APPENDIX C
BEST MANAGEMENT PRACTICES

Introduction

Best Management Practices (BMPs) are the primary mechanism to enable the achievement of water quality standards (Environmental Protection Agency 1987). This Appendix describes the Forest Service's BMP process, lists the key Soil and Water Conservation Practices (SWCPs) selected to be used in the alternatives analyzed in this Draft Environmental Impact Statement (DEIS), and describes each SWCP that will be refined for site-specific conditions, arrive at the project level BMPs to protect beneficial uses, and meet water quality objectives.

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 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 Flathead Land Resource Management Plan (Flathead Forest Plan 2001 version) emphasizes the application of BMPs "to protect or improve the quality of the water source" (p.II-49). Practices compiled from The Flathead Drainage 208 Project (May 1980), Flathead National Forest Hydrologic Guidelines (1981), and other sources are listed in the Water and Soils sections of Chapter II, Forest-Wide Standards portion of the Flathead Forest Plan (pp. II-49 thru II-55). Additional BMPs are listed with the descriptions of individual management areas and in Appendix Q, Landtype Guidelines (pp. Q-1 through Q-9). The Water standards section further states "(Water quality) limits listed in the State water quality standards are coordinated with BMPs" (p. II-49).

State Requirements For Protection Of Water Quality

Compliance with State requirements for protection of waters of the State of Montana (Administrative Rules of Montana, 16.20.603) means that "land management activities must not generate pollutants in excess of those that are naturally occurring regardless of the stream's classification. 'Naturally occurring' is defined in the Administrative Rules as that water quality condition resulting from runoff or percolation over which man has no control or from developed land where all 'reasonable' land, soil, and water conservation practices' have been applied." The Administrative Rules also state "Best Management Practices are 'reasonable' only if beneficial uses are protected" (i.e. fisheries). Land management activities that are in compliance with Montana water quality law and regulations have three elements in common:

1. BMPs are applied;
2. Beneficial uses are not impaired; and
3. Monitoring is in place to test whether BMPs are adequate to protect beneficial uses.

Montana State Water Quality Standards require the use of Reasonable Land, Soil, and Water Conservation Practices (analogous to BMPs) as the controlling mechanism for nonpoint pollution. Use of BMPs is also required in the Memorandum of Understanding (MOU) between the Forest Service and the State of Montana as part of our responsibility as the Designated Water Quality Management Agency on National Forest System lands.

BMP Implementation Process

In cooperation with the State, the Forest's primary strategy for the control of nonpoint sources is based on the implementation of preventive practices (BMPs) determined necessary for the protection of the identified beneficial uses.

The Forest's Nonpoint Source Management System consists of:

1. BMP selection and design based on site-specific conditions; technical, economic and institutional feasibility; and the designate beneficial uses of the streams.
2. BMP application.
3. BMP monitoring to ensure that they are being implemented and are effective in protecting designated beneficial uses.
4. Evaluation of BMP monitoring results from 'step' 3.
5. Feeding back the results into current/future activities and BMP design.

The District Ranger is responsible for ensuring that this BMP feedback loop is implemented on all projects.

1. BMP Selections and Design.

Water quality standards and goals are identified in the Flathead Forest Plan. These standards and goals meet or exceed applicable legal requirements, including State water quality regulations, the Clean Water Act, and the National Forest Management Act. The Logan EIS is tiered to the Flathead Forest Plan, using the NEPA process. Appropriate BMPs are selected for each action Alternative by the Tally Lake Interdisciplinary Team (ID Team). As BMPs are applied to differing conditions and locals, flexibility in BMP design is allowed to best suit local conditions and values and the beneficial uses of water.

BMP selection and design are dictated by water quality objectives, soils, topography, geology, vegetation, and climate. Environmental impacts and water quality protection options are evaluated and alternative mixes of practices are considered. A final collection of practices is selected that not only protect water quality but meet other resource needs. These final selected practices constitute the BMPs.

2. BMP Application.

The selected BMPs are translated into contract clauses and project plan specifications. This ensures that the operator or person responsible for applying the BMP actually is required to apply it. The site-specific BMP prescriptions are taken from plan-to-ground by a combination of project layout and resource specialists (hydrology, fisheries, soil, engineering, and others). This is when final adjustments to fit the BMP prescriptions to the site are made before implementing the resource activity.

