UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Deadman-Memorial Way Road Capital Improvement Project

Environmental Assessment

White Sulphur Springs and Judith Ranger Districts
Meagher and Judith Basin Counties, Montana

NORTHERN REGION
Lewis and Clark
National Forest
May 2007

For Information Contact: Bob Korb
Lewis and Clark National Forest
1101 15th Street North
Great Falls, MT 59403
(406) 791-7737

Table of Contents

Introduction

Forest Development Roads Memorial Way (FDR No. 487) and Deadman Road (FDR No. 837) are forest arterial and collector routes, respectively, on the Lewis and Clark National Forest. Memorial Way junctions with Highway 89 near Kings Hill and continues to the eastern forest boundary near the junction of the South and Middle Forks Judith River, where it becomes County jurisdiction, a distance of about 31 miles. Deadman Road No. 837 leaves Highway 89 about 4 miles south of Kings Hill and currently connects to Memorial Way Road in the vicinity of Spur Park, a distance of about 4.5 miles (see Map 1). These are designated Maintenance Level 3, meaning that they will be open and maintained for travel by prudent drivers in standard passenger cars. They are some of the most heavily used system routes on the Forest for both recreation and other resource management purposes. The Forest has identified these routes as priorities for Capital Investment and has requested funding for fiscal years 2008 and 2009 for reconstruction work. This assessment documents the proposed action, alternatives to the proposed action, and provides an analysis of anticipated environmental effects resulting from the proposed action and alternatives.

Purpose and Need for Action

Road standard issues on the Deadman and Memorial Way routes have resulted in resource damage including braiding and rutting from poor drainage and erosion from the lack of drainage control on steep grades. There are user safety concerns associated with a narrow roadbed, and unsafe roadbed conditions during wet and icy periods. The proposed action is needed because Memorial Way will continue to serve as an arterial route through the Forest and the forest is not meeting road management objectives. The upper 2.3 miles of Deadman Road is steep, difficult to maintain and traverses a sensitive landtype with high risk of mass failure when constructing roads. Deadman Road is usually used as a shorter route to get to Highway 89 from Spur Park than continuing on Memorial Way, but during wet conditions, the road surface becomes slick and dangerous and passenger and heavy equipment travel can be risky. In 2002, a loaded logging truck carrying salvage logs from the Ant Park fire salvage sale, nearly went off the road as it traversed this stretch during spring melt conditions. Under the proposed action, Weatherwax Road No. 2056 would become the primary connector to Memorial Way Road and upper Deadman Road would be converted to a motorized trail suitable for high clearance vehicles.

This action responds to goals and objectives outlined in the Lewis and Clark Forest Plan and moves the project area towards meeting management standards described in that plan. The Plan identifies management standards for maintenance and construction of roads, trails, and other facilities (Forest Plan, pages 2-65 through 71). Forest Plan standard L-4(27) states “Maintain roads to a level commensurate with the need for the following operational objectives: resource protection, road investment protection, user safety, user comfort, and travel efficiency. A Forest Road Maintenance Plan will be prepared annually and be responsive to the long-term needs of the Forest Transportation System.” As mentioned, the forest identified the current needs when prioritizing projects as part of the Forest’s capital investment program.

Proposed Action

Memorial Way Road No. 487 would be reconstructed from its junction with Weatherwax Road No. 2056 in Section 12, T.12 N., R.8 E. southeasterly to its junction with Spring Creek Road No. 274 in Section 8, T. 11 N., R. 10 E., a distance of approximately 15 miles. Five sections of road, totaling about 3.5 miles, would be relocated to address issues of road grade and drainage and provide for safe travel (see Map 2). Road sections that are replaced by relocated routes will be obliterated by returning the road prism to as near natural contour as possible and placing slash or other woody debris on the reclaimed surface.

A pulloff area off the edge of Road No. 487 in Section 11, T. 11 N., R 9 E. would be constructed to provide a trailhead facility for Trail No. 409.

About 1 mile of Deadman Road No. 837 from its junction with Weatherwax Road No. 2056 in Section 24, T.12N, R 8 E. to a dispersed camping area in Section 25, T. 12 N., R. 8 E. would be reconstructed. Here a trailhead would be constructed and the remainder of Road No. 837 to its junction with Road No. 487 in Spur Park (approximately 2 miles) would be converted to a motorized trail, accessible by full-sized high clearance vehicles.

Approximately 32,000 cubic yards of road surfacing material would be crushed from an existing mineral material pit in Section 7, T. 12 N., R. 9 E. The pit may be expanded up to 2 acres in an old harvest unit.

Reconstruction entails adding road base material where necessary and re-surfacing the entire road with new gravel. Ditches and culverts would be installed where necessary. Drain dips would be maintained near lower Spur Park in an area where culvert installation is not practical. Inter-visible turnouts would be installed to accommodate 2-way traffic. The primary road surface would be 14 feet in width; ditch installation and roadway clearing could encompass an area about 25 feet either side of the road centerline. New road signs would be erected.

Timeframes for project completion would span several years. Reconstruction of 9 miles of road (1 mile of Deadman Road and 8 miles of Memorial Way Road to Ant Park) is proposed to take place in 2008 and 2009. Approximately 18,000 cubic yards of gravel would be crushed and stockpiled in 2008; actual road reconstruction and placement of gravel would take place in 2009. Reconstruction of Memorial Way from Ant Park to the junction of Spring Creek Road and trailhead construction for Trail No. 409 would occur as funding is made available.

Decision Framework

Given the purpose and need, the deciding official reviews the proposed action and the other alternatives in order to determine:

- Whether to approve the proposed road reconstruction and relocation actions as proposed or modified, or as described in an alternative;
- What mitigation measures are needed; and
- What monitoring is required.

Public Involvement

The proposal was listed in the Schedule of Proposed Actions on April 1, 2007. A scoping letter was sent to interested parties on August 20, 2007, notifying them of the proposed action and providing an opportunity for them to submit issues, comments or concerns. Six individual letters and 19 form letters were received during a 30-day comment period. Comments from the public scoping including the following:

- It was unclear how the project would affect snowmobile grooming and use of the snowmobile route on Deadman Road No. 837. In response to this issue, the winter alternative under the recent travel plan decision (10/1/07) would keep this route, and the Weatherwax Road, as groomed snowmobile routes.
- Some respondents wanted Deadman Road No. 837 to be a motorized trail open to full-sized vehicles as this is a popular hunting access to Spur Park and some felt Weatherwax Road can become snowed in and impassable during the hunting season. Alternative 2 addresses this issue by converting the portion of the Deadman Road from its junction with Weatherwax Road to Spur Park to a motorized trail open yearlong to full-sized high-clearance vehicles.
- One commentator wanted the Memorial Way re-routes to remain open to OHV use instead of being obliterated. This is not considered in the alternatives as it wasn't reasonable to keep small segments open to certain motorized uses when they would have to connect up again with the main road within a short distance.
- A couple commentators didn't want anything done to the roads. The No Action Alternative 1 addresses this issue.
- Montana Department of Fish, Wildlife and Parks recommended that reconstruction efforts not occur during the general big game archery or rifle seasons.

In addition, as part of the public involvement process, the agency visited with a representative of the Montana Wilderness Association to describe proposed actions for road relocation just inside the Middle Fork Judith inventoried roadless area (I-734). This roadless area is outside of, but contiguous to, the Middle Fork Judith Wilderness Study Act area.

Based on internal scoping and comments from the public, other agencies, and tribal contacts, the interdisciplinary team developed the following list of issues to address.

Issues

The Forest Service separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or

which have been covered by prior environmental review (Sec. 1506.3)…" The section below identifies significant issues and touches on other resource considerations.

As for significant issues, the Forest Service identified three topics raised during scoping. These issues include:

Inventoried Roadless Areas: Road relocation has the potential to impact roadless characteristics. Two of the road relocations, as well as the gravel pit expansion, are in Roadless Areas. The proposed trailhead construction for Trail No. 409 in Section 11 is also in Roadless Area. Measures of effects will include a qualitative comparison of potential impacts with roadless characteristics and a quantitative comparison of motorized route mileage within inventoried roadless areas by alternative.

Heritage Resources: The proposed action has the potential to impact historic routes and historic and prehistoric sites. The east half of Forest Road 487, mainly along its current route, is first shown on a 1927 GLO plat. The west half of Forest Road 487 is also known as the Jamison Trail Road (24ME285). The segment through the project area is first shown on the 1923 Forest Map. A historic phone line ('Field 2') would be interrupted by a proposed reroute and two prehistoric material scatters are in or near proposed reroutes (24JT85 and 'Field 1'). Quantitative measures of effects are shown as number of sites and miles of historic routes impacted by alternative.

Sensitive Plants: Road relocation and reconstruction has the potential to impact populations of Missoula phlox *(Phlox kelseyi var. missoulensis)*, a sensitive plant. Measure of effects is the area of potential and known plant occurrence impacted by road construction or relocation.

Other resource concerns analyzed include effects to wildlife and soil and water quality.

Alternatives

This section describes and compares the alternatives considered for the Deadman Memorial Way Road Capital Improvement project. Map 1 shows the existing situation; maps 2 and 3 show the alternatives considered. This section also presents the alternatives in comparative form, defining the differences between alternatives and providing a clear basis for choice among options by the decision maker and the public.

Alternative 1 - No Action

Under the No Action alternative, no road construction or reconstruction, road conversion to motorized trail, or mineral material removal would take place at the present time. Road conditions would remain as they are currently. The frequency and extent of future maintenance would depend on funding availability. Other actions, such as trailhead construction and signage would also not take place at this time.

Alternative 2 - The Proposed Action

The proposed action is described in more detail above and generally includes:

- Resurfacing of 15 miles of Memorial Way Road No. 487 and 1 mile of Deadman Road No. 837 (including placement of new base material where necessary, and gravel surfacing on 14 foot road surface)
- Crushing and stockpiling of approximately 32,000 yards of road surfacing material
- Relocation of 5 segments of Memorial Way Road, totaling 3.5 miles.
- Road ditch improvement
- Culvert installation
- Drain dip installation near lower Spur Park
- Construction of inter-visible turnouts for 2-way passing
- Signage where necessary
- Construction of a pullout area off the edge of Memorial Way Road in Section 11, T. 11 N., R. 9 E. to provide a trailhead facility for trail No. 409
- Construction of a trailhead facility in Section 25, T. 12 N., R. 8 E near a dispersed camping area. The remainder of Deadman Road No. 837 (about 2 miles) to its junction with Memorial Way Road No. 487 in Spur Park would be converted to a motorized trail accessible by full-sized high clearance vehicles.

Alternative 3 – Reconstruction with Limited Reroutes

Under this alternative, road reconstruction on the existing template and right-of-way would take place on Deadman and Memorial Way routes as described above (including the addition of road base, new gravel surfacing, installation of new culverts where needed, ditching, turnouts, and signage, except **no route relocations would be constructed for route segments 2, 3, and 4** (see Map 3). This would eliminate road reconstruction within or immediately adjacent to inventoried roadless areas, and the proposed reroute segment that crosses a population of Missoula phlox, a sensitive plant. Trailhead construction for Trail No. 409 would not take place either as it is within the inventoried roadless area.

The rerouted portion just north of Ant Park in sections 27, 28 and 34, T12N, R9E would be reconfigured to a single switchback.

Deadman Road No. 837 from the dispersed campsite in Section 25, T12N, R8E to its junction with Memorial Way Road No. 487 (about 2 miles) would be converted to a trail open yearlong to ATVs and motorbikes, but not to full-sized vehicles.

Mitigation Common to All Action Alternatives

Mitigation measures were developed to address some of the potential impacts the various alternatives may cause. The mitigation measures may be applied to any of the action alternatives.

Heritage Resources: The completion of Section 106 review prior to ground disturbance is the mitigation measure most often identified for cultural resources in NEPA documents. Adverse effects will be avoided, minimized, or mitigated. Site-specific forms of mitigation which may be employed are discussed under each resource issue in the analysis of alternatives. Common treatments include:

- Incorporating avoidance measures or site-armoring techniques into road or trail reconstruction plans when prehistoric sites are present.
- Monitoring sites for impacts
- Detailed resource documentation
- Contextual study

Sensitive plants:

- No two-way passing turnouts would be constructed within the Spur Park Missoula phlox population.
- Limit the amount of equipment movement off Forest road 487's road prism through Spur Park.
- Monitor disturbed sites throughout Spur Park (Forest road 487) to determine presence of noxious weed establishment. If noxious weeds are located, appropriate treatment would be applied as described in the Lewis and Clark National Forest Noxious Weed Control Final Supplemental Environmental Impact Statement and Record of Decision (USDA 1994).
- Herbicide application in project areas with sensitive plant populations would comply with guidelines described in the Lewis and Clark National Forest Noxious Weed Control Final Supplemental Environmental Impact Statement and Record of Decision (USDA 1994) and would maintain a 100-foot buffer around sensitive plant populations.
- If a new sensitive plant population is located in a treatment area prior to or during project implementation, the population would be evaluated, delineated, and avoided during all ground disturbing activities.

Soil and Water Resources:

- Rehabilitation of abandoned road segments should be conducted so as to ensure compaction of old road surface is relieved and any available topsoil is replaced. Seed disturbed or abandoned road cuts, and ditches with native seed mix. Any mulch used will be certified weed seed free.
- Where possible, ditch sections can be used to limit off road travel.
- Follow Best Management Practices in Appendix A and Forest Plan Standards for soil and water resources.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 1. Comparison of Alternatives

Measure of Effects	Alternative 1	Alternative 2	Alternative 3
INVENTORIED ROADLESS			
Acres of new disturbance within inventoried roadless	No change from existing	+4.4 acres (.24 miles of relocated road, trailhead and material pit development)	+1 acre (pit development)
HERITAGE			
Number of Heritage sites affected -non-linear (and site potentially impacted)	1: (24JT85) indirect impacts only	2: (24JT85 and 24ME726)	2: (24JT85, 24ME726)
Miles of linear sites affected (and sites potentially impacted)	n.a.	.1 mi. (Field 2)	.1 mile (Field2)
Miles of historic routes affected (and sites potentially affected)	n.a.	15 mi. upgraded, 3 mi. abandoned (24ME285, 24ME300, and Field 3)	15mi. upgraded, 2 mi. abdoned (24ME285 and Field 3)
SENSITIVE PLANTS			
Acres of sensitive plant habitat directly impacted	No change from existing	5.7 +	4.2
Biologic evaluation for Missoula Phlox (sensitive species)	No Impact (NI)	MIIH*	MIIH*
WILDLIFE			
Impacts to Sensitive species:			
Gray wolf	NI	MIIH	MIIH
Bald eagle	NI	MIIH	MIIH
Black-backed woodpecker	NI	MIIH	MIIH
Townsends big-eared bat	NI	MIIH	MIIH
Wolverine	NI	MIIH	MIIH
Peregrine falcon	NI	NI	NI
Flammulated owl	NI	NI	NI
Burrowing owl	NI	NI	NI
Harlequin duck	NI	NI	NI
Fisher	NI	NI	NI
Northern bog lemming	NI	NI	NI
Greater short-horned lizard	NI	NI	NI
Northern Leopard frog	NI	NI	NI
Western Toad	NI	NI	NI
SOILS			
Compliance with Regional Soil Quality Standards	Complies	Complies	Complies

* MIIH = May Impact Individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species

Environmental Consequences

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above.

