United States Department of the Interior
Bureau of Land Management
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Moon Creek/Swain Coulee Fire Hazard Abatement and Restoration Project Environmental Assessment

EA No. MT-020-2004-006

Current Condition in the Moon Creek fire area

Chapter 1.0: Purpose and Need

1.1 Introduction

In August 2003, the Moon Creek and Swain Coulee fires burned approximately 10,600 acres in Custer County, MT. The Moon Creek Fire burned approximately 3,100 acres of state, federal, and private land about 24 miles southwest of Miles City, MT (Township 4 North, Range 45 East, portions of sections 9, 10, 11, 12, 13, 14, 15, 16, 17, 22, 23, and 24). About 403 BLM-administered acres were burned.

The Swain Coulee Fire burned approximately 7,500 acres of state, federal, and private lands east of the Tongue River near Brandenberg, MT. Ashland, MT is located about 15 miles to the southwest. BLM portions of this fire are located in T1N, R45E, Sections 20, 26, 28, 30, 32, and 34. About 1,939 BLM-administered acres were burned.

The Miles City Field Office (MCFO) is proposing to apply mechanical treatment to these fire areas to reduce the fire hazard that would be created as standing dead burned trees fall to the ground, and to minimize impacts on future uses of the area. The MCFO is also proposing to treat unburned acres adjacent to the fire areas to reduce future fire hazard and promote recovery of hardwood draws within those areas by reducing unnatural conifer competition.

These fire areas and adjacent unburned acres are included in Moon Creek/Swain Coulee Fire Hazard Abatement and Restoration Project area. Figure 1 shows the location of the fire areas in relation to the County Roads that run through them (Beaver Creek County Road (Custer County Road 601) and the Moon Creek County Road).

1.1.1 Project Area Description

Moon Creek fire area: The project area includes all 403 BLM-administered burned acres in the west half of sections 14 and 24, and approximately 275 unburned acres in section 24.

Swain Coulee fire area: The project area includes approximately 1,847 of the 1,939 BLM-administered burned acres (sections 20, 28, 30, and 32). Approximately 458 unburned acres (sections 20 and 32) are also included.

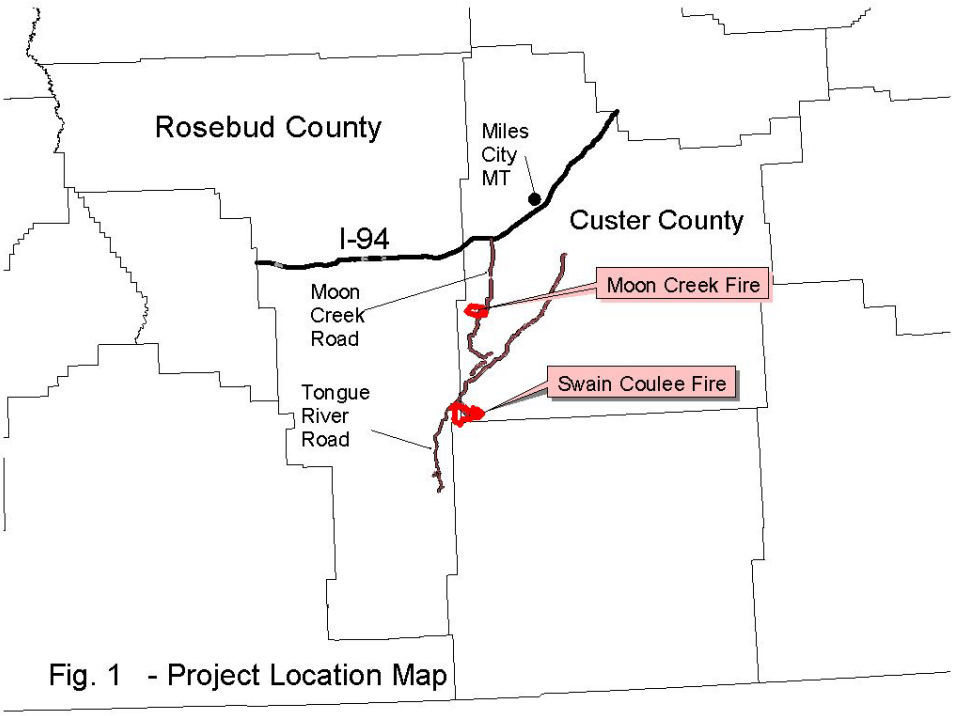

Fig. 1 - Project Location Map

Both fire areas are characterized by ponderosa pine (*Pinus ponderosa*) forest lands and Rocky Mountain Juniper (*Juniperous scopulorum*) woodlands. Silver sage and Mountain Big Sage shrub lands and mixed grasslands also occur in the area. Riparian (woody) draws that contain green ash (*Fraxinus pennsylvanica*), cottonwood (*Populus* spp) and chokecherry (*Prunus virginiana*) occur in all BLM parcels within the project area.

Both fire areas were classified from satellite imagery for burn severity ratings (see Table 1). The **Burned Area Reflectance Classification (BARC)** map classified the areas for High, Medium, or Low severity (See Appendix A for description of severity).

Table 1 **BARC Acres in the Moon Creek Project Sections**		
Unburned	300	44%
Low	107	16%
Medium	215	32%
High	61	9%
TOTAL	683	100%
BARC Acres in the Swain Coulee Project Sections		
Unburned	870	36%
Low	418	17%
Medium	978	41%
High	125	5%
TOTAL	2,391	100%

1.2 Current Condition:

Prior to the Moon Creek and Swain Coulee fires, all wildland fires had been successfully suppressed, and no trees had been removed from BLM-administered acres through timber sales or other projects. As a result, approximately 62 percent of the project forested area had medium to high tree densities at the time of the fires. The Swain Coulee and Moon Creek fires were intense, and tree mortality over most of the area was 95 percent or greater. Most dead trees in the medium to high density stands are currently standing; however, as these trees fall to the ground over the next 5-12 years, and fuel loadings will exceed 20-40 tons per acre of **Coarse Woody Debris**[1] (CWD). Fuel loading in excess of 25-30 tons per acre results in high fire hazard due to high resistance to control (Brown, Reidhardt, and Kramer 2003). These conditions were demonstrated during the Kraft Springs Fire in August 2002 (Sioux Ranger District, Custer National Forest), which **reburned** under similar CWD and fuel loading conditions (see photos 1 and 2). Additional detail on how this project relates to the Kraft Springs project is described in Chapter 3.0.

Future high fuel loadings also contribute to future high fire severity, with the potential for soil loss and damage. The 2003 fires burned with high fire severity on an average of 5 percent of the acres. These areas had less than 10 tons per acre of CWD prior to fires. Future high severity ratings would be likely in the vast majority of the forested areas, based on the amount of potential CWD in standing dead trees.

Excessive CWD (100 – 400 dead Trees Per Acre (TPA)) will also inhibit livestock and wildlife movement through the areas as standing dead trees fall to the ground. Fire-killed ponderosa pine typically has fall rates of 80 percent within 10 years.

The Moon Creek **Wildland Urban Interface** (WUI) is located near the Moon Creek fire perimeter. There are numerous homes and structures along the boundaries of the BLM parcels in sections 14 and 24.

[1] **Definitions are provided in the glossary for terms that appear in bold in the text**.

Photos 1 and 2: CWD from the Brewer fire before (left) and after (right) the Kraft Springs **reburn**

1.3 Project Objectives

- Reduce the long-term CWD fuel loading in medium to high density stands, from an estimated potential of 20-40 tons per acre to a range of 5 - 12 tons of CWD fuel per acre, where available. Accomplish this fuel reduction on 75% of the project landscape.
- Recover the economic value of fire killed commercial timber.
- Improve access to BLM lands for future management and/or public use.
- Improve water yields and forage production within the project area.
- Reduce short-term and long-term fire behavior and effects on unburned forest and woodland acres within the BLM project lands.
- Promote the recovery of green ash, chokecherry, and cottonwood in unburned hardwood draws

1.4 Desired Future Condition

- Less than 12 tons/acre of CWD are present on treated acres.
- Economic value of fire-killed timber has been recovered.
- Additional miles of road are safe and accessible for management and/or public use in sections that previously had no interior access.
- Cattle and wildlife are able to access 90 percent of the forest and woodland areas for grazing and foraging.
- Water yields and forage production are maintained at recovery levels.
- Forest is "fire-safe." Ground fire suppression tactics can manage fire behavior under average weather conditions:
  - Surface fuel conditions limit fire intensity
  - Forest stands are comprised of fire-tolerant ponderosa pine of variable sizes. Densities are close to the Historic Range of Variability (1-15 TPA on south and westerly aspects, 15-25 TPA (with some denser stands) on north and easterly aspects).
  - Low probability that fire will spread through the canopy.
  - Scattered individual juniper trees and some dense clumps are present on woodland sites.
- Hardwood draws are primarily composed of green ash, chokecherry, cottonwood. Ponderosa pine is absent or at minimal levels, and is not overtopping or shading out the hardwood species.

1.5 Need for Action

Action is needed to mitigate hazards, to expedite recovery, and to reduce the potential for future effects from stand-replacement fire in both burned and unburned sections, by achieving the project objectives and desired future conditions listed above.

1.6 Plan Conformance

The Powder River Resource Management Plan is an "issue-driven" plan that focused on Coal, Vegetation Utilization, Lands, and Wilderness. Decisions and analyses did not focus specifically on the forestry resource, except as it related to these four major issues.

Therefore, the determination that the project does conform to the plan is based on criteria that the plan provided for the soil, air, water, rangeland vegetation, and wildlife resources:

- This analysis constitutes the "project level planning" that considers "the significance of a proposed project and the sensitivity of soil, water and air resources." Section 2.2.2. of this EA includes "stipulations attached as needed to protect resources." The project allows for soils to be "managed to maintain productivity and minimize erosion". Water quality will be "maintained within state and federal standards" (summarized from Powder River ROD, p. 5).
- Management of the forestry resource on this site-specific project will provide for wildlife habitat, soils stabilization, and watershed, which were listed as key considerations in management of the forestry resources (Powder River ROD, p. 8).

In addition, removal of commercial and pre-commercial material is allowable for the purpose of reducing fuel loadings (Fire/Fuels Management EA/Plan Amendment for Montana and the Dakotas Decision Record, p. 2).

Chapter 2.0: Alternatives

2.1 No Action Alternative—BLM would not initiate organized fire hazard abatement or restoration activities within the project area. In 5-12 years, standing burned ponderosa pine would fall to and remain on the ground, resulting in 20-30 tons of CWD per acre on medium density sites (355 acres/33% of burned forest types) and 30-45 tons per acre on high density sites (319 acres/29% of burned forest types). Excessive fuel loadings for Safe Fire Behavior would remain on 62 percent of the burned project area acres.

Each resource program would initiate actions in response to the fire, including placing straw bale erosion structures on major drainages, monitoring for and treating noxious weeds, and felling individual "hazard" trees (i.e., those along fences and roads).

2.2 Hazard Abatement Alternative (Proposed Action): The following treatment types would be applied to reduce future fire danger and expedite vegetation recovery, using both commercial and non-commercial methods (see Appendix B for further description of treatment types):

2.2.1 Commercial Treatments

- Salvage Cutting (1,025 acres): In burned areas, dead and dying trees 9 inches or greater in diameter that meet merchantability standards would be felled and removed from the site through salvage harvest.
  - Dead and dying trees greater than 9 inches in diameter that do NOT meet merchantability standards would be left standing to provide snag habitat, if they are more than 10 feet tall, more than 75 feet from roads/fences, and do not create safety hazards during treatment.
  - Dead and dying trees less than 9 inches in diameter would remain on-site and would fall to the ground naturally over the next 8-12 years.
  - All live[1] trees would be left standing.
- Green treatment (293 acres):
  - Restoration Thinning: Stands would be moved back toward historical conditions (15-30 TPA). An average 20 foot spacing would be left between crowns (30-45 feet between tree boles); two to six of the leave trees per acre would be large (>10 inches DBH), and the rest would be small-medium (1-9 inches DBH) trees.
  - Fuel Breaks: Fuel breaks would be created along private property boundaries and county roads. Most trees would be removed from this 100-foot corridor. Exceptions would be large trees (>10 inch DBH) that would not hit the road, fences, or boundaries.
  - Hardwood Draw Restoration treatments (8 acres): Where riparian species such as cottonwood, green ash, chokecherry, and sumac exist in ephemeral draw bottoms, most conifers within 60-100 feet of these species would be removed. A few ponderosa pine and juniper may be left when needed for wildlife roost trees or bank stabilization.

