

APPENDIX D - BEST MANAGEMENT PRACTICES

INTRODUCTION

Best Management Practices are the primary mechanism to enable the achievement of water quality standards (Environmental Protection Agency 1987). This Appendix 1) describes the Forest Service's BMP process in detail; 2) lists the key Soil and Water Conservation Practices (SWAP) that have been selected to be used in the Gallatin; and 3) describes each SWCP that will be refined for site-specific conditions in order to arrive at the project level BMPs that 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 (40 CFR 130.2, EPA Water Quality Standards Regulation). 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 Gallatin National Forest Plan states that "Soil and water conservation practices as outlined in the Soil and Water Conservation Practices Handbook (FSH 2509.22, May 1988) will be incorporated into all land use and project plans as a principal mechanism for controlling nonpoint pollution sources; meeting soil and water quality goals; and to protect beneficial uses. Activities found not in compliance with the soil and water conservation practices or State standards will be brought into compliance, modified, or stopped." (GNF FP, p. II-23). 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 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 (NFS) lands.

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

BMP IMPLEMENTATION PROCESS

In cooperation with the State, the USDA Forest Service'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 Service Nonpoint Source Management System consists of:

1. BMP selection and design based on site-specific conditions; technical, economic and institutional feasibility; and the designated 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.
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.

A. BMP Selection and Design. Water quality goals are identified in Forest Plans. These goals meet or exceed applicable legal requirements, including State water quality regulations, the Clean Water Act, and the National Forest Management Act. Environmental assessments for projects are tiered to Forest Plans, using the NEPA process. Appropriate BMPs are selected for each project by an interdisciplinary team.

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 are selected that not only protect water quality but meet other resource needs. These final selected practices constitute the BMPs.

B. BMP Application. The BMPs are translated into contract clauses, special use permit requirements, project plan specifications, and so forth. 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, geology, etc.). This is when final adjustments to fit the BMP prescriptions to the site are made before implementing the resource activity.

C. BMP Monitoring. During project activities (ex., timber harvest or road construction), timber sale administrators, engineering representatives, resource specialists, and others ensure that the BMPs are implemented according to plan. BMP implementation monitoring is done before, during, and after resource activity implementation. 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 beneficial uses of water. State water quality standards, including the beneficial uses, will serve as one evaluation of the criteria for the Darroch-Eagle Timber Sale EA.

D. 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:

1. The BMP: Is it technically sound, properly designed, and effective? Is it really best, or is there a better practice which is technically sound and feasible to implement?
2. The implementation program or processes: Was the BMP applied entirely as designed? Was it only partially implemented? Was it properly designed? Were personnel, equipment, funds, or experience lacking with a result of inadequate or incomplete implementation?
3. The water quality criteria: Do the parameters and criteria used for effects evaluation adequately reflect human induced changes to water quality and beneficial uses?

E. 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 the 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.

FORMAT OF THE BMPs

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 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 & research, administrative studies, and professional experience. The SWCP is rated 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 ecosystem)
3. Experience (judgment of an expert by education and/or experience)
4. Fact (obvious by reasoned [logical] response)

Implementation: This section identifies: 1) the range of site-specific water quality protection measures to be implemented and 2) how the practices are expected to be applied.

ITEMS COMMON TO ALL SOIL AND WATER CONSERVATION PRACTICES

Responsibility for Implementation: The Gardiner District Ranger is responsible for ensuring that the factors identified in the following SWCP's are incorporated into the Timber Sale Contracts through the inclusion of proper B and/or C provisions; or public works contracts with the inclusion of specific contract clauses.

Unless otherwise specified, the Presale Forester is responsible for insuring that the factors identified in the following SWCP's are incorporated into Timber Sale Contracts through inclusion of proper B and/or C provisions; or The Contracting Officer through his/her official representatives (Sale Administration and/or Engineering Representatives for timber sale contracts: and Contracting Officers Representative for public works contracts) is responsible for insuring that the provisions are properly administered on the ground.

Monitoring: Unless otherwise noted, SWCPs will be monitored by the TSA as part of BMP Implementation Monitoring of timber sale activities, and by the COR or public works road construction work.