3. BMP Monitoring.

When the resource activity begins, timber sale administrators, engineering representatives, contracting officer representatives, resource specialists, and others ensure that the BMPs are implemented according to plan. BMP implementation monitoring is done before, during, and after project activity. This monitoring answers the question: Did we do what we said we were going to do? Once BMPs have been implemented, further monitoring is done to evaluate if BMPs are effective in meeting management objectives and protecting water beneficial uses. State water quality standards, including the beneficial uses, will serve as one evaluation criteria for the monitoring of the Proposed Action.

4. BMP Monitoring Evaluation.

The technical evaluation/monitoring described above will determine how effectively BMPs protect and/or improve water quality. Water quality standards and conditions of the beneficial uses of water will serve as one

evaluation criteria. If the evaluation indicates that water quality standards are not being met and/or beneficial uses are not being protected, corrective action will consider the following three components:

A. The BMP: Is it technically sound. Is it really best or is there a better practice that is technically sound and feasible to implement?

B. The Implementation Program or Processes: Was the BMP applied entirely as designed? Was it only partially implemented? Were personnel, equipment, funds, or training lacking which resulted in inadequate or incomplete implementation?

C. The State Water Quality Criteria: Do the parameters and criteria that constitute water quality standards adequately reflect human induced changes to water quality and beneficial uses?

5. Feedback.

Feedback of the results of BMP evaluation is both short and long-term in nature. Where corrective action is needed, immediate response will be undertaken. This action may include: modification of BMP, modification of the activity or ceasing the activity. Cumulative effects over the long-term may also lead to the need for possible corrective actions. Effectiveness of BMPs is based on audit results. Audit results specific to the Flathead National Forest are on file with the Soil Scientist in the Flathead National Forest Supervisor's Office.

6. BMP Effectiveness

BMP audits have occurred on the Flathead National Forest and Kootenai National Forests since 1988. Audits are a form of monitoring BMPs to determine if they were properly applied and if so were they effective at preventing soil or water impacts. Since 1988, individual BMPs have been audited or monitored 2232 times on the Flathead and Kootenai National Forests. They were effective 2211 times. The Kootenai and Flathead Forests were grouped together because they have similar climates and similar soils.

BMP audits were grouped according to the soil type on which they occurred in order to analyze the results. The simplest way is to group them by either residual soils that formed from the underlying bedrock, or soils formed from glacial till. Looking at these soil criteria, BMPs were effective when properly applied on glacial soils 1585 times out of 1596 applications. BMPs were effective when properly applied on residual soils 154 out of 156 applications. An additional 480 BMPs were monitored without reference to the soil types on which they were applied. Of these, 472 were effective at protecting soil and water quality.

In summary, BMPs were effective 99.3 percent of the time they were properly applied on glacial till soils. They were effective 98.7 percent of the times they were properly applied on residual soils. Lumping all the audit results together regardless of their soil types and including the earliest audits that were not specific to soil type, BMPs were effective 99 percent of the time they were properly applied on the Flathead and Kootenai National Forests.

On an individual BMP basis, no particular BMP stood out as an ineffective practice to maintain soil and water quality. However, there are a few that were less than 100 percent effective when properly applied on soils formed in glacial till, the major soil type in the Logan Creek project area. These include the following:

- Roads planning and location, BMP IIIA3, Fit road to the topography. This BMP was effective 95 percent of the time it was properly applied (21 out of 22 times).

- Road construction, BMP IIIC1, keep slope stabilization, erosion and sediment control work current with road construction. This BMP was effective 93 percent of the time it was properly applied (25 out of 27 times).

- Road construction, BMP IIIC2, Stabilize erodible exposed soils by seeding etc. This BMP was effective 87 percent of the time it was properly applied (39 out of 45 times).

- Site Preparation, BMP IVC5, carry out brush piling and scarification when soils are frozen or dry enough to minimize compaction and displacement. This BMP was effective 89 percent of the time it was properly applied (8 out of 9 times).

- Hazardous Substances, BMP VIIA1, know and comply with regulations governing storage, handling, application and disposal of hazardous substances. This BMP was effective 92 percent of the time it was properly applied (11 out of 12 times). It is most commonly applied to the handling of fuel and oil.

