

CHAPTER 4 - PREPARATION AND CONSULTATION

4.1 List of Contributors

The following Forest Service Employees participated in this analysis and are responsible for the preparation of this Environmental Assessment.

Allen, Walt - Gallatin National Forest/Archeologist
Anderson, Anna - Hebgen lake Ranger District/Fuels Specialist
Ballard, Tom - Gallatin National Forest/Archeology Asst.
Canfield, Jodie – Gallatin National Forest/Ecosystem Program Manager, Interim IDT Leader
Christiansen, Steve – Gallatin National Forest/Environmental Coordinator
Fusselman, Milton – Hebgen Lake Ranger District, Forester/Recreation and Special Uses
Hoffman, Tris – Hebgen Lake Ranger District/Rangeland Management Specialist
Jones, Fred – West Zone Fire Management Officer
Kempff, Jonathan - Gallatin National Forest/Transportation Planner
Lamont, Susan – Hebgen Lake Ranger District, Forester/Economic Analysis, Invasive Weeds, Livestock
Martell, Steve – Gallatin Forest Ecology Group/Sale Administrator
Novak, Mark - Gallatin Forest Ecology Group/Forest Silviculturist
Pils, Andrew – Hebgen Lake Ranger District, Assistant Ranger/Wildlife Biology & Sensitive Plants
Queen, Bill – Hebgen Lake Ranger District/District Ranger

Roberts, Bruce – Gallatin National Forest, West Zone Fisheries Biologist
Ruchman, Jane - Gallatin National Forest/Landscape Architect, Scenery
Schlenker, Kimberly – Gallatin National Forest, Wilderness, Recreation Program Manager/ Roadless
Seth, Teri – Gallatin National Forest, West Zone NEPA Team Leader
Shovic, Henry – Gallatin National Forest/Soil Scientist
Story, Mark – Gallatin National Forest/Hydrologist & Air Quality Specialist

4.2 Individuals, Organizations and Other Agencies Consulted

The following individuals, organizations and agencies provided comments or input for this proposal:

Greater Yellowstone Coalition, Patricia Dowd
Wild West Institute, Jeff Juel
Men at Work, Steve Schumaker
Native Ecosystems Council, Sara Jane Johnson
Osler Logging, Sharon Osler
R-Y Timber, Doug Hansen
Trout Unlimited
Montana Fish and Game, Craig Jourdanais

Adams, David, West Yellowstone, MT
Anderson, Blair, West Yellowstone, MT
Bauter, Rich, West Yellowstone, MT
Booth, Earl, West Yellowstone, MT
Caine, Linde, West Yellowstone, MT
Dunbar, Jan, West Yellowstone, MT
Garff, Bill, West Yellowstone, MT
Groth, Mike, West Yellowstone, MT
Hill, Rebecca, Boulder, Colorado
Hoffman, Carol, West Yellowstone, MT

Howard, Tom & Clair, West
Yellowstone, MT
Jacobsen, Charlotte, West Yellowstone,
MT
Lyon, Dorothy, West Yellowstone, MT
Lyon, Matthew, Gahanna Ohio
Maughan, Christine, West Richland,
WA
Mollinet, John, West Yellowstone, MT
Opheikens, Darrell, West Yellowstone,
MT
Povah, Pat, West Yellowstone, MT
Ryberg, Ed, West Yellowstone, MT
Ryberg, Steve, West Yellowstone, MT
Troy, Shelly, Missoula, MT
Watkins, Sharon, George and George III,
West Yellowstone, MT

4.3 Glossary and Definitions

Active Crown Fire: A **crown fire**, also called **running** and **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 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 Thin – trees that have commercial value would be thinned leaving 40-50% of the trees osietr for this project. Trees would be removed from the forest and used for commercial purposes.

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) wind speed at which **active crown fire** is possible for the specified **fire environment**.

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)

Fire-Adapted Ecosystem: An ecosystem 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, wind speed and direction, relative humidity, and slope steepness.

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.

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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 determine the ease of ignition and the resistance to control, also, 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 (IAA) (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 IAA 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 III 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
III	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 attacked 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 tonnes 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 buildup 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 farther 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, de-composing litter, buried logs, roots, and the below-surface portion of stumps. Compare with **surface fuels**.

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.

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 Thin: trees would be thinned using mechanical equipment to fell and/or move the trees to another location.

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.

Small tree thin: removal of trees generally less than 6 inches in diameter at breast height.

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 wind speed 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**.

Take: Pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb.” The definition of disturb was to “agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior (U.S. Fish & Wildlife Service 2007, page 2).”

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

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

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 wind speed to the open (6.1-m/20 ft.) wind speed. For

convenience of measurement, eye-level winds are usually substituted for midflame winds.

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