ABBREVIATIONS

GNF = Gallatin National Forest
TSC = Timber Sale Contract
TSA = Timber Sale Administrator
SAM = Sale Area Map
COR = Contracting Officer's Representative
PWC = public Works Contract
SWCP = Soil and Water Conservation Practices
BMP = Best Management Practice
SMZ = Streamside Management Zone
SPS = Special Project Specification
EPA = Environmental Protection Agency
CFR = Code of Federal Regulations

BEST MANAGMENT PRACTICE DESCRIPTIONS

PRACTICE 11.01 - Determination of Cumulative Watershed Effects

OBJECTIVE: To insure that impacts from individual actions do not cause cumulative effects in the larger area.

EFFECTIVENESS: Not applicable for this SWCP.

IMPLEMENTATION A watershed cumulative effects analysis was completed as part of the analysis and accounted for all existing roads and timber harvest units in the Bear Creek drainage. The R1R4 sediment yield model was the basis for this analysis.

PRACTICE 11.05 - Wetlands Analysis and Evaluation; PRACTICE: 13.03 - Tractor Operation Excluded from Wetlands, Bogs, and Wet Meadows; and PRACTICE 14.16 - Meadow Protection During Timber Harvesting

OBJECTIVE: To maintain wetland functions and avoid adverse soil and water resource impacts associated with the destruction or modification of wetlands, bogs and wet meadows.

EFFECTIVENESS: High

IMPLEMENTATION This is covered by standard TSC Provision B6.61 (Meadow Protection) which is a standard provision in all contracts. When it is necessary to identify these areas on the SAM, direction to do so and protective requirements will be incorporated into C6.61 (Wetlands Protection). Vehicular or skidding equipment shall not be used on meadows except where roads, landings, and tractor roads are approved. Unless otherwise agreed, trees felled into meadows shall be removed by end-lining, and resulting logging slash shall also be removed. Damage to meadows caused by unauthorized purchaser's operations shall be repaired by the purchaser in a timely manner to restore and prevent further damage. In the Dry Pine sale no riparian timber harvest is planned.

PRACTICE 11.09 - Management by Closure to Use

OBJECTIVE: To exclude activities that could result in damages to facilities or degradation of soil and water resources.

IMPLEMENTATION: Specific guidelines for closure of roads during the period of the contract and at the end of the purchasers operations will be spelled out in the TSC provision C5.51.

PRACTICE 13.04 - Revegetation of Surface Disturbed Areas

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

EFFECTIVENESS: Moderate

IMPLEMENTATION: All temporary roads, landings, and skid trails will be seeded following use. Seed mixes and fertilizer specifications will be incorporated into TSC provision C6.601 (Erosion Control Seeding). TSC provision C6.623 (Temporary Road, Skid Trail/Skid Road and Landing) will be included in the contract to incorporate specific requirements for scarification of skid trails and landings prior to seeding. Specified roads will be scarified no deeper than two (2) inches. This will be incorporated into TSC provision C6.601 (Erosion Control Seeding).

PRACTICE 13.05 - Soil Protection During and Following Slash Windrowing (SLASH FILTER WINDROWING)

OBJECTIVE: To reduce erosion and sedimentation from road surfaces and fill slopes, slash is windrowed below the fill slope.

IMPLEMENTATION: At a minimum, slash filter windrows will be installed 100 feet on both sides of all new ephemeral draw crossings where sediment delivery from the fill slope could occur. Slash filter windrows will also be implemented where erosion may deliver sediment to stream systems. No new road construction crossing of perennial streams will occur.

PRACTICE 13.06 - Soil Moisture Limitations for Tractor Operation

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

EFFECTIVENESS: High

IMPLEMENTATION: Tractor operations will be limited to periods when the soil moisture content is sufficiently so low that excessive rutting or other soil damage does not occur.

PRACTICE 14.02 - Timber Harvest Unit Design, PRACTICE 14.08 - Tractor Skidding Design, and PRACTICE 14.10 - Log Landing Location and Design

OBJECTIVE: To insure that timber harvest unit design will secure favorable conditions of water flow and maintain water quality and soil productivity by locating/designing landings and skidding patterns to best fit the terrain and avoid soil erosion.

EFFECTIVENESS: High

IMPLEMENTATION: TSC provision C6.3 (Plan of Operation) will specify how the purchaser intends to meet erosion control requirements.

