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Best Management Practices

Introduction

Best Management Practices (BMPs) are the primary mechanism to enable the achievement of water quality standards (EPA 1987). This Appendix describes the Forest Service's BMP process in detail; lists the key Soil and Water Conservation Practices (SWCP) that have been selected to be used on the Lolo National Forest; and describes each SWCP that may be refined for site-specific conditions to 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 (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 Lolo National Forest Plan states, "The application of best management practices will assure that water quality is maintained at a level that is adequate for the protection and use of the National Forest and that meets or exceeds Federal and State standards." (Lolo Forest Plan, Standard No. 15, page II-12). 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 (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.

Lolo National Forest BMP Effectiveness:

In 2002, the Lolo National Forest published a Best Management Practices Effectiveness Monitoring Report. This report documented specific sites where BMPs have been applied and were found to be effective. In addition to information contained within the monitoring report, the Lolo National Forest has many other excellent examples of BMP installation, use and effectiveness. The following locations are just a few examples of the BMPs that have been implemented on the Forest. These or similar practices are standard operating procedure for road construction and reconstruction on the Forest and are incorporated in the engineering package for each project and are adjusted as each situation warrants.

- The Deep Gilman Timber Sale has some excellent examples of fill slope protection and stabilization as well as slash filter windrows along riparian areas.
- The Borax Timber Sale has examples of rolling grades in road locations and drain dips.

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- The Randolph Creek Road has examples of surfacing, fill-slope rip-rap, toe slope stabilization, ditch relief into buffer strips as well as cut and fill seeding and fertilizing.
- Road 16343 of the Big Elk Timber Sale is an excellent example of drainage features and road prism seeding.
- Mitigation measures used on the Schwartz Creek Road are example practices implemented to stop road generated sediment from entering adjacent streams. Mitigation includes berms, drainage outlets to filter strips and gravel surfacing.

These, as well as other BMPs have been monitored for effectiveness; we have determined that these practices are performing at the levels that research has projected (See Annual Forest Plan Monitoring Reports).

An exception to projected effectiveness is seeding and fertilizing of some cut slopes. We have observed in a few situations that within the first season of planting, the ground coverage is in the 25 to 50 percent range or in some cases even less. When these situations are noted, sale administrators see that these areas are reseeded through the contract or do the reseeded themselves, so that by the third year most of these areas have grass coverage that meet requirements. The Forest continues to monitor BMPs and any reduction in effectiveness or problems are noted and corrected.

BMP Implementation Process

In cooperation with the State of Montana, 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 stream
2. BMP Application
3. BMP monitoring to ensure that they are being implemented and are effective in protecting designated beneficial uses.
5. Evaluation of BMP monitoring results.
6. Feeding back the results into current/future activities and BMP design. The District Ranger is responsible for insuring that this BMP feedback loop is implemented on all projects.

BMP Selection and Design. Water quality goals are identified in the Lolo Forest Plan (Pages II-1, V-2,3). 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. After identifying the designated beneficial uses for the associated streams, the initial list of BMPs is developed from the Forest Plan standards and guidelines, Forest Service handbooks, and special provisions identified by watershed and fisheries specialists for sensitive areas.

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.

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 during harvest unit layout through marking, tagging and flagging by pre-sale crews and tagline surveys, road drainage, and stream crossings locations by engineers. This is when final adjustments to fit the BMP prescriptions to the site are made before implementing the resource activity.

BMP Monitoring. During the course of project activities (e.g., 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 water beneficial uses. State water quality standards, including the beneficial uses, will serve as one evaluation criteria for the EIS monitoring.

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 properly designed, technically sound, 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? Were personnel, equipment, funds, or training lacking which resulted in inadequate or incomplete implementation?
3. **The State water quality criteria:** Do the parameters and criteria used for effectiveness evaluation adequately reflect human induced changes to water quality and beneficial uses?

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.

SOIL AND WATER CONSERVATION PRACTICES

CLASS SOIL AND WATER CONSERVATION PRACTICE (FSH 2509.22)

11. WATERSHED MANAGEMENT

- A11.01 Determination of Cumulative Watershed Effects
- A11.05 Wetlands Analysis and Evaluation (13.03, 14.16)
- A11.09 Management by Closure to Use
- W11.13 Sanitary Guidelines for Construction of Temporary Labor, Spike, Logging, and Fire Camps, and Similar Installations

13. VEGETATION MANIPULATION

- G13.02 Slope Limitations for Tractor Operation (14.07)
- G13.03 Tractor Operation Excluded from Wetlands, Bogs, & Wet Meadows
- E13.04 Revegetation of Surface Disturbed Areas

14. TIMBER

- A14.02 Timber Harvest Unit Design (14.08, 14.10)
- A14.03 Use of Sale Area Maps for Designating Soil and Water Protection Needs
- A14.04 Limiting the Operating Period of Timber Sale Activities
- A14.05 Protection of Unstable Areas
- A14.06 Streamside Management Zone Rules, Riparian Area Designation
- G14.07 Determining Tractor Loggable Ground
- E14.08 Tractor Skidding Design
- E14.09 Suspended Log Yarding in Timber Harvesting
- A14.10 Log Landing Location and Design
- E14.11 Log Landing Erosion Prevention and Control (14.12, 14.15)
- E14.12 Erosion Prevention and Control Measures During Timber Sale Operations
- E14.15 Erosion Control on Skid Trails
- E14.16 Meadow Protection During Timber Harvesting
- S 14.17 Streamcourse Protection (Implementation and Enforcement)
- E14.18 Erosion Control Structure Maintenance
- A14.19 Acceptance of Timber Sale Erosion Control Measures Before Sale Closure
- E14.20 Slash Treatment in Sensitive Areas
- A14.22 Modification of the Timber Sale Contract
- A14.23 Reforestation Requirement
- G14.24 On-site Large Woody Residue and Soil Litter Retention