2.2.2 Non-commercial Treatment

- Fuel breaks burned area: Fuel breaks 100 feet wide would be created along boundaries, fences, and roads. Trees less than 10 inches in diameter would be felled. About 40 percent of these trees would be left on site to meet CWD requirements; the rest would be hand piled and burned. Burned trees greater than 10 inches in diameter would be felled if they would hit fences, the road, or boundary lines adjacent to the fuel break.
- Fuel breaks unburned area: Trees less than 10 inches in diameter would be hand piled and burned. 1 – 5 larger trees (>10 inches) would be left per acre if they wouldn't hit the road, boundary, or a fence when felled.

[1] Live crown greater than or equal to 30 percent of the pre-fire crown length and less than 360 degree bole scorch indicates that tree will likely live

- Forest Products/Firewood Harvest: If the timber sale is not accomplished on any proposed treatment acres (due to wood borer insects, blue stain, etc.), then Forest Products and Firewood may be sold and removed from those acres. Forest products or firewood would not be available on any acres treated in a commercial timber sale to maintain the levels of CWD for other resource needs (see section 2.2.2). However, firewood could be sold from log landing decks or Fuel Breaks treatment areas.

See Figures 3 and 4 for treatment distributions.

2.2.3 Related/Support Activities: The miles of road and landing information are estimated totals that could be necessary for ground-based treatment. Fewer actual miles and less landing disturbance may be necessary, depending on the equipment used to implement the treatment.

- Road construction: Approximately 15 miles of road (4 at Moon Creek and 11 at Swain Coulee) would be constructed to implement the alternative (see Appendix B for locations). After treatment, approximately 6 miles of road (1.8 miles at Moon Creek and 4.2 miles at Swain Coulee) would left open (see Design Features 3 and 4 and Appendix B for locations).
- Slash piles/disposal: Excess small trees within the Shaded Fuel Break and Restoration Thinning treatment areas would be felled, piled and burned.
- Access:
  - On the Swain portion, BLM would acquire access on approximately 1.77 miles of trail on Brewer's private land in Section 29, in return for access for timber hauling across approximately 0.10 mile of BLM in section 30, subject to access provisions (see section 2.2.1, and Project File, Lands and Realty specialist report, pp. 4-6).
  - For the Moon Creek portion, A Land Use License would be obtained from the Eastern Montana DNRC so that timber could be hauled across state section 13.
- Anticipated maintenance treatments: Future prescribed fire or mechanical treatments would be necessary to maintain post-treatment densities.

2.2.4 Design Features: The following measures are included in the Proposed Action:

1. Skid trails would not be constructed on slopes over 30 percent.
2. Equipment would not operate on slopes over 40 percent, except on short lengths where approved by the BLM.
3. Temporary roads and landings would be reseeded, and water-barred when project is completed. Portions of temporary roads would be ripped prior to reseeding where the slope exceeds 7 percent, for 50 feet upslope of waterbars, and for 50 feet on either side of draws. An approved native seed mix would be used (certified weed seed free, at the appropriate pure live seed ratios, seeding rates, and applied at the appropriate time).
4. New roads left open would be bladed (if necessary), water-barred, and seeded.
5. Activities would be conducted when ground is frozen if possible.
6. Disturbance would be minimized. Total soil disturbance (roads, landings, constructed skid trails, and primary skid trails) would be limited to less than 15 percent of the total area.
7. Where available, the following amounts of CWD would be left in treated burned stands: 1-5 tons/acre in low density stands 5-8 tons/acre in medium density stands, and 7-12 tons/acre in high density stands.
8. Where available, 1 - 5 tons/acre of CWD would be left in unburned treated stands. Additional CWD would be contributed by the live stand.
9. Equipment would not be allowed in SMZs around the identified class 3 streams, except in marked crossings (see Project File, Hydrology, p.11).

10. Off-road harvesting equipment would be washed prior to entering the project area.
11. Measures to minimize disturbance in the vicinity of the Brandenberg eagle nest would be implemented as developed with USFWS (FWS, 2003).
12. Designated cultural sites would be avoided. If antiquities/cultural sites were discovered during treatment, operations would cease and the BLM Field Manager would be notified. The timber sale contract would reflect the Conditions of Approval developed to protect cultural resources (see Project File, Cultural, p. 2).
13. Raptor surveys would be accomplished starting in mid-March, prior to project implementation. Priority surveys would be in unburned treatment units, burned units will have minimum levels of survey. Appropriate mitigation measures would be implemented to avoid disturbance of nesting raptors. The Montana Final Statewide Oil and Gas EIS Standards would be used. The Field Office Manager may modify the standards based on site specific situations.

2.3 Alternatives Considered but not analyzed in Detail: The interdisciplinary team considered whether project objectives and Desired Future Conditions could be achieved using prescribed fire without mechanical pretreatment. That alternative was dropped from further consideration for the following reasons:

- The increasing fire hazard and safety risk to firefighters could not be mitigated in the short-term (0-7 years).
- It would be more difficult to control the amount of Coarse Woody Debris left on-site.
- Economic value of fire-killed timber would be lost.
- Additional grazing deferments would be necessary prior to and after the prescribed burn.
- Consumption of 20+ tons per acre of CWD with prescribed fire would cause excessive burn severity and corresponding soil damage.

Based on consultation and coordination with the public and public agencies, no unresolved conflicts concerning alternative uses of available resources have been identified that warrant consideration of additional alternatives; therefore, no other alternatives were identified. Three comments were submitted during the public scoping period; all indicated support for the project (see section 4.1).

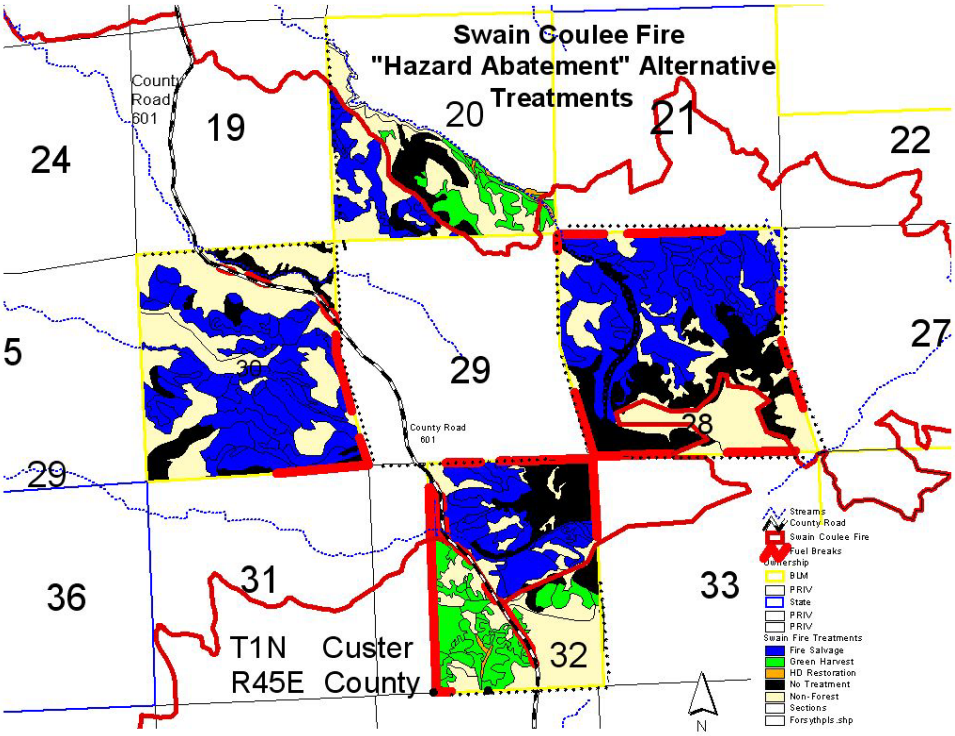

Figure 3: Treatments at Swain Coulee fire area, under Hazard Abatement Alternative

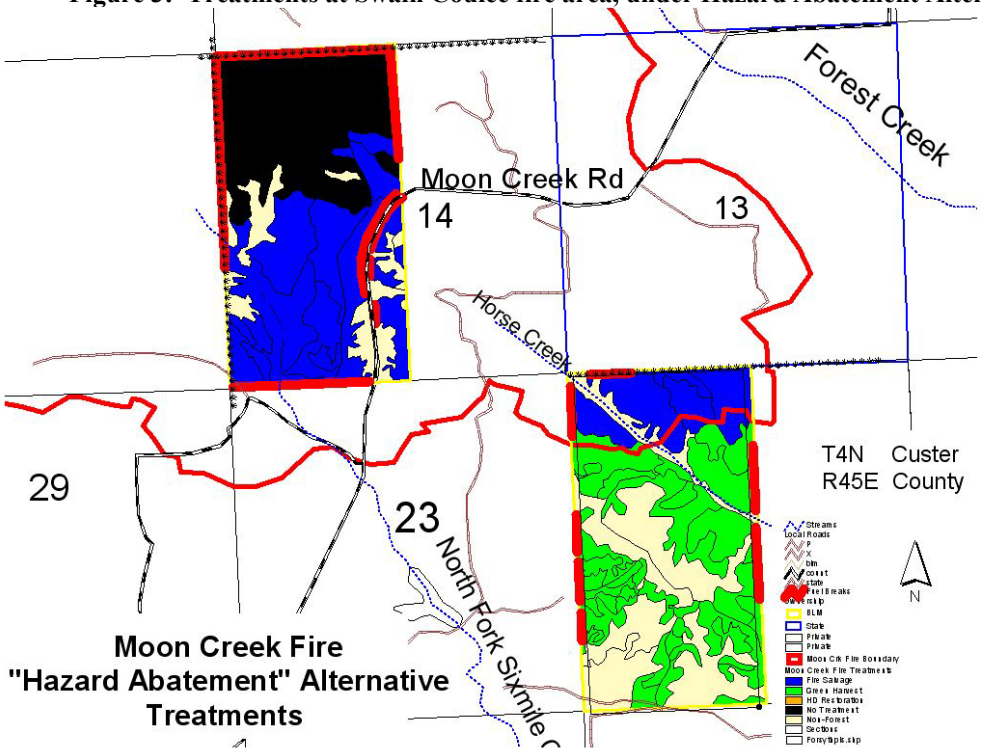

Figure 4: Treatment at Moon Creek fire area, under Hazard Abatement Alternative

Note: Treatment acreages and boundaries of treatment areas are based on the best available spatial information and may not precisely represent the project area. If the project is implemented, these acreages and boundaries would be adjusted as needed in response to on-the-ground characteristics.

Chapter 3: Affected Environment and Environmental Impacts

3.1 Introduction

As described in section 1.2, the Moon-Swain landscapes were very similar to the landscape within the Kraft Springs Fire Hazard Abatement and Restoration Project area. In addition, the post-fire conditions in the Moon-Swain project area are very similar to the conditions that were created by the Brewer Fire, prior to the Kraft Springs **reburn**. The Moon-Swain ID team referred to the Kraft Springs EA as they qualified the current condition of the Moon-Swain landscape and predicted effects if the area **reburns** in the future. Information and approaches used by the Forest Service Enterprise T.E.A.M.S. were instrumental in the development and analysis of this project.

3.1.1 Current and anticipated future related activities (Cumulative Actions)

At the current time, no active logging treatments are being conducted in the project area. Present activities include livestock grazing, wildland fire suppression, and recreational hunting. BLM is also planning to initiate emergency stabilization and rehabilitation activities in the area as described in the Swain Coulee and Moon Creek Emergency Stabilization and Rehabilitation Plans (DOI BLM 2003a and 2003b).

Two private landowners have indicated they are investigating the possibility of salvage cutting portions of their forestlands, and the State (MT DNRC) plans to harvest section 13 (adjacent to BLM section 24) and section 16 on the Moon Creek fire, and Section 36 on the Swain Coulee Fire.

3.1.2 Critical Elements of the Human Environment:

The project area does not include and would not affect the following Critical Elements of the Human Environment: Prime and unique farm lands, Floodplains, and Wild and Scenic Rivers. The areas do not meet the criteria for nomination as Wilderness, and BLM does not plan to nominate lands within the project area as Areas of Critical Environmental Concern (ACECs). There are no known hazardous or solid wastes existing within the project area, and any management activities would be conducted in compliance with Best Management Practices (BMPs).