TSC provision B6.422 (Landings and Skid Trails) requires that the location of all skid trails and landings must be agreed upon before construction. Specific items that will be addressed during sale-layout and pre-work with the operator will include the following:

1. SMZ Unit Boundaries: No harvesting or skidding in SMZ's in the Darroch-Eagle Creek Timber Sale will occur.
2. Skid Trails:
 - a. Design and locate skid trails and skidding operations to minimize soil disturbance.
 - b. Locate skid trails to avoid concentrating runoff and provide breaks in grade and waterbars.
 - c. Locate skid trails and landings away from natural drainage systems, and divert runoff to stable areas.
3. Landings:
 - a. Landings and log decks will not be located in riparian areas in the Darroch-Eagle timber sale.
 - b. Landings and/or burn piles will be located a minimum of 100 feet from streams and/or riparian zones, far enough away that direct (unfiltered) entry of sediment, bark, or ash and burning products, will not occur. (C6.50)

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

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

EFFECTIVENESS: High

IMPLEMENTATION: The following features will be designated on the SAM:

1. Streamcourses (perennial and ephemeral) to be protected under B6.5. Since no riparian harvesting is planned, designated streamcourses will be very limited.
2. Wetlands and Riparian Areas (meadows, lakes, pot holes, etc.) to be protected per C6.61.

These features will be reviewed on the ground by the purchaser and the sale administrator prior to harvesting.

MONITORING: A watershed specialist (Forest or District) will ensure that the above features have been designated on the Sale Area Map during contract development.

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

OBJECTIVE: To minimize soil erosion and sedimentation and loss in soil productivity by insuring activities, including erosion control work, road maintenance, etc., are done in a timely manner: 1) within the time period specified in the TSC; or 2) when ground conditions are such that erosion and sedimentation can be prevented.

EFFECTIVENESS: High

IMPLEMENTATION: For the Darroch-Eagle Creek Timber Sale, the following specifications apply for the operating periods:

1. Standard TSC provision B6.31 allows operations outside the normal operating season, subject to requirements in B6.6, and B6.65. Specific requirements will be covered by adding the following wording to C6.6: not feasible, or are not functioning, trails and temporary roads will be waterbarred on a weekly basis and/or prior to any prolonged shutdown.
 - b. Temporary roads will be stabilized, drained, and if necessary seeded after purchaser use in accordance with BT 6.62.

2. Unless otherwise agreed, the following additional requirements apply to winter operations:

- a. Skidtrails will be constructed with waterbars, and/or draindips, and allowed to freeze prior to skidding operations.
- b. Prior to spring shutdown, slash and/or cull logs will be placed into skidtrails to approximate waterbars.

Winter operations will also require that during all snowplowing activities, breaks will be maintained in the snow berm along the outside of roads, particularly in the areas of expected road drainage (C5.46).

Operations will be discontinued if conditions change and activities are no longer occurring on frozen or snow covered ground, which is the intent of winter logging.

PRACTICE 14.06 - Riparian Area Designation and Protection

OBJECTIVE: To minimize the adverse effects on riparian Areas with prescriptions that manage nearby logging and related land disturbance activities and meet all SMZ provisions of the 1991 Montana Streamside Protection Act and subsequent 1993 rules as well as the Montana Forestry BMP's.

IMPLEMENTATION: Although no riparian or SMZ harvesting is planned for the Darroch-Eagle Creek sale, riparian areas and SMZ's will be "site specifically" mapped prior to landing establishment. SMZ's areas will be identified in TSC provision C6.6 as being required to be located on the SAM. Requirements for protection of these areas will also be in TSC provision C6.6. Specific mitigation measures to be included in TSC C6.6 for the Darroch-Eagle sale contract include:

- Minimum SMZ is 50' slope distance on each side of the streams for all landings.
- Broadcast burning in the SMZ is prohibited
- Operation of wheeled or tracted equipment in the SMZ is prohibited except established roads unless the ground is frozen to a depth of 2" or covered with at least 24" of snow.
- At least 10 trees (of any size) must be retained in each 100' lineal feet of the SMZ.
- Shrubs and submerchantable trees must be protected and returned to the fullest extent possible when conducting forest practices in the SMZ.
- Logging camps (if necessary) are prohibited within 100' of surface water. Camping units will be self contained. Human waste will not be disposed of within 100' of surface water.
- Equipment servicing/fueling is not allowed within 100' of surface water. All petroleum products will be securely stored in leak proof containers. Petroleum waste products will be removed from the site at least weekly.
- Herbicides associated with weed control, if necessary, will not contact surface water and must be applied by a competent applicator in strict accordance with label directions.