CLASS SOIL AND WATER CONSERVATION PRACTICE (FSH 2509.22)

15. ROADS AND TRAILS

- S15.02 General Guidelines for the Location and Design of Roads and trails
- E15.03 Road and Trail Erosion Control Plan
- E15.04 Timing of Construction Activities
- E15.06 Mitigation of Surface Erosion and Stabilization of Slopes
- E15.07 Control of Permanent Road Drainage
- E15.08 Pioneer Road Construction
- E15.09 Timely Erosion Control Measures on Incomplete Road and Streamcrossing Projects

E15.10	Control of Road Construction Excavation & Sidecast Material
S15.11	Servicing and Refueling of Equipment
S15.12	Control of Construction in Riparian Areas
S15.13	Controlling In-Channel Excavation
S15.14	Diversion of Flows Around Construction Sites
S15.15	Streamcrossings on Temporary Roads
S15.16	Bridge and Culvert Installation (Disposition of Surplus Material and Protection of Fisheries)
E15.18	Disposal of Right-of-Way and Roadside Debris
E15.21	Maintenance of Roads
E15.22	Road Surface Treatment to Prevent Loss of Materials
E15.23	Traffic Control During Wet Periods
E15.24	Snow Removal Controls
E15.25	Obliteration of Temporary Roads

18. FIRE SUPPRESSION AND FUELS MANAGEMENT

A18.02	Formulation of Fire Prescriptions
E18.03	Protection of Soil & Water from Prescribed Burning Effects
E18.04	Minimizing Watershed Impacts from Fire Suppression Efforts
E18.05	Stabilization of Fire Suppression Related Watershed Damage

CLASSES OF SWCP (BMP)

A	= Administrative
G	= Ground Disturbance Reduction
E	= Erosion Reduction
S	= Stream Channel Protection/Stream Sediment Reduction
W	= Water Quality Protection

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:
 - 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)
- **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 PRACTICE

Responsibility for Implementation: The District Ranger is responsible for ensuring the factors identified in the following SWCPs are incorporated into the correct Timber Sale Contract provision, that the provisions are included in the Timber Sale Contract, or public works contract through the inclusion of specific contract clauses, and implemented on the ground. Specific Timber Sale Contract clauses are often included in the BMPs for further reference, and the clauses start with a "B" or a "C" followed by number (e.g. B6.4).

Unless otherwise specified, the Presale Forester is responsible for insuring that the factors identified in the following SWCPs are incorporated into the correct Timber Sale Contract B and/or C provision and that the provisions are included in the Timber Sale Contract.

The contracting officer through his/her official representatives (sale administrator and/or engineering representative on timber sale contracts and contracting officers representative on public works contracts) are responsible for insuring that the clauses are properly administered on the ground.

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

ABBREVIATIONS

TSC = Timber Sale Contract
TSA = Timber Sale Administrator
COR = Contract Officers Representative
SAM = Sale Area Map

****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: Moderate

IMPLEMENTATION: Water resource effects analyses are assisted through the WATSED model (R1 WATSED, USDA Forest Service, Jan. 1992). This model simulates the cumulative effects of timber harvest, road construction, and fire on sediment and water yield. Stream channel condition with respect to stability, morphology, and fish habitat are determined by the interpretation of water and sediment yield effects estimates. This WATSED model is the combination of two models that have been used in this area for a number of years: the R1-R4 model (sediment yield) and a water yield prediction model, locally called the Lolo WATBAL model. References to all three models will be made in this BMP.

The R1-R4 model (Guide for Predicting Sediment Yields From Forested Watersheds, R. Cline et al., 1981, USDA Forest Service and Users Guide to R1-R4, Hennis et al., USDA Forest Service, 1985) quantifies estimates of sediment for natural watersheds and predicts sediment yield changes in response to management activities such as logging, road construction and fire. These estimates are based on the amount of ground disturbance and the expected erosion for each landtype group in the watershed. The model also estimates how much of the eroded material will be routed to the stream reach in question, based on the amount of ground disturbance, the expected erosion for each landtype group in the watershed, topography and proximity to stream channels.

The R1-R4 model was developed for use with the Idaho batholith type geology. It has been adapted for use on the Lolo National Forest by adjusting erosion estimates and sediment delivery characteristics to fit local conditions. It is assumed that new road construction will use BMPs, including seeding and fertilizing cut and fill slopes, and using slash filter windrows along road fills in sediment contributing zones. Additional measures may be included for new road construction, such as placing gravel surfacing and excelsior netting on cut and fill slopes at stream crossings and other sediment contributing areas.

Indirect effects of the proposed action on quantity and timing of water yields are predicted using the WATBAL portion of the WATSED model. On-site water yields are estimated, based on elevation, precipitation and habitat types for the natural condition and proposed treatment. The potential increase in water yields are routed to the stream reach in question to address indirect effects on those yields. Changes in timing of water yields and changes in peak flows are estimated, based on site-specific conditions and how the proposed treatments affect shading and melt rates. Cumulative changes in water yields of past, proposed, and reasonably foreseeable actions are estimated.

Both water and sediment yield portions of the WATSED model use a watershed approach and simplify for analysis purposes complex physical systems from a limited data base. Although specific quantitative values for sediment and water yields are generated, the results should be treated as broad estimates of how real systems may respond. **Therefore, each model's use is realistically limited to providing a means of comparison among**

alternatives, rather than used as an absolute measure against verifiable standards.

The results will be compared to thresholds as a means of risk assessment, realizing that this use is limited. When predicted yields approach or exceed a given threshold, it means that the risk of major long term impact is increased.

Existing closed roads will be modeled at a maximum sediment mitigation of 90 percent when there is no evidence of erosion, the road is well vegetated and drained, not traveled and not maintained. Closed roads and open roads will be field inspected. If there is evidence of erosion in sediment contributing areas or roadway rutting, then sediment mitigation may be as low as zero for such road segments.