As provided for under Environmental Justice, BLM considered all public input from persons or groups, regardless of age, race, income status or other social or economic characteristics. No disproportionate and adverse impacts or issues specific to minority or low-income populations were identified.

Air Quality, Water Quality (Surface and Ground), Native American Religious Concerns, Wetland/Riparian Zones, Cultural Resources, Invasive Non-Native Species, Threatened and Endangered Species, and Cultural Resources are addressed in sections 3.5, 3.5, 3.6, 3.8 and 3.9 of this chapter.

3.2 Forest Vegetation

Current Condition: Forty-five percent (1,282 acres of 2,830 project area acres) of the project area has forest cover, all of which is dominated by ponderosa pine (*Pinus ponderosa*). Seventeen percent of the area has upland woodland cover, dominated by Rocky Mountain Juniper (*Juniperous scopulorum*). Fourteen percent of the area is Scabland/Rock cover, dominated by herbaceous vegetation with scattered juniper and pine. Twenty-three percent of the project area is a grassland cover type.

Topography and elevations vary within the project area (2,900-3,320 feet on the Moon Creek portion and 2,960-3,700 feet on the Swain Coulee portion). Dense ponderosa pine stands generally occur on moist, north aspects with a mix of less dense ponderosa pine stands and grasslands on the drier, south aspects and benches. Draws within the project area contain green ash, chokecherry, and some cottonwood.

About 792 acres (62%) of the forest cover (1,282 total forested acres) was classified as High or Medium tree density, 37 percent as Low density, and 1 percent as sparse density.

Prior to the fires, naturally-occurring openings, ranging from 1 to 150 acres, were common across the project landscape. The Moon Creek and Swain Coulee fires removed over 95 percent of the forest cover with stand replacement fires. Extensive fire-caused openings now exist in addition to naturally occurring non-forest openings.

Fire intensity is estimated at 95 percent HIGH for forest and woodland burned acres (see Appendix A for description of Intensity). Complete loss of understory vegetative cover occurred within the high intensity burn areas. However, these areas contain organic material with evidence of residual basal and root presence (low and medium burn *severity*). In many cases some unburned organic material is present. Medium burn intensity areas include some "islands" of unburned vegetation; consumption of litter, shrubs, and understory vegetation was near complete in some of the areas due to drought conditions and low fuel moisture. Indirect tree mortality will continue for the next several years in some of the low and medium intensity burned areas due to crown scorch, bole injuries, and retention of heat under closed canopies that resulted in root damage. These conditions make individual trees much more susceptible to insect and disease attack.

Most of the burned areas are HIGH Intensity forested areas with limited or no conifer seed source available except when adjacent to unburned areas (see Project File, Forestry, p. 2). These areas will require long natural regeneration periods for trees. Minor pockets of LOW-MEDIUM Intensity and LOW-MEDIUM Severity burning may have some viable seed left in the soil and contain a few live trees that will provide some seed for regeneration.

Adjacent unburned juniper should be adequate for reestablishment assisted by birds and animals. There is a high probability that juniper will slowly re-colonize areas in the fire, and be within its historical range within several years.

Woody draws containing green ash and common chokecherry for the most part experienced HIGH intensity and HIGH Severity fires. Barring heavy pressure from livestock and big game, these woody draws should recover from the fire over the next 3 to 10 years. Green ash and chokecherry are already re-sprouting within the burned draws.

Western wheatgrass, prairie sandreed, and other species are also already beginning to recover. Regrowth of forbs and shrubs is minimal at this time. Vegetative communities would go through secondary succession as annual forbs colonize the site and are gradually replaced by grass species and some shrubs. Eventual landscape cover on range ecosites would be a mix of grasses, forbs, and shrubs. Life spans would be a mix of annuals, biennials, and perennials. Recovery will depend on precipitation levels and native herbivory utilization levels. Domestic livestock will be deferred from the burned areas for at least one growing season (DOI BLM 2003a and 2003b), which will help the plants to recover from the fire.

No current noxious weed infestations have been identified during site visits or conversations with landowners and county officials. Canada thistle, which is common after wildfires, is the primary concern.

Environmental Impacts: No Action Alternative:

- **Direct effects**: There would be no direct effects on forest vegetation in burned areas since fire-damaged trees would not be removed, and because the Moon Creek and Swain fires moved large, continuous blocks of forest cover to grass/forb/shrub growth stage, with little or no forest canopy remaining. Economic value of fire-killed timber would not be recovered. In unburned stands, tree vigor would not be improved, and expected fire behavior would not be mitigated (see section 3.3).

- **Indirect effects:** Large woody debris would remain on-site, and the unhealthy, overstocked condition of unburned forested areas would continue. Untreated stands would be susceptible to insect and disease. Herbaceous and shrub vegetation would recover and proceed through secondary succession towards the Potential Natural Community (see Project File, Understory Vegetation, p. 1). As standing dead trees fall to the ground, down CWD would kill herbaceous vegetation by direct contact with the soil or shading-out the vegetation. The amount of on-the-ground CWD would make noxious weed detection and control more difficult and expensive, since standard monitoring and control equipment (ATV-mounted sprayers) could not be used in medium and high-density stands (62 percent of the area). The extent and vigor of hardwood species such as green ash and chokecherry would continue to decline.

  If the area reburns, natural conifer regeneration would be lost, and CWD would burn hot and sterilize the soil. Annual forbs would follow the fire, and herbaceous perennials would not be able to grow until there is sufficient organic matter to support plant growth. Vegetative recovery from future fires may be slower than the recovery from the 2003 fires due to increased

fuel loads, higher expected intensities, and soil sterilization due to down fuels.

· **Cumulative impacts***:* Conditions on BLM lands (lack of fuel breaks, 25-40 tons of CWD over 62 percent of the area, overstocked unburned stands) would contribute to an increased potential for catastrophic wildland fire across the landscape.

Hazard Abatement Alternative (Proposed Action):

· **Direct effects**: Future CWD levels would be reduced to acceptable levels over 75 percent of the area. An estimated economic value of $30,000 to $52,500 would be recovered through salvage cutting, restoration thinning, and fuel break construction. No additional openings (other than those created by the fires) in the forested canopy would be created in burned areas because green trees would be left standing. In unburned stands, improved stand vigor and lower susceptibility to other disturbance events (such as insects and disease) would be direct effects of reducing tree densities. Stands would be moved back toward a historical density and structural state. Off-road harvesting equipment is not anticipated to introduce weed seeds from outside the area because design feature 10 would be followed. After treatment, the low, medium, and high density stands would be accessible with standard equipment for monitoring and weed control efforts. Monitoring would be conducted for three to five years after the logging is completed, and active weed management would be applied if any noxious weeds are found through monitoring, further reducing potential for noxious weed problems following treatment.

· **Indirect effects**: A new, even-aged stand of trees would be created by treating medium to high burn intensity acres with total stand modification (except those designated as wildlife snags or reserve trees). The ability to accomplish future management actions (e.g., mechanical thinning and prescribed fire) efficiently with minimum environmental impacts is an additional indirect effect of reducing CWD levels. Vegetative communities on range ecosites would make progress towards Potential Natural Community via secondary succession after CWD is removed. The areas may not reach PNC depending on the level of treatment. Even-aged stands of trees may compete with other vegetation. Vigor and production of herbaceous species would likely increase where green treatments (including restoration thinning and shaded fuel break) are applied to unburned stands, due to increased water yields (see Section 3.5) and reduction of overstory. Increased vigor and production would be most noticeable in areas where juniper overstory is reduced.

· **Cumulative impacts**: Completing fuels treatments on BLM lands, combined with likely fuels treatments on DNRC and private lands, reduces the potential cumulative impacts associated with wildland fire (as compared to the No Action alternative).

3.3 Fire and Fuels Management

Current Condition: The current condition is the result of the Moon Creek and Swain Coulee fires that burned the areas during August 2003. As described in sections 1.1 and 3.2, the Moon Creek and Swain Coulee fires burned with high severity on 5 and 9 percent (respectively) of the acres. Fire intensity was not mapped for the Moon Creek or Swain Coulee fires, but is estimated at 95 percent HIGH for burned acres (See Appendix A for intensity and severity definitions).

As described in section 1.2, the August 2003 fires entered the stands after a lack of low-intensity fire disturbance over the last 100 years. High or medium tree densities were present over 62 percent of the area. Forest structure exhibited increased tree density in the overstory, abundant tree regeneration in the understory, and a buildup of ground fuels (both larger diameter and litter layers) throughout the area. This successional pathway resulted in contiguous mid-aged/sized tree stands that were more prone to stand replacing fire because of increased fuel.

Environmental Impacts: No Action Alternative:

· **Indirect effects**: Standing dead trees would fall to the ground over the next 12 years, creating estimated fuel loadings of 20-40 tons per acre of CWD in medium to high density stands. Large fuels amounts and state of decay contribute to fire persistence (the ability for fire to remain burning on a site, even if current conditions are not conducive to fire spread), burnout time (the amount of time necessary to consume a piece of fuel of a certain diameter), and resistance to control (resistance to fireline construction efforts). Increased fire persistence, resistance to control, and burnout time negatively influence firefighter safety by hampering suppression

efforts and increasing firefighter exposure to environmental hazards. They also contribute to the development of large fires and high fire severity (Brown et al 2003).

Based on CWD fuel loadings of 12 to 30 tons/acre of CWD, fires would exhibit medium to high resistance to control if reburned (Brown et al., 2003). Brown et al. (2003) suggest that the resistance to control would extend and increase for approximately 60 years as large woody debris decays; there is a high probability that a **reburn** would occur over this time period. Given this fuel loading, the impacts of the re-burn would be similar to those that resulted from the Kraft Springs Fire (extreme fire behavior, resistance to control, intense soil heating, consumption of organic material, and sterilization of the soil and seed bank (USDA-FS, 2003)). The severity of such a fire would be much greater than that experienced during the original burn (USDA-FS, 2003).

Potential fire behavior in the unburned stands was modeled with the BEHAVE program, using the exact temperature, relative humidity, and windspeed recorded when the Moon Creek fire started in August 2003. Predicted flame lengths in fuel model 2 (timber grass and understory) ranged from 5.3 to 18.2 feet (see Project File, Fire/Fuels Management, pp. 3-4). At 5.3 feet, predicted flame lengths would exceed the capability of hand crews (Rothermel 1983). With flame lengths of 18.2 feet, no direct fire suppression method is effective. In fuel model 9 (timber litter), flame lengths are shorter (2.8-8.5 feet) than in fuel model 2, but rate of spread is much higher (see Project file, Fire and Fuels Management, pp. 4-5). The structures along the west side of Section 24, T4N, R45E, in the Moon Creek Wildland Urban Interface (WUI) would be susceptible to loss from wildland fire.

Hazard Abatement Alternative (Proposed Action):

- **Indirect effects**: The number of 10-inch diameter large woody debris would be reduced below the 10-20 pieces per acre cited by Brown (2003) as contributing to high and extreme resistance-to-control ratings when combined with 3-10 inch diameter CWD. Loadings would be comprised primarily of less-than-10 inch diameter CWD, and would range from 5-12 tons per acre in medium to high density burned stands. This post-treatment loading is within the 5-20 tons per acre "optimum range" of CWD for meeting resource needs in warm dry forest types (Brown et. al 2003), while being substantially less than the 25-30 tons per acre of large woody debris that contributes to high fire hazard (resistance to control, fire behavior) and the 40 tons per acre that contributes to excessive soil heating.

  Achieving crown spacing of at least 20 feet in unburned stands and locating fuel breaks along private property boundaries would improve ability to provide fire protection for homes, private property, and natural resources during future fires. Expected flame lengths on an average fire day would be within the capability of hand crews and equipment. Ability to enter the area with standard firefighting equipment would be improved.

3.4 Soils

Current Condition: In the Moon Creek area, 62 percent of the area is covered by the Cambert – cherry - cabba silt loams (12-25 percent slopes). These soils are moderately deep, deep and shallow soils with predominately moderate and slight potential erosion hazards. These soils commonly exist on a landscape continuum with the Cherry series on lesser slopes, Cambert series on moderately steep slopes and Cabba series on the steeper potions of this unit. These series cover much of the landscape in different complexes. Small acreages of sandy loams and clay loam exist in the Moon Creek area.