The project area encompasses the road corridor (approximately 50 feet either side of the road centerline) and the area of the gravel pit.

Other past, present or reasonably foreseeable actions that may be considered for cumulative impacts include:

- ✓ ongoing road maintenance
- ✓ 2007 Travel Plan implementation
- ✓ Ant Park fire and salvage operations (2001-2003)

INVENTORIED ROADLESS AREAS

Portions of the proposed action would take place within the North Fork Smith IRA (I-744) and roadless areas adjoining the Middle Fork Judith Wilderness Study Area. The exact boundaries of the roadless areas are somewhat nebulous. GIS capabilities have allowed for detail in boundary delineation beyond those used when the roadless area boundaries were identified for Forest planning. Because of this, small incursions into roadless areas may be identified during project development. In addition, the western boundary of the Middle Fork Judith roadless area appears to follow the Judith Basin/Meagher county boundary and as such, Memorial Way Road No. 487 itself weaves in and out of the roadless area boundary.

The Roadless Area Conservation Rule (RACR) at 36 CFR 294, issued January 12, 2001, was reinstated in a District Court order in September 2006. The Rule prohibits road construction or reconstruction in inventoried roadless areas unless certain exception criteria are met. The project meets exceptions to prohibitions to road construction or reconstruction in inventoried roadless areas under 36 CFR 294.12(b)(4) and (5) as follows:

(b) Notwithstanding the prohibition in paragraph (a) of this section, a road may be constructed or reconstructed in an inventoried roadless area if the Responsible Official determines that one of the following circumstances exits:

(4) Road realignment is needed to prevent irreparable resource damage that arises from the design, location, use, or deterioration of a classified road and that cannot be mitigated by road maintenance. Road realignment may occur under this paragraph only if the road is deemed essential for public or private access, natural resource management, or public health and safety:

(5) Road reconstruction is needed to implement a road safety improvement project on a classified road determined to be hazardous on the basis of accident experience or accident potential on that road.

Section 294.11 of RACR outlines the responsible official status with respect to decisions of this nature in inventoried roadless areas. It defines the Responsible Official as "The

Forest Service line officer with the authority and responsibility to make decisions regarding protection and management of inventoried roadless areas pursuant to this subpart".

Existing Conditions:

The 1964 Wilderness Act considered several attributes in determining whether certain lands possessed wilderness characteristics. These included:

- natural integrity
- apparent naturalness
- opportunities for solitude, and
- opportunities for primitive recreational experiences.

The RACR has definitions of roadless characteristics. The following crosswalk correlates features from the roadless rule with those attributes found in the Wilderness Act. The discussion in the analysis uses the terms from the Wilderness Act, but can be correlated with roadless character as shown in Table 2.

Table 2: Wilderness/Roadless Attributes Crosswalk

Wilderness Attributes	Roadless Characteristics
Natural Integrity	High quality or undisturbed soil, water, and air Sources of public drinking water Diversity of plant and animal communities Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land Reference landscapes
Apparent Naturalness	Natural appearing landscapes with high scenic quality
Remoteness and Solitude	Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation
Special Features and Special Places or Values	Other locally identified unique characteristics Traditional cultural properties and sacred sites
Manageability and Boundaries	No criteria

Subsequent evaluations of roadless area qualities included attributes of special features and boundary management (Forest Service Handbook 1909.12 Chapter 70). This analysis will include an evaluation of the proposed actions on these roadless characteristics and compare any changes to the current conditions.

The following descriptions of existing conditions are based on Forest Plan evaluations. Conditions in the North Fork Smith IRA (I-744) are described in Appendix C of the Forest Plan, pages C-253-256). Conditions in the Middle Fork Judith IRA were documented in the EIS conducted as part of the Montana Wilderness Study Act review. Subsequent changes, if any, to portions of the Middle Fork Judith and North Fork Smith IRAs within the project area since development of the Forest Plan are noted.

Natural Integrity and Apparent Naturalness: The EIS notes that much of the Middle Fork Judith Wilderness Study Area is essentially a natural environment. It notes three areas which, compared to other areas in the Little Belts, rate as average or below average for apparent naturalness. One of those is in the vicinity of the project area in the Weatherwax/Harrison Creek area, where timber harvest in the late 1960s and early 1970s has taken place, resulting in approximately 13 clearcuts and 4.6 miles of high standard road. A major powerline and mineral exploration have also left readily apparent impacts. The mineral material pit for this project is located within one of the clearcut units and has existing roaded access to it. As mentioned previously, the western boundary of the roadless area largely follows the Judith Basin/Meagher county boundary and as such, Memorial Way road No. 487 itself weaves in and out of the roadless area boundary.

Opportunity for Solitude: Creek valleys and ridges in the interior of the Middle Fork IRA seem very removed from development. Opportunities for solitude in the North Fork Smith are limited because of its small size and the amount of roading along its perimeter. Because the re-routes are immediately adjacent to the existing roaded access, opportunities for solitude are limited in the project area.

Primitive Recreation Opportunity: The Middle Fork Judith IRA is popular for hunting and fishing. The greatest hunting pressure is on the ridges that can be accessed by four-wheel drive vehicles, including the project area. The small size of the North Fork Smith IRA again limits primitive recreation opportunities. Few primitive challenges exist immediately adjacent to the road and sights and sounds of human presence along Memorial Way itself already effectively eliminate any sense of remoteness in the project area.

Effects Analysis:

1. Direct and Indirect Effects

Direct Effects to Natural Integrity and Apparent Naturalness: Natural integrity is the extent to which long-term ecological processes are intact and operating. Impacts to natural integrity are measured by the presence and magnitude of human induced change to an area. Apparent naturalness means that the environment looks natural to most people using the area. It is a measure of importance of visitors' perceptions of human impacts to the area. Even though long-term ecological processes of an area may be interrupted, the landscape of an area generally appears to be affected by the forces of nature. If the landscape has been modified by human activity, the evidence is not obvious to the casual observer, or it is disappearing due to natural processes.

Alternative 1: Under Alternative 1, no change in current natural integrity, as described under Existing Conditions above, is expected. The presence of a major arterial road within portions of inventoried roadless areas would continue as is and represent an existing human-induced change to the area.

Alternative 2: Under Alternative 2, the proposed action, small portions of road (segments 2 and 3 on Map 2) would be relocated into the Middle Fork Judith or North Fork Smith Creek inventoried roadless areas (IRA). Approximately .15 miles (about 790 feet) of relocation on segment 2 (see Map 2) would be located within the GIS boundaries of the North Fork Smith IRA. An additional .09 mile (about 565 feet) of road relocation (segment 3 on Map 2) is within the Middle Fork Judith inventoried roadless area, but outside of the Middle Fork Judith Wilderness Study Act (WSA) area. The WSA boundary is east of the IRA boundary. These relocations total about 1.4 acres, using a 50 foot width for total road right-of-way disturbance.

The existing mineral material pit location is also within the Middle Fork IRA. Additional material removal could expand the pit boundaries by about 2 acres. The proposed trailhead for Lost Fork Trail No. 409 would entail widening off the Memorial Way road into the Middle Fork IRA, utilizing about 1 acre.

Under Alternative 2, there will be evidence of human-induced changes on approximately 4.4 acres of inventoried roadless lands. This will be in the form of earth disturbance for road relocation segments, possible expansion of the existing mineral material pit within the previously clearcut area, and widening of the road prism to accommodate trailhead parking across from Trail No. 409. These disturbances will be evident for some period of time, possibly decades, until vegetation reestablishes to the point that human-induced disturbance is no longer perceived.

Obliteration of the abandoned road segments by recontouring and pulling slash and debris back onto the roadbed will, over time, return those areas to a condition nearer natural, but evidence of surface impacts are likely to persist for several years. Once abandoned segments have healed to the point that evidence of human-induced change is not recognizable, the overall effect to roadless area characteristics will be similar to what currently exists.

If the abandoned road prisms are allowed to remain in place, a return to near-natural conditions will take much longer, possibly many decades, and evidence of human-induced changes to natural integrity will continue to affect an additional 0.7 – 1 acres.

Alternative 3: No road reconstruction or trailhead construction would take place in inventoried roadless areas under Alternative 3. Human-induced changes as described for Alternative 2 would be evident on about 1 acre should the gravel pit be expanded.

Direct Effects to Opportunities for Solitude, Remoteness, and Primitive Recreation Experience*:* Solitude is a personal, subjective value defined as isolation from sights, sound and presence of others, and human development. Remoteness is a perceived condition of being secluded, inaccessible, and out of view. A primitive recreation

experience includes opportunities for isolation from evidence of man, a vastness of scale, feeling a part of the natural environment, having a high degree of challenge and risk, and using outdoor skills characterized by meeting nature on its own terms without comfort or convenience of facilities.

Opportunities for solitude and sense of remoteness are primarily affected by actions that increase human presence in an area, such as road development, development of recreation sites, changes in types of uses, such as allowing motorized vehicular use in an area that was previously non-motorized. Sights of human civilization can also affect remoteness or opportunities for solitude and primitive and unconfined recreational experiences.

Opportunities for solitude, remoteness and primitive recreation experiences in the project area are already so limited by the presence of a major arterial road, that little change to current conditions are expected by any of the alternatives. Accessibility to this area may be slightly improved by having improved travel conditions under Alternative 2 (and to a lesser extent under Alternative 3), but overall ability to access the area will not change. Construction of a trailhead facility under Alternatives 2 and 3 could bring more use to Trail No. 409, thereby increasing the possibility of other human encounters in the Lost Fork.

Obliteration of abandoned route segments would ensure that additional motorized uses on these routes would not occur, thereby retaining similar opportunities for solitude as what currently exists. If these routes remain open for motorized use, opportunities for solitude may be slightly affected, although not to a great extent in that the proximity of the existing road would have a primary effect on solitude in the project area anyway.

Special Features*:* No special features have been identified in either the Middle Fork Judith or North Fork Smith IRAs. No direct, indirect or cumulative effect to special features is anticipated from proposed road reconstruction/relocation actions. See the discussion for sensitive plants and heritage resources for effects of actions under the alternatives to those resources.

Manageability/Boundaries*:* No changes to boundaries are proposed. No direct, indirect or cumulative effect to the manageability or boundary administration of the IRAs is anticipated.

2. Cumulative Effects

If relocated routes are obliterated, there should be no cumulative impacts to roadless area characteristics from road relocation as obliterated sections blend with the surrounding landscape. Expansion of the gravel pit and construction of the trailhead could affect about 3 acres of roadless character. No past, present or reasonably foreseeable actions are anticipated to result in additional cumulative impacts to roadless character of the North Fork Smith IRA. Overall improvement to roadless/wilderness characteristics of the Middle Fork Judith roadless area is expected as a result of the Little Belt, Castles, and North Half Crazy Mountains Travel Plan decision, in which roughly 30 miles of

motorized routes previously open to motorized travel (including undetermined or user-created routes) are no longer open for motorized travel.

HERITAGE RESOURCES

Heritage resources or cultural resources are broad and synonymous terms referring to cultural, historic, archaeological, and ethnographic properties and traditional lifeway values representing past, and in some cases, continuing human activities or uses. By their nature, historic resources are nonrenewable, easily damaged, and with few exceptions, considered irreplaceable. Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations require that federal agencies consider the effects of their undertakings on historic properties. The term 'historic' in this context refers to cultural properties that have been determined eligible for inclusion in the National Register of Historic Places (NRHP). It also refers to sites not yet evaluated as being ineligible. Historic properties may be the result of aboriginal use (prior to Euro-American influence) or historic period use. They may represent a single event or a complex system. They may be an object, feature, site, or district. They must meet the criteria outlined in 36CFR60.4 to qualify for the National Register.

Federal Agencies carry out their responsibilities under heritage laws and regulations by conducting documentary research, consulting with Indian Tribes, the State Historic Preservation Office (SHPO), possibly the Advisory Council on Historic Preservation (ACHP), and others, and often by field-surveying to identify cultural properties. Disclosure of potential effects is initiated with the NEPA analysis, and finalized through compliance with NHPA Section 106 for the selected alternative. Site-specific effects analysis and the resolution of effects are ensured by following the regulatory review process at 36 CFR 800. This process is further guided by the Region One Forest Service Programmatic Agreement and certain Federal and Regional Forest Service policies. These documents include the Region One Policy for integrating NEPA and NHPA (1991), the Region One Programmatic Agreement for Cultural Resources (USDA Forest Service et. al. 1995), and the Lewis and Clark National Forest Site Identification Strategy (1995). Through the Section 106 process, all undertakings are identified and addressed, and mitigation measures incorporated into project design, the draft EA or other appropriate heritage resource agreement. The goal is to avoid, minimize, or mitigate impacts to significant heritage properties.

Formal consultation was initiated with SHPO in March 2008. Evaluation information on eligibility of Jamison Trail (Forest Road 47, 24ME285) has been submitted to SHPO, but eligibility remains unresolved. A staged approach to moving through the National Environmental Policy Act (NEPA) process concurrent with Section 106 of NHPA was proposed and accepted by SHPO.

Both NHPA and ARPA contain provisions for the confidentiality of certain cultural resource information. Site-specific locations and other sensitive site data are not disclosed to the public. Documents containing this information are filed separately in the project planning record and are marked with an asterisk (*) in the EA bibliography; this information is exempt from public disclosure and not available under the Freedom of Information Act.

1. Defining the Analysis Area

For the purposes of this analysis, the "general heritage analysis area", also known as the "area of potential effect" (APE) is the road or reroute ROW and an area extending 30 feet out in both directions. It also includes the proposed Deadman Trailhead location, the Trail No. 409 pullout, and buffer zones around them. Where prehistoric sites are present in the APE it is further expanded to include the whole site. Linear historic features would be considered commensurate with the scope of project impacts. Past surveys and recent ones tailored to this project have covered the entire APE.

