As anticipated in the Recovery Plan, the YGBE grizzly bear population has stabilized and is increasing, and grizzly bears are expanding their range outside of the recovery zone. Grizzly bears outside the recovery zone probably experience a higher level of adverse impacts due to land management actions than do grizzly bears inside. Considering the large size of the YGBE recovery zone, land management within the recovery zone, and the status of grizzly bears, we do not expect the level of adverse affects to appreciably reduce the likelihood of both the survival and recovery of the grizzly bear.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act, and Federal regulations pursuant to section 4(d) of the Act, prohibit the take of endangered and threatened species, respectively without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent act or omission that creates the likelihood of injury to listed wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are non-discretionary and must be undertaken by the Forest so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The Forest has a continuing duty to regulate the activity that is covered by this incidental take statement. If the Forest (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Forest must report the progress of the action and its

impact on the species to the Service as specified in the incidental take statement [50CFR 402.14(i)(3)].

Amount or Extent of Take Anticipated

A biological opinion on the effects of the Forest-wide Travel Management Plan, pertaining to the construction and use of roads, was completed on September 20, 2006 (U.S. Fish and Wildlife Service 2006). This opinion analyzed the effects of the Travel Plan on grizzly bears both within the recovery zone and the distribution area outside of the recovery zone. In other words, the Travel Plan biological opinion analyzed impacts on the entire Forest south of I-90. The effects of the existing forest roads and temporary project roads were analyzed and the effects of access management on the Forest, including the action area, were fully considered in the analysis in the 2006 biological opinion. The biological opinion included an incidental take statement along with terms and conditions for the proposed action. The road use associated with this project would not impart any effects to grizzly bears in addition to those analyzed in the 2006 biological opinion and the proposed project would be in compliance with the incidental take statement of that opinion. Therefore, consultation on the effects of roads to grizzly bears has been completed and incidental take has been exempted. No additional incidental take will be exempted in this biological opinion.

Based on research, the temporary and short-term nature of the action, and the location of the proposed action, we do not anticipate any incidental take of grizzly bears as a result of fuel reduction activities, with the exception of the impacts from helicopter logging (discussed below). We also do not anticipate incidental take of grizzly bears due sanitation issues because the Forest wide Food Storage Order is in effect.

Helicopter logging will be used in 12 units on about 843 total acres in areas where no road access would be available. Of this, about 200 acres occur within the IRA. The Forest has estimated that the helicopter logging units would require 107 days to 144 days to complete. Helicopter logging in occupied grizzly bear habitat during the non-denning period may elicit a response in grizzly bears. Effects may range from a simple awareness of the helicopter, short-term disturbance or flight response or displacement from an area. In timbered habitats, McLellan and Shackleton (1989) found that an overt avoidance or displacement response required high intensity helicopter activity, such as carrying equipment within 200 meters of a grizzly bear. The duration of the helicopter use will be extended (up to 144 days over 5 years) and multiple passes would occur per day. This type of activity may interfere with the normal behavior patterns of grizzly bears. The effects to grizzly bears of repeated, low altitude flight paths that follow open roads may be partially offset by the existing under-use of habitat in the immediate vicinity of the roads due to the “avoidance” by the grizzly bears of habitat in close proximity to open roads. In most cases, the effects of helicopter logging that occurs in roaded habitat would have insignificant effects to grizzly bears as long as all roaded and core habitat effectiveness parameters indicate that enough secure habitat is provided for grizzly bears. However, because the Bozeman Municipal Watershed Fuel Reduction project will result in temporary increases in road densities, such helicopter logging in this case may contribute to the disturbance and increase the potential for incidental take

caused by these temporary access management changes. Also, the helicopter logging in the IRA would likely result in adverse effects to grizzly bears similar to adverse effects caused by roads.

We anticipate incidental take of a few adult female grizzly bears that may be impacted by helicopter logging in association with increased road densities caused by temporary roads, over a five-year time frame. We anticipate take in the form of harm or harassment of these adult females, resulting in underuse of key feeding areas in home range habitat. Such underuse could last for the five years of activity, and for a few years after until wary females regain full use of their home ranges. Such underuse would significantly impair feeding and breeding patterns, which would result in failure to breed or to complete gestation. We do not anticipate the take of adult males or subadult grizzly bears, nor all adult females within the action area.

The effects helicopter logging on individual grizzly bears are difficult to quantify in the short term and may be measurable only as long-term effects on the species' habitat and population levels. The amount of take is difficult to quantify for the following reasons:

1) The amount of take would depend on the number of adult female grizzly bears impacted by the project. We lack specific information on the precise number of adult female grizzly bears that use the action area, but due to the location and scale of the project, we reasonably assume very few adult females would be affected.
2) Individual grizzly bears would react differently to the disturbance. Not all adult female bears that are exposed to disturbances from the proposed project would be adversely impacted to the point of take.
3) Individual female grizzly bears that initially may be sensitive to disturbances may over time become accustomed to the routine disturbances generated during the project. Therefore, determining the precise amount of take, as defined by impaired reproductive potential, is difficult.

The amount of take would be also difficult to detect for the following reasons:

1) Grizzly bears are not easily detected or observed in the wild.
2) Reproductive rates of female grizzly bears vary naturally due to environmental and physiological causes.
3) A reduction in "normal" reproductive success is not discernable in the wild.
4) The reasons a grizzly bear fails to breed and/or failure to complete gestation are not discernable in the wild.

In instances where incidental take is difficult to quantify, the Service uses a surrogate measure of take. The number of grizzly bears that use the action area is unknown but is expected to be low. Grizzly bears occur at relatively low numbers across the landscape. Therefore, the Service anticipates only a low level of incidental take of female grizzly bears would occur in the form of harm or harassment from the helicopter logging. The duration of

helicopter logging, up to 144 days during the non-denning period over 5 concurrent years, represents our surrogate measure of the incidental take we anticipate as a result of the Bozeman Municipal Watershed Fuel Reduction activities.