In the Swain area, Lamedeer – cabba - ringling complex (25 to 70 percent slopes) and Armells – cabbart - kirby complex (25 to 70 percent slopes) cover the largest acreage at 18 and 12 percent respectively. These units cover the steepest parts of the landscape and contain soils developed in clinker – the Lamedeer, Ringling, Armells and Kirby series which often cap ridge tops. These soils generally have severe erosion potential hazard. Other soil series in the area include complexes of sandy loams and clay loams.

On a general basis, soils have surface and subsurface textures of silt loam and fine sandy loam. Soils on steeper slopes have severe potential erosion hazard, and as slope decreases, potential erosion hazard decreases. Generally soils have low surface organic matter content. Soil depths vary from deep on lesser slopes to shallow and very shallow on steeper slopes. Soils are generally productive, though this varies with texture, slope and other characteristics.

Environmental Impacts: No Action Alternative: Effects under the No Action alternative are associated with the amount of CWD left on-site.

- **Indirect effects**: Leaving higher fuel levels in CWD on the surface would create long-term high fire risk and potential for high severity fire. Increased heat severity beneath CWD (areas already void of organic and duff layers) would result in undesirable levels of soil heating, loss of productivity, and soil erosion. The degree of effect would depend on amounts of CWD.

  Soil nutrient loss from fires can occur through oxidation or volatilization of compounds, convection of ash particles, increased leaching losses, and acceleration of erosion (Christensen 1993). However, post fire fertility may be increased with biochemical changes in the soil (Christensen 1993). Waldrop et al. (1987) concluded that fires may increase available phosphorus, exchangeable calcium, amount of organic matter in mineral soils, and that nitrogen is not reduced due to post-burn propagation of nitrogen fixing plant species.

  Infiltration may be decreased and run-off and sediment yield may be increased by fires (Robichaud and Waldrop 1994). Loss of surface organic matter and debris from fire may result in reduced water holding capacity and increased soil erosion by wind and water. An increase in erosion due to raindrop splash and overland flow of water is possible. Soil biota may be decreased or eliminated in the soil surface depending on intensity of the fire. Additional **indirect effects** occur from nutrient release back to the soils by decomposition. A more productive and diverse vegetative cover as a result of the fire would provide for greater soil protection from erosion and benefit soil health.

Hazard Abatement Alternative (Proposed Action):

- **Direct effects**: Movement of water and air through the soil in would be reduced in areas compacted by treatment, and soil would be exposed to wind and water erosion in disturbed areas. Compaction would be localized in areas of equipment use, and would be limited if ground is frozen at time of treatment. Building temporary roads and improving existing roads to access treatment areas would compact soils and expose soils to wind and water erosion. Compaction on temporary roads would be released by ripping, and erosion would be minimized by reseeding. With successful rehabilitation, soil health and erosion in these areas would return to natural conditions, except where increased recreational traffic causes increased compaction and disturbance on remaining improved roads. Manual treatment would result in less compaction and disturbance, in degree and areal extent. Loss of nutrients and exposure of more soil surface to raindrop impact would be **direct effects** of removing trees from the site.

- **Indirect effects**: Monitoring vehicles could cause additional compaction and disturbance.

3.5 Hydrology

Current Condition: Nine stream reaches within the project area are considered Class III as described in the *Montana Guide to the Streamside Management Zone Law and Rules* (MT DNRC 1995)(http://data.opi.state.mt.us/bills/mca_toc/77_5_3.htm). The rest of the streams are considered "ephemeral" under the SMZ law (see Project File, Hydrology Technical Report, Figures 9-14 on pp. 21-23). These stream classifications were confirmed by the MT DNRC Eastern Land Office State Service Forester during an on-site visit (Pileski, 2003). There are no indigenous fisheries, and none of the streams affected by this action are listed on Montana Department of Environmental Quality's (DEQ's) list for impaired streams under the Clean Water Act.

Environmental Impacts: Under both alternatives, impacts on surface and ground water would be related to soil loss and eventual input into streams. Soil loss impacts area based on characteristics of representative sites, as input into the Revised Universal Soil Loss Equation (RUSLE) (See Project File, Hydrology Report, p. 7-13).

No Action Alternative: Effects under the No Action would come from soil loss from the fires.

- **Direct effects**: Potential soils loss of 12.43-13.24 tons/acre/year for burned sites, and 5.81 tons/acre/year from unburned sites. These erosion rates would not likely cause noticeable impacts to surface water. Increased groundwater levels would be anticipated unless medium to high tree densities re-establish.

- **Indirect effects**: Allowing 20-40 tons/acre of CWD to remain on-site creates potential for future high intensity, high severity wildland fire on 792 acres. As described in Section 3.3, the severity of a reburn would be much greater than that experienced during the original burn (USFS, 2003). Such a reburn would require several

years for vegetation to become reestablished, and in the interim high levels of soil erosion could occur.

Hazard Abatement Alternative (Proposed Action): Effects under the proposed action would come from disturbance to soils during treatment.

- **Direct effects**: If 15 percent of the existing vegetation is lost due to disturbance from roads, constructed skid trails, primary skid trails, and landings (see Design Feature 6), vegetation would cover only 8.5% of the area as opposed to 10% of the area under the No Action alternative. Potential soil loss associated with treatment would range from 12.64-13.46 tons/acre/year in burned treatment units, and 5.99 tons/year in the unburned treatment units. Increases of this magnitude would not cause noticeable impacts, particularly since the nearest perennial stream is 1.75 miles from the treatment units.

- **Indirect effects***:* Groundwater levels would increase in the long-term, and the threat of high severity wildfire would be reduced.

3.6 Air Quality

Current Condition: Air quality is excellent in these areas because of sparse population and limited industrial activity. These areas have a Prevention of Significant Deterioration Class II air quality rating under the Clean Air Act of 1977. This classification allows deterioration associated with moderate development and population growth.

The nearest federal PSD Class I areas are: the Northern Cheyenne Indian Reservation (60 miles southwest), UL Bend Wilderness (130 miles northwest), Yellowstone National Park (200 miles southwest), and Gates of the Mountain Wilderness (260 miles northwest).

The nearest designated non-attainment areas are: Lame Deer (50 miles southwest), Billings and Laurel (100 miles southwest), Great Falls (260 miles northwest), East Helena (280 miles northwest).

Environmental Impacts: No Action Alternative:

- **Direct Effects**: Impacts to air quality would include combustion engine emissions and fugitive dust from vehicle use on roads and for agricultural practices. Carbon presently sequestered in trees would be released and increase atmospheric carbon.

- **Indirect Effects**: If the areas reburn, fires may be more intense due to the increased fuel load from downed trees. Impacts to air quality from gaseous emissions and particulate matter may be greater than the recent fires. This impact would be short term, having no lasting effect to the air quality of the region.

Hazard Abatement Alternative (Proposed Action):

- **Direct effects**: Treatment may cause increases in fugitive dust and combustion engine emissions generated by manual and mechanical treatment methods. Impacts to air quality would be temporary, small in scale, and quickly dispersed. Carbon sequestered in trees removed from the site would not be released to the atmosphere.

  When piles are burned, BLM would comply with individual state and local smoke management programs. Direct and cumulative impacts such as smoke accumulation and pollutant emission may occur, but would be limited through coordination with the Montana/Idaho Executive Airshed Board, which conducts formal coordination and scientific weather monitoring and recommends any necessary restrictions.

- **Indirect effects**: Protection to soils would be reduced (in disturbed areas) following treatment which may result in increased wind erosion and an increase in local dust levels. Once vegetation is re-established, dust levels would return to natural conditions. Woody material left on site may increase atmospheric carbon through decomposition.

- **Cumulative impacts**: If cumulative impacts would potentially violate air quality standards, burns would not be conducted until conditions improve. Established procedures would be used to avoid exceeding ambient air quality standards or degrading air quality in Federal Class I or designated non-attainment areas.

3.7 Wildlife

Current Condition: Topography, elevations, and plant community compositions within the project area are described in section 3.2. This type of landscape and wildlife habitat covers thousands of acres in southeast Montana. The acres burned have been lost as feeding and nesting habitat forest wildlife dependent on dense, structured late successional conditions (e.g., black bear).

No breeding bird or wildlife surveys have been performed, and none are being performed for this analysis. Wildlife information is based on direct observations and sign identifications made during several post-fire evaluations of the burn areas, and on contracted bird surveys from 2002 and 2003. Species using the area likely include mule deer, pronghorn antelope, elk, coyote, badger, raccoon, porcupine, black bear, sharp-tailed grouse, sage grouse, turkeys, black-backed woodpecker, mourning dove, western meadowlark, western kingbird, and American kestrel. It is expected that species identified in land bird surveys in other similar habitat types would have existed within the Swain and Moon Creek habitats prior to the fire.

Two BLM-contracted bird transect surveys were completed near the project area in 2002 and 2003. The H S School transect is located halfway between both burns, just west of the Tongue River in T.3N., R.45E, Section 35. The species encountered on this transect are typical for the habitat and are displayed in Table 2. The Jack Creek transect is located several miles east of both burns in T.4N., R.48E., Section 30. Table 3 shows the species encountered at this transect in 2002. The 2003 data is not yet available.

When regenerated (120-150 years), this area would provide habitat for animals requiring mature trees. In the meantime, small rodent and rabbit populations are expected to increase in the grassland openings, especially under dead/down material. Early succession wildlife species are also anticipated to increase. Numerous species of "dark loving" beetles, including bark beetles and woodborers, are attracted to recently-burned forests to mate and lay eggs beneath the blackened bark. These beetles are typically followed by insect-loving birds such as mountain bluebirds, robins, and black-backed woodpeckers. Caton (1996) concluded that black-backed woodpeckers occupy burns for one to six years following the burn, with peak densities occurring at three and four years post burn. This corresponds to the timeframe that bark beetles and woodborers are present in the highest densities (DeNitto *et al*. 2000).

Larger animals, such as mule deer, pronghorn antelope, black bears, and birds of prey were displaced from the area during the fire. The burned areas will offer suitable (and highly sought-after) foraging habitat, but will not provide suitable thermal and hiding habitat for many years. Animals dependent on the areas that burned have dispersed to suitable adjacent habitat. These animals may choose to return to the burned area; shortly after the fires were out, three mule deer does were observed bedded down on a steep slope in an area that burned intensely.

USFWS lists six threatened, endangered, or candidate species as occurring (or being likely to occur) in Custer, Powder River, and Rosebud counties, the counties that converge at the fires (see Project File, Wildlife, p. 3). The bald eagle is the only species likely to inhabit the area. There is an historic bald eagle nest in T. 1 N., R. 44 E., Section 11, about three miles from the project site (MT Natural Heritage Program Database).

Environmental Impacts: All species likely to use the project area occur over a geographical area encompassing several states. Because their distribution is so large, their viability is not tied to actions occurring on such a small portion of their natural range as the Moon Creek/Swain Coulee fire hazard abatement and restoration project Area. Adverse impacts occurring within the project area are assessed to identify any contributions to problems in species viability over time.

Environmental Impacts: No Action Alternative:

- **Indirect Effects:** As standing dead trees fall to the ground over the next 5-12 years, early successional forage would become less and less available to large foraging animals (including livestock). These conditions would likely lead to a catastrophic fire similar to the Kraft Springs fire in 2002, which burned over the 1988 Brewer fire (refer to photos 1 and 2 on page 2). Habitat recovery after fire this intense and severe would be very slow. Consequently, plant and animal species associated with all successional stages, from the early grass/forb/shrub stage to the mature forest stage, would be set back as a result of the reburn.

- **Cumulative impacts:** Implementation of this alternative would be expected to produce the fewest short-term adverse impacts to all species because there would be no human related activities and noise. However, it would leave habitat within the project area in the poorest condition for most species. Cumulative impacts on wildlife in the area would be minimal, because of the relatively small size of the project area in relation to the abundance of similar adjacent habitat throughout southeastern Montana.

Table 2 H S School Bird Transect, 2002	
Bird Species Present	Number Observed
Mourning Dove	2
Merlin	1
American Goldfinch	1
Ring-necked Pheasant	2
Black-billed Magpie	2
Brewer's Blackbird	14
Western Meadowlark	58
Vesper Sparrow	5
Savannah Sparrow	1
Rock Wren	1
Loggerhead shrike	4
Brown-headed Cowbird	1
Lark Sparrow	4
Lark Bunting	1
Western Kingbird	2
Killdeer	1
Red-winged Blackbird	1
European Starling	1

Table 3 Jack Creek Bird Transect, 2002	
Bird Species Present	Number Observed
Mourning Dove	2
Western Wood-Pewee	1
Common Grackle	3
Say's Phoebe	1
Black-billed Magpie	1
Brewer's Sparrow	14
Western Meadowlark	45
Vesper Sparrow	1
Rock Wren	9
Killdeer	1
Rufous-sided Spotted) Towhee	2
Brown-headed Cowbird	4
Lark Sparrow	21
Lark Bunting	2
Brewer's Blackbird	3
Field Sparrow	13

Hazard Abatement Alternative (Proposed Action):

- **Direct effects:** Animals that choose to return to the burned area could be displaced to adjacent habitats while treatments are being applied. This would be short-term, and because of a general lack of forage and cover within the burned areas, few large, mobile animals would be affected during the winter.