Existing open and closed road sediment mitigation will normally be modeled at 40 percent, depending upon field inspection. Existing road sediment mitigation is dependent upon road drainage effectiveness and road cut and fill slope vegetation.

New road construction using Forest Plan standards for grass seeding and fertilization on all road cut and fill slopes and slash filter windrow emplacement at toe of road fill slopes in sediment contributing areas will be modeled at 60 percent sediment mitigation. Effectiveness of slash filter windrows depends upon the use of hydraulic excavators in road pioneering. Measures such as road surfacing in sediment contributing areas and mulching or netting on sensitive slopes can increase the total sediment mitigation modeling factor to a maximum of 80 percent.

Adjustment of road sediment mitigation coefficients used in the R1R4SED model are and will continue to be coordinated with Montana Department of State Lands and neighboring National Forests for assessing cumulative watershed effects. Research support for road sediment mitigation coefficients is documented in a paper by Edward R. Burroughs, Jr. and John G. King of the Intermountain Research Station, titled, "Reduction of Soil Erosion on Forest Roads," July, 1989, Forest Service General Technical Report INT-264.

The sediment prediction model will use the mitigation coefficients discussed above and will be adjusted to reflect local landtypes and geology. Localization of the model results in routed natural sediment yields which range from about 5 tons/square mile/year on quartzitic landtypes to 25 tons/square mile/year on gneissic granitic steep landtypes.

Soil and water conservation practices (i.e. sediment mitigation measures) will be incorporated into project alternatives as the principle means to protect beneficial water uses such as fisheries, domestic use, recreation and irrigation. The effectiveness of the soil and water conservation practices will be tested through predictions of effects of project alternatives on the water resource. Sediment yield calculations along with on-site inspections, will be used to predict the potential effect of activities/alternatives on beneficial uses. If evaluation of the model calculations and site inspection show that the beneficial uses will be impacted by implementing an alternative, one of the following actions will be taken: 1) the alternative will be redesigned or dropped; or 2) soil and water conservation practices will be refined and additional ones added as necessary.

When there is concern that fisheries could be affected by management activities, an interdisciplinary team including a hydrologist, fisheries biologist, and soil scientist will analyze the effects activities could have on project affected watersheds. In addition to analysis for project watersheds, the effects of activities such as road construction and

reconstruction, road maintenance, and hauling on watersheds outside the project area will be analyzed.

Thresholds will be evaluated over time (Forest Plan monitoring) for validity and protection of beneficial water uses. Results will be documented in the annual Forest Plan monitoring report. Any changes in the WATSED and fish/sediment models will be disclosed in environmental documents and notification of major changes in the models or thresholds will be made to individuals on the project mailing list.

****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 (See 14.06 Also)**

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). Application is mandatory on all vegetation manipulation projects unless specifically excluded in the NEPA process. Contract specifications and controls and requirements are identified in the environmental analysis. The project supervisor and/or Contracting Officer are responsible for identifying wetlands and meadows not previously recognized in the NEPA process, and for following management controls and contract provisions pertaining to wetlands and meadows. When it is necessary to identify these areas on the SAM, direction to do so and protective requirements will be incorporated into TSC Provision C6.61 (Wetlands Protection). Vehicular or skidding equipment shall not be used on meadows except where there are no viable alternatives. If there are no practicable alternatives activities must be assessed by the watershed specialist and approved by the Forest Supervisor. Unless otherwise agreed, trees felled into meadows will be removed by end-lining, and resulting logging slash shall also be removed. Damage to meadows, stream courses, and Riparian Areas caused by unauthorized Purchaser's operations shall be repaired by the Purchaser in a timely manner to restore and prevent further damage.

****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.

EFFECTIVENESS: Moderate.

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 TSC provision C5.51.

****PRACTICE: 11.13 - Sanitary Guidelines for Construction of Temporary Labor, Spike, Logging, and Fire Camps and Similar Installations**

OBJECTIVE: To eliminate water pollution and other potential environmental and health impacts from the disposal of human waste and wastewater from temporary camps of all types.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Latrines or pits for camps will be located at least 150 feet downstream from the camp, 100 feet from surface water, and 4 feet above high groundwater. Latrines will be replaced with chemical toilets or similar units as soon as practicable.

****PRACTICE 13.02 - Slope Limitations for Tractor Operation,**

****PRACTICE 14.07 - Determining Tractor Loggable Ground**

OBJECTIVE: To reduce gully & sheet erosion and associated sediment production, and to minimize soil displacement by restricting tractor operation to slopes where corrective measures for proper drainage are easily installed and effective.

EFFECTIVENESS: High

IMPLEMENTATION Tractor logging generally will be limited to slopes of **35%** or less. Small areas of greater than 35% slope within the treatment area may be tractor logged only after review by the soil scientist and the interdisciplinary team and only where any possible erosion will settle out before reaching the stream or channels. TSC provision C6.6.

****PRACTICE 13.04 - Revegetation of Surface Disturbed Areas**

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

EFFECTIVENESS: Moderate

IMPLEMENTATION: All roads, landings, and skid trails will be seeded as soon as possible following use. Site specific actions include treating the disturbed areas with a grass seed mix and fertilizer. Seed mixes and fertilizer specifications are incorporated into TSC provision C6.601 (Erosion Control Seeding). For seeding and fertilizing recommendations refer to "Lolo Seeding and Fertilization Guidelines". If recommended by the soils scientist, 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 four (4) inches. This will be incorporated into TSC provision C6.601 (Erosion Control Seeding)

****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, maintain water quality and soil productivity by locating/designing landings and skidding patterns to best fit the terrain and to minimize soil erosion, compaction, and displacement.