A copy of the summaries this is based on and which specific BMPs they refer to are available in Exhibit H-16.

Format of the BMPs

The Practices (BMPs) described herein are tiered to the practices in Forest Service Handbook 2509.22 (Soil and Water Conservation Practices Handbook.) They were developed as part of the NEPA process, with interdisciplinary involvement and meet Forest and State water quality objectives.

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

TITLE: Includes the sequential number of the Practice and a brief title.

MONTANA BMPs: Includes references for compliance to the State BMPs.

OBJECTIVE: Describes the SWCP objective(s) and the desired results for protecting 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 rated High, Moderate, or Low based on the following criteria:

a. Literature/Research (must be applicable to area)
b. Administrative studies (local or within similar ecosystem)
c. Experience (judgment of an expert by education and/or experience)
d. Fact (obvious by reasoned, logical response or observation)

IMPLEMENTATION: This section identifies:

1) The range of site-specific water quality protection measures to be implemented.
2) How the practices are expected to be applied.

Items Common To All Soil And Water Conservation Practices

Responsibility for Implementation: The Tally Lake District Ranger and the Forest Engineer are responsible for ensuring that all applicable SWCP's are applied and implemented. The Ecosystems Operations Staff, Tally Lake Project Engineer and Logan ID Team are responsible for ensuring that the objectives of the SWCP's identified in this appendix are incorporated into the Timber Sale Contracts by use of the appropriate Timber Sale Contract Provisions (2400-6 or 2400-6T July 2001). This is accomplished by selecting and incorporating the appropriate Timber Sale C provisions and by use of Forest Service Specifications for Construction of Roads and Minor Drainage Structures (April 1985), Forest Service Specifications for Construction of Bridges and Other Major Drainage Structures (April 1985), and by use of Special Project Specifications as needed. The Timber Sale

Administrator and Engineering Representative/Contracting Officers Representative (ER/COR) are responsible for ensuring that contract provisions are properly administered on the ground.

Monitoring: The Timber Sale Administrator, ER/COR, Forest Soil Scientist, and Forest Hydrologist as needed, will monitor the effectiveness of the applied SWCP's. Should the practice not be effective in meeting State or Forest Plan standards, the practice or project activity will be redesigned, rescheduled, or dropped. Feedback of the results of the site-specific SWCP monitoring to the Forest Soil Scientist will ensure that the best practices are incorporated into all projects impacting water quality. This requirement conforms to the objectives of Practice 11.02 - Soil and Water Resource Monitoring and Evaluation.

SWCP's For The Logan Creek Proposal

PRACTICE 11.07 - Oil and Hazardous Substance Spill Contingency
PRACTICE 15.11 - Servicing and Refueling of Equipment

MONTANA BMPs: VII, A, 1-2.

OBJECTIVE: To minimize contamination of waters from accidental spills of fuels, lubricants, bitumens, raw sewage, wash water, and other harmful materials by prior planning and development of Spill Prevention Control and Countermeasure Plans.

EFFECTIVENESS: High

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 case of a hazardous spill, as outlined in the Forest Hazardous Substance Spill Contingency Plan (SWCP 11.07). Contract provisions B6.34/C6.34 Sanitation and Servicing, B6.341Prevention of Oil Spills and C6.342 Hazardous Substances are included in all timber sale contracts. B6.341 requires the purchaser to prepare a spill prevention control and counter measure plan that shall meet applicable EPA requirements, including certification by a registered professional engineer. This requirement is enacted when the total oil or oil products storage exceeds 1,320 gallons, or if any single container exceeds a capacity of 660 gallons.

PRACTICE 13.02 - Slope Limitations for Tractor Operations
PRACTICE 14.07 - Determining Tractor Loggable Ground

MONTANA BMPs: IV, A, 2, 5; IV, B, 1.

OBJECTIVE: To reduce gully and sheet erosion and associated sediment production by restricting tractor operations to slopes where corrective measures for proper drainage are easily installed and effective.

EFFECTIVENESS: High; soil displacement when turning or climbing uphill is greatly reduced on slopes less than 35% (Observation, Forest Soil Scientist)

IMPLEMENTATION: All tractor units in the Logan Area have been determined by the ID Team to be loggable with tractor operations. Units with sustained slopes of more than 35% will be skyline yarded.