Other sites in the general area but outside the APE include three prehistoric material scatters; a Bair Ranch sheep camp; Montana Power cabins including Ant Park; a Forest Service guard station foundation; roads, trails, and sheep driveways intersecting project roads; and a can dump. The Rainbow Dam to Two Dot powerline and a dismantled Forest Service phone line are inside the APE but they would not be impacted by any of the alternatives.

2. Direct and Indirect Effects Common to All Action Alternatives

The alternatives propose varying combinations of road upgrades, reroutes, trailhead construction, and allowed vehicle category changes. In general, road construction and reconstruction in the form of surface and subsurface disturbances for the full width of the roadway, associated borrow ditches, and excavated run-off trenches can cause direct effects to a site. Construction equipment turn-arounds cause shallow subsurface disturbances. Gravel surfacing can obscure sites and protect them from unauthorized collecting. Where road upgrades are proposed, some impacts are limited to previously disturbed areas. Indirect effects of road work might include changes in vegetation and erosion patterns, or changes in the amount or type of use. Where abandoned segments are closed and reclaimed, direct effects can involve culvert removal, ground contour restoration, placement of biodegradable anti-erosion features such as filter cloth or staked hay bales, and reseeding. Often, road reclamation activities are done within the previously disturbed road prism. Indirect effects include reductions in type and amount of traffic. If the route is historically significant itself, abandoning segments could impact route integrity. According to historic maps and plats, routes in the project area have undergone various reroutes over time, however. Additional reroutes may not affect integrity except possibly as a cumulative effect.

3. Direct, Indirect and Cumulative Effects by Alternative:

Alternative 1: Bear Sign Scatter (24JT85) is a prehistoric material scatter bisected by Memorial Way. The road was built before archeological surveys were done. Initial road construction and on-going road-related erosion are directly disturbing 800 feet of the site, and would be expected to continue under the no action alternative. Currently, the site is archeologically monitored to track conditions and check for exposed features and artifacts.

On-going cumulative effects to historic roads would result from maintenance such as blading, adding rolling dips or run-off channels, and ditches, as well as traffic related developments such as multiple parallel tracks and side-roads.

Alternative 2: Alternative 2 proposes reroute construction along 600 feet of the edge of the prehistoric material scatter discussed for Alternative 1. If the reroute is constructed, the abandoned segment would be closed and reclaimed. This would be done with heavy equipment and would result in additional damage to portions of the site bordering the current roadbed. These construction and reclamation actions are direct impacts to the site. Indirect impacts are slight in comparison. If this alternative is chosen, to mitigate these effects, Sec 106 compliance would start with SHPO consultation on site significance. This would require documenting site condition, possibly through archeological excavation. If the site is determined to be significant, consultation would proceed to discussions of project effects and mitigation options, possibly including excavation along areas that would be disturbed by construction and reclamation. Following excavation, permanent filter cloth could be laid along the affected route to mark the natural ground surface and separate it from introduced gravel.

Lithic Scatter 24ME726 is a prehistoric material scatter along a road proposed to be upgraded as part of Alternative2. Upgrades could be confined to the width of the existing road prism but the site has a buried component which introduces complexities. Direct effects of Alternative 2 proposals could include blading and equipment staging disturbances, imported gravel mixing with cultural layers, erosion, and compaction. Indirect effects could include erosion and deposition disturbances resulting from the upgrades, and changes in post-construction maintenance patterns and impacts. Preservation options involving roadbed and/or roadside excavation, filter cloth, and equipment operation and staging restrictions could mitigate impacts of these effects. Consultation with the SHPO is planned.

The R&B Scatter (Field 1) is a very small prehistoric material scatter 50 feet beyond the impact area of a proposed reroute. Reroute construction would involve a road cut –and-fill pattern to form the road bed. Direct effects of construction and traffic near the site could be avoided with construction phase provisions specified in the area of the site. These could include no equipment operating or parking below the fill zone and no sawn trees or debris discarded or staged in the area of the site. Indirect effects of the construction and traffic might include erosion or deposition changes on-site, depending on the type and location of drainage features incorporated into road design. Off-road travel or parking on the site would not be expected. If this alternative is chosen, these types of stipulations would adequately protect the site.

Alternative 2 proposes construction of reroutes and general upgrades along Memorial Way (Forest Road 487) between the Road 274 junction (Corral Creek), west to the Road 2056 junction (Weatherwax). Implementation would directly impact route features. It may indirectly impact historic character. The oldest documented component of this road is the Jamison Trail Road (Forest Road 47, 24ME285) thought to date to 1875. It ran from the river basin south of Ant Park to Kings Hill via Spur Park and the head of Harrison Creek. It is called the Jamison Trail Road to distinguish it from the older

Jamison Trail. The Road diverged from the Trail in places south of Spur Park. The South Fork Judith Road first appears along its current route on the 1927 GLO plat. It wasn't named on the plat. As the Forest developed system roads, the road up the South Fork and northwest to Kings Hill, including Jamison Road northwest of Ant Park, became Forest Road 487. Forest Road No. 487 was known as Judith River Road into the 1950s. Sometime in the 60s, it was administratively named "Memorial Way" in honor of western artist Charles M. Russell who lived on the South Fork and illustrated landmarks and historic scenes from the area. In this way, the north end of the Jamison Road also acquired the name "Memorial Way'. Where it is necessary to discuss history of the two roads separately, the portion of Road 487 east of Ant Park will be called "South Fork Road" or "Field 3" and the portion northwest of Ant Park, to the northwest, will be called "Jamison Road" or "24ME285", its official site number.

Current locations of the South Fork Road and Jamison Road vary from those shown on historic maps. According to the 1923 Forest Map and 1927 GLO plat, segments of Jamison Road north of Ant Park followed ridgelines. The current route is generally below ridgelines. On those maps the Jamison Road reached Spur Park in different locations also. These variations are examples of reroutes being part of general route evolution. The nature of transportation evolves, destinations shift, perceptions of ideal routes changes, and route locations change in response. Part of the Segment 1 reroute north of Ant Park would bring the road closer to earlier locations. None of the Alternative 2 reroutes vary from past or current locations by more than .1 miles and generally they are relatively close to current or historic routes. See alternative maps.

Alternative 2 involves upgrading both the South Fork Road and Jamison Road from the Road 274 junction (Corral Creek) west to the Road 2056 junction (Weatherwax). From Ant Park northwest to the Road 2056 junction, Jamison Road has been rerouted and upgraded over time. From Corral Creek junction west to Ant Park, upgrades to the South Fork Road have been limited. That portion is an unsurfaced, minimally bladed, lane-and-a-half road with drainage dips and cuts. Culverts would be installed, borrow ditches would be cut in, the road bed would be built up, and gravel surfacing would be added. Short pull-outs would be built, expanding the road to two lanes in places. Also, a longer pullout would be built, to allow parallel parking where it meets Lost Fork Judith Trail 409. In general, the road standard would be improved. While these upgrades affect the physical character of the route, like reroutes, upgrades are a typical pattern of route evolution.

As part of Section 106 compliance, Forest heritage resource personnel are in the process of consulting with the SHPO on the historic significance of the Jamison Trail Road (24ME285). Recordation and evaluation of the South Fork Road (Field 3) is planned. As part of evaluation and consultation, integrity of route locations, the pattern of upgrades, and reclamation of abandoned segments will be considered in the context of route evolution.

A phone pole and phone insulators on trees indicate a segment of an historic phone line (Field 2) ran from the head of Harrison Creek toward the Bair Sheep Camp (24ME230) or an area northwest of Spur Park. Its origin and destination are not yet known and it may not be part of the Forest Service fire phone system. About .1 miles of it would be interrupted by reroute construction. Trees bearing insulators and remnants of wire would

be felled along the reroute and phone line route definition would be directly affected. Indirect effects would be minimal. The line crossed the mapped Forest Service phone line that closely followed the Jamison Road through this area. The Field 2 phone line is not shown on historic Forest maps nor has any documentation been noted to date. As an unevaluated historic resource in the area of a proposed reroute, it would be recorded and evaluated. SHPO concurrence would be sought on significance and effects. It appears that archival documentation is scant or obscure. Once references have been checked and a detailed site form has been done, it is possible the Forest and the SHPO would agree the site is insignificant or that recordation is adequate mitigation to avoid adverse effects.

An Alternative 2 reroute would cross the north end of the North Fork Smith Sheep Driveway Spur, part of 24ME300. It would cross just south of where the current road crosses the driveway. Direct effects would include physical construction and reclamation impacts where the new road would replace the current road. No indirect effects were identified. The spur is several miles long and one of many through the area. SHPO consultation on significance is planned. If consultation on effects is also needed, mitigation options could result in a finding of no adverse effects.

The South Fork Deadman Road (No. 837) is shown as a trail on the 1939 Forest Map and the upper segment followed a different route than the current one. Alternative 2 proposes construction of a trailhead and designation of the current upper segment as a motorized route open to all sizes of vehicles. This means route condition would be low standard and maintenance would be minimal. This road segment is not historic and no direct or indirect impacts to cultural resources are expected as a result of the Alternative 2 proposals. Due to maintenance problems along the upper segment of South Deadman Road No. 837, drivers have been taking Road 2056 to Weatherwax junction, and Memorial Way from there to Spur Park, or vice versa, for the last few years. The proposed Deadman route changes represent after the fact recognition of an existing situation. They would introduce no new direct or indirect effects.

Alternative 2 Cumulative Effects: The area of heritage analysis for Alternative 2 is the same general heritage research area outlined above.

Where roads bisect sites, maintenance and traffic impacts such as blading, off-road parking, erosion, and compaction introduce negative cumulative effects to sites. A network of reroutes, upgrades, and increased traffic can also cumulatively affect the remote or historic character of site settings. These situations apply to the three lithic scatters discussed above.

Jamison Trail (24ME285) and South Fork Rd (Field 3) have been cumulatively affected by changes in modes of travel, destinations, reroutes, multiple use of corridor segments for utility lines and sheep driveways, maintenance, and upgrades. The proposed Alternative 2 road upgrades and reroutes would cumulatively affect the physical character of the two historic routes.

For the Field 2 phone line, an Alternative 2 reroute would have the cumulative effect of reducing physical integrity and route definition. To a lesser extent, this is also the case for the sheep driveway (24ME300).

These cumulative effects would be considered. Those that would result from project proposals would be mitigated as needed in the same way as the direct and indirect effects described above.

Alternative 3: Bear Sign Scatter (24JT85) is a prehistoric material scatter bisected by a project road. Initial road construction and on-going road-related erosion are disturbing 800 feet of the site. Alternative 3 proposes road reconstruction along the existing alignment. In the area of the site, this could include the addition of road base, new gravel surfacing, and installation of new culverts where needed, or ditching. It presents options and trade-offs for site preservation. The segment through the site could be left as is and erosion would continue. Gravel and/or culverts could be added to reduce erosion but these developments would impact the site by introducing new material (gravel) to the setting or by excavating to place the culverts or cut ditches. If the developments are proposed Sec. 106 compliance would start with SHPO consultation on site significance. This would require documenting site condition, possibly involving excavation. If the site is determined to be significant, consultation would proceed to discussions of project effects and possible mitigation options which might include archeological excavation ahead of gravelling and drainage developments.

Alternative 3 proposals in the area of Lithic Scatter 24ME726 are identical to those of Alternative 2. See the discussion above.

Alternative 3 proposes reconstruction of Memorial Way, with two reroutes proposed. One north of Ant Park is 1.4 miles long, along a slightly different route than the Alternative 2 version. The other is the same as one proposed for Alternative 2, partially along the old phone line (Field 2). The Alternative 2 discussions of the undertaking and Jamison Trail and South Fork Road history, effects, and SHPO consultation apply. The Alternative 2 Field 2 phone line discussion also applies.

Alternative 3 includes a proposal to upgrade the existing road that crosses the north end of the North Fork Smith Stock Driveway (24ME300). This would not be considered to affect the driveway.

Under Alternative3 the upper segment of South Deadman Road No. 837 would be downgraded to a trail for motorbikes and ATVs. This ‘trail’ designation is consistent with the historic road/trail designations shown on the 1939 Forest Map, although then the upper segment was in a different location. The proposal would not have direct or indirect effects to historic resources.

Alternative 3 Cumulative Effects: The area of heritage analysis for Alternative 3 is the same general heritage research area outlined above. Alternative 2 cumulative effects discussions apply to Alternative 3 proposals and the sites involved.

4. Summary of effects to heritage sites:

None of the proposed alternatives are expected to cause an increase in traffic through the general area, except possibly during wet periods, if some drivers have been avoiding potentially slick unsurfaced segments. Upgrades, reroutes, and reclamation of abandoned route segments are proposed for historic routes. This is part of route evolution. On-going consultation with the SHPO would determine whether the routes and other sites are historically significant. The Regional Programmatic Agreement includes a process for addressing effects to significant prehistoric and historic sites. 36 CFR 800 outlines criteria for determinations of adverse effects and provisions for mitigation. Complying with those processes and provisions should result in avoidance of adverse effects to significant sites. Both action alternatives would affect sites. Alternative2 would affect more miles of historic roads than Alternative 3.

SENSITIVE PLANTS

The sensitive plant analysis describes current plant populations in the project area and discusses the anticipated impacts to sensitive plants from taking no management action (Alternative 1) and from implementing the two action alternatives (Alternatives 2 and 3). Road construction and decommissioning are the management actions being considered in this analysis. Compliance with the Lewis and Clark Forest Plan and other laws and regulations is discussed.

Regulatory Framework

Lewis and Clark National Forest Land and Resource Management Plan

Management Standard C-2 (2 & 13): Conduct biological evaluations of each program or activity carried out on occupied sensitive species habitat to determine whether the activity may affect sensitive species. Assessments of suitable habitats for sensitive plants will be conducted before surface disturbing activities are permitted.

Forest Service Manual – FSM 2672.41

Ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or contribute to trends toward Federal listing of any species.

Area Of Analysis

The sensitive plant analysis area is limited to areas of road relocation, reconstruction, and decommissioning; pull-off, turnout, and trailhead construction; and other activity areas associated with the proposed action alternatives. The analysis area for the no action alternative would be the same locations as described above.

Effects Analysis Methods

This effects analysis is based on known sensitive plant occurrences, as provided by the Montana Natural Heritage Program (MNHP 2006) and the Lewis and Clark National

Forest plant atlas, and on potential habitat, as displayed in the Forest's geographic information system (GIS) sensitive plant model. A preliminary analysis of the project area was conducted using information available from color aerial and NAIP photography, topographic and landtype maps, the timber stand management record system database (TSMRS), and the inventory of known sensitive plant populations. Habitat requirements for each of the sensitive plant species were compared with habitat occurring in the project area. Field surveys were conducted during 2007 in areas of potential habitat and proposed activity areas.