PRACTICE 14.09 - Suspended Log Yarding in Timber Harvesting

OBJECTIVE: To protect the soil from excessive disturbance and accelerated erosion and to maintain the integrity of the riparian area and other sensitive watershed areas.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Cable yarding (partial or full suspension) will be used on all areas identified for such logging on the sale area map. As noted in TSC provision B1.1, item (n), areas requiring special yarding, as identified in TSC provision B6.42 (Skidding and Yarding), will be identified on the sale area map. These requirements will be included in TSC C6.4 (Conduct of Logging).

PRACTICE 14.12 - Erosion Prevention and Control Measures During Timber Sale Operations, PRACTICE 14.11 - Log Landing Erosion Prevention and Control, and PRACTICE 14.15 - Erosion Control on Skid Trails

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

EFFECTIVENESS: High

IMPLEMENTATION: The following criteria will be used in controlling erosion and restoring landings and skid trails so as to minimize erosion:

General:

- TSC provision B6.6 requires the purchaser to conduct operations in a reasonable fashion to minimize erosion. This is a standard provision in the TSC. Additionally, specific erosion requirements will be spelled out in TSC Provisions such as C6.4, C6.6, C6.601, C6.602, C6.622, C6.623.
- Skid trails and landings will be seeded with a mix specified in C6.601.

Landings:

- During period of use, landings will be maintained in such a manner that debris and sediment are not delivered to any streams.
- Landings will drain in a direction and manner that will minimize erosion and preclude sediment delivery to any stream.
- Standard TSC provision B6.63 (Landings) requires that after landings have served the purchaser's purpose, the purchaser shall ditch or slope them to permit the water to drain or spread.

Skid Trails:

- Skid trails will be water-barred, using the spacing guide from FSH 7709.56 as a reference.

PRACTICE 14.13 - Special Erosion Prevention Measures on Areas Disturbed by Harvest Activities and PRACTICE 14.14 - Revegetation of Areas Disturbed by Harvest Activities

OBJECTIVE: To establish a vegetative cover on disturbed sites in order to reduce erosion and sedimentation on disturbed areas where normal revegetation methods where other contract provisions will not apply.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Revegetation by seeding and fertilization to control erosion is planned for all temporary roads, skid trails, and landings. If erosion problems still occur on these areas, or other problem areas are discovered or are brought to the attention of the Sale Administrator, KV Plans will be revised to reseed and/or fertilize, or provide for other control measures. If KV Funds are not available, Appropriated Funds will be used.

PRACTICE 14.17 - Stream Channel Protection (Implementation and Enforcement)

OBJECTIVES: (1) To protect the natural flow of streams; (2) to provide unobstructed passage of stormflows; (3) to reduce sediment and other pollutants from entering streams; and (4) to restore the natural course of any stream as soon as practicable if the stream is diverted as a result of timber management activities.

EFFECTIVENESS: High

IMPLEMENTATION: Because no riparian area harvest is planned in the Baldy timber sale is planned, very little riparian disturbance, if any, will occur. However, the following items will be incorporated into the TSC via the identified B and C provisions:

1. Location and method of stream crossings will be agreed upon prior to construction. (B6.422 Skid Trails and Landings)

2. Purchaser shall repair all damage to a streamcourse if the purchaser is negligent in his operations, including damage to banks and channel, to an acceptable condition as agreed to by the certified sale administrator and purchaser's representative.
3. All project debris shall be removed from streamcourse in an agreed upon manner that will cause the least disturbance. (B6.5 Streamcourse Protection)
4. Wheeled or track laying equipment shall not operate within 50 feet slope distance of the apparent high water mark of streamcourses designated for protection on the Sale Area Map. (C6.6 Erosion Prevention and Control)
5. Material from temporary road and skid trail stream crossings will be removed and streambanks restored to an acceptable condition. (B6.62 Temporary Roads)
6. Logs should be fully suspended when skyline skidding them across a stream and when immediately above streambanks. (C6.4 Conduct of Logging)

PRACTICE 14.18 - Erosion Control Structure Maintenance

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

EFFECTIVENESS: High

IMPLEMENTATION: TSC provision B6.66 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, but not for more than one year after their construction. After 1 year, any erosion control work needed is accomplished through KV funding earmarked for that use.