  The project may affect, but is not likely to adversely affect, the bald eagle. No effect is anticipated to the other five listed or candidate species that may occur in Rosebud, Treasure, and Custer Counties (see Project File, Letter to USFWS, and US FWS Letter of Concurrence).

- **Indirect Effects**: The potential for future catastrophic fire would be reduced. Large foraging animals (mule deer, pronghorn, elk, and livestock) would also have better access to the early successional forage throughout the burn. Leaving snags would allow perches for birds that prey on rodents and cavity trees for cavity nesting birds. Progression toward ponderosa pine/juniper woodland would not be substantially different than the timeframe under the No Action alternative (120-150 years). In the interim, wildfires that do occur in the project area should be less intense and severe. These conditions would benefit many more wildlife species than would the No Action Alternative.

3.8 Livestock Grazing

Current Condition: The Swain portion of the project area includes four allotments (Table 4) permitted for 1,315 AUMs (Animal Unit Months). One allotment located in the Moon Creek Fire (Table 5) is permitted for 216 AUMs. All allotments are cattle (cow/calf) permits. Miller Creek is also permitted for horse.

Livestock grazing will not be allowed on BLM-administered burned acres for at least one growing season (DOI BLM 2003a AND 2003b). If conditions warrant, grazing may be authorized after an inspection of the BLM lands. Complete recovery will be dependent upon pre-existing ground conditions and precipitation events.

Environmental Impacts: No Action Alternative:

- **Indirect effects:** As standing dead trees fall to the ground over the next 12 years, forage would become more difficult for livestock to access. After all trees are on the ground, large animal movements may be impeded by the downed CWD. Forage would be reduced in the long-term. In addition, downed CWD would kill vegetation underneath by direct contact with the soil or shading-out vegetation. After all the snags have fallen, an estimated 97 acres would be inaccessible in the Moon Creek fire and 425 acres would be inaccessible in the Swain Coulee fire.

Table 4: Allotments, acreages, and AUMs affected by the 2003 Swain Coulee Fire
Information from BLM permits, tabsheets, and fire maps

Allotment Name	Acres	Authorized AUMs	Affected AUMs	S&G information
Flowers	2163 total 640 BLM	115	115*	Will be assessed before 2006. Condition to be maintained
Searcy-Ball Unit	23019 total 1442 BLM 1280 State	182	0 BLM	Assessed in 1999 & met standards. Condition to be maintained
Diamond R Creek Unit	6678 total 1176 BLM	300	300	Assessed in 1999 & met standards. Condition to be maintained
Liscomb Creek	46216 total 3812 BLM	718	0 BLM**	Assessed in 1999 & met standards. Condition to be maintained
* Partial AUMs could be used (unburned) if livestock are contained on unburned portion with electric fence. ** BLM acreage was burned in the fire, however, the portions burned was insignificant				

Table 5 : Allotment, acreage, and AUMs affected by the 2003 Moon Creek Fire
Information from BLM permits, tabsheets, and fire maps

Allotment Name	Acres	Authorized AUMs	Affected AUMs	S&G information
Miller Creek	6039 total 1239 BLM	216	117*	Assessed in 2000 & met standards. Custodial allotment.
* Partial AUMs could be used (unburned) if livestock are contained on unburned portion with electric fence.				

This loss of vegetation would impact the livestock producers and may result in a request to the BLM to adjust the preference.

Hazard Abatement Alternative (Proposed Action):

- **Direct Effects**: A temporary loss of forage may result from the temporary roads, skid trails, and landings. Recovery actions (ripping and seeding) on those areas would reduce any forage loss. However, those areas shouldn't affect livestock operations because livestock will not be in the allotments during activities.

- **Indirect Effects**: Ecosites would improve over the long-term as plant species recover under reduced fuel loading. Removing dead trees would reduce the fuels for future fires and improve livestock movement within the project areas. Vegetation in the affected ecosites would make progress towards the potential natural community for the area, providing for an increase in forage production for livestock and wildlife species. Untreated burned areas may be inaccessible to large animals due to high concentrations of downed CWD (estimated at 39 acres in the Moon Creek fire and 82 acres in the Swain Coulee fire). BLM does not anticipate the need to alter grazing preferences as a result of downed CWD in these areas.

3.9 Visual Resources

Current Condition: There is no VRM classification of the project area. The characteristic landscape is rolling hills, timbered with ponderosa pine.

Environmental Impacts: No Action Alternative:

- There would be no **direct** or **indirect effects** because no treatments would be applied.

Hazard Abatement Alternative (Proposed Action):

- **Direct Effects**: Treatment would cause the loss of standing dead trees and presence of new roads would be direct effects of treatment. However, the impacts are short-term as these are temporary short-term changes to the landscape, and as herbaceous vegetation re-establishes, visual impacts from stumps, skid trails, and roads would be eliminated.

3.10 Lands and Realty

Current Condition: The Moon Creek portion of the project area includes two BLM-administered ½ sections (sections 14 and 24). Access from Miles City is via Interstate 94 and the Moon Creek Road. Three BLM-authorized rights-of-way (ROWs) cross the project area (Custer County R.S. 2477 Road ROW, Range Telephone Coop. buried telephone line ROW, and Tongue River Electric Coop, overhead powerline ROW in Section 14) (See Project File, Lands and Realty, p. 1).

The affected tracts of BLM-administered land in the Swain portion are Section 20, Section 28, Section 30, and Section 32. Access from Miles City is via Highway 59 (Broadus Highway) and

the Tongue River Road (Road 332) and the Beaver Creek County Road (Custer County Road 601). The following BLM-authorized ROWs cross Section 30 and Section 32: Custer County R.S. 2477 Road ROW in Sections 30 and 32, and Garold Spire access road ROW in Section 32. E (See Project File, Lands and Realty, p. 4).

Environmental Impacts: No Action Alternative:
Indirect effects of not reducing fuel loads include potential damage to the utility ROWs in the Moon Creek Project Area, especially the overhead powerline, and adjacent land owners' property in both project areas, by future high intensity, high severity wildfire.

Hazard Abatement Alternative (Proposed Action):
- **Direct Effects:** Additional heavy truck traffic and possible damage from logging trucks would be direct effects on the Custer County Road right-of-way in both project areas. However, future fire danger and associated threats to utility ROWs and adjacent landowner property would be reduced.

3.11 Cultural Resources

Current Condition: Of the approximately 2,830 acres of the project area approximately 2,000 acres has been subjected to a cultural resource survey conducted on the project's Area of Potential Effect. Surveys were conducted for cultural resources in 2003 (see inventory report number: MT-020-04-046). Within the project area, all of the proposed roads were subjected to Class III surveys for cultural resources, including the road through Section 19 on private surface. Surveys also included all the landing areas (approximately 15 miles of road = approximately 182 acres of roads surveyed). In addition, generally those areas with slopes of less than 30% were also surveyed for cultural resources in areas where timber salvage harvest activities would occur. This included all fairly flat to level areas and gentle slopes along the bottoms at the base of the steep timbered slopes, as well as the flat ridge tops areas on those ridge tops where roads will be constructed to allow access to the ridge tops for timber harvesting purposes. These areas were surveyed for cultural resources.

Areas not surveyed within the project area include portions of those areas where there is to be no proposed treatment and portions of the non-forested areas (areas where there is no timber to harvest or where timber harvest activities are not likely to occur). Generally, slopes of over 30 percent were not surveyed for cultural resources as cultural resource values are generally scarce to not present on steep slopes of over 40 percent grade. These are the areas where timber is most dense and where harvest activities would most likely occur.

As a result of the cultural resource surveys, 14 cultural resource sites were identified within the project area, two sites each in Sections 20 and 32 in the Swain Coulee project area and 10 sites in Section 14 in the Moon Creek project area. These sites were located and recorded during cultural resource inventories of the project area.

Environmental Impacts: No Action Alternative: No impacts are anticipated to occur to cultural resources as a result of the selection and implementation of the No Action alternative.

Hazard Abatement Alternative (Proposed Action):
- **Direct effects:** The surface disturbing activities of the proposed action, road and landing area construction and the use of skid trails, have the potential to cause impacts to cultural resources. The cultural resources inventory process attempts to identify previously unknown cultural resource values within the project's Area of Potential Effect prior to their being impacted, disturbed or destroyed by the proposed undertaking.

  To mitigate potential impacts to cultural resources, the 14 identified cultural resource sites would be avoided through project redesign or relocation. In this case, roads, landing areas, and skid trails that have the potential to impact cultural resources will be redesigned to avoid these site areas. As a result, no sites considered eligible for the National Register of Historic Places would be impacted or affected by the proposed action.

- **Indirect effects**: Indirect Effects could consist of artifact collect and site vandalism as a result of increased access to the site areas as a result of the road construction accessing inaccessible back country areas. The short duration of the project activity in any one area and that most of the proposed roads will be reclaimed after use will help mitigate potential impacts of these indirect effects. Implementation of attached Conditions of Approval will also help contribute to lessening potential impacts of direct and indirect effects.

· **Cumulative impacts***:* There would likely be no cumulative impacts or long term affects to cultural resources as a result of the proposed undertaking with the implementation of the above proposed mitigation measures.

3.12 Paleontological Resources

Current Condition: The proposed project areas are located within the Tongue River member of the Fort Union Formation. The Fort Union Formation contains a wide variety of plant fossils representing streamside swamp, bottomland and riparian community environmental zones. The formation also contains channel filling formations of well established river courses containing a abundance of freshwater clams and snails. However, most of the significant fossils (turtles, fish, retiles, mammals) are found in the lower Tullock member of the Fort Union Formation.

Environmental Impacts: No Action Alternative:

· No impacts are anticipated to occur to paleontological resources as a result of the selection and implementation of the No Action alternative.

Hazard Abatement Alternative (Proposed Action):

· **Direct effects**: No impacts are anticipated to occur to cultural resources as a result of the selection and implementation of the preferred Hazard Abatement alternative as the geologic formation within which the undertaking will occur does not generally contain significant plant or vertebrate fossils.

3.13 Recreation

Current Condition: The areas are primarily used seasonally by sportsmen for hunting. There are very few roads within the project area BLM parcels. Sections 20 and 30 in the Swain Fire have a few "two-track" roads. Graveled county roads pass through Section 14 in the Moon Creek Fire, and sections 30 and 32 in the Swain Fire.

Environmental Impacts: No Action Alternative:

· There are no anticipated direct, indirect, or Cumulative impacts on seasonal access to or use of the area for hunting.

Hazard Abatement Alternative (Proposed Action):

· **Direct Effects**: The ability to use the area for seasonal hunting is not likely to be affected. However, additional interior roads would be available to recreationists in sections 30 and 32 at Swain Coulee and in section 14 at Moon Creek.

Chapter 4.0
Consultation and Coordination

4.1 Public Involvement and persons consulted

The beginning of the project planning process and the date/location of an informational public meeting was announced in newspapers and radio announcements (9/22/03 and 9/23/03). Over 40 letters were also sent to potentially affected/interested public land (9/17/03). One member of the public attended the informational public meeting on September 23, 2003.

BLM resource specialists coordinated with the following members of the public and state/federal agency specialists:

- Chris Pileski, State Service Forester, Eastern Montana Land Office (site visit on 10-3-03)
- Lou Hanebury and Katrina Dixon, US Fish and Wildlife Service (Informal Section 7 Consultation)
- Tom Reid, Montana DEQ
- Mr. Dick Brewer, private landowner
- Mr. J. Currie Colvin, private landowner
- George Foley, District Ranger, John Clark, Forest Timber Management Officer—Presented a summary of the Kraft Springs EA process and picture tour of Kraft Springs fire to the IDT (9/10/03).
- Enterprise T.E.A.M.S. USDA Forest Service

Two citizens and one industry representative submitted scoping comments by September 30, 2003. All comments indicated support for the project, and no concerns were identified. Substantive portions of the comments are included below:

- "The meeting was very helpful in explaining wildfire threats and preventive measures I can take to help combat future wildfires."
- "As the persons most affected by this fire I feel like harvest as much fire kill as possible. Section 31 has some potential harvestable timber. Clean up as much as possible. Remove whole tree and limb and top all trees in a location where all slash can be burned not left on the ground to rot or become more fire hazard later on."
- "We strongly support the proposed action. The burned trees are in 'urgent' need of harvesting 'before' insect activity and blue-stain reduces the marketability—immediate action is critical. We agree to treat the green timber within and adjacent to the burned acres is logical at this time. Reduction in basal area density will decrease the likelihood of future uncontrolled wildfires."