EFFECTIVENESS: High

IMPLEMENTATION: TSC provisions C6.3 (Plan of Operation) and B6.422 (Landings and Skid Trails) require 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:

Unit Boundaries:

- a. Design and locate unit boundaries which provide log skidding, site preparation, and slash treatment opportunities which minimize disturbance to soils, stream channels, and riparian areas.

Skid Trails:

- a. Design and locate skid trails and skidding operations to minimize soil disturbance. Forest Plan direction is to maintain long-term soil productivity by minimizing the amount of soil disturbance. Ground-disturbing activities can cause displacement of the nutrient rich litter and mineral soil surface layers, compaction of the upper soil layers, and soil puddling (e.g. ruts). Severe burning due to prolonged excessively high temperatures during slash disposal can negatively affect soil properties. The Forest Plan defines detrimentally affected for these four categories. Of this 20 percent, no more than 15 percent of the activity area can be significantly impaired (Soil Quality Standards; FSH 2509.18 - Soil Management Handbook). Essentially 100 percent of the main skid trails had soil displacement in recent studies (Clayton, 1990; Froelich et al., 1983). The effects of displacement and compaction are long term and have repeatedly been shown to cause significant reductions in tree growth (Froelich et al., 1980; Froelich, et al, 1983; Helms, 1983).

In order to stay within the guidelines of the Forest Plan, the following practices may be useful:

- Use of designated skid trails which would comprise no more than 15 percent of the activity area. Trails would be designed to maximize potential to cable winch logs to the trail rather than having the skidder go off the trail to retrieve logs.
- Directional felling of trees to allow skidders to cable winch logs to the skid trail.
- Use of log-forwarding equipment that employs full suspension of logs off of the ground. Although it is unknown to what degree such equipment will disturb

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soils, the travel routes used by log-forwarders likely will not suffer such heavy impacts as occurs on skid trails used by skidders dragging logs.

- Use of ground-based logging equipment only when the soil is frozen or covered with a minimum of 18 inches of snow.
- Use of rubber-tired skidders rather than tractor type skidders. Rubber-tired skidders tend to disturb less soil when operating off the skid trail than track equipment (Clayton, 1990 and Froelich et al., 1983).
- Minimize site preparation by heavy equipment. Utilize small hand scalps (less than 2 square feet) as much as possible.
- Restrict operating season to times less likely to be subject to compaction.
- bloated skid trails to avoid concentrating runoff and to provide breaks in grade and waterbars.
- collocate skid trails and landings away from natural drainage systems, and divert runoff to stable areas.

Landings

a. Landings, log decks and/or burn piles will be located a minimum of 100 feet from streams, far enough outside of the ordinary high water marks and channels of any streams so that direct (unfiltered) entry of sediment, bark, or ash and burning products, will not occur. (TSC Provision C6.422)

References:

Clayton, J.L. 1990. Soil disturbance resulting from skidding logs on granitic soils in Central Idaho. USDA Forest Service, Intermountain Research Station, Research Paper INT-436.

Froelich, H.A., J. Azevedo, P. Cafferata, and D. Lysne. Predicting soil compaction on Forested land. Final Project Report to USDA Forest Service, Pacific Northwest Forest and Range Experiment Station and Missoula Equipment Development Center, Cooperative Agreement No. 228.

Froelich, H.A., D.W. Miles, Richard Robbins, and J.K. Lyons. 1983. Soil monitoring project report on Payette National Forest and Boise Cascade Lands. Forest Engineering Department, Oregon State University, Corvallis, OR.

Helms, J.A. 1983. Soil compaction and stand growth. Final Report to UDSA Forest Service, Amendment of Supplement 42, Master Agreement 21-395.

****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:

- a. Streamcourses (perennial and ephemeral) to be protected under standard TSC provision B6.5 (Streamcourse Protection)
- b. Wetlands and Riparian Areas (meadows, lakes, pot holes, etc.) to be protected per TSC provision C6.61. (Wetlands Protection)
- c. Special treatment areas, including riparian areas with planned harvest, where logging and site prep will differ from adjoining units as identified in TSC provision C6.4 and C6.7. (Riparian Areas)
- d. Active and inactive slumps and areas with moderate or high mass failure hazard.

These features will be reviewed on the ground by the Purchaser and the Sale Administrator prior to harvesting.

MONITORING: The Forest Hydrologist will insure 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, such as frozen or snow covered conditions.

EFFECTIVENESS: High

IMPLEMENTATION: Within the treatment area, the following limitations for operating periods have been identified and recommended by the IDT:

- a. Operating seasons and requirements will be incorporated into TSC provision C6.316 if identified as necessary by the soils scientist or hydrologist.
- bystander TSC provision B6.31 allows operations outside Normal Operating season, subject to requirements in B6.6, B6.65 and C5.46.

****PRACTICE 14.05 - Protection of Unstable Areas**

OBJECTIVE: To protect unstable areas and to avoid triggering mass movements of the soil mantle and resultant erosion and sedimentation.

EFFECTIVENESS: High

IMPLEMENTATION: Dozers will not be permitted in wet areas, nor will incised skid trails normally be permitted on slump blocks. If the slump must be crossed, the forest soil

scientist must be involved in trail location. Slumps should be crossed in the upper 1/3 of the slump if all possible. If the interdisciplinary team determines that current or prospective logging methods would result in unacceptable watershed impact, the harvest is deferred.

****PRACTICE 14.06 - Riparian Area and Streamside Designation and Protection**

OBJECTIVE: To minimize the adverse effects on riparian areas with prescriptions that manage riparian area vegetation manipulation as well as nearby logging and related land disturbance activities. Riparian areas will be managed as an ecosystem to maintain flora, fauna, water quality, and water-related recreation activities. Refer to 15.12 (Control of Construction in Riparian Areas) and 18.03 (Protection of Soil and Water from Prescribed Burning Effects) for further riparian area protection practices.