PRACTICE 13.03 - Tractor Operation Excluded from Wetlands, Bogs, and Wet Meadows

MONTANA BMPs: IV, B, 2, 3; VI, A, 1.

OBJECTIVE: To protect ground cover; and limit soil damage, turbidity, and sediment production resulting from soil compaction, rutting, runoff concentration in wetlands, bogs and wet meadows.

EFFECTIVENESS: High

IMPLEMENTATION: The timber sale contract provisions B6.61 Meadow Protection and B6.62 Wetlands Protection cover this. When it is necessary to identify these areas on the Sale Area Map, direction to do so and protective requirements will be incorporated into C6.62 Site Specific Wetlands Protection Measures. Vehicular or skidding equipment shall not be used on meadows except where roads, landings, and tractor roads are approved. In all cases, soil and vegetation will be protected from disturbance, which would cause adverse affects on water quality, quantity, and aquatic habitat. Unless otherwise agreed, trees felled into meadows shall be removed by end lining, and resulting logging slash shall also be removed. Damage to meadows, stream courses, and riparian areas caused by unauthorized operations shall be repaired in a timely manner to restore and prevent further damage.

PRACTICE: 13.04 - Revegetation of Surface Disturbed Areas

MONTANA BMPs: IV, A, 5; IV, B, 5, 6.

OBJECTIVE: To protect soil productivity and water quality by minimizing soil erosion.

EFFECTIVENESS: High

IMPLEMENTATION: All surface disturbed areas resulting from road rehabilitation, construction, and reconstruction will be seeded and fertilized. In the event that soil disturbance occurs in harvest units, these areas will be analyzed and a combination of seed and fertilizer, water bars, and spreading of slash will be used to minimize soil erosion (C6.601).

PRACTICE 13.05 - Soil Protection During and Following Slash Windrowing (piling and scarification).

MONTANA BMPs: IV, C, 2, 3, 4, 5, 6.
OBJECTIVE: To prevent removal or severe disruption of the productive surface soil and to minimize losses from erosion.

EFFECTIVENESS: High

IMPLEMENTATION: An excavator will be used on units needing mechanical site preparation and/or slash piling. Excavators will be required to operate from existing skid trails where feasible. Equipment will not be operated within Streamside Management Zones, adjacent wetlands, or Special Treatment Areas. Contract provisions C6.7 Hazard Reduction and Site Preparation and C6.50 Streamside Management Zones (special zone requirements) will be used in the contract.

PRACTICE 13.06 - Soil Moisture Limitations for Tractor Operation

MONTANA BMPs: IV, A, 4; IV, B, 1; IV, C, 5.

OBJECTIVE: To minimize soil compaction, puddling, rutting, and gullying with resultant sediment production and loss of soil productivity.

EFFECTIVENESS: Moderate; less compaction of surface soil is observed on dry soils (18% soil moisture, or less). Dedicated skid trails reduce the area compacted (Froehlich, H. A., D. E. Aulerich, and R. Curtis, 1981. Designing skid trail systems to reduce soil impacts from tractor logging machines. Oregon State Univ., For. Res. Lab., Res Paper 44. 13p.)

IMPLEMENTATION: Timber Sale contract provisions B6.422, B6.424, C6.4, B6.6, B6.7, and C6.7 will be included in the Timber Sale Contract.

PRACTICE 14.03 - Use of Sale Area Maps for Designating Soil and Water Protection Needs

MONTANA BMPs: II.

OBJECTIVE: To delineate the location of protection areas and special treatment areas, to ensure their recognition, proper consideration, and protection on the ground.

EFFECTIVENESS: High

IMPLEMENTATION: The following features will be designated as needed on the Timber Sale Area Map:

1. Stream courses (perennial and intermittent) to be protected under contract clause B6.5

2. Wetlands and riparian areas (meadows lakes, pot holes, etc.) to be protected under C6.61.

3. Stream side management zones (SMZ'S) in units as per contract clause C6.50.

4. Special treatment zones (STZ'S) as per contract clause C6.4.

PRACTICE 14.04 - Limiting the Operating Period of Timber Sale Activities
PRACTICE 15.04 - Timing of Construction Activities

MONTANA BMPs: III, D, 1, 4; III, E, 6; IV, B, 1; IV, C, 5; V, C, 1; VI, A, 2.