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Glossary

BARC map—A Burned Area Reflectance Classification (BARC) is a satellite derived map of postfire condition. The BARC has four classes: high, moderate, low and unburned. The BARC classification is mostly an "environmental severity" classification, something a soil scientist would use to focus rehab efforts to mitigate problem areas. It is not necessarily a severity or intensity rating for dead trees per se.

BARC maps are made by comparing satellite near infrared reflectance values to satellite mid infrared reflectance values. Here's how it works: (This example is based on Landsat data in forested ecosystems since this is a common situation.)

- Near infrared light is largely reflected by healthy green vegetation. Landsat band four measures near infrared light. That means that band four values will be very high in areas of healthy green vegetation and low in areas where there is little vegetation.
- Mid infrared light is largely reflected by rock and bare soil. Landsat band seven measures mid infrared light. That means that band seven values will be very high in bare, rocky areas with little vegetation and low in areas of healthy green vegetation.

Landsat data collected over a forest in a pre-fire condition will have very high band four values and very low band seven values. Landsat data collected over a forest after a fire will have very low band four values and very high band seven values.

It is the relationship between these two bands that BARC mapping attempts to exploit. The best way to do this is to measure the relationship between these bands prior to the fire and then measure them again after the fire. The areas where that relationship has changed the most are the ones that are most likely to be severely burned. The areas where that relationship has changed little are likely to be unburned or very lightly burned.

Coarse Woody Debris— Coarse woody debris (CWD) is defined by Graham, et. al. 1994 as woody material greater than 3 inches in diameter. It is a major component of forests and has many functions ranging from soil protection to wildlife and microbial habitat. The management of large woody debris helps maintain ecosystem function. Snag retention is a management tool that benefits this function.

Coarse woody debris performs many physical, chemical, and biological functions in forest ecosystems. It protects the forest floor and mineral soil from erosion and mechanical disturbances and protects new seedlings from livestock damage. Coarse woody debris is a key habitat component (especially large logs) for wildlife and is important to stream ecology. Large woody debris alters airflow and provides shade, insulation, and protection for new forest growth. Ponderosa pine studies have recommended that approximately 10 to 15 tons per acre should be maintained under healthy (unburned) forest conditions (Graham, et. al., 1994).

When coarse woody debris decays it retains water, making moisture available to vegetation during dry periods. When buried in the forest floor, large woody debris is an excellent host for ectomycorrhizal root tips. Even though this debris is a small portion of the forest soil, it contains the majority of the ectomycorrhizae. Ectomycorrhizae help woody plants take up water and nutrients, and their fruiting bodies play important roles in the food chains of small rodents and larger predators.

Cumulative Impacts—Impacts that result from the incremental impact of an action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Direct Effects—Effects that are caused by an action and occur at the same time and place (40 CFR 1508.8).

Indirect Effects: Effects that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems) (40 CFR 1508.8).

Reburn—When falldown of an old, burned forest contributes significantly to the fire behavior and fire effects of the next fire (Brown 2003).

Shaded Fuel Break—Areas of long-term high fire resiliency where fire will not move through tree crowns because they are spaced a minimum of 30 feet apart.

VRM Class III areas – The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

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

Appendix A
Description of Burn Intensity and Severity

Burn Intensity: This is the effect of fire on vegetation. The degree of burn intensity depends on litter and duff depth, slope, burning conditions, and fuels. It generally relates to the proportion of vegetation blackened or consumed. Intensity affects residual ground cover, hydrologic calculations, hydrophobicity of the ash layer, regrowth of surface-seeded grasses, and regrowth of trees dependent on cone-based seeds.

- **HIGH** burn **intensity**: Wildfire produced intense heat that blackened greater than 90% of all trees and consumed all ground vegetation; some black needles occur in the ash; remnants of cones, needles and grass crowns occur in the ash layer. Many crowns have brown needles; small fuels (branches, needles, shrub stems) remain, but are blackened. All surface plants are dead. Standing burned trees are blackened and snags are charcoaled
- **MEDIUM** burn **intensity**: This is a mosaic of canopy burn, surface burn, and unburned area. On the average 10% to 90% of the tree canopy has burned. There is a patchwork of unburned and surface-burned forest floor vegetation. Standing trees are blackened partway up the trunk, but not charcoaled.
- **LOW** burn **intensity**: This is a mosaic of unburned and burned vegetation in forested areas.

Burn Severity: This is an effect of fire on the ecosystem, primarily concerned with soils. It is only loosely correlated to burn intensity, since some highly intense fires may be of such a duration that soil is largely unheated, whereas some surface burns may severely affect soils because of extended heating by burning litter and duff. Litter and duff depth, antecedent soil moisture, soil texture, and slope can also affect soil heating. Severity affects hydrophobicity (water repellency) as well as the regrowth of shrubs and grasses dependent on sub-surface sprouting.

- **HIGH** Burn **Severity**: Deep ground char occurs where the duff is completely consumed and the top of the mineral soil is visibly reddish or orange. Color below 1 cm is darker or charred from organic material. Downed logs are consumed or deeply charred. All shrub stems are consumed. Hydrophobicity can extend up to 5 cm in depth. Lethal temperatures can extend to 10 cm. Infiltration potential can be lessened, and erosion potential can be significantly increased. Roots and rhizomes may be killed and revegetation is delayed.
- **MEDIUM** Burn **Severity**: Litter is consumed and the duff is deeply charred. The underlying mineral soil surface is altered only in terms of darkening. Lethal temperatures occur down to depths of 5 cm. Hydrophobicity is limited to the surface 2.5 cm of soil. Roots and rhizomes will resprout within 3 years. Infiltration is reduced and erosion potential may be increased in the short run.
- **LOW** Burn **Severity**: Litter is partially consumed. Soil is normal color. Lethal temperatures occur down to depths of 1 cm. Hydrophobicity occurs to 1 cm. Root crowns and surface roots will resprout quickly (within two years). Infiltration and erosion potential is not significantly changed.

Appendix B—Treatment Descriptions and Associated Activities

Commercial Fuels Treatment - Salvage Cutting
Salvage cutting is an accepted silvicultural practice and is defined as the removal of dead trees or trees damaged or dying because of injurious agents other than competition, to recover economic value that would otherwise be lost (SAF 1998). See Appendix C for additional discussion of salvage cutting as an appropriate post-fire treatment method. Based on the existing conditions, salvage cutting will best meet the project objectives of:

- Reduce existing and future hazardous fuels created from dead and dying trees.
- Recover economic value of dead and dying timber.

Dead and dying trees meeting merchantability standards would be harvested. All trees with a live crown (green) greater than or equal to 30 percent (based on the pre-fire crown length) and less than 360 degree bole scorch would be left standing.

Un-merchantable dead trees greater than or equal to 9 inches DBH, 10 feet tall and more than 75 feet from a road or fence would be left standing as snag habitat within treatment areas when they do not pose a safety hazard during treatment operations.

Salvage cutting on the medium to high burn intensity acres with total stand modification will remove the entire stand of trees, except those designated as wildlife snags or reserve trees within a delineated unit. This creates a new even-aged stand of trees.

Non-Commercial Fuels Treatment–Fuel Breaks
All trees less than 10 inches in diameter will be felled within designated fuel breaks. Approximately 60% of these trees will be hand piled and burned to reduce CWD levels to less than 5 tons per acre. In addition, all trees larger than 10 inches in diameter will be felled if they will hit the fence or road or boundary line adjacent to the fuel break zone. Limbs and tops of merchantable trees will be lopped, piled, and burned.

Green Tree Harvest
Unburned areas will be treated to reduce high tree densities in all diameter classes.

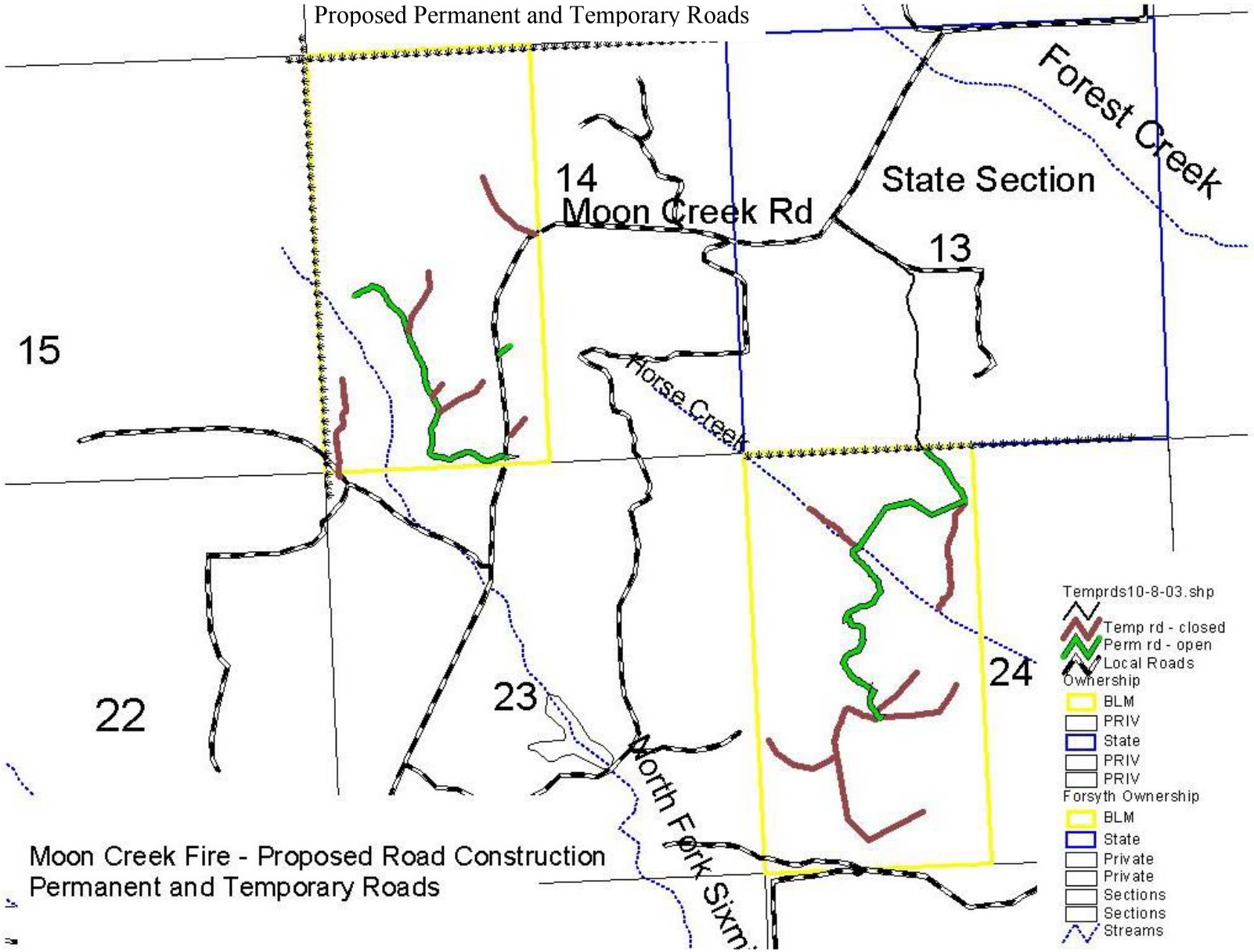
Areas adjacent to private property lines and roads will be treated as Fuel Breaks, removing most trees.

Interior stands (approximately 293 acres unburned forest and woodland acres) will be treated with a Restoration Thinning/Sanitization prescription, leaving 15-25 TPA. Poor genetic phenotypes will be removed, targeting diseased trees, poor form and broken/ forked top trees. The residual stands will include saplings, poles, and larger diameter trees. Commercial entries will remove all designated trees greater than 9 inches in diameter. Pre-commercial size trees will be thinned following commercial removals and the brush will be hand piled and burned.