EFFECTIVENESS: High

IMPLEMENTATION: In addition to riparian area management requirements of the Lolo Forest Plan, streamside protection will be done in accordance with Montana Streamside Management Zone Act. The following are the requirements of the Act:

(1) This subchapter applies to forest practices conducted within a timber sale in the streamside management zone. Such practices, as defined at 77-5-302(3), MCA, include the following activities when conducted within a "timber sale" as that term is defined below:

- (a) the harvesting of trees;
- (b) road construction or reconstruction associated with harvesting and accessing trees;
- (c) site preparation for regeneration of a timber stand;
- (d) reforestation;
- (e) management of logging slash.

(2) Wherever used in this subchapter, unless a different meaning clearly appears from the context:

(a) "Alternative practices" means forest practices conducted in the SMZ that are different from the practices required by the standards provided in 77-5-303, MCA, and are approved by the department either by adoption of this subchapter or on a site-specific basis upon application of the operator.

(b) "Broadcast burning" means spreading fire through a continuous fuel cover. The fuels consist of slash resulting from forest practices, surface litter, and duff. Fuels are left in place, fairly uniform, and ignited under certain conditions with the intent to meet planned management objectives in the desired area.

(c) "Class 1 stream segment" means a portion of stream that supports fish; or a portion of stream that normally has surface flow during 6 months of the year or more; and that contributes surface flow to another stream, lake, or other body of water.

(d) "Class 2 stream segment" means a portion of stream that is not a class 1 or class 3 stream segment. Two common examples of class 2 stream segments are:

(1) A portion of stream which does not support fish; normally has surface flow during 6 months of the year or more; and contributes surface flow to another stream, lake, or other body of water; or

(2) A portion of stream that does not support fish; normally has surface flow during 6 months of the year or more; and does not contribute surface flow to another stream lake, or other body of water.

(e) "Class 3 stream segment" means a portion of a stream that does not support fish; normally has surface flow during less than 6 months of the year; and rarely contributes surface flow to another stream, lake, or other body of water.

(f) "Clearcutting" means removal of virtually all the trees, large and small, in a stand in one cutting operation. Virtually all woody vegetation is removed from the site preparatory to establishment of new trees.

(g) "Construction" means cutting and filling of earthen material that results in a travel-way for wheeled vehicles.

(h) "Diameter at breast height" (abbreviated "dbh") means the diameter of a tree measured 4 ½ feet from the ground level. Ground level is the highest point of the ground touching the stem.

(i) "Eastern Zone" means the counties of Big Horn, Blaine, Carter, Chouteau, Custer, Daniels, Dawson, Fallon, Fergus, Garfield, Golden Valley, Hill, Liberty, McCone, Musselshell, Petroleum, Phillips, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Toole, Treasure, Valley, Wibaux, and Yellowstone.

(j) "Established road" means an existing access or haul route for highway vehicles that is passable under one or more of the following circumstances:

- (1) without any work;
- (2) with clearing of windfall or small woody vegetation;
- (3) with surface blading;
- (4) with replacement of stream crossing structures and drainage structures that were removed to restrict access; or
- (5) with removal of constructed access barriers.

(k) "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.

(l) "Lake" means a body of water where the surface water is retained by either natural or artificial means, where the natural flow of water is substantially impeded, and which supports fish.

(m) "Ordinary high water mark" means the stage regularly reached by a body of water at the peak of fluctuation in its water level. The ordinary high water mark is generally observable as a clear, natural line impressed on the bank. It may be indicated by such characteristics as terracing, changes in soil characteristics, destruction of vegetation, presence or absence of litter or debris, or other similar characteristics.

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(n) "Other body of water" means ponds and reservoirs greater than 1/10th acre that do not support fish; and irrigation and drainage systems discharging directly into a stream, lake, pond, reservoir or other surface water. Water bodies used solely for treating, transporting, or impounding pollutants shall not be considered surface water.

(o) "Road" means a travel-way suitable for highway vehicles.

(p) "Salvage" means harvesting trees that have been killed or damaged or are in imminent danger of being killed or damaged by injurious agents other than competition between trees.

(q) "Sidecasting" means the act of moving excess earthen material over the side of a road during road maintenance operations.

(r) "Slash" means the woody debris that is dropped to the forest floor during forest practices. Timber slash consists of stems, branches, and twigs left behind after forest practices.

(s) "Slope distance" means the length of a line between two points on the land surface.

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

(u) "Streamside management zone" or "zone" (abbreviated "SMZ"), 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 to include wetlands and areas that provide additional protection in zones with steep slopes or erosive soils."

(v) "Timber sale", as defined at 77-5-302(9), MCA, means "a series of forest practices designed to access, harvest, and regenerate trees on a defined land area for commercial purposes."

(w) "Wetlands" means 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.

(3) This subchapter shall become effective March 15, 1993. (History: Sec. 77-5-307, MCA; IMP, Sec. 77-5-307, MCA; NEW, 1993 MAR p. 14, Eff. 3/15/93.)

26.6.602 WIDTH OF STREAMSIDE MANAGEMENT ZONE - MARKING BOUNDARY

(1) The slope of the SMZ is measured perpendicular to the stream or lake from the ordinary high water mark to a point 50 feet slope distance from the ordinary high water mark.

(2) The SMZ width is 50 feet slope distance on each side of streams, lakes, and other bodies of water measured from the ordinary high water mark, in all cases except:

(a) Where wetlands exist adjacent to the stream, lake, or other body of water, the SMZ extends to include the wetlands;

(b) On class 1 and 2 stream segments and lakes where the slope of the SMZ is greater than 35 percent, the SMZ width is 100 feet, except:

(1) where an established road exists between 50 and 100 feet from the ordinary high water mark, the SMZ boundary is located at the toe of the road fill; or

(2) where the slope of the SMZ decreases to 15 percent or less to form a bench that is 50 to 100 feet from the ordinary high water mark and at least 30 feet wide, the SMZ boundary is located at the edge of the bench nearest the stream.