OBJECTIVE: To minimize soil erosion, sedimentation, and loss in soil productivity by ensuring activities, including erosion control work, road maintenance, and other control work, are done in a timely manner: 1) within the time period specified in the Timber Sale Contract; and 2) when ground conditions are such that erosion and sedimentation can be minimized.

EFFECTIVENESS: High

IMPLEMENTATION: Within the Logan area the following limitations for operating periods have been identified and recommended by the ID Team:

a. The normal operating season is from December 1 thru March 15 for winter operations and June 1 through September 15 for summer operations. These dates will be incorporated into Timber Sale Contract provisions C6.316 or C6.4 and A21.

b. Standard Timber Sale Contract provision B6.31 allows operations outside the Normal Operating Seasons, subject to requirements in B6.6 and B6.66. All contracts will include C5.316 Snow Removal.

PRACTICE 14.12 - Erosion Prevention and Control Measures During Timber Sale Operations
PRACTICE 14.11 - Log Landing Erosion Prevention and Control
PRACTICE 14.14 - Revegetation of Areas Disturbed by Harvest Activities
PRACTICE 14.15 - Erosion Control on Skid Trails

MONTANA BMPs: IV, A, 5, 6; IV, B, 4, 5, 6.

OBJECTIVE: To protect water quality by minimizing erosion and subsequent sedimentation derived from log landings and skid trails.

EFFECTIVENESS: High

IMPLEMENTATION: Standard Timber Sale provision B6.6 requires the purchaser to conduct operations in a reasonable fashion to minimize erosion. Additionally, specific erosion requirements will be spelled out in provisions such as C6.4, C6.6, C6.601, and C6.623. The following criteria will be used in controlling/minimizing erosion, restoring landings and skid trails. B6.4 and B6.5 covers landings and skid trails.

Landings:

a. During periods of use, landings will be maintained in such a manner that debris and sediment are not delivered to any streams.

b. Landings will drain in a direction and manner that will minimize erosion and will preclude sediment delivery to any stream.

c. Standard Timber Sale Contract provision B6.64 Landings requires that after landings have served the Purchaser's purpose, the Purchaser shall ditch or slope them to permit water to drain or spread. Landings will be seeded as needed with a mix approved by the Forest Soil Scientist.

Skid Trails:

a. Skid trails will be water-barred and location and spacing will be designated by the Sale Administrator (SWCP 15.25).

b. Skid trails likely to produce sediment will be covered with slash and/or seeded with a mix of seed and fertilizer specified in C6.601.

PRACTICE 14.18 - Erosion Control Structure Maintenance

MONTANA BMPs: III, D, 1; III, E, 2, 7; VI, B, 2, 5.

OBJECTIVE: To ensure that constructed erosion control structures are stabilized and working effectively.

EFFECTIVENESS: High

IMPLEMENTATION: Timber Sale Contract provision, B6.6, requires that during the period of the contract, the Purchaser shall provide maintenance of soil erosion control structures constructed by the Purchaser until they become stabilized. Should the Purchaser fail to do erosion control work prior to any seasonal period of precipitation or runoff, the Forest Service may temporarily assume responsibility and charge the Purchaser accordingly. The Timber Sale Administrator will ensure that erosion control structures are working effectively.

PRACTICE 14.19 - Acceptance of Timber Sale Erosion Control Measures Before Sale Closure

MONTANA BMPs: VI, B, 5.

OBJECTIVE: To assure the adequacy of required erosion control work on timber sales.

EFFECTIVENESS: High

IMPLEMENTATION: Timber Sale Contract provision, B6.36, requires that upon the Purchaser's written request and assurance that contract work has been completed; the Forest Service shall perform an acceptance inspection. For erosion control work, "acceptable" means only minor deviation from established standards, provided no major or lasting impact is caused to soil and water resources. The Timber Sale Administrator will not accept as complete, any erosion control work that does not meet this criteria.