Existing Condition

a. Natural characteristics

The Lewis and Clark National Forest Land and Resource Management Plan provides Forest-wide management direction in regard to sensitive plants stating "Conduct biological evaluations of each program or activity which is Forest Service funded, authorized, or carried out on occupied Threatened, Endangered, or Sensitive species habitat, to determine whether the activity may effect Threatened and Endangered or Sensitive species" (USDA 1986). The three plants listed on the Endangered Species List as "threatened" and occurring in Montana are water howellia (*Howellia aquatilis*), Spalding's catchfly (*Silene spaldingii*), and Ute ladies'-tresses (*Spiranthes diluvialis*). Species occurrences and suitable habitat are only known on Forests west of the Continental Divide for water howellia and Spalding's catchfly and in the Missouri, Jefferson, Beaverhead, Ruby, and Madison River drainages for Ute ladies'-tresses. No further analysis will be conducted for the threatened species.

Forest Service sensitive species are defined as "[t]hose plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: a) significant current or predicted downward trends in population numbers or density or b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution" (USDA Forest Service 2005). Regional Foresters are delegated the authority to designate sensitive plant species based on the definition above (USDA Forest Service 2005). The current USFS Northern Region (R-1) sensitive plant species list was developed October 28, 2004 (Kimbell 2004a). On November 24, 2004, long-styled thistle (*Cirsium longistylum*) was removed from the Regional Forester's list after completion of a status assessment (Kimbell 2004b).

The current Northern Region sensitive plant species list (Kimbell 2004a) was reviewed as it pertains to the project area. There are currently eleven sensitive plant species that either occur or are suspected to occur on the Jefferson Division (Belt Creek, Judith, Musselshell, and White Sulphur Springs Ranger Districts) of the Lewis and Clark National Forest. The presence or absence of plant populations or habitat is summarized in the following table (Table 3) and discussed below. Five species are known to occupy habitat and have documented occurrences in the Jefferson Division. These sensitive plant species are short-styled columbine (*Aquilegia brevistyla*), Northern wild-rye (*Elymus innovatus*), Northern rattlesnake-plantain (*Goodyera rep*ens), Missoula phlox (*Phlox kelseyi* var. *missoulensis*), and Austin's knotweed (*Polygonum douglasii ssp. Austinae*). Six species, English sundew (*Drosera anglica*), linear-leaved sundew (*Drosera linearis*),

Hall's rush (*Juncus hallii*), Barratt's willow (*Salix barrattiana*), water bulrush (*Scirpus subterminalis*), and alpine meadowrue (*Thalictrum alpinum*), may also be present on the Lewis and Clark National Forest. Twelve species are not known to occur on the Jefferson Division of the Lewis and Clark National Forest. These plant species are round-leaved orchis (*Amerorchis rotundifolia*), Lackschewitz' milkvetch (*Astragalus lackschewitzii*), upward-lobed moonwort (*Botrychium ascendens*), peculiar moonwort (*Botrychium paradoxum*), small yellow lady's-slipper (*Cypripedium parviflorum*), sparrow's-egg lady's-slipper (*Cypripedium passerinum*), giant helleborine (*Epipactis gigantea*), Lackschewitz's fleabane (*Erigeron lackschewitzii*), Macoun's gentian (*Gentianopsis macounii*), stalked-pod crazyweed (*Oxytropis podocarpa*), blunt-leaved pondweed (*Potamogeton obtusifolius*), and five-leaved cinquefoil (*Potentilla quinquefolia*).

Table 3. Sensitive plant species on the Jefferson Division of the Lewis and Clark National Forest.

SPECIES NAME	HABITAT PREFERENCE AND OCCURRENCE IN PROJECT AREA
short-styled columbine (*Aquilegia brevistyla*)	Open woods and stream banks at mid-elevations in the montane zone. *No habitat or populations occur in the analysis area.*
Northern wild-rye (*Elymus innovatus*)	Sandy meadows, streambank and rocky hillsides to open lodgepole pine or spruce forests. Elevations range from 4,600 to 5,200 feet on the Forest. *No habitat or populations occur in the analysis area.*
Northern rattlesnake-plantain (*Goodyera repens*)	North-facing, mossy forested slopes in the montane zone. Usually in old-growth/late successional forests. *No habitat or populations occur in the analysis area.*
Missoula phlox (*Phlox kelseyi var. missoulensis*)	Open, exposed, limestone-derived slopes in foothills and montane zones. *Habitat and populations occur in the analysis area.*
Austin's knotweed (*Polygonum douglasii ssp. austinae*)	Barren to sparsely vegetated, dry, gravelly, often shale-derived soils of eroding slopes and banks in the montane zone. Elevations range from 4,900 to 7,000 feet on the Forest. *No habitat or populations occur in the analysis area.*
English sundew (*Drosera anglica*) (S)	Sphagnum moss in wet, organic soils of fens in the montane zone. *No habitat or populations occur in the analysis area.*
linear-leaved sundew (*Drosera linearis*) (S)	Sphagnum moss bogs, organic soils of nutrient-poor fens at mid-elevations in the montane zone. *No habitat or populations occur in the analysis area.*
Hall's rush (*Juncus hallii*) (S)	Montane to sub-alpine, wet sloughs to moist or dry meadows and open, grassy slopes. Often associated with fescue grasslands or more moist meadows, sometimes partially shaded. *No habitat or populations occur in the analysis area.*
Barratt's willow (*Salix barrattiana*) (S)	Cold, moist soils near or above timberline. *No habitat or populations occur in the analysis area.*
water bulrush (*Scirpus subterminalis*) (S)	Shallow fresh water and boggy margins of ponds, lakes, and sloughs in valley, foothill, and montane zones. *No habitat or populations occur in the analysis area.*
alpine meadowrue (*Thalictrum alpinum*) (S)	Hummocks, often beneath low shrubs in moist, alkaline meadow in the montane zone. *No habitat or populations occur in the analysis area.*

(S) = Suspected to occur on the Lewis and Clark National Forest.

Missoula phlox, a mat-forming perennial, is the only sensitive species documented in the analysis area (MNHP 2006, Fields data form). Pre-field analysis and field

reconnaissance indicates that suitable habitat for the remaining sensitive plant species does not occur in the project area. Therefore, no further analysis will be completed for these species.

Missoula phlox was first discovered in 1921 on Water Works Hill in Missoula, Montana. Since that time, only 16 moderate to large-sized populations have been documented on various ownerships from Missoula to the Little Belt Mountains in west-central Montana (MNHP 2008). The Lewis and Clark National Forest supports five of the known populations. Missoula phlox is ranked as a G2/S2 species of concern which means it is imperiled (vulnerable to global extinction or extirpation) in Montana because of rarity (MNHP 2008, Schassberger and Achuff 1991) (see Appendix A). Missoula phlox is also classified as a regional endemic which is a species that is confined to a relatively small geographic area and often to one particular specialized habitat within that area.

Missoula phlox populations occur in habitats that range from sparsely vegetated with dry gravelly slopes, to heavily vegetated forb meadow sites. Most sites, like Spur Park in the analysis area, are on windswept ridges and crests on all aspects between 3600 and 8100 feet elevation (Schassberger and Achuff 1991). Missoula phlox on the Lewis and Clark National Forest is found on limestone and granite/shale soils between 7400 and 8100 feet elevation.

Documented population sizes range from several hundred to 10,000 plants. The Spur Park population of 500 to 1000 plants covers approximately 44 acres and contains variable plant densities. The Lewis and Clark National Forest contains 5 Missoula phlox populations averaging 3,300 plants on approximately 130 acres. Population information is presented in Table 4. The actual extent of the Slide Rock/Cabin Mountain population has not been mapped.

Table 4. Lewis and Clark National Forest Missoula phlox population information.

Population Name	Discovery / Survey Dates	Number of Plants	Population Acres
Spur Park	1992	750	44
Kings Hill	1948 / 1990 / 1992	1000	50
Harley Park	1945 / 1990	500	25
Upper Wilson Park	1990	750	12
Slide Rock/ Cabin Mountain	1991	300	2 (2 pops 2.5 miles apart)
Total		3,300	133

Noxious weed establishment, development, and recreation trail use are some of the threats documented phlox populations are currently experiencing (MNHP 2008). Although no information is available on responses to specific actions, Missoula phlox seems to be able to occupy some disturbed sites, such as old roads and heavily grazed pastures (Schassberger and Achuff 1991). However, this slow growing perennial has a low recruitment rate (Schassberger and Achuff 1991).

Long-styled thistle, a state endemic thistle restricted to areas of Central Montana, was removed from the Northern Region sensitive plant list in 2004 (Kimbell 2004b) when available data and observations indicated that population levels had remained fairly stable over the past decade (Mincemoyer 2004). This species is currently ranked as a G3/S3 which means that it is vulnerable because of rarity or restricted range (MNHP 2008) (see Appendix A). Long-styled thistle populations are estimated to be around 30,000 plants scattered over four mountain ranges. A majority of the populations reside on the Helena and Lewis and Clark National Forests. The project area contains part of the Kings Hill site supporting at least 9,500 individuals over 2000 acres growing on roadsides and in meadows (Mincemoyer 2004). This site includes individuals along Forest roads 487 and 837. Long-styled thistle responded positively to fire in the Spur Park and Ant Park areas with many individuals seen flowering after the fire (Mincemoyer 2004). "Periodic disturbance appears to play a key role in the survival and establishment of populations. Roadsides provide habitat for the species throughout its range due to the bare soil, lack of competition and increased availability of light, water and nutrients that are common along many mountain roads. These populations are also susceptible to the negative impacts associated with roads such as weed invasion, herbicide spraying and road grading, among other possible threats" (Mincemoyer 2004).

Canada thistle (*Cirsium arvense)* and houndstongue (*Cynoglossum officinale)* are a few noxious weed species noted in or near the project area. There is a moderate to high potential for these species to be transported to the project area along roads 487 and 837.

b. Desired condition

One of the long-range goals of the Lewis and Clark National Forest is to promote high quality, wildlife and fish habitat to insure a desired mixture of well-distributed species and numbers for public benefit with special emphasis given to sensitive plant, animal, and fish species management. A Forest-wide management objective is to insure maintenance of sensitive species populations through inventory data collection and program area coordination. Special consideration may be given in land management to maintain genetic diversity (USDA Forest Service1986). Based on the Forest Plan goals, objectives, and management standards, viable populations of sensitive plant species would be maintained across the Forest, and Forest populations would contribute to a viable Regional population (USDA Forest Service1993).

Effects By Alternative

a. Effects Common To All Action Alternatives

1. Direct and Indirect Effects

Implementation of either action alternative would have no effect upon Northern Region sensitive plant species, other than Missoula phlox, because no individuals or suitable habitat occur in the project area. Relocation of Forest road 487 out of the Missoula phlox population in Spur Park meadow and into the forest was discussed, but eliminated from further consideration due to resource concerns and feasibility.

Relocation and reconstruction activities would impact long-styled thistle populations where they occur along Forest roads 487 and 837. Individuals could be removed or covered with cast-off road material within the 50-foot right-of-way.

Noxious weeds are aggressive colonizers that can have long-term negative effects on sensitive plant species and/or potential habitat through direct competition and displacement. Soil disturbance along Forest road 487 would increase the risk of noxious weed establishment within the Missoula phlox population. Post-treatment monitoring to determine presence of weed establishment would be needed to ensure that appropriate noxious weed treatments are prescribed while infestations are small. Because herbicide use to manage invasive species can kill sensitive plants, mitigation measures identified in the Noxious Weed Control FEIS (USDA 1994) for herbicide application are required and would minimize impacts to known sensitive plant populations.

2. Cumulative Effects

Under the Little Belt, Castle, and (North Half) Crazy Mountains Travel Plan, Record of Decision, Forest road 6417 along Harrison Creek would be decommissioned (USDA Forest Service 2007). Approximately 1000 feet of the route intersects the Spur Park Missoula phlox population. There is a potential for decommissioning activities to impact existing Missoula phlox individuals. However, until a site-specific NEPA document is complete, the exact decommissioning method and effects to Missoula phlox is unknown at this time.

b. Alternative 1

1. Direct and Indirect Effects

No change in the Missoula phlox population is expected with implementation of the No Action Alternative. Individual plants growing immediately adjacent to the road prism could be impacted with routine road maintenance activities, but this impact would be status quo.

2. Cumulative Effects

There would be no cumulative effects to Missoula phlox under this alternative.

c. Alternative 2

1. Direct and Indirect Effects

Road relocation and construction of segments 3 and 4 would negatively impact a natural, intact population of Missoula phlox. The new road segments would be up to 50 feet wide and would remove about 1.4 acres of Missoula phlox habitat and individuals. Following construction of the new segments, relocated sections of the original route would be obliterated by returning the road prism to as near natural contour as possible and placing slash or woody debris on the reclaimed surface. Because Missoula phlox individuals have been documented immediately adjacent to the road surface, obliteration and recontouring of the original route near segment 4 would remove individual phlox plants. No phlox individuals or habitat would be disturbed during obliteration activities near segment 3. Depending upon the extent of activities off the road prism, about 1 acre of phlox habitat and individuals are expected to be impacted.

Sections of roads 487 and 837 that are not relocated or obliterated would be reconstructed by adding new road base material, resurfacing, installing ditches and culverts, and maintaining drain dips and run-off trenches in lower Spur Park. Reconstruction activities, especially resurfacing, ditch installation, or trench excavation, have the potential to either cover or remove Missoula phlox individuals and habitat. Operation of construction equipment, especially turning, off the road prism can cause shallow soil disturbances that would remove or detrimentally impact Missoula phlox individuals. The amount of Missoula phlox impact depends upon the intensity of trench maintenance and operation of equipment off the road prism. It is estimated that about 3.5 acres of Missoula phlox individuals and habitat would be detrimentally impacted through road reconstruction activities in Spur Park. Installation of inter-visible 2-way passing turnouts is also proposed along both Forest Service roads. However, turnouts should not be constructed in the Spur Park area to avoid additional Missoula phlox habitat and plant removal.

Based on the above information, it is estimated that about 5.7 acres of occupied Missoula phlox habitat or 15 percent of the plants could be impacted through implementation of this alternative. The impacted area constitutes about 4 percent of the occupied Missoula phlox habitat on the Lewis and Clark National Forest.