(3) Where forest practices that are prohibited in the SMZ will be conducted adjacent to the SMZ boundary on a class 1 or class 2 stream segment, the SMZ boundary must be clearly marked prior to conducting such practices. (History: Sec. 77-5-307, MCA; IMP, Sec. 77-5-301, 302(8), MCA; NEW, 1993 MAR p. 14, Eff. 3/15/93.)

26.6.603 BROADCAST BURNING

(1) Broadcast burning in the SMZ is prohibited unless approved by the department under a site-specific alternative practice. (History: Sec. 77-5-307, MCA; IMP, Sec. 77-5-303, MCA; NEW, 1993 MAR p. 14, Eff. 3/15/93.)

26.6.604 EQUIPMENT OPERATION IN THE SMZ

(1) Operation of wheeled or tracked equipment in the SMZ except on established roads is prohibited except as provided in this rule.

(2) In order to permit timber harvest on wetlands under conditions that protect the integrity of the SMZ, an operator may, as an alternative practice without site-specific approval, operate wheeled or tracked equipment from the outside edge of an SMZ to within 50 feet of the ordinary high water mark wherever:

(a) the SMZ extends beyond 50 feet from the ordinary high water mark to include adjacent wetlands;

(b) there exist winter conditions with adequate snow or frozen ground; and

(c) operation of the wheeled or tracked equipment:

(1) does not cause rutting or displacement of the soil;

(2) protects and retains shrubs and submerchantable trees to the fullest extent possible;

(3) does not remove stumps; and

(4) otherwise conserves the integrity of the SMZ.

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(3) In order to minimize road construction and skid trails necessary for timber harvest on lands adjacent to the SMZ, an operator may, as an alternative practice without site-specific approval, cross the SMZ and the stream or other body of water with wheeled or tracked equipment on a class 3 stream segment or other body of water at locations spaced approximately 200 feet apart or more provided that:

- (a) crossings are located in areas where the stream or other body of water is dry and the banks and bottoms are stable;
- (b) excavation is minimized;
- (c) the capacity of the stream channel or other body of water is maintained; and
- (d) the distance traveled through the SMZ is minimized.

(4) In order to minimize road construction necessary for timber harvest on lands adjacent to the SMZ, an operator may, as an alternative practice without site-specific approval, operate wheeled or tracked equipment inside the SMZ off of established roads on the side of the road away from the stream wherever:

- (a) an established road exists inside the SMZ or construction of a road inside the SMZ is authorized under ARM 26.6.606;
- (b) the toe of the road fill nearest the stream is at least 25 feet from the ordinary high water mark; and
- (c) operations are conducted in such a manner that:
 - (1) wheeled or tracked equipment stays out of wetlands except under winter conditions as provided in (2) above;
 - (2) all skidding of logs takes place on designated skid trails located approximately 200 feet apart or more;
 - (3) all skid trails in such areas are reclaimed by installing erosion control measures and reestablishing vegetative cover;
 - (4) drainage features are established or reestablished on all roads used under this section;
 - (5) logs are not decked on the side of the road toward the stream; and
 - (6) no landings are constructed in the SMZ.

(5) When logs are being winched or cable yarded across a class 1 or 2 stream segment by equipment located outside the SMZ, logs must be fully suspended unless otherwise authorized pursuant to the Natural Streambed and Land Preservation Act of 1975, 75-7-101 et seq., MCA.

(6) The department may also approve operation of wheeled or tracked equipment in the SMZ as a site-specific alternative practice only under conditions that:

- (a) conserve the integrity of the SMZ;
 - (b) do not cause rutting of the soil; and
 - (c) protect the residual stand of shrubs and trees.
- (History: Sec. 77-5-307, MCA; IMP, Sec. 77-5-301, 303, MCA; NEW, 1993 MAR p. 14, Eff. 3/15/93.)

26.6.605 RETENTION OF TREES IN THE SMZ - CLEARCUTTING

(1) The forest practice of clearcutting is prohibited in the SMZ unless approved by the department under a site-specific alternative practice.

(2) Further, in order to provide large woody debris, stream shading, water filtering effects, and to protect stream channels and banks, merchantable and submerchantable trees must be retained in the first 50 feet of the SMZ beyond the ordinary high water mark and in the entire SMZ where the SMZ is extended for wetlands under ARM 26.6.602(2) (a), on each side of streams, and along lakes and other bodies of water as follows:

(a) On each side of class 1 stream segments and lakes retain 50 percent of the trees greater than or equal to 8 inches dbh, or 10 trees greater than or equal to 8 inches dbh in each 100 lineal feet of the SMZ, whichever is greater.

(1) If less than 10 trees greater than or equal to 8 inches dbh are present in any 100 lineal foot segment of the SMZ, then a minimum of 10 trees of the largest diameter available must be retained in that segment.

(2) Trees retained must be representative of the species and size of trees in the pre-harvest stand.

(3) Shrubs and submerchantable trees must be protected and retained in the entire SMZ to the fullest extent possible when conducting forest practices in the SMZ.

(b) On each side of class 2 stream segments retain 50 percent of the trees greater than or equal to 8 inches dbh, or 5 trees greater than or equal to 8 inches dbh in each 100 lineal feet of the SMZ, whichever is greater.

(1) If less than 5 trees greater than or equal to 8 inches dbh are present in any 100 lineal foot segment of the SMZ, then a minimum of 5 trees of the largest diameter available must be retained in that segment.

(2) Trees retained must be representative of the species and size of trees in the pre-harvest stand.

(3) Shrubs and submerchantable trees must be protected and retained in the entire SMZ to the fullest extent possible when conducting forest practices in the SMZ.