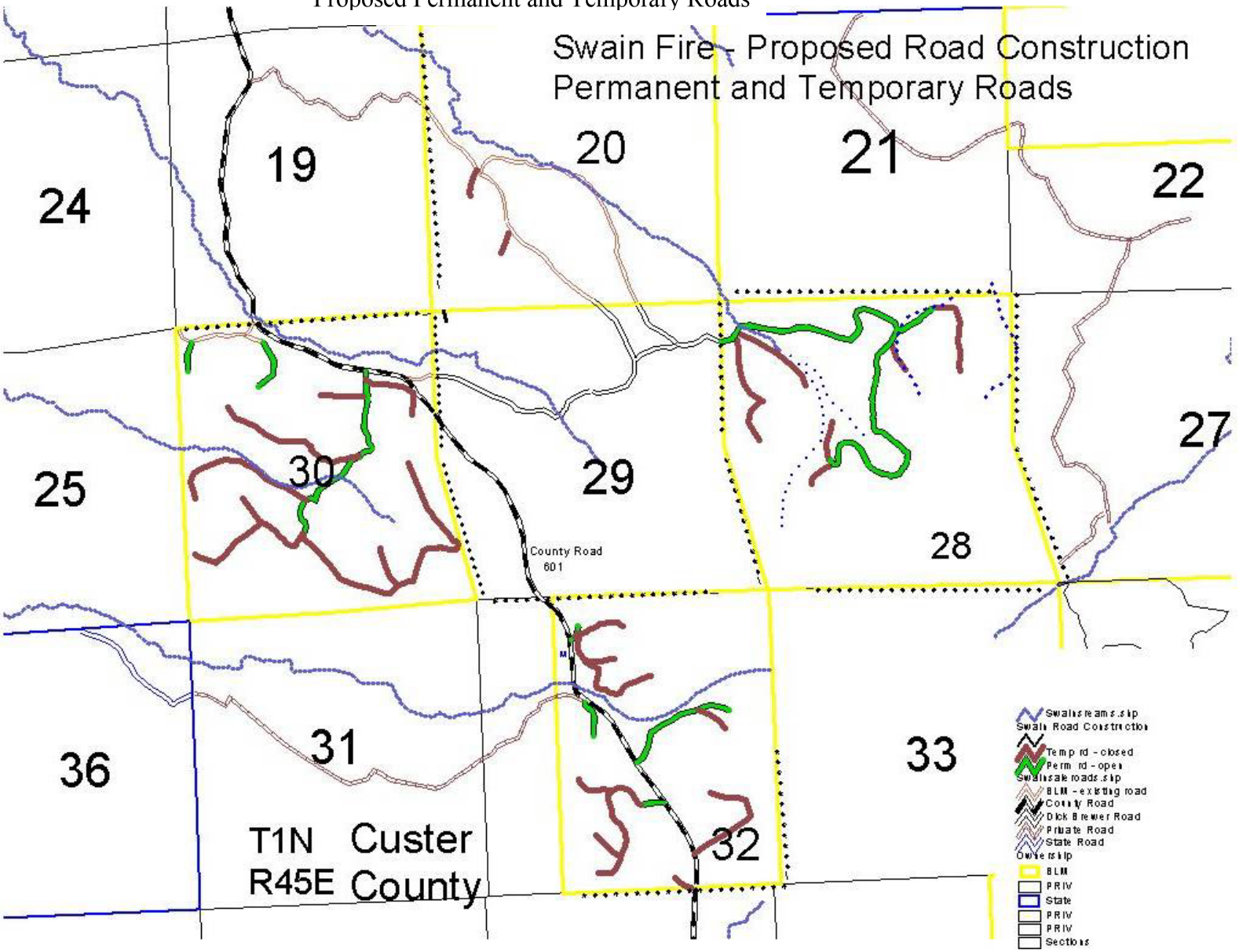
Forest Products/Firewood Harvest
Posts, Poles, and Firewood harvest, from personal use up to commercial harvest levels, may occur on any proposed treatment acres. Removal of Forest Products will be accomplished through Vegetative Sale permits.

A commercial timber sale will remove all merchantable material in excess of CWD and snag needs in this analysis. If the commercial timber sale is not accomplished on any of the proposed treatment acres, then Forest Products and Firewood may be sold and removed from those acres. Any acres treated in a commercial timber sale will not have Forest Products or Firewood removed. Exceptions include log landing decks and Fuel Break areas. A commercial timber sale may not be accomplished if wood borer or other insects bore and nest in the fire killed trees and the wood becomes blue-stained and loses economic value.

Hardwood Draw Restoration
Where hardwood species such as cottonwood, green ash, and chokecherry exist in draw bottoms, most conifers within 60 – 100 feet of these species will be removed. A few ponderosa pine and juniper may be left when needed for wildlife roost trees or bank stabilization. Commercial size conifers will be removed in a commercial timber sale. Pre-commercial size conifers will be removed during fuels reduction/manual thinning actions after the commercial activities are completed.


Proposed Permanent and Temporary Roads
Forest Creek
State Section
14
Moon Creek Rd
13
15
Horse Creek
22
23
24
North Fork Sixm
Moon Creek Fire - Proposed Road Construction
Permanent and Temporary Roads
Temprds10-8-03.shp
Temp rd - closed
Perm rd - open
Local Roads
Ownership
BLM
PRIV
State
PRIV
PRIV
Forsyth Ownership
BLM
State
Private
Private
Sections
Sections
Streams

Proposed Permanent and Temporary Roads



Appendix C—Determination of Appropriate Post-Fire Forest Practices For the Moon Creek-Swain Coulee Fires

One of the main issues to be considered in evaluating management of a recovering fire area is the management of fire-killed trees in the recovering forest. The focus of this deliberation is the reduction of future fuels hazard and the recovery of the economic value of the fire killed timber while maintaining the productivity and health of the forest and range.

For example, in 1988, the Brewer Fire, Sioux Ranger District, Custer National Forest, in eastern Monatana, burned much of the Long Pines administrative unit. Fire killed trees were left on the Brewer Fire. In 2002 this area re-burned in the Kraft Springs Fire. Many on the Sioux Ranger District who were present on the Kraft Springs fire believe that the standing snags and downed fuel load contributed substantially to the intensity and spread of the fire (USFS, 2003). Recent studies (Brown et al., 2003) describe that:

"Large woody fuels have little influence on spread and intensity of the initiating surface fire in current fire behavior models; however, they can contribute to development of large fires and high fire severity. Fire persistence, resistance-to-control, and burnout time (which affects soil heating) are significantly influenced by loading, size, and decay state of large woody fuel."

Brown also states that:
"Torching, crowning and spotting, which contribute to large fire growth, are greater where large woody fuels have accumulated under a forest canopy and can contribute to surface fire heat release."

For these reasons it is desirable to reduce the future fuel loading that would result from no action in fire killed stands. When removing these fuels it is important to note that a certain level of course woody debris (CWD) (3 inches in diameter and greater) provide benefits to soil health, prevention of erosion, wildlife habitat and nutrient cycling. Thus a balance must be reached between reducing the fire hazard to an acceptable level, and ensuring proper ecological function of the post fire ecosystem.

It has been noted (Beschta et al., 1995) that post fire salvage activities can have detrimental impacts to a recovering fire area. Based on considerable *academic* experience, the authors of Beschta et al (1995) provide their opinions on this issue in the form of general principles and recommendations. The authors present their suggested policy principles and land management recommendations as generally applicable to federal lands throughout the western United States, or at least the Upper Little Missouri Watershed. They are not focused on the specific ecological, social, and economic characteristics of any particular fire. Additionally they only consider the management of the post-fire forest in the context of preventing soil erosion, and minimizing impacts to surface waters. The authors do not consider the multiple-use goals, objectives and standards of the Bureau of Land Management, Miles City Field Office. In particular they do not consider the prevention of future large, high severity fires. Thus the authors' suggested principles and recommendations must be evaluated verses multiple-use goals in the context of specific post-fire conditions.

To address the issues raised in Beschta et al. (1995) and by others, the Sioux Ranger District on the Custer National Forest convened an interdisciplinary team (ID team) with a wide variety of resource expertise in soils science, wildlife biology, hydrology, botany, silviculture, fire behavior, economics, engineering, and others.

The USFS's ID team's task was to identify and evaluate ecological, social, and economic issues, including those raised by the authors of Beschta et al. (1995), associated with management needs following the Kraft Springs Fire. Unlike the authors of Beschta et al. (1995), the team's task was to evaluate these issues in the specific context of the post-fire conditions on the Kraft Springs Fire area and the multiple-use goals and objectives of the Custer National Forest Land Management Plan. The analysis provided by this team provides an excellent starting point for evaluating similar post-fire situations.

The following series of points and counterpoints addresses the concerns and recommendations of Beschta et al. (1995). This discussion relies heavily on the analysis already conducted by the USFS ID Team. Quotes from Beschta et al., are in

bold italics, quotes from the USFS ID team report are in italics:

The first recommendation of Beschta et al. (1995) for Post-Fire Practices is that: "***Salvage logging should be prohibited in sensitive areas. Logging of sensitive areas is often associated with accelerated erosion and soil compaction (Marston and Haire 1990), and inherently involves the removal of large wood that in itself has multiple roles in recovery. Salvage logging may decrease plant regeneration, by mechanical damage and change in microclimate. Finally, logging is likely to have unanticipated consequences concerning microhabitat for species that are associated with recovery, e.g., soil microbes. Salvage logging by any method must be prohibited on sensitive sites, including:***

- ***In severely burned areas (areas with litter destruction),***
- ***On erosive sites,***
- ***On fragile soils,***
- ***In roadless areas,***
- ***In riparian areas,***
- ***On steep slopes,***
- ***On any site where accelerated erosion is possible.***

To which the USFS ID Team responds that:
"The potential impacts of management activities on these sensitive sites are important considerations in this environmental analysis. Federal laws and regulations, the Administrative Rules of Montana, and the Custer National Forest Land Management Plan provide authoritative direction to ensure that management activities on these sites do not result in unacceptable impacts to soil and water resources.

It is well understood that the harvest and yarding of trees may lead to increased erosion, soil compaction, loss of down wood, and soil fauna. However, the extent to which these effects occur depends upon a variety of factors such as specific site conditions, the methods used, the timing of these activities, and their duration. In other words, not all harvest and yarding methods have the same impacts, and the potential impacts of particular harvest and yarding methods depend upon where and under what conditions they are used. Land management agencies and logging contractors continue to develop and implement innovative methods for minimizing and avoiding these and other potential effects of post-fire logging. Depending on local site conditions, some harvest and yarding methods can be conducted at particular times of the year and for limited duration, resulting in very little impact to erosion rates, soil compaction, soil fauna, and sediment production. In addition, land managers can prescribe the amount of large wood left on site to achieve various objectives including erosion control, soil productivity, nonsymbiotic nitrogen fixation, mycorrhizal fungi functions, and wildlife habitat."

The proposed action in the Moon Creek-Swain Coulee Fire Hazard Abatement EA (Moon-Swain EA) is designed to avoid or mitigate potential impacts of timber harvest on sensitive areas. The following characteristics of the action alternative are responsive to the concerns of Beschta et al. (1995):

- All streams (as defined by the MT-SMZ Law) will utilize at least a 50-foot streamside buffer zone.
- In areas where slopes are greater than 30% constructed skid trails will not be allowed.
- In areas where slopes are greater than 40% no equipment operation will be allowed.
- Coarse woody debris would be left in amounts consistent with recommendations for dry ponderosa pine type forests. In particular in the stands that are currently low density 1-5 tons/acre will be left, in medium density stands 5-8 tons/acre will be left, and in high density stands 7-12 tons per acre will be left (Brown et al., 2003).
- Best Management Practices will be used on all timber harvest and road management activities, and will be monitored.

The Moon-Swain EA addresses the potential impacts of timber harvest and yarding on soils. The EA also describes the effects of post-fire logging on erosion and watershed functions. The environmental analysis evaluates the potential for the proposed action to accelerate erosion and increase sediment delivery to streams.

The USFS ID Team goes on to evaluate the potential impacts from timber harvest activities, and evaluates the effectiveness of the proposed mitigation measures, particularly the implementation of BMPs. The USFS ID Team felt that implementation of the BMPs "*would reduce or eliminate threats to decreases in watershed conditions".*

The proposed action in the Moon-Swain EA does not completely comport with the recommendations suggested by the authors of Beschta et al. (1995), however it will minimize potential short-term impacts resulting from vegetation management activities.