2. Cumulative Effects

Original construction of portions of Forest roads 487, 6417, 6418, and 6464 removed approximately 8 acres of Missoula phlox individuals and habitat. However, over time some phlox have established adjacent to road prism where the soil was once disturbed. Implementation of Alternative 2 has the potential to remove an additional 5.7 acres of Missoula phlox individuals and habitat. The total disturbance to the population would be about 14 acres. Although Missoula phlox could reestablish in the obliterated roadbeds, recruitment would occur over a long time period because of Missoula phlox's low recruitment rate and slow growth (Schassberger and Achuff 1991). Revegetation of the reclaimed road surface would also hinder Missoula phlox's establishment.

d. Alternative 3

1. Direct and Indirect Effects

Although road relocation of segments 3 and 4 would not occur to avoid impacting the Missoula phlox population, road reconstruction would still occur on the existing road template and right-of-way. As described in Alternative 2, reconstruction activities have the potential to remove Missoula phlox individuals and habitat or detrimentally cover them with cast-off road material. It is estimated that 4.2 acres of Missoula phlox individuals and habitat would be detrimentally impacted with implementation of Alternative 3. This represents about 3 percent of the Missoula phlox habitat on the Lewis and Clark National Forest. It is estimated that about 8 to 9 percent of the plants could be impacted. Installation of inter-visible 2-way passing turnouts is also proposed along both Forest Service roads. However, turnouts should not be constructed in the Spur Park area to avoid additional Missoula phlox habitat and plant removal.

2. Cumulative Effects

Original construction of portions of Forest roads 487, 6417, 6418, and 6464 removed approximately 8 acres of Missoula phlox individuals and habitat. However, over time some phlox have established adjacent to road prism where the soil was once disturbed. Implementation of Alternative 3 has the potential to remove an additional 4.2 acres of Missoula phlox individuals and habitat along Forest road 487's right-of-way. The total disturbance to the population would be about 12 acres.

Forest Plan And Other Regulatory Framework

Table 5 below briefly states management direction provided in Section 2 - Regulatory Framework and describes how each alternative complies with that direction.

Table 5. Compliance with management direction.

Management Direction	Compliance with Management Direction
Management Standard C-2 (2 & 13): Conduct biological evaluations for sensitive species. Assess potential for suitable habitat prior to surface disturbing activities.	Field surveys completed in 1992 and 2007 indicate the Missoula phlox is the only Northern Region designated sensitive plant species in the project area. This report constitutes the sensitive plant species biological evaluation.
FSM 2672.41 – Ensure Forest Service actions do not contribute to loss of viability.	Implementation of either action alternative would not contribute toward a loss of Missoula phlox viability across its range. Alternatives 2 and 3 could impact 15 and 8 to 9 percent of Missoula phlox plants in Spur Park, respectively. This project is anticipated to impact only 3 to 4 percent of the documented Missoula phlox habitat on the Lewis and Clark National Forest.

Determination Of Effects

It is my determination that implementation of the Deadman-Memorial Way Road Capital Improvement Project would have **no impact** upon short-styled columbine, Northern wild-rye, Northern rattlesnake-plantain, Austin's knotweed, English sundew, linear-leaved sundew, Hall's rush, Barratt's willow, water bulrush, and alpine meadowrue. Implementation of Alternatives 2 and 3 **may impact Missoula phlox individuals and habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species**.

Table 6. Determination of effects.

Sensitive Species	Alternative 1	Alternative 2	Alternative 3
short-styled columbine	NI	NI	NI
Northern wild-rye	NI	NI	NI
Northern rattlesnake-plantain	NI	NI	NI
Missoula phlox	NI	MIIH	MIIH
Austin's knotweed	NI	NI	NI
English sundew	NI	NI	NI
linear-leaved sundew	NI	NI	NI
Hall's rush	NI	NI	NI
Barratt's willow	NI	NI	NI
water bulrush	NI	NI	NI
alpine meadowrue	NI	NI	NI

NI = No Impact
MIIH = May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species.
WIFV = Will impact individuals or habitat with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species.
BI = Beneficial Impact

OTHER RESOURCE CONSIDERATIONS

Wildlife

Impacts to Threatened, Endangered, Sensitive, Candidate, and Forest Plan Management Indicator Species were considered. A Biological Assessment/Biological Evaluation has been completed and is in the project file.

Effects to wildlife species were determined considering amount of open road and acres of habitat impacted by alternative. These are displayed in Tables 7 and 8 below. There is little change in either parameter by alternative.

Table 7. Miles of Trail and Road Segment Re-route by Alternative

	Existing	Alternative 2	Alternative 3
Road No. 837 Segment 1	2.27 miles of road open yearlong	2.27 miles converted to motorized trail	2.27 miles converted to motorized trail
Road No. 487 Segment 1	0.92	1.46	1.36
Road No. 487 Segment 2	0.52	0.43	0
Road No. 487 Segment 3	0.17	0.21	0
Road No. 487 Segment 4	0.42	0.42	0
Road No. 487 Segment 5	0.83	0.98	0.98
Total Road Segments		**3.50 miles new construction; 2.86 miles road decommissioned**	**2.34 miles new road construction; 1.75 miles road decommissioned**

Existing reflects the miles of road currently in the project area. For Trail Segment 1 the road is converted to a trail for the same length in each action alternative. Under Alternative 2, all Road Segments under existing would be decommissioned (2.86 miles), and 3.50 miles of new road would be constructed. Under Alternative 3, Road Segments 1 and 5 under existing would be decommissioned (1.75 miles), and 2.34 miles of new road would be constructed.

Road segment 1 cuts through an area previously burned. Standing dead trees (snags) would be removed for this re-route. Road segments 2, 3, and 4 cross open areas with grass cover and an occasional small tree. Road segment 5 is located in a timber stand of primarily lodgepole and Douglas-fir. Clearing for the re-routes would be 50 feet wide. In addition, the re-routed section of road would be decommissioned. For re-routed road segments 1, 2, 3, and 4 the old road template would quickly re-colonize with grasses and forbs. Re-routed road segment 5 would eventually be restocked by trees, with grasses and forbs colonizing the old road template first. The proposed trailhead is located in an open grassland and would be approximately 1.5 acres in size. Table 8 shows the acres of each habitat impacted by the re-routes, by alternative.

Table 8. Acres of Habitat Impacted by Each Alternative

	Alternative 2			**Alternative 3**		
	lost	gained	**net**	lost	gained	**net**
Snags	-8.8	0	**-8.8**	-8.2	0	**-8.2**
Grass	-8.0	12.25	**4.25**	-1.5	5.6	**4.1**
Timber	-5.9	5.0	**-0.9**	-5.9	5.0	**-0.9**

Aside from the acres of habitat impacted by the re-routes, the primary effect of the project would be disturbance during implementation. In 2008, the road surface material would be crushed and stockpiled over a 2 to 3 week period. In 2009, the work along

Deadman Road, and on Memorial Way Road from Weatherwax Road to Ant Park, would be completed. This includes resurfacing of the road, placing drainage structures (culverts and dips), and the re-routes. This is expected to take several months to complete. Reconstruction of Memorial Way from Ant Park to the junction of Spring Creek Road would take place as funds are available.

A description of anticipated effects and determinations for Threatened, Endangered, Sensitive, and Management Indicator Species is summarized below and in tabular form in the project record. Alternative 1, the no action alternative, would result in no effect/impact on any Threatened, Endangered or Sensitive species; and would not result in habitat alteration for any Management Indicator Species. The action alternatives (Alternative 2 and 3):

- May impact individuals or habitat, but would not likely contribute to a trend towards Federal listing of loss of viability to the population or species for bald eagle, black-backed woodpecker, Townsend's big-eared bat, and wolverine and the gray wolf (delisted March 28, 2008).

- Will have no impact on peregrine falcon, flammulated owl, burrowing owl, harlequin duck, fisher, northern bog lemming, or greater short-horned lizard.

- A small amount of habitat will be altered for elk, mule deer, white-tailed deer, black bear, mountain lion, northern goshawk, blue grouse, and bobcat. These habitat alterations result in a less than 10 acre net change in habitat type across the project area.

- No habitat will be altered for bighorn sheep, mountain goat, beaver habitat, golden eagle, prairie falcon, and northern 3-toed woodpecker.

Forest Plan standards for open road density were calculated in the Final Environmental Impact Statement for the Little Belt, Castle, and North Half Crazy Mountains Travel Management Plan. Under all alternatives, Forest Plan road density standards would be met. Alternative 2 would also result in a decrease of 1.65 miles of open road, while Alternative 3 would result in a decrease of 1.71 miles.

No impacts to westslope cutthroat trout is expected under any of the alternatives.

Water Resources

The location of the proposed road work is outside of the sediment contribution zone of streams and the road work is not located in nor would the work influence wetlands. Standard road construction BMPs for erosion control would be used during and after construction to limit sediment movement away from the construction site. Therefore, there are no water quality or watershed extraordinary circumstances associated with the proposed road work.

Soil Resources

Regional and Forest Plan Direction:

Regional Soil Quality Standards (FSM 2500-99-1) are designed to meet direction in the National Forest Management Act of 1976 and other legal mandates. Objectives of the standards are to manage National Forest System lands under ecosystem management principles without permanent impairment of land productivity and to maintain or improve soil quality. Soil quality standards apply to lands where vegetation and water resource management are the principal objectives such as timber sales, grazing allotments, wildlife habitat or riparian areas. The standards do not apply to intensively developed sites such as mines, developed recreation sites, administrative sites, rock quarries or system roads. **Regional Soil Quality Standards would not apply to this project**.

Forest Plan requirements are listed below.
Management Standard F-1: Utilize adequate soil and water conservation practices to protect soil productivity and to control nonpoint pollution from project activities, using as a minimum, practices specified in any State-developed "Best Management Practices."

Management Standard F-3: (1) Require application of Best Management Practices to project activities to ensure meeting or exceeding State water quality standards.

(2) Develop additional Best Management Practices during the environmental analysis process and incorporate them into all land use and project plans as a principal mechanism for controlling non-point sources and meeting soil and water quality or other resource goals.

(8) Require drainage structures on disturbed areas where it is necessary to control erosion.

(11) Require prompt revegetation of disturbed areas, especially cut and fill slopes, to control surface erosion. To stabilize disturbed areas, seed with grasses, forbs and deep-rooted native shrubs, where natural establishment of native cover is not expected within two years. Ideally the seedbed should be firm with a roughened surface. The slope must be stable, usually less than 2:1. Steeper slopes can be benched or terraced. Compacted soils should be ripped from eight to twelve inches.

(13) Achieve a 70 percent vegetative or litter cover level on cut and fill slopes and other soil disturbance areas within 2 growing seasons or a natural level of vegetative and litter cover when it is less than 70 percent.

Management Standard L-4: (3) Design and construct roads and other facilities to protect riparian areas, to control erosion, and to protect lands and resources.

(16) Design, construct and maintain roadways and other facilities to minimize surface runoff. Avoid construction during runoff periods, to minimize stream sedimentation. If

construction is essential during runoff, minimize sedimentation by installing debris basins, where necessary. Revegetate disturbed soil.

(21) Construction equipment service areas shall be located and treated to prevent gas, oil or other contaminants from washing or leaking into streams or lakes.

(22) Use the Forest's Soil Resource Inventory to determine limitations and hazards for construction. In particular, special consideration will be given to the following landtypes. 14B, 14C, 22, 25C—Severe cut-bank failure potential

Existing Conditions:

The roads and mineral materials pit fall on several different land types as shown in Map 4 (from Highway 89 to Ant Park). A summary of interpretations relevant to roads are found in Table 9 below.

Table 9. Land Type Summary

Land Type	Land form and Dominant Slopes (1)	Road Construction Suitability Rating (2)	Cutbank Slumping Risk (3)	Road Cut Erosion Hazard (4)	Depth to Bedrock (5)
11	Colluvial basins on mountain ridges (0-10%)	Moderate limitations due to shallow concentrations of ground water	Low	Low	Greater than 60 inches
12	Ridges and upper slopes (10-25%)	No limitations	Low	Low	15-30 inches to limestone
14C	Rotational slumps and mud flows (25-40%)	Moderate to severe limitations due to severe mass failure hazard	Severe	Low	20-60+ inches to clay/shale
14J	Very steep warm aspect slopes (60%+)	Moderate limitations due to shallow, non-rippable hard rock	Low	Low	20-60+ inches to limestone
16A	Ridgetops (10-25%)	No limitations	Low	Low	20-40 inches to limestone
16B	Ridgetops (10-25%)	No limitations	Low	Low	20-40 inches limestone/mudstone
20	Ridgetops or hilly valley floors (0-10%)	No limitations	Low	Low	Greater than 60 inches
20A	Colluvial basins or toeslopes (25-40%)	Moderate limitations due to shallow concentrations of ground water	Moderate	Low	Greater than 60 inches
20B	Steep valley slopes (25-40%)	No limitations	Low	Low	40-60 inches to sandstone or granitics
20F	Steep valley slopes (25-60%)	No limitations	Moderate	Low-Mod	20-40 inches to shale
27	Ridges and upper slopes (10-40%)	No limitations	Low	Low	20-40 inches to shale or rhyolite

1) Holdorf, 1981.
2) Holdorf, 1981. Limitations to road construction considered include non-rippable hard rock or subsurface concentrations of groundwater at depths where they are likely to be encountered during construction.
3) Holdorf 1981. This is a rating of the hazard of various kinds of gravitational erosional processes occurring. In this area the major processes are mass failure by rotational slumping and mud flows.
4) Holdorf 1981. This rating assumes the qualities of the subsoils. The rating considers only resistance to detachment and movement of exposed soil material and the ease of establishment of erosion control seedings as it affects the time the soil is susceptible to erosion.
5) Holdorf 1981.