(c) On each side of class 3 stream segments and other bodies of water, shrubs and submerchantable trees must be protected and retained in entire SMZ to the fullest extent possible when conducting forest practices in the SMZ.

(3) Hardwood trees and snags meeting diameter standards of (2) above may be counted toward retention tree requirements in the same approximate proportion as their occurrence in the stand prior to commencement of forest practices.

(4) Trees retained pursuant to this rule must be distributed within the SMZ as guided by the following criteria:

(a) favor bank-edge trees;

(b) favor trees leaning toward the stream and those that cannot be felled without falling into the stream;

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(c) where the SMZ is greater than 50 feet wide and harvesting will result in the minimum stocking of trees required to be retained under section (2) (a) and (b), concentrate retained trees within 50 feet of the stream.

(5) Trees retained pursuant to this rule may be salvaged only under the following conditions:

(a) Trees to be harvested meet the definition of salvage at ARM 26.6.601 (2) (p); and

(b) The minimum tree retention requirements of section (2) are met by standing live trees, or by dead or fallen trees where sufficient standing live trees are not available; and

(c) All trees that have fallen across or in the stream must be retained, unless salvage of such trees is approved as a site-specific alternative practice subject to other federal and state laws and regulations.

(6) All practices which deviate from the tree-distribution criteria provided in (2) and (4) above require approval as site-specific alternative practices. (History: Sec. 77-5-307, MCA; IMP, Sec. 77-5-301, 303, MCA; NEW, 1993 MAR p. 14, Eff. 3/15/93.)

26.6.606 ROAD CONSTRUCTION IN THE SMZ

(1) The construction of roads in the SMZ is prohibited except when necessary to cross a stream or wetland unless approved by the department under a site-specific alternative practice or as provided in this rule. The construction of roads across streams, wetlands or other bodies of water is not regulated by these rules but may be subject to other state and federal laws and regulations.

(2) Road fill material must not be deposited into the SMZ except as needed to construct crossings.

(3) In order to minimize excavation for road construction on erosive soils characteristic of Eastern Montana, an operator may, as an alternative practice without site-specific approval, construct or locate a road inside the SMZ on class 3 stream segments in the eastern zone only wherever:

(a) the slope of the SMZ immediately adjacent to the stream is 10 percent or less for a distance of at least 25 feet from the ordinary high water mark;

(b) there exists in the outer portion of the SMZ a hillside with slopes in excess of 35 percent; and

(c) the road is constructed or located on the gentler slopes in such a manner that:

(1) cutting and filling of earthen material is minimized;

(2) the toe of the road fill is located at least 15 feet from the ordinary high water mark;

(3) the road is located as far away from the ordinary high water mark as is practical; and

(4) road drainage features are installed as needed to minimize sediment delivery to streams. (History: Sec. 77-5-307, MCA; IMP, Sec. 77-5-301, 303, MCA; NEW, 1993 MAR p. 14, Eff. 3/15/93.)

26.6.607 HAZARDOUS OR TOXIC MATERIALS

(1) The handling, storage, application, or disposal of hazardous or toxic materials in the SMZ in a manner that pollutes streams, lakes, or wetlands or that may cause damage or injury to humans, land, animals, or plants is prohibited.

(2) Any application of herbicides or pesticides must be done in a manner that such materials are not introduced to streams, lakes, wetlands, or other bodies of water through surface runoff or sub-surface flow.

(3) Any application of herbicides or pesticides must be done in a manner which does not destroy vegetation in the SMZ to an extent which impairs the capacity of the SMZ to provide shade or to act as an effective sediment filter.

(4) Any application of herbicides or pesticides in the SMZ must be in accordance with all label directions and in compliance with all applicable laws and regulations regarding the use of such material.

(5) Dust abatement agents which do not contain waste oil may be applied on roads in the SMZ provided that such material is not directly introduced into a stream, lake, or other body of water. (History: Sec. 77-5-307, MCA; IMP, Sec. 77-5-303, MCA; NEW, 1993 MAR p. 14, Eff. 3/15/93.)

26.6.608 SIDE-CASTING OF ROAD MATERIAL

(1) The side-casting of road material into a stream, lake, wetland, or other body of water during road maintenance operations is prohibited in the SMZ. (History: Sec. 77-5-307, MCA; IMP, Sec. 77-5-303, MCA; NEW, 1993 MAR p. 14, Eff. 3/15/93.)

26.6.609 DEPOSITING SLASH

(1) Depositing slash in streams, lakes, or other bodies of water is prohibited unless approved by the department under a site-specific alternative practice subject to other state and federal laws and regulations. (History: Sec. 77-5-307, MCA; IMP, Sec. 77-5-303, MCA; NEW, 1993 MAR p. 14, Eff. 3/15/93.)

26.6.610 SITE-SPECIFIC ALTERNATIVE PRACTICES

(1) The owner or operator shall comply with the management standards stated in 77-5-303(1), MCA, and this subchapter, unless approval has been obtained from the department for alternative practices designed for site-specific conditions encountered during a timber sale prior to conducting such practices.

(2) The department may approve a proposed alternative practice only if such practice would be otherwise lawful and the department determines with reasonable certainty that the proposed alternative practice would conserve the integrity of the streamside management

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zone and would not significantly diminish the function of the zone as stated in 77-5-301, MCA:

- (a) to act as an effective sediment filter to maintain water quality;
- (b) to provide shade to regulate stream temperature;
- (c) to support diverse and productive aquatic and terrestrial riparian habitats;
- (d) to protect stream channel and banks;
- (e) to provide large, woody debris that is eventually recruited into a stream to maintain riffles, pools, and other elements of channel structure; and
- (f) to promote floodplain stability.

(3) In order to obtain department approval of alternative practices, the owner or operator shall submit to the department an application describing the proposed practices and location. Applications must provide all data specified by the department and must be submitted on forms provided or approved by the department.