PRACTICE 15.01 - General Guidelines for Transportation Planning
PRACTICE 15.02 - General Guidelines for the Location and Design of Roads and Trails

MONTANA BMPs: III, A, B; IV, A, 4, 5.

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

EFFECTIVENESS: High

IMPLEMENTATION: All roads will be designed to drain naturally by appropriate location, use of out-sloping, and grade changes. Drain dips will be designed whenever reliance upon natural drainage would not protect the running surface, excavation, or embankment.

PRACTICE 15.03 - Road and Trail Erosion Control Plan

MONTANA BMPs: None Applicable

OBJECTIVE: To prevent, limit, and mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction and maintenance activities.

EFFECTIVENESS: HIGH

IMPLEMENTATION: Within 60 days of final award of contract, purchaser must furnish Forest Service a written plan of operations. The plan will set forth planned periods for and methods of road construction, maintenance, and erosion control methods B6.311 and B6.312. No work will be permitted on the project until plans have been approved. In addition, proposed erosion control work, and the necessity of keeping the work current and maintained, will be stressed at the prework meeting.

PRACTICE 15.06 - Mitigation of Surface Erosion and Stabilization of Slopes
PRACTICE 15.10 - Control of Road Construction Excavation and Side cast Material

MONTANA BMPs: III, D; III, E, 1, 5, 7.

OBJECTIVE: To reduce sedimentation from unconsolidated excavated and side cast material caused by road reconstruction or maintenance, and to minimize erosion of the travel way.

EFFECTIVENESS: High (Burroughs and others, 1985. Burroughs and King, 1989)

IMPLEMENTATION: Design and construct the following erosion control devices on the following roads:

All road reconstruction: 1. Seed cut slopes, fill slopes, and roadbeds upon completion of road construction or reconstruction with a seed and fertilizer mix approved by the Forest Soil Scientist. 2. Require the use of certified weed free straw where needed to control sediment. Provision B6.22 Protection of Property.

PRACTICE 15.07 - Control of Permanent Road Drainage

MONTANA BMPs: III, C.

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

EFFECTIVENESS: High

IMPLEMENTATION: The Contracting Officer or Engineering Representative will ensure compliance with the plans and specifications and that the Purchaser is in compliance with his approved operating plan.

PRACTICE 15.23 - Traffic Control During Wet Periods

MONTANA BMPs: III, E, 6.

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

EFFECTIVENESS: High

IMPLEMENTATION: Road closures and traffic control measures will be implemented on all roads when damage would occur as a result of use during wet weather (B5.12 Use of Roads by Purchaser). The Sale Administrator will control hauling activities. The Tally Lake District Ranger will make the decision for road closures, should the Ranger determine that any resource could be damaged by Timber Sale activities during wet weather.

PRACTICE: 18.02 - Formulation of Fire Prescriptions
PRACTICE: 18.03 - Protection of Soil and Water from Prescribed Burning Effects

MONTANA BMPs: IV, C, 8.

OBJECTIVE: To maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients, and debris from entering surface water.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Tally Lake Fuels Management Specialist will ensure that the following practices are adhered to during prescribed burning: 1. Water bars will be constructed in fire lines at a spacing prescribed by the Fuels Management Specialist before the area goes through a winter or the area is considered mopped up. 2. Fire will be prevented from entering riparian areas. 3. Intense prescribed fires will be avoided. 4. Alumigel and other flammable material used to ignite fires must be kept out of flowing streams and other surface water.

The following Soil and Water Conservation Practices are incorporated where applicable into the appropriate document (Logan EIS, Timber Sale Contract, and Plans and Specifications through the normal NEPA process):

PRACTICE 11.01 - Determination of Cumulative Watershed Effects
PRACTICE 11.02 - Soil and Water Resource Monitoring and Evaluation
PRACTICE 11.03 - Watershed Improvement Planning and Implementation
PRACTICE 11.13 - Sanitary Guidelines for Construction of Temporary Logging or Fire Camps (B6.2 Improvements)
PRACTICE 14.01 - Timber Sale Planning
PRACTICE 14.02 - Timber Harvest Unit Design
PRACTICE 14.06 - Riparian Area Designation (Sale Area Maps)
PRACTICE 14.08 - Tractor Skidding Design (C6.4 Conduct of Logging)
PRACTICE 14.09 - Suspended Log Yarding in Timber Harvesting (C6.4 Conduct of Logging)
PRACTICE 14.10 - Log Landing Location and Design (B6.64 Landings)
PRACTICE 14.17 - Stream Channel Protection (Implementation and Enforcement) (B6.5 Stream course Protection)
PRACTICE 14.22 - Modification of the Timber Sale Contract (B8.3 Contract Modification)
PRACTICE 14.23 -Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects (B6.312 Plan of Operations for Road Construction and B6.361 Acceptance of Specified Roads)
PRACTICE 15.15 - Stream Crossings on Temporary Roads (B6.63 Temporary Roads)