Effects Analysis:

1. Direct and Indirect Effects

Direct Effects to soils: Established road surfaces are, for practical purposes, eliminated from the productive soils base. Roads and trails can intercept surface flow, concentrating runoff and directing flows and erosion toward streams (Wemple and Jones 2003). Roads and trails built across sensitive soils with a high risk of mass movement undermine upper slopes and increase the risk of soil movement and mass failure (Gucinski et al. 2001). Soil impacts from roads and trails tend to be more severe at high elevations due to higher precipitation rates, an extended period of snowmelt resulting in muddy soils, more severe freeze/thaw cycles causing more loose soil and increased exposure to wind erosion (Leung and Marion 1996). Soil impacts from roads and trails continue once established since the soil comprising the travel way is subject to continuing erosional forces of rainfall, running water, wind, freeze/thaw cycles, gravity and traffic (Leung and Marion 1996; Switalski et al 2004; Summer 1986). Soil erosion and sedimentation from established roads occurs because roads lack vegetative cover and the running surface is compacted. Increased use, especially by heavier vehicles, damages road drainage (Seyedbagheri 1996). Poor road drainage accelerates erosion rates by allowing runoff to accumulate on the roads, often collecting water from upslope (Trombulak et al 2000). Small soil particles that are easily removed by runoff are another result of increased use by heavier vehicles (Seyedbagheri 1996; Trombulak et al 2000). Applying Best Management Practices that maintain road drainage, minimize use when the subbase is wet and stabilize cuts and fills would reduce soil impacts (Seyedbagheri 1996; Megahan et al, 1992).

Removing and stockpiling soil from the surface of mineral pits provides a medium for more rapid recovery of effective vegetation cover following mining activities. However topsoil stockpiling destroys soil structure, mixes soil layers and kills much of the soil microbial population and vegetation. Stockpiling soils in teardrop shaped piles the size of school buses or smaller and providing effective, permanent drainage often allows recovery of microbial activity and regrowth of some grasses and forbs on the surface of the piles. This "skin" of the stockpile may remain biologically active for years.

Construction of trailheads includes vegetation removal, mixing of soil layers, loss of soil structure and ultimately removal of the site from the productive soils base. These sites are usually contoured to provide permanent drainage and surfaced with gravel to

minimize erosion. Following Best Management Practices that limit construction activities to dry conditions and complete construction of the site within one field season or leave sites in a stable condition for over-wintering minimize offsite erosion and sedimentation.

Restoration of roads requires improved infiltration for road surfaces and effective vegetative cover (Luce 1997; Foltz and Maillard 2003). Ripping below the compacted road layer and adding organic material or topsoil can improve infiltration, improve the germination and growth of seeded plants and lessen the probability of establishment of weeds (Switalski et al 2004).

Alternative 1

Under this alternative, no road construction or reconstruction, road conversion to motorized trail, mineral removal or trail head construction would take place at this time. The frequency and extent of future maintenance would depend on funding availability. The roads being considered in this project were not maintained in 2007 and there are currently no plans to maintain these roads west of Ant Park in 2008 (Gardiner 2008).

No new soil disturbance would occur under this alternative with exception of disturbance associated with the lack of maintenance. As described above, soil impacts from existing roads and trails continue once established. Soil impacts from roads tend to be more severe at these high elevations due to higher precipitation rates, an extended period of snowmelt resulting in muddy soils, more severe freeze/thaw cycles causing more loose soil and increased exposure to wind erosion. Roads focused on in this project climb to and continue along the divide of the Little Belt Mountains. Erosion of the road surface and drainage features is expected with some sediment carried off site.

Alternatives 2 and 3

Table 10 below summarizes lengths of roads according to landtypes and landtype limitations for construction/reconstruction/rehabilitation actions.

Table 10. Rehabilitation and Reroute Segment Summary

Proposed Reroute Construction Segment	Existing Route Length (miles)	Alternative 2 Length (miles)	Alternative 3 Length (miles)	Landtype Crossed by Reroute	Landtype Limitations for Road Construction/Reconstruction
1	0.9	1.5	1.4	16B, 16A	Low, but with bedrock between 20-40"
2	0.5	0.4	0	16B	Low, but with bedrock between 20-40"
3	0.2	0.2	0	16B	Low, but with bedrock between 20-40"
4	0.4	0.4	0	12, 20F, 20B	Low, but with bedrock between 20-40"
5	0.8	1.0	1.0	20F	Low, but with bedrock between 20-40"
Trail Segment 1	2.3	2.3	2.3	12, 14C, 14J	Landtype 14C is subject to mass failures
Total Road Segments	**2.9 (Alt 2) 1.7 (Alt 3)**	**3.5**	**2.4**		

Proposed actions for construction of new road segments and rehabilitation of existing road segments are limited only by moderately hard to hard bedrock at 20-40 inches in depth. Soil profiles of all landtypes above have high amounts of gravels and cobbles. The 2.3 mile road/trail segment crossing landtype 14C has a high risk of mass failure. To date no major areas of mass failure have been found on this portion of existing road, but evidence of high risk are seen in cut bank sloughing, areas of shallow water concentrations and high clay content of subsoils and substratum layers.

The proposed trailhead in Section 25, T12N, R8E would impact approximately 1.5 acres of soils. The mineral pit expansion in Section 7, T12N, R9E would remove up to approximately 2 acres from the productive soils base. The pull off area on the edge of Road No. 487 in Section 11, T11N, R9E would remove less than 0.5 acre from the productive soils base.

Table 11 below provides a comparison between Action Alternatives 2 and 3 with respect to acres of disturbance.

Table 11. Summary of Acres of Soils Impacted by Alternative

	Alternative 2	Alternative 3
Acres of New Roads	21.2	14.9
Acres of Trailhead, Trail Pulloff, and Mineral Pit Expansion	4	1
Acres of Road Rehabilitation	17.6	10.3
Maximum Acres of Road Reconstruction (Potential impacts dependent upon level of reconstruction, actual amounts anticipated to be much less)	87.9	87.9

Alternative 2 would impact approximately 6.3 acres more than Alternative 3 with respect to new road construction and 7.3 acres more of road rehabilitation. Both alternatives include reconstruction of approximately 3.3 miles of Forest Road No. 837 (From Junction with FR 2056 to new trailhead and Trail Segment 1) which exists in part on a landtype (14C) with high risk for mass failure. The proposed rehabilitation of abandoned road segments includes relief of compaction of the old road surface, respreading of any topsoil, seeding, and additions of adjacent coarse woody material and rock which will shorten the time for recovery of soil and water functioning. However, full recovery of the rehabilitated road segments would be years away. The amount of reconstruction needed on the remaining segments of Forest Roads 837 and 487 would vary but would stay within the 50 foot wide road corridors. Activities would potentially include widening, construction or replacement of drainage features and additional turnouts. The majority of soil impacts are anticipated to be associated with activities listed under the first three rows of Table 3 above, not with reconstruction activities on the remainder of the project.

2. Cumulative Effects

The project file contains the list of Past, Present and Reasonably Foreseeable activities which is the basis for describing cumulative effects. Only those projects with measurable soil impacts were considered.

There have been five large, mostly stand replacing wildfires in the recent past within and adjacent to the project area. The 1985 Sandpoint Fire (10,945 acres), 2000 Lost Fork Ridge fire (1405 acres), 2001 Lost Fork Fire (2325 acres) and 2003 Burnt Ridge complex (Ant Park (2100 acres) and Burnt Ridge (52 acres) fires) resulted in considerable bare ground that has not effectively revegetated throughout the fire perimeters. Ground cover is improving yearly with native species of grasses, forbs and trees. Burned snags continue to fall adding large organic material.

A portion of the 2001 Lost Fork Fire was salvage logged during the winter of 2002/2003. Monitoring of soil impacts from the Ant Park Salvage (740 acres) winter harvest showed encouraging results. Detrimental soil impacts were held to less than 8 percent on the units monitored. The harvest areas continue to show improved ground cover of grasses, forbs and trees. Some tree planting has taken place within harvested areas as well.

Under the Little Belt, Castle and (North Half) Crazy Mountains Travel Plan, Record of Decision, Forest road 6417 (forms a junction with Forest road 487 in SW ¼ Section 20, T12N, R9E) would be decommissioned (USDA Forest Service 2007). The method of decommissioning has not yet been determined. Impacts to soils of decommissioning would be determined in a future NEPA document.

Achieving Forest Plan Standards

Table 12. Forest Plan Compliance

Forest Plan Standard	How the Standard is Addressed in the Project
F-1: Utilize adequate soil and water conservation practices to protect soil productivity and to control nonpoint pollution from project activities, using as a minimum, practices specified in any State-developed "Best Management Practices."	The list of Best Management Practices in Appendix A was incorporated into the analysis.
F-3: (1) Require application of Best Management Practices to project activities to ensure meeting or exceeding State water quality standards.	The list of Best Management Practices in Appendix A was incorporated into the analysis.
F-3: (2) Develop additional Best Management Practices during the environmental analysis process and incorporate them into all land use and project plans as a principal mechanism for controlling non-point sources and meeting soil and water quality or other resource goals.	The list of Best Management Practices in Appendix A was specifically developed from the R1/R4 Soil and Water Conservation Handbook (2509.22, 5/88) and incorporated into the analysis.
F-3: (8) Require drainage structures on disturbed areas where it is necessary to control erosion.	Incorporated into the analysis as a BMP.
F-3: (11) Require prompt revegetation of disturbed areas, especially cut and fill slopes, to control surface erosion. To stabilize disturbed areas, seed with grasses, forbs and deep-rooted native shrubs, where natural establishment of native cover is not expected within two years. Ideally the seedbed should be firm with a roughened surface. The slope must be stable, usually less than 2:1. Steeper slopes can be benched or terraced. Compacted soils should be ripped from eight to twelve inches.	Incorporated into the analysis as a BMP.
F-3: (13) Achieve a 70 percent vegetative or litter cover level on cut and fill slopes and other soil disturbance areas within 2 growing seasons or a natural level of vegetative and litter cover when it is less than 70 percent.	Incorporated into the analysis
L-4: (3) Design and construct roads and other facilities to protect riparian areas, to control erosion, and to protect lands and resources.	Incorporated into the analysis as BMPs.
L-4: (16) Design, construct and maintain roadways and other facilities to minimize surface runoff. Avoid construction during runoff periods, to minimize stream sedimentation. If construction is essential during runoff, minimize sedimentation by installing debris basins, where necessary. Revegetate disturbed soil.	Incorporated into the analysis as BMPs

L-4: (21) Construction equipment service areas shall be located and treated to prevent gas, oil or other contaminants from washing or leaking into streams or lakes.	Incorporated into the analysis a BMP
L-4: (22) Use the Forest's Soil Resource Inventory to determine limitations and hazards for construction. In particular, special consideration will be given to the following landtypes. 14B, 14C, 22, 25C—Severe cut-bank failure potential	Incorporated into the analysis

Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

ID TEAM MEMBERS:

Bob Korb, IDT Leader, Forest Civil Engineer

Robin Strathy, Forest Planning Staff Officer

Kelly Keim, Archaeologist

Tanya Murphy, Forest Silviculturist

Wayne Green, Forest Hydrologist

John Hamann, Soils Scientist

Laura Conway, Forest Wildlife Biologist

FEDERAL, STATE, LOCAL AGENCIES and TRIBES:

Meagher County Commissioners

Judith Basin County Commissioners

Blackfeet Tribe

Nez Perce Tribe

Chippewa Cree Tribe

Eastern Shoshone Tribe

Crow Tribe

Salish Kootenai Tribe

Metis

Little Shell Band

Gros Ventre Tribe

Assiniboine and Sioux Tribes

Montana State Historic Preservation Office

Montana Department of Fish, Wildlife and Parks

OTHERS:

Mark Good, Montana Wilderness Association

LITERATURE CITED

Foltz, R.B. and E. Maillard. 2003. Infiltration Rates on Abandoned Road-Stream Crossings. Presented to 2003 American Society of Agricultural and Biological Engineers International Meeting, Las Vegas, Nevada. 10pp.

Gardiner, R.J. 2008. Engineering Technician for Lewis and Clark National Forest, Great Falls, MT. Personal communication.

Gucinski H., M.J. Furniss, R.R. Ziemer and M.H. Brookses. 2001. Forest Roads: A Synthesis of Scientific Information. General Technical Report PNW0Gtr-509. Portland, OR. U.S. Department of Agriculture, Forest Service. Pacific Northwest Research Station. p. 12-21.

Holdorf, H.F. 1981. Soil Resource Inventory, Lewis and Clark National Forest, Interim in Service Report, Non-Wilderness Portions. Unpublished document. On File with: U.S. Department of Agriculture, Forest Service, Lewis and Clark National Forest, P.O. Box 869, Great Falls, MT 59403. p. 1-62.

Kimbell, A.R. 2004a. Letter of October 28, 2004, Northern region revised sensitive species list. USDA Forest Service, Northern Region. 1 p.

Kimbell, A.R. 2004b. Letter of November 24, 2004, Sensitive species status – *Cirsium longistylum*. USDA Forest Service, Northern Region. 1 p.

Leung, Y. and J.L. Marion. 1996. Trail Degradation as Influenced by Environmental Factors: A State-of-the-Knowledge Review. Journal of Soil and Water Conservation. March-April 1996. p. 130-136.

Luce, C.H. 1997. Effectiveness of Road Ripping in Restoring Infiltration Capacity of Forest Roads. Restoration Ecology 5(3):265-270.

Megahan, W.F., S.B. Monsen, M.D. Wilson, N. Lozano, D.F. Haber and G.D. Booth. 1992. Erosion Control Practices Applied to Granitic Roadfills for Forest Roads in Idaho: Cost Effectiveness Evaluation. Land Degradation and Rehabilitation, Vol. 3. John Wiley and Sons Ltd.

Mincemoyer, S. 2004. Range-wide status assessment of *Cirsium longistylum* (long-styled thistle). Report to Burnett Land, LLC. Montana Natural Heritage Program, Helena, MT. 22 p. plus appendices.

Montana Natural Heritage Program. 2006. Data records in GIS format.

Montana Natural Heritage Program. 2008. Montana Natural Heritage program field guide – Missoula phlox. On-line http://fieldguide.mt.gov/detail_PDPLM0D190.aspx.

NatureServe Explorer. 2008. NatureServe Explorer comprehensive species report – Phlox missoulensis. On-line http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Phlox+kelseyi+var.+missoulensis

Schassberger, L., and Achuff, P. 1991. Status review of *Phlox kelseyi* var. *missoulensis*. Prepared for the USDA Forest Service, Region 1, Lewis and Clark National Forest, Montana. Montana Natural Heritage Program, Helena, MT. 37 p.

Seyedbagheri, K.D. 1996. Idaho Forest Best Management Practices: Compilation of Research on Their Effectiveness. USDA Forest Service, Intermountain Research Station, General Technical Report INT-GTR-339, Ogden, UT. pp. 7-33 & 65-67.

Summer, R.M. 1986. Geomorphic Impacts of Horse Traffic on Mountane Landforms. Journal of Soil and Water Conservation. 41:126-128.

Switalski, T.A., J.A. Bissonett, T.H. DeLuca, C.H. Luce and M.A. Madej. 2004. Benefits and Impact of Road Removal. Frontiers in Ecological Environment 2(1):21-28.