TSC provision C6.6(F) requires the purchaser to maintain erosion control structures concurrently with his operations under the sale and in any case not later than 15 days after completion of skidding on each unit or subdivision.

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

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

EFFECTIVENESS: High

IMPLEMENTATION AND RESPONSIBILITY: TSC provision B6.35 requires that upon the purchaser's written request and assurance that work has been completed the Forest Service shall perform an inspection. One area the purchaser might request acceptance for is specific requirements such as logging, slash disposal, erosion control, or snag felling. In evaluating acceptance the following definition will be used by the Forest Service: "Acceptable" erosion control means only minor deviation from established standards, provided no major or lasting impact is caused to soil and water resources. Certified TSAs will not accept as completed erosion control, measures which fail to meet this criteria.

PRACTICE 14.20 - Slash Treatment in Sensitive Areas

OBJECTIVE: To protect water quality by protecting sensitive tributary areas from degradation which would result from the use of mechanized equipment for slash disposal.

EFFECTIVENESS: Moderate

IMPLEMENTATION: All such sensitive areas, including riparian harvest areas, bogs and meadows will be identified on the sale area map, the slash treatment map, and in the contract B(T)8.31 (Contract Modification).

PRACTICE 14.22 - Modification of the Timber Sale Contract

OBJECTIVE: To modify the Timber Sale Contract if new circumstances or conditions indicate that the timber sale will cause irreversible damage to soil, water, or watershed values.

EFFECTIVENESS: High

IMPLEMENTATION: Over time, the Forest Service adopts new policies and direction that amend how to address timber harvest operations. An example is the 1993 Montana SMZ rules which require leaving stable large organic debris in stream channels instead of removing it all. In cases such as this, modifications to the TSC would occur under provision B2.37 (Minor Changes).

If evidence indicates that unacceptable impacts would occur to soil and water resources, when the sale was harvested as planned, the Forest Service Representative will request the Contracting Officer to gain Regional Forester advice and approval to proceed with a resource environmental modification, mutual cancellation, or unilateral cancellation of the modification, once the action is approved by the Regional Forester, the appropriate Line Officer will assign an interdisciplinary team to make recommendations for implementation.

PRACTICE 14.23 - Reforestation Requirement

OBJECTIVE: To promote prompt reforestation and to limit disturbance on areas with limited regeneration potential.

EFFECTIVENESS: High

IMPLEMENTATION AND RESPONSIBILITY: All areas projected for regeneration harvest have been reviewed for silvicultural opportunities and have been certified that regeneration with five years is achievable. The regeneration method has been identified in the EIS by unit, and will be checked during Standard Regeneration Surveys during years 1, 3, and 5 after harvest. Project KV Plans will include funding for surveys as well as planting and site prep if necessary.

MONITORING: Regeneration Survey results are included in stand records.

PRACTICE 15.01 - General Guidelines for Transportation Planning

OBJECTIVE: To include soil and water resource considerations into Transportation Planning.

IMPLEMENTATION: Standard TSC provision B5.1 authorizes the purchaser to construct and maintain roads, bridges, and other transportation facilities needed for harvesting. Road construction contracts to implement the Darroch-Eagle Creek Timber sale preferred alternative will include provisions to meet water quality soils, and other resource protection requirements required in the EA.

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

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

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following items, listed and mentioned under several other Practices, nevertheless are general road location and design guidelines for minimizing impacts on water quality (FSH 7709.55, 56; Montana State BMP's):

1. Resource Specialist Review - Review available information and consult with specialists as necessary to help identify problem soil types and unstable areas, if any, and to assist with location and design.
2. Fit the road to the topography - Use natural benches, follow contours, avoid long, steep road grades. Balance cut/fill where possible to avoid waste areas.
3. Locate on stable topography - Avoid slumps and slide-prone areas, and steep sidehills.