PRACTICE 15.18 - Disposal of Right-of-Way and Roadside Debris (B6.222 Protection of Property)
PRACTICE 15.21 - Maintenance of Roads (C5.31 Road Maintenance Requirement)
PRACTICE 15.22 - Road Surface Treatment to Prevent Loss of Materials (C5.31 – T103 Dust Abatement)
PRACTICE 15.24 - Snow Removal Controls (C5.316 Snow Removal)

BEST MANAGEMENT PRACTICES FOR FORESTRY IN MONTANA

December 1997

(Revision of 1988 BMPs to include SMZ law requirements)

I. DEFINITIONS

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

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

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

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

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

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

II. STREAMSIDE MANAGEMENT

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

III. ROADS

A. Planning and Location

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

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

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

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

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

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

B. Design

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

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

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

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

C. Drainage from Road Surface

1. Provide adequate drainage from the surface of all permanent and temporary roads. Use out-sloped, in-sloped, or crowned roads, and install proper drainage features. Space road drainage features so peak flow on road surfaces or in ditches will not exceed capacity.

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

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

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

2. For ditch relief culverts, construct catch basins with stable side slopes. Protect the inflow end of cross drain culverts from plugging and armor if in erodible soil. Skew ditch relief culverts 20 to 30 degrees toward the inflow from the ditch to help maintain proper function.

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

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

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

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

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

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

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

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

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

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

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

7. Consider road surfacing to minimize erosion.

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

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

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

E. Maintenance

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

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

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

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

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

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

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

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

IV. TIMBER HARVESTING AND SITE PREPARATION

A. Harvest Design

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

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

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

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

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

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

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

B. Other Harvesting Activities

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

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

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

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

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

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

C. Slash Treatment and Site Preparation

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

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

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

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

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

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

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

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

V. STREAM CROSSINGS

A. Legal Requirements

1. Under the Natural Streambed and Land Preservation Act of 1975 (the "310 law"), any activity that would result in physical alteration or modification of a perennial stream, its bed, or immediate banks must be approved in advance by the supervisors of the local conservation district. Permanent or temporary stream crossing structures fords, rip rapping or other bank stabilization measures, and culvert installations on perennial streams are some of the forestry-related projects subject to 310 permits.

   Before beginning such a project, the operator must submit a permit application to the conservation district indicating the location, description, and project plans. The evaluation generally includes on-site review, and the permitting process may take up to 60 days.

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

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

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

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

2. Avoid unimproved stream crossings. When a culvert or bridge is not feasible, locate drive-throughs on a stable, rocky portion of the stream channel.

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

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

2. When using culverts to cross small streams, install those culverts to conform to the natural stream bed and slope on all perennial streams and on intermittent streams that support fish or that provides seasonal fish passage. Ensure fish movement is not impeded. Place culverts slightly below normal stream grade to avoid culvert outfall barriers. Do not alter stream channels upstream from culverts, unless necessary to protect fill or to prevent culvert blockage.

3. Design stream-crossings for adequate passage of fish (if present), minimum impact on water quality, and at a minimum, the 25-year frequency runoff. Consider oversized pipe when debris loading may pose problems. Ensure sizing provides adequate length to allow for depth of road fill.

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

5. Consider dewatering stream crossing sites during culvert installation.

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

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

VI. WINTER LOGGING

A. General

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

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

3. Consult with operators experienced in winter logging techniques.

B. Road Construction and Harvesting Considerations

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

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

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

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

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

VII. HAZARDOUS SUBSTANCES

A. General

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

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

B. Pesticides and Herbicides

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

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