Trombulak, S.C. and C. A. Frissell. 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. Conservation Biology, Volume 14: 18-30.

USDA Forest Service. 1986. Lewis and Clark National Forest Plan, as amended 1993. USDA Forest Service, Lewis and Clark National Forest.

USDA Forest Service. 1993. Decision Notice and Forest Plan Amendment Number 12. USDA Forest Service, Lewis and Clark National Forest.

USDA Forest Service. 1994. Lewis and Clark National Forest Noxious Weed Control Final Supplemental Environmental Impact Statement Record of Decision. USDA Forest Service, Lewis and Clark National Forest. 10 p.

USDA Forest Service. 2005. Forest Service manual 2600 - wildlife, fish, sensitive plant habitat management, amendment 2600-2005-1, chapter 2670 – threatened, endangered, and sensitive plants and animals, sections 2670.5 and 2672.11. USDA Forest Service, Washington Office.

USDA Forest Service. 2007. Record of Decision. Little Belt, Castle and North Half Crazy Mountain Travel Management Plan. Lewis and Clark National Forest, Great Falls, MT.

Wemple, B.C. and J.A. Jones. 2003. Runoff Production of Forest Roads in A steep Mountain Catchment. Water Resources Research 39(8):1220-1239.

Appendix A—Best Management Practices

Best Management Practices (BMPs) are the primary mechanism to enable the achievement of water quality standards (Environmental Protection Agency 1987). This Appendix lists the key Soil and Water Conservation Practices (comparable to BMPs) that have been selected to be used on this project and describes each BMP that will be refined for site-specific conditions in order to arrive at the project level BMPs that protect beneficial uses, meet water quality standards and Forest Plan standards.

BMPs include, but are not limited to, structural and nonstructural controls operations and maintenance procedures. BMPs can be applied before, during and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters. Usually BMPs are applied as a system of practices rather than a single practice. BMPs are selected on the basis of site specific conditions that reflect natural background conditions and political, social, economic and technical feasibility.

The practices described herein are tiered to the practices in FSH 2509.22. They are developed as part of the NEPA process, with interdisciplinary involvement and meet Forest and State water quality objectives.

BMP Format

Each Soil and Water Conservation Practice (SWCP) is described as follows:

Title: Includes the sequential number of the SWCP and a brief title
Objective: Describes the SWCP objective(s) and the desired results for protecting soil and water quality
Effectiveness: Provides a qualitative assessment of expected effectiveness that the applied measure will have on preventing or reducing impacts on water quality. The SWCP effectiveness rating is based on literature and research, administrative studies and professional experience. The SWCP is rater either High, Moderate or Low based on the following criteria:

1. Literature/Research (must be applicable to area)
2. Administrative studies (local or within similar ecosystems)
3. Experience (judgement of an expert by education and/or experience)
4. Fact (obvious by reasoned, logical response)

Explanation: A more detailed description of the SWCP and how the SWCP would be applied effectively
Implementation: This section identifies the process of how the practices are expected to be applied.

Key Soil and Water Conservation Practice List

The following table displays the Soil and Water Conservation Practices (comparable to BMPs) required in Forest Service Handbook 2509.22. Note that not all the SWCPs are

listed here. The Forest Service requires adherence to all practices outlined in the handbook.

Identification Number	SWCP Title
15.02	General Guidelines for the Location and Design of Roads and Trails
15.03	Road and Trail Erosion Control Plan
15.04	Timing of Construction Activities
15.05	Slope Stabilization and Prevention of Mass Failure
15.06	Mitigation of Surface Erosion and Stabilization of Slopes
15.07	Control of Permanent Road Drainage
15.09	Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects
15.10	Control of Road Construction Excavation and Sidecast Material
15.11	Servicing and Refueling of Equipment
15.12	Control of Construction in Riparian Areas
15.17	Regulation of Borrow Pits, Gravel Sources and Quarries
15.19	Streambank Protection
15.21	Maintenance of Roads
15.23	Traffic Control During Wet Periods

Soil and Water Conservation Practice Descriptions

PRACTICE: 15.02 - General Guidelines for the Location and Design of Roads and Trails

OBJECTIVE: To locate and design roads and trails with minimal soil and water resource impact while considering all design criteria.

EFFECTIVENESS: High

EXPLANATION: There are several considerations which must be incorporated into the location and design of roads and trails. These factors directly affect protection of water quality, soil, and other resource values. The following coordination instructions apply to all transportation activities:

a. Area Transportation Analysis and project planning will be completed using an interdisciplinary process, and the appropriate NEPA document will be prepared and tiered to the Forest Plan. Area Transportation analysis is an extremely effective tool to reduce overall road mileages and, thus, minimize potential resource impacts.

b. Location, design, and construction activities shall utilize appropriate technical resource staffs, when needed, to evaluate effects of transportation development and operations, and recommend mitigating measures to minimize adverse impacts.

c. Roads and trails will be located and designed to facilitate completion of the transportation system, serve specific resource management needs, fit the terrain, and minimize damage to improvements and resources. Fragile, unstable, sensitive, or special areas should be avoided.

d. Roads and trails should be designed based on traffic and safety requirements of anticipated use and to meet the overall transportation plan. The design shall incorporate features to prevent or minimize soil movement and sedimentation as well as undue disruption of water flow.

e. Stream crossing structures shall be designed to provide the most efficient drainage facility consistent with resource protections, importance of the road, legal obligations, and total costs. The design may involve a hydrologic analysis to determine runoff rates and volumes, flood conditions, velocities, scour, open channel shapes, approach topography, materials-foundation condition, and fish passage, as required. An economic comparison of various flood frequencies versus structure sizes and types is also considered.

f. Locate and design roads and trails to drain naturally by appropriate use of out-sloping or in-sloping with cross drainage and grade changes, where possible. Relief culverts and roadside ditches will be designed whenever reliance upon natural drainage would not protect the running surface, excavation, or embankment. Road and trail drainage should be channeled to effective buffer areas to maximize sediment deposition prior to entry into live water.

IMPLEMENTATION: during the environmental analysis, an interdisciplinary team will be used to insure that management needs, objectives, requirements, and controls are incorporated in the location and design of roads and trails. Mitigation measures needed to protect soil and water resources will be identified in the NEPA process. Contract provisions will be prepared that meet the soil and water resource protection requirements.

PRACTICE: 15.03 - Road and Trail Erosion Control Plan

OBJECTIVE: To prevent, limit, and mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction and maintenance activities through effective contract administration during construction and timely implementation of erosion control practices.

EFFECTIVENESS: High

EXPLANATION: Land disturbing activities usually result in at least short-term erosion. Poorly designed, located, constructed, and maintained roads and trails are usually responsible for the majority of stream sedimentation problems associated with forest

management practices. By effectively planning for erosion control, sedimentation can be minimized.

Roads and trails require a variety of erosion control measures. Many erosion control practices will not only protect water quality but also maintain road prism integrity, reduce maintenance costs, and improve trafficability. The location of the road or trail with respect to streams, beneficial uses of that water, soil, and geologic information and other site factors govern the degree of stabilization required. Stabilization usually includes a combination of practices that promotes the reestablishment of vegetation on exposed slopes, provides physical protection to exposed surfaces, prevents and downslope movement of soil, or controls road drainage.

Since a newly constructed road is most susceptible to erosion from seasonal precipitation, the timing of erosion control practices is of primary concern. Those practices that can be accomplished concurrent with road counteractions shall be favored as a means of immediate protection of the water resource.

IMPLEMENTATION: Erosion control objectives and detailed mitigation measures are developed using an interdisciplinary approach during the environmental analysis. These measures and objectives shall be reflected in the contract specifications and provisions for the road or trail. When standard specifications do not provide the degree of mitigation required, special project specifications will be developed by the interdisciplinary team.

Prior to the start of construction, the Purchaser shall submit a schedule for proposed erosion control work as required in the Standard Specifications. The schedule shall include all erosion control items identified in the specifications. The schedule shall consider erosion control work necessary for all phases of the project. The Purchaser's construction schedule and plan of operation will be reviewed in conjunction with the erosion control plan to insure their compatibility before any schedules are approved. No work will be permitted on the project until all schedules have been approved by the Contracting Officer.

The Contracting Officer or Engineering Representative shall ensure that erosion control measures are implemented according to the approved schedule and are completed in an acceptable fashion. Field reviews and on-site inspection by the Line Officer and/or Forest Engineer will identify any additional erosion control measures required to protect the streams that were not recognized during planning or design. Necessary correction measures shall be implemented immeidately through normal administrative channels.

The following items may be considered as erosion control measures when constructed in a timely manner. To maximize effectiveness, erosion control measures must be in place and functional prior to seasonal precipitation or runoff.

a. Measures to reestablish vegetation on exposed soils. This is usually accomplished by seeding suitable grass and legume species in conjunction with mulching and fertilization. In some situations, treatments may include tree seedling planting or sprigging of other woody species.

b. measures which physically protect the soil surface from detachment or modify the topography to minimize erosion. These treatments may include the use of dust oil or gravel on the road travelway and ditches and the use of mulches, riprap, erosion mats, and terracing on cuts, fills, and ditches. Temporary waterbars in areas of uncompleted roads and trails can be effectively utilized to reduce sedimentation.

c. Measures which physically inhabit the downslope movement of sediments to streams. These may include the use of slash filter windrows on or below the fill slopes, baled straw in ditches or below fillslopes, catch basins at culvert inlets, and sediment basin slash filter windrows may be utilized in live water drainages where fish passage is not required and where peakflows are low.

d. Measures that reduce the amount of soil disturbance in or near streams. These measures may include dewatering culvert installation or other construction sites, and immediate placement of permanent culverts during road pioneering. Temporary pipes should not be allowed unless positive control of sedimentation can be accomplished during installation, use, and removal.

e. Measures that control the concentration and flow of surface and subsurface water. These may include insloping, outsloping, ditches, cross drains, under drains, trenches, and so forth.

PRACTICE: 15.04 - Timing of Construction Activities

OBJECTIVE: To minimize erosion by conducting operations during minimal runoff periods.

EFFECTIVENESS: Moderate-High

EXPLANATION: Erosion and sedimentation are directly related to runoff. Scheduling operations during periods when the probabilities for rain and runoff are low is an essential element of effective erosion control. Purchasers shall schedule and conduct operations to prevent erosion and sedimentation. Equipment shall not be operated when ground conditions are such that excessive impacts will result. Such conditions are identified by the Contracting Officer or Engineering Representative with assistance from technical resource staffs as needed. Temporary erosion control measures may be required to prevent, control, and mitigate erosion and sedimentation.

In addition, it is important to keep permanent erosion control work as current as practicable with ongoing operations. Construction of drainage facilities and performance of other contract work which will contribute to the control of erosion and sedimentation shall be carried out concurrent with earthwork operations or as soon thereafter as practicable. Limitation of the amount of area being graded at a site at any one time, and minimization of the time that an area is laid bare should be a consideration in contract preparation. Erosion control work must be kept current when road construction occurs outside of the normal operating season.

IMPLEMENTATION: Detailed erosion control measures are developed by an interdisciplinary team during the environmental analysis and are incorporated into the contract specifications. Compliance with plans, specifications, and the operating plan is assured by the Contracting Officer and/or Engineering Representative.

PRACTICES: 15.05 - Slope Stabilization and Prevention of Mass Failures

OBJECTIVES: To reduce sedimentation by minimizing the chances for road-related mass failures, including landslides and embankment slumps.

EFFECTIVENESS: High

EXPLANATION: Road construction in mountainous terrain requires cutting and loading natural slopes which may lead to landslides and/or embankment failures depending on the soil strength, geology, vegetation, aspect, and groundwater regime. Landslides and embankment failures are undesirable because they interrupt traffic, are costly to repair, visually unacceptable, and generate large quantities of erosion and sedimentation.

Roadways may drastically change the subsurface drainage characteristics of a slope. Since the angle and height of cut and fill slopes increase the risk of instability, it is often necessary to provide subsurface drainage to avoid moisture saturation and subsequent slope failure. Where it is necessary, horizontal drains, drainage trenches, or drainage blankets may be used to lower the subsurface water levels and to prevent groundwater from entering embankments.

In areas with high landslide potential, the composition and characteristics of embankments may be controlled since they are essentially engineered structures. Care must be taken to prevent the incorporation of construction slash or other organic material and the embankment material should be placed by one of the following methods.

a. Layer placement.

b. Controlled compaction.

c. Controlled compaction using density controlled strips.

d. Compaction controlled with a special project specification.

IMPLEMENTATION: In areas with intrinsic slope stability problems, appropriate technical resource staffs must be involved in an interdisciplinary approach to route location. Sufficient subsurface investigation and laboratory testing must be performed to general design parameters and mitigating features which will meet the constraints and requirements developed through the NEPA process.

In contracted projects, compliance with environmental analysis requirements and controls which have been provided for in the specifications is assured by enforcement of the Timber Sale Contract Provisions by the Contracting Officer and/or Engineering Representative.

PRACTICE: 15.06 - Mitigation of Surface Erosion and Stabilization of Slopes

OBJECTIVE: To minimize soil erosion from road cutslopes, fillslopes, and travelway.

EFFECTIVENESS: Moderate-High

EXPLANATION: Road construction exposes fresh, loose soil to the erosive force of wind, water, and traffic. Surface erosion from roads is greatest during the first year following construction. If is desirable to minimize erosion due to the adverse impacts on water quality, vehicle maintenance, road maintenance, and safety. Erosion can occur on cutslopes, fillslopes, and/or travelway. Each of the three surfaces has unique erosion consideration which are outlined below:

Surface	General Characteristics	Stabilization-Mitigation Measures
Cutslope	Steeper, undisturbed, and more sterile soil	Vegetative and mechanical stabilization
Fillslope	Flatter, loose, and more fertile soil	Vegetative and mechanical stabilization
Travelway	Flattest, compact (due to traffic)	Surface Stabilization

Vegetative measures include seeding herbaceous species (grass, legumes, or browse species) or the planting of brush or trees.

Fertilization, mulching, watering, and/or erosion netting and fabrics may be required to insure success.

Mechanical measures include construction of slash windrows, straw bale dams, erosion netting and fabrics, terraces, or benching, riprapping, tackifiers, and gunnite.

Surface stabilization includes watering, dust oiling, dust pallatives, aggregate layer, bituminous surface treatment, or asphalt paving depending on traffic, soils, and climatic factors.

An integrated system of collection control, and dispersion of concentrated surface water is very important in order to prevent erosion on fillslopes, travelways, and natural slopes below cross drains and culverts.