4. Location with respect to ephemeral draws and water bodies, including wetlands - Locate roads a safe distance away from streams and other water bodies, and provide an adequate buffer zone to trap sediment before it enters into any water body. Where possible, locate turn-outs and turn-arounds at least 200 feet from water bodies or riparian zones. Where placement within 200 feet is necessary due to safety considerations, emphasize erosion control measures to protect water quality; i.e. additional windrowing, seeding, etc.
5. Draw crossing sites - Minimize the number of stream crossings, and choose stable sites. Structures will be designed (sized) for long-term stability, generally for the Q50 (50- year return interval event), and will provide for fish passage if present. An FG-124 filing with the Montana Water Quality Division and Department of Fish, Wildlife, and Parks is required for any crossings of perennial streams (none in the Darroch-Eagle Creek timber sale).
6. Road drainage - Locate and design roads and trails to drain naturally by appropriate use of out-sloping and in-sloping with cross drainage and grade changes, where possible. Cross drains will be installed to 1) carry intercepted flow across constructed areas; 2) to relieve the length of undrained ditch; and 3) to minimize disruption of normal drainage patterns. Road and trail drainage should be channeled to effective buffer areas, either natural or manmade, to maximize sediment deposition prior to entry into live water.

In addition, roads and trails will be designed to minimize impacts on water quality. Design criteria to accomplish this will include:

- a. Ditch lines and road grades will be designed to minimize unfiltered flow into ephemeral draws. A rolling dip, relief culvert or similar structure will be installed as close as practical to crossings to minimize direct sediment and/or water input directly into draws. Route the drainage through buffer strips, or other sediment settling structures where possible.
 - b. At a minimum, windrows (Practice 15.10) will be installed 100 feet on both sides of crossings, and where installation will minimize sediment delivery to nearby streams or channels. Windrows will also be installed where fill slope erosion is possible, or where road derived erosion may be delivered; i.e. outflow area of culverts or rolling dips, etc (Std. FS Spec. Section 201, Clearing and Grubbing; 05- Slash Treatment).
 - c. The design objective of cross drainage and ditch relief culverts will be to restore intercepted flow to the natural drainage path and direction as rapidly as possible. A deliberate attempt will be made to keep the road and trail network from becoming the concentration mechanism so related to water yield and peak flow increase problems.
7. Design standards- Design to the minimum standard necessary to accomplish anticipated use and equipment needs safely, balancing long-term and short-term maintenance needs.
 8. Stabilization of erodible cut and fill surfaces through revegetation- Aggressive seeding and fertilization of erodible surfaces exposed during construction will be accomplished. Out-year seeding and fertilization will be done where original treatment is not fully successful.

PRACTICE 15.03 - Road 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: Moderate

IMPLEMENTATION: The following erosion control objectives and mitigation measures have been developed by the IDT and will be reflected in contract specifications and provisions. The Engineer will certify that the Contractors Erosion Control Plan meets the specifications of Std. FS Spec. Section 204:

1. Vegetation will be re-established as soon as possible on exposed cut and fill slopes. Various operating seasons on varied units and sales within the sale area will require seeding and fertilization specs to vary. Mulching will be required on erodible slopes where difficulty in re-establishing vegetation is anticipated.

2. Prompt attention to potential erosion problems, both anticipated and un-anticipated, before they become a water quality issue, will be required. On-site stock piling of straw bales for immediate availability and erosion cloth or a suitable substitute stored off-site but available will also be required.
3. Windrows will be used on all significant fill slopes where there is a possibility of erosion or sedimentation into a nearby stream or channel (Std. FS Spec. 201).
4. Cross drains and relief culverts will be installed so as to minimize effects from the intercepted water (see also Practice 15.02 f.(3)).
5. Equipment shall not be operated when ground conditions are such that excessive ground impacts will occur unless these impacts are documented and mitigated through other Conservation Practices.

PRACTICE 15.05 - Slope Stabilization and Prevention of Mass Failures

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

EFFECTIVENESS: Moderate

IMPLEMENTATION: In areas with intrinsic slope stability problems, appropriate technical resource staffs (Geotechnical Engineers, Soil Scientists, Geologists) will be involved in an interdisciplinary approach to route location and design to meet requirements developed through the NEPA process.

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

OBJECTIVE: To minimize soil erosion from road cut slopes, fill slopes, and travelway.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Areas requiring mitigation of surface erosion will occur during the life of the contracts. When these are found, the following provisions will be implemented:

1. Where surface erosion is occurring because of inadequate vegetative cover, additional seeding and refertilization will occur using recommended seed and fertilizer mixes. A T108 spec covers reseeding of cut slopes, if bared by the purchaser's maintenance operation. If the purchaser has done his required seeding, or bare spots are not caused by the purchaser, revise the KV Plan to cover costs.
2. Where ditches are carrying erosion products into ephemeral draws, rock check dams, straw bale, erosion cloth ditch blocks, or other economical structures will be installed to "short-circuit" the delivery. If problem areas are known before contract award, use C5.254 to change to design of cross ditching on segment of road.
3. Where straw bale/erosion cloth structures either fail or opportunity for success is doubtful, additional relief culverts will be installed to drain the ditches out onto suitable ground to at least minimize delivery of erosion products to the draw. If problem areas are known before contract award, add C6.602# to require cross ditching on segments of road.
4. Slumping of cutslopes may require a combination of both mechanical and vegetative controls. If/when this problem is found, a solution will be determined in consultation with a geotechnical engineer, and C5.254 used to change the design.