The next recommendation of Beschta et al. (1995) is that

"On portions of the post-fire landscape determined to be suitable to salvage logging, limitations aimed at maintaining species and natural recovery processes should apply.

Dead trees (particularly large dead trees) generally have multiple ecological roles in the recovering landscape including providing habitat for a variety of species, and functioning as an important element in biological and physical processes (Thomas 1979). In view of these roles, salvage logging must:

· Leave at least 50% of standing dead trees in each diameter class.

· Leave all trees greater than 20 inches dbh or older than 150 years.

· Generally, leave all live trees."

TheUSFS ID Team found that:

"The authors of Beschta et al. (1995) provide no rationale for their specific quantitative recommendations for leaving at least 50% of standing dead trees in each diameter class, and leaving all trees greater than 20 inches dbh or older than 150 years. The action alternatives provide for the retention of snags and coarse woody debris within harvest units based upon a consideration of the biophysical environments of the Kraft Springs Fire area and the ecological context of the forest conditions after the fire.

After the timber harvest activities from any one of the action alternatives are completed, there will still be more standing dead trees, distributed over a greater area, than has been historically known within the Long Pines administrative unit. As a result, it seems reasonable to conclude that the amount and pattern of dead trees on the Kraft Springs Fire area will be sufficient to provide for their ***"multiple ecological roles in the recovering landscape including providing habitat for a variety of species, and functioning as an important element in biological and physical processes,"*** *(Thomas 1979), and (Beschta et al. 1995)."*

The proposed alternative proposes that within the burned areas between 5 and 12 tons/acre of CWD will be left on the ground. Of this approximately 4 snags per acre will be left in harvest units, and all live trees will remain unless they interfere with the safety of the logging operation. This volume of CWD is in excess of that which has beeen historically know in these areas. As a result it seems reasonable to conclude that this amount of CWD should be sufficient to provide for soil productivity, prevent excessive soil erosion, and provide for nutrient cycling, while reducing potential for uncontrollable high severity fires in the future.

Another concern of Beschta et al. (1995) is that: ***"Because of soil compaction and erosion concerns, conventional types of ground-based yarding systems (tractors and skidders) should be generally prohibited. New equipment or techniques may be suitable where it can be demonstrated that soil integrity will be protected, that is, where acceleration of soil erosion and increased soil compaction can be demonstrated not to occur, and where there is no impairment of hydrologic and biological soil integrity. Helicopter logging and cable systems (particularly those that provide partial or full suspension) using existing roads and landings may be appropriate as may be horse logging; however, even these methods are not without potential problems and could locally increase runoff and sediment. Therefore, they must be actively monitored and avoided where sedimentation is already a major problem for salmonids or other sensitive aquatic species. Any activity that disturbs litter layers or soil surface horizons, either pre- or post-fire, can accelerate soil erosion and sediment delivery to aquatic systems."***

The Moon-Swain EA specifies site design measures for local ground conditions rather than by prescribing logging techniques. The design criteria require minimal soil disturbance, and do not allow for greater than 15% of the treated area to be disturbed. Woody debris will be reduced to 5-12 tons per acre of residual wood which will be sufficient to provide for nutrient cycling, prevention of excessive erosion, maintenance of soil productivity, and protection and regeneration of wildlife habitat (Brown et al., 2003).

Ground-based harvest and yarding equipment is limited to areas outside of riparian areas for all units. To further reduce the potential of sediment

reaching streams and impacting aquatic systems, a 50-foot buffer will be implemented along all stream in areas treated for hazardous fuels reduction.

The next recommendation of Beschta et al. (1995) is that: **"Building new roads in the burned landscape should be prohibited.** ***Roads are associated with a variety of negative effects on aquatic resources, including disruption of basin hydrology and increased chronic and acute sedimentation. Under no circumstances should new roads be introduced into sensitive areas, including roadless or riparian areas. Outside of these areas, road building should be avoided except where new road construction may be necessary to complete a larger program of partial or complete road obliteration. In such instances, offsetting benefits must be demonstrated. These may include cases in which a new road segment has been demonstrated to be necessary to enable obliteration of other roads that cause significant potential or existing adverse environmental impacts."***

The proposed action includes the construction of approximately 15 miles of road, of which 6 miles will remain open after the project is completed. Once project activities are completed, the 9 miles of temporary roads would be ripped, seeded, and water-barred. Constructed roads will avoid riparian areas and only enter stream buffers where absolutely necessary to cross a stream channel. Where stream channels are crossed the distance within the SMZ will be minimized. The proposed action includes only 2 stream crossings.

Beschta et al. (1995) further recommend that: ***"Active reseeding and replanting should be conducted only under limited conditions.*** ***Introduction of non-native species or exotic genotypes of native species should be prohibited from all reseeding/replanting programs. Seeding grasses into burned forests has been shown to disrupt recovery of native plants and is likely to create more problems than it solves. (Amaranthus et al 1993). The use of pesticides, herbicides, and fertilizers should generally be prohibited.***

Spot-specific hand application of herbicides only for the removal of exotics may occasionally be considered if there is evidence that such action is likely to lead to long term reclamation of the site.

In general, active planting and seeding has been shown to advance regeneration and most often creates an entirely new, exotic flora. In addition, reseeding is associated with additional problems and costs. Therefore, such practices should be employed only where there are several years of evidence that natural regeneration is not occurring. For example, native species from regional stocks that may enhance fire resistance of a site may be planted if the effect is not to homogenize the landscape, (e.g., alder in southwestern Oregon and Northern California)."

The only planting proposed in the proposed action is the reseeding of temporary roads, primary skid trails, and landings following completion of the timber sale. Any seeding must use certified weed free native plant seeds. Herbicides would only be used for the removal of exotics, where it is likely to lead to long term reclamation of the site. It is anticipated that noxious weed monitoring and treatments will occur into the foreseeable future.

Structural post-fire restoration is generally to be discouraged.

Frequently, post-fire restoration efforts involve the installation of hard structures including sediment traps, fish habitat alterations, bank stabilization, hay bales, weirs, check dams, and gabions. Such hard structures are not generally modeled or sited on the basis of natural processes, and their ability to function predictably may be particularly low in dynamic post-fire landscapes. Hard structures have high rates both of failure and of unanticipated side effects. Therefore, structures are generally an undesirable and unsuccessful method for controlling adverse environmental impacts.

Sediment management should focus on reducing or eliminating anthropogenic sources prior to their initiation (e.g., improve stream crossings to prevent culvert failure), and protecting and maintaining natural sediment control mechanisms in burned landscapes, particularly the natural recruitment of large woody debris on hillslopes and in streams. The goal should be to reestablish the natural postfire background quality, quantity, and timing of sediment, including the presence of large woody debris, and this level should be considered the baseline."

The major means of controlling sedimentation under the proposed action is to leave 5-12 tons/acres of CWD on hillslopes. A portion of this

debris would eventually be transported into streams. CWD levels in the dry ponderosa pine environment during pre-European settlement times were on the order of 5-10 tons/acre (Brown et al., 2003). Thus the proposed levels of CWD are in line with the true "baseline" for these environments.

The only "hard structures" proposed in the proposed action are straw bail sediment control structures on drainages. The proper location and construction of these structures will mitigate adverse environmental impacts. There are no streams which provide fish habitat within the project area.

"Post-fire management will generally require reassessment of existing management.
For example, the condition of a transportation system (i.e., pre-existing roads and landings) should be reassessed after a fire. By increasing runoff, erosion, and sedimentation, fires may increase the risks posed by existing roads. Therefore, post-fire analysis is recommended to determine the need for undertaking road maintenance, improvement, or obliteration. There is some urgency to this reassessment as the longer appropriate treatments are put off; the more likely it is that failure will be triggered by a large runoff event. Additionally, post-fire livestock grazing should be altered or eliminated to allow natural recovery processes to occur.

Immediately after containment of the fires, the BLM Miles City Field Office prepared the Burned Area Emergency Stabilization and Rehabilitation plan which assessed significant short-term and long term threats to resources from the Moon Creek and Swain Coulee Fires. Where necessary, this plan recommended treatments for mitigation. This interdisciplinary effort addressed various aspects of resource management such as soil and watershed integrity, wildlife, weed management, infrastructure, and recreation. The BAER report identified several measures to reduce erosion, alter grazing patterns, and provide for the integrity of roads and fences.

Riparian and upland rangeland sites already showed some re-growth, re-establishment of native vegetation, and soil stabilization during September of 2003. This included the re-sprouting of western wheat grass in the Low to medium intensity areas of the fires, and the sprouting of Ash, Chokecherry, and Skunk-brush where they existed. Grazing will be deferred until at least August 1st, 2004 on the BLM allotments. Inspections of the range condition will occur during the spring-summer of 2003, prior to livestock entry, to evaluate soil, streambank and vegetation conditions. If recovery appears to be proceeding at the established rate and livestock control fences are rebuilt, grazing will be authorized under a prescription that includes late season entry after forage plant maturation.

The main objective for the proposed action in the Moon-Swain EA is to prevent future uncontrollable, high severity, high intensity fires.

The authors of Beschta et al. (1995) state that ***"we are aware of no evidence supporting the contention that leaving large dead woody material significantly increases the probability of reburn."***

To this the USFS ID Team replies:
"We agree with the authors of Beschta et al. (1995) that the amount of large, woody fuel does not affect the probability of reburn or wildland fire ignitions in general. The probability of ignition is determined by the meteorological and physical processes that generate lightning, and the human behavior that leads to human caused fires.

There is abundant scientific evidence that increased fuel loads can result in increased fire intensity and severity, and large continuous areas of relatively high fuel loads are more likely to result in larger fires than areas where the spatial arrangement of high fuel loads is discontinuous. The purpose and need of the fuel reduction portions of this project is not to reduce the probability of ignition or the occurrence of future fires. Rather it is to break up fuel continuity and reduce fuel loads in strategic locations and along the forest boundary in order to decrease risks that future fires will pose to human health and safety, property, improvements, and resources."

Similarly, the proposed action in the Moon-Swain EA is not intended to reduce the probability of ignition. It is intended to reduce the severity and intensity of future fires in this area, and to keep future fire behavior in the "low resistance-to-control" category. The fuel loading that will normally keep fire behavior in this category is less than 14 tons/acre (Graham et al., 1999 and Brown et al., 2003). The proposed action will provide for less severe environmental impacts over the long term due to the decreased intensity and severity

causing less impacted soils and vegetation. The proposed action will also provide for the safety of the public and firefighters; and prevent the loss of property, improvements, and resources that can occur as a result of fires that are difficult to control.

The final recommendation of Beschta et al. (1995) is that: ***"Additional information must be provided to the public regarding natural fires and post-burn landscapes to provide balance to the 'Smokey Bear' perspectives of fires and forests.*** ***Although post-fire landscapes are often portrayed as "disaster" in human terms, from an ecological perspective, fire is part of the normal disturbance regime and renewal of natural forest ecosystems. An increased appreciation and understanding of natural disturbance regimes in the ecology of forest ecosystems is needed by the public, and the public's land managers."***

There is an ongoing effort within the BLM to re-introduce prescribed fire onto the landscape. There are constantly meetings with the public to further this objective. These discussions have included the recognition that fire needs to play a part in future land management practices.

Evers (2002) has noted that "…experience has shown that even when popular support for wildland fire use is high, this support is largely intellectual. An emotional response is more typical once a fire happens where these same people can see it every day. Tolerance for the fire drops rapidly, especially for long duration fires that produce direct effects from smoke and when fire threatens to move into wildland-urban interface areas."

As long as people and property are located within the forests, uncontrolled wildfire will continue to be fought; if not by BLM, then by the local population whose homes, property and livelihoods are threatened. Once this is accepted, it is clear that it is necessary for fuels to be reduced by means other than wildfire if future uncontrollable, high severity, high intensity fires are to be avoided. For 100 years of fire natural fire has been excluded from our forest ecosystems. These systems are now far out of balance with their natural fuel loadings. Therefore, it is now necessary to bring the ecosystem into balance with its natural fuel loading. Mechanical treatments and prescribed burns (such as the proposed action in the Moon-Swain EA) are two means to achieve this objective. In some cases the existing condition has become so overstocked that the introduction of any fire into it is unsafe. In such cases mechanical treatment becomes a necessary first option for restoring the ecosystem.