If the helicopter logging takes longer than the number of days described in our surrogate measure above, then the level of incidental take we anticipated in this biological opinion would be exceeded and therefore the level of take exempted would be exceeded. Under CFR 402.16 (1), in any scenario, reinitiation of consultation would be required.

Effect of the take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the grizzly bear. The best information indicates the overall status of the YGBE grizzly bear population is stable to increasing. Impacts on the grizzly bear population, including anticipated levels of incidental take, as a result of the Bozeman Municipal Watershed Fuel Reduction Project will not appreciably reduce survival or the recovery of the species. The YGBE grizzly bear population is estimated at 596, and the amount of take anticipated here is very low in comparison. Incidental take as a result of project activities may occur over five years from when project activities begin, and for a few years after until females regain full use of their home range. We anticipate no mortality of adult or subadult grizzly bears, but rather some low level of effect on the normal reproductive potential of a few adult female bears in the area. Critical habitat has not been designated for the grizzly bear, therefore none would be affected.

Reasonable and prudent measures

Biological opinions provide reasonable and prudent measures that are expected to reduce the amount of incidental take. Reasonable and prudent measures are those measures necessary and appropriate to minimize incidental take resulting from the proposed Bozeman Municipal Watershed Fuel Reduction Project. Reasonable and prudent measures are nondiscretionary and must be implemented by the agency in order for the exemption in section 7(o)(2) to apply.

1. Reduce the potential for harm caused by displacement of female grizzly bears as a result of helicopter logging.

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Forest must comply with the following terms and conditions that implement the reasonable and prudent measure described above and outline reporting and monitoring requirements. These terms and conditions are nondiscretionary:

1 Prioritize helicopter logging that will occur in the Inventoried Roadless Area (IRA) so that helicopter logging will not occur in more than one non-denning season. There are no limits on helicopter logging in the IRA during the winter. If it is not possible to complete the

helicopter logging within the IRA during this timeframe due to an unforeseen circumstance, the Forest shall contact the Service's Helena office. A detailed report of helicopter logging activities and if and why they were not completed within the above timeframe, is required under Reporting Requirement #1 below.

2 Prioritize all helicopter logging in order to complete related activities in the minimum days as possible

***Reporting Requirements* – to demonstrate compliance with the terms and conditions for grizzly bears, the Forest shall:**

1. Maintain an up-to-date record of helicopter logging activities including but not limited to the following: a) A record of helicopter logging implemented during the previous year including: the location, date and duration; b) whether or not the helicopter logging within the IRA was completed within the time frame of term and condition #1 above; and c) A schedule of anticipated helicopter logging actions to be carried out during the current year.
2. Complete a report with this information and submit it to the Service's Montana Field Office by January 31 of each year for the preceding calendar year.

3. Notify the Service's Montana Field Office, within 24 hours, of any grizzly bear-human conflicts or the management removal or human-caused death of a grizzly bear associated with implementation of the proposed action.

Closing statement

The Service is unable to precisely quantify the number of grizzly bears that will be incidentally taken as a result of the proposed Bozeman Municipal Watershed Fuel Reduction Project. We use the duration of helicopter logging (up to 144 days during the non-denning period over five concurrent years) as a surrogate measure of incidental take. In this opinion, we have determined that this level of incidental take would not jeopardize grizzly bears. If the duration of helicopter use is exceeded then the level of take exempted through this incidental take statement would be exceeded.

Reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. We have included reasonable and prudent measures along with terms and conditions in this incidental take statement, as well as reporting requirements that detail the progress of the action in order to monitor the impacts of incidental take. If, at any time during the course of the action, the level of take occurring exceeds that anticipated in this incidental take statement, such incidental take requires reinitiation of consultation and review of the incidental take statement. The Forest must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Sections 7(a)(1) of the Act directs federal agencies to use their authorities to further the

purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans or to develop information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibility for the species:

1. For those areas where mechanized treatment of slash would occur, consider either broadcast burning slash or leave the area untreated post-harvest (rather than piling slash and burning piles). Such treatments promote regeneration of vegetation and cover important to grizzly bears.
2. Continue to manage access on the Forest to achieve lower road densities. By managing motorized access, several grizzly bear management objectives could be met including: 1) minimize human interaction and potential grizzly bear mortality; 2) minimize displacement from important habitats; 3) minimize habituation to humans; and 4) provide relatively secure habitat where energetic requirements can be met (Interagency Grizzly Bear Committee 1998). Additionally, lower road densities would also benefit other wildlife and public resources. Lower road densities may result in lower maintenance costs that free up funding for other resource needs.
3. Motorized access management is only one of several factors influencing grizzly bear habitat and grizzly bear security. The presence of attractants is a major factor leading to the food conditioning and habituation, and the eventual direct mortality or management removal of grizzly bears. The Service supports the Forest's continued efforts to manage food storage. Management of garbage, food and livestock feed storage, to prevent access to bears, benefits grizzly bears as well as black bears and other carnivores. Human/carnivore interactions would also be reduced, leading to a public safety benefit.

REINITIATION NOTICE

This concludes consultation on the action outlined in your November 12, 2009 request for consultation on the effects of the Bozeman Municipal Watershed Fuel Reduction Project on the Bozeman Ranger District. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental is exceeded;
(2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your continued assistance in the conservation of endangered, threatened, and proposed species. If you have any questions or comments on this biological opinion, please contact Katrina Dixon or me at (406) 449-5225.

Sincerely,

For: R. Mark Wilson
Field Supervisor

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