Unless caused by the purchaser during his maintenance operations (a.) or known before sale award (c.), or are part of a recurrent slide area (d.) these items will be beyond the scope of purchaser responsibility. Repair and/or improvement will be handled under reconstruction modified into the contract under C8.3 or KV Plan revision.

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: Moderate

IMPLEMENTATION: A. For Construction - The following criteria will be incorporated into new road design:

1. Provide adequate drainage from the surface of all permanent and temporary roads through use of sloping, dips, grade changes, etc.
2. Ditch relief culverts will be designed to handle anticipated ditch flow.
3. Provide energy dissipaters or downspouts where necessary at the downstream end of ditch relief culverts to reduce erosion energy of the emerging water.

B. For Reconstruction - At a minimum, the following items will be added to or improved in the existing road system that will be used for proposed timber haul:

1. Rock energy dissipaters or downspouts will be placed below problem culvert outlets where feasible (Reconstruction Item). Refer to FS Std. Spc. 204 and 206A.
2. In all areas where ditch erosion is significant at this time, relief culverts that drain onto suitable areas will be installed where feasible (Reconstruction Item).
3. Roads restricted after use will also have erosion control measures in place prior to final pull-out. (TSC B/C 6.6, B6.65)
4. For all native surface roads to be closed, the travelway will be scarified, seeded and fertilized. (TSC C6.601, FS Std. Spc 299).

PRACTICE 15.08 - Pioneer Road Construction

OBJECTIVE: To minimize sediment production and mass wasting associated with pioneer road construction.

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following contract specifications will be required:

1. Construction of pioneer roads shall be confined to the roadway limits unless otherwise approved. (Std. FS Spec. 203.11, and 299.04).
2. Pioneering shall be conducted so as to prevent undercutting of the designated final cut slope, and to prevent avoidable deposition of materials outside the designated roadway limits (Std. FS Spec. 203, and 299).
3. Erosion control work will be completed concurrent with construction activity or prior to the wet season. During the wet and winter season, no more than 1000 feet of road can be in the pioneer state without the required erosion control work at any time (Std. FS Spec. 204 and 625).
4. Permanent culverts will be installed during the pioneer phase unless positive control of sediment can be accomplished during installation, use, and removal of the temporary structure.

PRACTICE 15.09 - Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects

OBJECTIVE: To minimize erosion of and sedimentation from disturbed ground on incomplete projects at the end of the normal operating season.

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following preventive measures will be implemented during projects at the end of the normal operating season:

1. The removal of temporary culverts, culvert plugs, diversion dams, or elevated stream crossing causeways when permanent facilities are in place;
2. The installation of temporary culverts, side drains, flumes, cross drains, diversion ditches, energy dissipators, dips, sediment basins, berms, debris racks, or other facilities needed to control erosion when disturbed areas will be left after the operating season, but prior to permanent erosion control structures.
3. The removal of debris, obstructions, and spoil material from channels and floodplains if specified in the contract, or caused by contractors action.

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, through the use of slash filter windrowing (FS Std. Spc. 301.05, 203, or 299.03).

EFFECTIVENESS: High

IMPLEMENTATION: At a minimum, windrows will be installed 100 feet on both sides of all new ephemeral draw crossings. Windrows will also be installed wherever erosion may deliver sediment to a stream system.

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

IMPLEMENTATION: The Contracting Officer, Engineer, or 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. (B6.34; C6.341 for oil and oil products). Equipment servicing/fueling is not allowed within 100' of surface water. All petroleum products will be stored in leak proof containers. Petroleum waster products will be removed from the site at least weekly.

PRACTICE 15.13 - Controlling In-Channel Excavation

OBJECTIVE: To minimize stream channel disturbances and related sediment production, and to make sure activities comply with the FG-124 Process as agreed upon between the Forest Service and the State of Montana.