IMPLEMENTATION: During the NEPA process, detailed mitigation measures and slope stabilization techniques are incorporated into the design package by the interdisciplinary team. Compliance with environmental analysis controls and requirements is obtained by the Contracting Officer and/or Engineering Representative through the Standard Specifications and/or Timber Sale Contract Provisions.

PRACTICE: 15.07 - Control of Permanent Road Drainage

OBJECTIVE: To minimize the erosive effects of concentrated water and the degradation of water quality by proper design and construction of road drainage systems and drainage control structures.

EFFECTIVENESS: High

EXPLANATION: Degradation of water quality by sediment and the erosive effects of surface runoff can be minimized by stabilizing the road prism and adjacent disturbed areas from erosion. Velocities in the road drainage system can be dissipated before entry into the natural system by design and construction of control structures.

A number of measures can be used alone or in combination to control the detrimental effects of road drainage. Methods used to control water and reduce erosion may include: properly spaced culverts, cross drains, water bars, rolling dips, energy dissipaters, aprons, gabions, and armoring of ditches and drain inlets and outlets. Dispersal of runoff can also be accomplished by rolling the grade, insloping, outsloping crowning, contour trenching, installation of water spreading ditches, and so forth.

IMPLEMENTATION: Project location, design criteria, drainage control features, and detailed mitigation measures are determined during the NEPA process by an interdisciplinary approach. Compliance with plans, specifications, and operating plans is assured by the Contracting Officer or Engineering Representative.

PRACTICE: 15.09 - Timely Erosion Control Measures on Incomplete Roads and Streamcrossing Projects

OBJECTIVE: To minimize erosion of and sedimentation from disturbed ground on incomplete projects.

EFFECTIVENESS: High

EXPLANATION: The best drainage design and erosion control measure can be useless if projects are incomplete at the end of the normal operating season. Affected areas can include roads, fills, tractor trails, skid trails, landings, streamcrossings, bridge excavations, and firelines. Preventive measures include:

a. The removal of temporary culverts, culvert plugs, diversion dams, or elevated streamcrossing causeways.

b. The installation of temporary culverts, side drains, flumes, cross drains, diversion ditches, energy dissipaters, dips, sediment basins, berms, debris racks, or other facilities needed to control erosion.

c. The removal of debris, obstructions, and spoil material from channels and floodplains.

d. Grass seeding, planting deep rooted vegetation, and/or mulching.

IMPLEMENTATION: Protective measures must be applied to all areas of disturbed, erosion-prone, unprotected ground that is not to be further disturbed in the present year. When conditions permit operations outside the Normal Operating Season, erosion control measures must be kept current with ground disturbance, to the extent that the affected area can be rapidly closed, if the weather conditions deteriorate. Areas must not be abandoned for the winter with remedial measures incomplete.

Project location and mitigative measures are developed in the NEPA process using an interdisciplinary approach. Compliance with environmental analysis controls and requirements, contract specifications, and operating plans are assured by the Contracting Officer or Engineering Representative.

PRACTICE: 15.10 - Control of Road Construction Excavation and Sidecast Material

OBJECTIVE: To reduce sedimentation from unconsolidated excavated and sidecast material caused by road construction, reconstruction, or maintenance.

EFFECTIVENESS: Moderate-High

EXPLANATION: Unconsolidated material from road construction is frequently exposed on cut and fillslopes, can be difficult to stabilize, and represents a major sediment source. The area of exposed material is often reduced when the cut and fillslopes and roadbed are constructed to the lines, grades, and dimensions shown on the drawings or designated on the ground. The Contracting Officer and/or Engineering Representative insures that construction is within tolerances, particularly on sections of high erosion or stability hazards. In some cases layer placement and/or benching may be necessary for stabilization and to obtain the proper dimensions and fill slope ratios. End hauling and retaining structure may be necessary to prevent thin layers of consolidated material from being sidecast on steep slopes where compaction is impractical. Prior to commencing construction, reconstruction, or maintenance activities, waste areas should be located where excess material can be deposited and stabilized. If waste areas are located on steep slopes, sidecast materials should be consolidated and stabilized. Disposal of slide debris should be in areas where it can be stabilized. The purchaser may be required to remove excess material not placed according to the contract and/or restore damaged areas.

Normal erosion control such as seeding should be supplemented with special mitigation measures such as jute netting, erosion cloth, mulching, slash windrows, sediment ponds, hay bale dams, and rock gabions, when such measures are determined necessary for local conditions.

IMPLEMENTATION: Project location, selected disposal areas, and mitigative measures are developed through the NEPA process, using an interdisciplinary approach. Forest Service supervisors are responsible for insuring that In-Service projects meet design standards and project requirements. For contracted projects, compliance with specifications and operating plans is assured by the Contracting Officer and/or Engineering Representative.

PRACTICE: 15.11 - Servicing and Refueling of Equipment

OBJECTIVE: To prevent contamination of waters from accidental spills of fuels, lubricants, bitumens, raw sewage, wash water, and other harmful materials.

EFFECTIVENESS: High

EXPLANATION: During servicing or refueling, pollutants from logging or road construction equipment may enter a watercourse. This threat is minimized by selecting service and refueling areas well away from wet areas and surface watercourses and by

using berms around such sites to contain spills.

IMPLEMENTATION: The Contracting Officer, Engineering Representative, or certified Sale Administrator will designate the location, size and allowable uses of service and refueling areas. They will also be aware of actions to be taken in cause of a hazardous spill, as outlined in the Forest Hazardous Substance Spill Contingency Plan (SWCP 11.07).

PRACTICE: 15.12 - Control of Construction in Riparian Areas

OBJECTIVE: To minimize the adverse effects on Riparian Areas from roads and trails.

EFFECTIVENESS: High

EXPLANATION: Except at designated stream crossings, road and trail construction will avoid placing fill materials or structures in Riparian Areas that will directly affect the ecological values of the stream. Occasionally exceptions may occur. These instances should be identified by the interdisciplinary team in the NEPA process and the final location designed to create the minimum impact possible. Factors such as stream class, channel stability, sideslope steepness, slope stability, resources dependent on these areas and standards, guidelines, and direction from Forest Plans are considered in determining the management of activities and width of Riparian Areas. Mitigation measures should be used to the optimum to insure minimum impact.

IMPLEMENTATION: Riparian Area requirements are identified during the environmental analysis by the interdisciplinary team. The road or trail project is designed to include site specific recommendations for the prevention of sedimentation and other stream damage from road/trail activities. As appropriated, monitoring and evaluation will be identified in the NEPA documentation. Forest Service supervisors are responsible for insuring that In-Service projects meet design standards and project requirements. On contracted projects, compliance with project requirements, contract specifications and operating plans is assured by the Contracting Officer or Engineering Representative.

PRACTICE: 15.17 - Regulation of Borrow Pits, Gravel Sources and Quarries

OBJECTIVES: To minimize sediment production from borrow pits, gravel sources, and quarries, and limit channel disturbance in those gravel sources suitable for development in floodplains.

EFFECTIVENESS: Moderate

EXPLANATION: Borrow pits, gravel sources, and quarries are often susceptible to erosion due to steep side slopes, lack of vegetation, and/or their proximity to water courses. Whenever possible, the top soil should be removed and stockpiled for use as surface dressing during the reclamation phases, prior to excavation of the site.

Drainage design for the excavation should consider temporary erosion control measures during the life of the material source and permanent drainage control measures after the site has been rehabilitated. When excavation of the site has been completed on all or part of the area, and the site will not be used again, the sides will be sloped, graded, or scaled and the general pit are smoothed and stabilized. Oversized material, if planned for future

use as riprap or derrick rock, should be stockpiled. If not, it should be scattered or buried. Finer material, if available, should be spread over the bottom of the pit prior to spreading stockpiled or imported topsoil. Seeding, mulching, and/or planting should be carried out. If the site will be used again, the above requirements will be limited to those essential to resource protection between uses. Access roads to the site should also have temporary or permanent drainage design for erosion control depending on the life of the pit or the roads should be ripped, drained, blocked to traffic, and seeded, mulched, and/or planted unless other uses are planned.

Borrow pits and gravel sources located in floodplains require special attention. Material deposited in floodplains or along channel sections during storm runoff often provide excellent and inexpensive sand and gravel. Because of easy access, these deposits are often in demand. With careful planning and design, these deposits can be removed with minimal impact on water resources. Under some circumstances, sand and/or gravel removal may alter stream flow characteristics and consequently affect stream channel stability and create a new sediment source. Excavation of these deposits within stream channels should be limited to those above the waterline which is normal for the period of the excavation. If the borrow area is subject to periodic flooding, leveling, shaping, or other special drainage features shall be provided.

Excavation in flood plains should not take place below the water table unless sediment basins are built to contain or catch the resulting sediment. Sediment basins should not be subject to washouts. If excess sediment accumulates in basins, it should be excavated to clean the basin and the sediment removed to an approved site.

Wash water or waste from concrete batching or aggregate operations shall not be allowed to enter streams prior to treatment by filtration, flocculations, settling and/or other means. The potential pollution of adjacent water resources by blasting agent in quarry operations shall be addressed in the pit operation plan.

IMPLEMENTATION: Project feasibility, location, suitability, and the limits for disturbance and sediment production will be identified through the NEPA process using an interdisciplinary approach. Detailed mitigative measures are developed by the design engineer using criteria from the environmental analysis and through consultation with technical resource staffs when needed. Development of borrow pits or gravel sources in the floodplain will be coordinated with State and local agencies.

Special-use permits issued for borrow pits, gravel sources, and quarries will include the above requirements and District Rangers or their representatives are responsible for insuring compliance. Forest Service supervisors are responsible for implementing In-Service projects to design standards. For contracted projects, compliance with management requirements, specifications, and operating plans is assured by the Contracting Officer or Engineering Representative.

PRACTICE: 15.19 - Streambank Protection

OBJECTIVE: To minimize sediment production from streambanks and structural abutments in natural waterways.

EFFECTIVENESS: Moderate-High

EXPLANATION: The stabilization of stream embankments disturbed by the construction of a water crossing or a raodway fill parallel to a streamcourse, is necessary to prevent erosion of the material during natural stream flow. To reduce sediment and channel bank degradation, it is necessary to incorporate "armoring" in the design of a structure to allow the water course to stabilize after construction. Riprap, gabion structures, and other measures are commonly used to armor stream banks and drainage ways from the erosive forces of flowing water. These measures must be sized and installed in such a way that they effectively resist erosive water velocities. Stone used for riprap should be free from weakly structured rock, soil, organic material and materials of insufficient size, all of which are not resistant to stream flow and would only serve as sediment sources. Outlets for drainage facilities in erodible soils commonly require riprapping for energy dissipation.'

IMPLEMENTATION: Project location and detailed mitigative measures are developed through the NEPA process to meet the objectives and requirements of the management. Forest Service supervisors are responsible for implementing In-Service projects to design standards and management requirements. For contracted projects, compliance with contract specifications and operating plans is assured by the Contracting Officer or Engineering Representative.

PRACTICE: 15.21 - Maintenance of Roads

OBJECTIVE: To maintain all roads in a manner which provides for soil and water resource protection by minimizing rutting, failures, sidecasting, and blockage of drainage facilities.

EFFECTIVENESS: Moderate-High

EXPLANATION: Roads normally deteriorate because of use and weather impacts. This deterioration can be minimized through proper and timely maintenance and/or restriction of use (SWCP 11.09). All system roads will be maintained to at lease the following level: Provide the basic custodial care required to protect the road investment and to insure that damage to adjacent land and resources is held to minimum. This level of maintenance often requires an annual inspection to determine what work, if any, is needed to keep drainage functional and the road stable. This level is the normal prescription for roads that are closed to traffic. As a minimum measure, maintenance must protect drainage facilities and runoff patterns. Higher levels of maintenance may be chosen to reflect greater use or resource administrative needs. Additional maintenance measures could include resurfacing, outsloping, clearing debris from dips and cross drains, armoring of ditches, spot rocking, and drainage improvement.

Maintenance needs will be reflected in an annual road maintenance plan developed to include all roads under Forest Service control. Individual maintenance plans will be developed annually for each timber sale and for each cost share area outlining performance standards, responsibilities, and timing.

For maintenance of roads on active timber sales, the Forest Service and the Purchaser shall annually agree at the beginning of the operating season on an Annual Road Maintenance Plan outlining responsibilities and timing. If the road is subjected to commercial use, the Forest Service may collect deposits to facilitate road maintenance and to equitably assess maintenance cost of each user.

In addition to timely performance of regular maintenance, each Forest should have an emergency action plan which identifies procedures to be used during periods of high runoff to protect facilities and reduce resource damage.

IMPLEMENTATION: The work is controlled through the Forest Engineer who is responsible for the development of the annual road maintenance plan based on condition surveys. Maintenance levels are established for each road and maintenance performed in accordance with standards. On timber sales, maintenance is a Purchaser responsibility and compliance with standards is assured by the Contracting Officer, Engineering Representative, or certified Sale Administrator. On system roads outside of active timber sales, road maintenance is insured by the Engineering Representative or Contracting Officer.

PRACTICE: 15.23 - Traffic Control During Wet Periods

OBJECTIVES: To reduce the potential for road surface disturbance during wet weather and to reduce sedimentation probability.

EFFECTIVENESS: Moderate-High

EXPLANATION: The unrestricted use of many National Forest roads during wet weather often results in rutting and churning of the road surfaces. Runoff from such disturbed road surfaces often carries a high sediment load. The damage/maintenance cycle for roads that are frequently used during wet periods can create a disturbed road surface and sediment source.

Roads that must be used during wet periods should have stable surface and sufficient drainage to allow such use with a minimum of resource impact. Rocking, oiling, paving, and armoring are measures that may be necessary to protect the road surface and reduce erosion potential. Roads not constructed for all weather use should be closed during the wet season. Where winter field operations are planned, roads may need to be upgraded and maintenance intensified to handle the traffic without creating excessive erosion and damage to the road surfaces.

IMPLEMENTATION: Road closures (SWCP 11.09) and traffic control measures should be implemented on all roads when damage would occur as a result of use during wet weather. Project-associated implementation procedures can be enforced by District personnel. Hauling activity can be controlled by the certified Sale Administrator within active timber sales. The decision for closure is made when the responsible Line Office determines that a particular resource or facility needs protection from use.

Detailed mitigative measures are developed by an interdisciplinary approach as necessary. Forest Service supervisors are responsible for implementing In-Service projects according to design standards. For contracted projects, compliane with plans,

specifications, and operating plans is assured by the Contracting Officer or Engineering Representative.