EFFECTIVENESS: High

IMPLEMENTATION: Construction equipment may cross, operate in, or operate near streamcourses only where so designated by the Forest Service or as necessary in the construction or removal of culverts and bridges. This will be done in compliance with the specifications and mitigation required in the FG-124 Permit and included in the project specifications. The FG-124 Form will be sent to MDFWP, approved or modified, and returned prior to actual channel work.

Unless otherwise approved, no in-channel excavation shall be made outside of de-watered areas, and the natural stream bed adjacent to the structure shall not be disturbed without approval of the Engineer. If any excavation or dredging is made at the site of the structure before caissons, cribs, or cofferdams are sunk in place, all such excavations will be restored to the original ground surface or the stream bed will be protected with suitable stable material. Material from foundation or other excavation shall not be discharged directly into live streams but shall be pumped to settling areas shown on the drawings or approved by the Engineer. If the channel is damaged during construction, it should be restored as nearly as possible to its original configuration without causing additional damage to the channel. Excavations for

stream crossings will conform to FG-124 criteria, including timing restrictions. (as well as Std. FS Spec 206, 206A, and applicable SPS's).

PRACTICE 15.15 - Stream Crossings on Temporary Roads

OBJECTIVE: To keep temporary roads from unduly damaging streams, disturbing channels, or obstructing fish passage.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Culverts, temporary bridges, low-water crossings, or log-fords will be required on all temporary roads and crossings. Streams that will have flowing water during the life of the temporary crossing will normally use culverts or a bridge. The number of temporary crossings will kept to the minimum needed for access.

1. Temporary crossings on temporary roads will be removed when no longer needed, and any fills will be removed and the channel restored to pre-project condition (TSC B5.2, B6.5, C5.2). An FG-124 will also be required.
2. Temporary crossings on system roads will be removed following use but protected fills, including constructed abutments, may remain.

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

IMPLEMENTATION:

1. For roads in active timber sale areas standard TSC provision B5.4 (Road Maintenance) requires the purchaser to perform or pay for road maintenance work commensurate with the purchasers use. C5.4 (Road Maintenance) road maintenance is the preservation of the road facility including surface, shoulders, miscellaneous structures, drainage, sight distance, and all such traffic control devices required to insure safe and efficient use by established road users and adequately protect adjacent resources. Purchaser's maintenance responsibility shall cover the before, during, and after operation period during any year when operations and road use are performed under the terms of the timber sale contract.

Purchaser shall perform road maintenance work, commensurate with purchaser's use, on roads controlled by Forest Service and used by purchaser in connection with this sale except for those roads and/or maintenance activities which are identified for required deposits in C5.411# and C5.412#.

All maintenance work shall be done currently, as necessary, in accordance with T-specifications set forth herein or attached hereto, except for agreed adjustments.

2. For roads not in an active timber sale area road maintenance must still occur at sufficient frequency to protect the investment in the road as well prevent deterioration of the drainage structure function. This will be accomplished by scheduling periodic inspection and maintenance, including cleaning dips and cross drains, repairing ditches, marking culvert inlets to aid in location, and cleaning debris from ditches and culvert inlets to provide full function during peak runoff events (FSH 7709.15).

PRACTICE 15.23 - Traffic Control During Wet Periods

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

EFFECTIVENESS: Moderate

IMPLEMENTATION: Generally, use restrictions on the paved roads control access to traffic use on the aggregate and native surfaced roads. Haul restrictions are placed on asphalt-surfaced roads, based on interpretation of thermistor data

or state restrictions. Restrictions are placed on native and aggregate-surfaced roads when a FS representative feels that damage will occur with further use. Roads that are restricted are so indicated in Forest Supervisor Orders, posted at FS Stations and in local media.

PRACTICE 15.25 - Obliteration of Temporary Roads

OBJECTIVE: To reduce sediment generated from temporary roads by obliterating them at the completion of their intended use.

EFFECTIVENESS: High

IMPLEMENTATION: Effective obliteration is generally achieved through a combination of the following measures: (TSC B6.62, C6.62, C6.622, C6.623)

1. Road effectively drained and blocked.
2. Temporary culverts and bridges removed and any modified channel slopes stabilized and revegetated.
3. Road returned to resource production through revegetation (grass, browse, or trees).
4. Sideslopes reshaped and stabilized.

These procedures will be used on the newly constructed road segments.