(4) Within 10 working days of receipt of the application for approval of alternative practices the department shall determine if the application is approved, approved with modification, disapproved, incomplete, requires additional information or environmental analysis, or requires a field review. The department shall notify the owner and the applicant of its decision in writing.

(5) If the department determines a field review is necessary, the field review must be made at a mutually agreeable time. The owner or his designee must be present at the field review.

(6) Within 10 working days after all necessary field review is complete, the department shall determine whether the application is approved, approved with modification, disapproved, incomplete, or requires additional information or environmental analysis. The department shall notify the owner and the applicant of its decision in writing.

(7) The department may notify the applicant in writing that it declines to conduct further environmental analysis of an application if it determines that the proposed alternative practices are complex, or affect an environmentally sensitive area, or involve a high degree of uncertainty that the proposed alternative practices will have a significant impact on the quality of the human environment. The notice must briefly describe the department's reasons for declining to conduct further analysis. In this case, the applicant may conduct further environmental analysis and submit documentation to the department. The department shall independently review any further environmental analysis and documentation of the proposed alternative practices provided by the applicant and may adopt such documentation if it is adequate under the Montana Environmental Policy Act (75-1-101 et seq., MCA) and rules adopted thereunder (ARM 26.2.628-663). If so adopted, the department may utilize such environmental documentation in further consideration of the application for alternative practices.

(8) In the event the department determines that an application for alternative practices may be of significant interest to the public, the time provided in this rule for considering such application may be extended in order to allow time for the public to be notified and participate in the department's decision pursuant to 2-3-101 et seq., MCA, and ARM 26.2.701-707.

(9) Persons applying for approval of alternative practices shall agree in writing that approved alternative practices, including any additional conditions imposed by the department, shall have the same force and authority as the standards contained in 77-5-303, MCA, and shall be enforceable by the department under 77-5-305, MCA, to the same extent as such standards. Persons responsible for conducting alternative practices shall comply with all conditions of such practices. In determining whether to approve applications for alternative practices, the department may consider past violations of such standards or of the requirements of previously approved alternative practices by the applicant.

(10) NE3E Authorization to conduct alternative practices is valid for 2 years from the date of approval or for such period as may be specified by the department. (History: Sec. 77-5-307, MCA; IMP, Sec. 77-5-302, 307, MCA; NEW, 1993 MAR p. 14, Eff. 3/15/93.)

****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. In cutting units designated "LF" (Log-Forwarder) on the Sale Area Map, included timber on slopes less than 40 percent shall be carried free of the ground as 18.5 foot or shorter logs. Any supplemental skidding required shall be limited to the nearest forwarder strip road. Log landings or transfer points shall be limited to specified roads and turnouts, unless otherwise approved in writing. Stumps shall not be grubbed from the forwarder strip road. The harvester shall place unmerchantable tops and limbs evenly in the strip road. Log forwarders with GVW ratings up to 15000 pounds shall have rear tires greater than 27 inches in width. Log forwarders with GVWs greater than 15000 pounds shall have a minimum of three load bearing axles. The TSC C6.42 will be used for forwarding. 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:

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General:

Standard TSC 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 TSC Provisions such as C6.4, C6.6, C6.601, C6.602, C6.622, C6.623.

It is the responsibility of the certified sale administrator to insure that these practices are properly administered on the ground with the assistance of the technical resource staff as needed. (ref. 14.11)

Skid trails and landings will be seeded with a mix specified in C6.601. Vegetative cover will be established within two years.

Equipment shall not be operated when ground conditions are such that excessive impacts will result.

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 will 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.

All landings should be seeded and fertilized unless otherwise specified.

Skid Trails:

Skid trails will be water-barred, using the spacing guide of 50 to 150 feet depending on slope steepness. Water-bars will be designated and constructed in such a way that collected water is diverted off the trail onto vegetated sites adjacent to the trail and so that the integrity of the water-bar is maintained at least until the skid trail is sufficiently revegetated.

****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. Stream channels are to be protected to secure favorable conditions of streamflow, that is, the natural stability and function in storage and transmission of water and sediment are to be maintained. Refer to 14.06 (Riparian Area and Streamside Designation and Protection) for stream channel riparian area woody debris recruitment guidelines, sale area map identification, cable yarding, and directional felling guidelines.

EFFECTIVENESS: High

IMPLEMENTATION: The following items will be incorporated into the TSC via the identified B and C provisions:

- a. Location and method of stream crossings will be agreed to prior to construction. (B6.422 Skid Trails and Landings)
- b. All project debris shall be removed from streamcourse, in an agreed and timely manner, which will cause the least disturbance. (B6.5 Streamcourse Protection)
- c. Wheeled or tracked 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)
- d. Material from temporary road and skid trail stream crossings will be removed and streambanks restored to an acceptable condition. (B6.62 Temporary Roads)

****PRACTICE 14.18 - Erosion Control Structure Maintenance**

OBJECTIVE: To insure 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 operation 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's might request acceptance for are 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 complete 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 using mechanized equipment for slash disposal.

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following requirement will be incorporated into TSC Provision C6.7

All sensitive areas, including riparian harvest areas, bogs, meadows and soils having severe compaction or displacement hazard will be identified on the sale area map, the slash treatment map, and in the contract.

****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 we address timber harvest operations. An example is the recent change in direction to leave some 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 if 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 Timber Sale Contract as allowed by TSC Provision B8.3. If the decision is for a resource environmental 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 within 5 years is achievable. The regeneration method has been identified in site specific silvicultural prescriptions 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 14.24 - On-site Large Woody Residue and Soil Litter Retention**

OBJECTIVE: To help maintain long-term soil productivity by retaining adequate amounts of large woody residue and organic litter on the soil surface

EFFECTIVENESS: High

IMPLEMENTATION: Large woody residue left on site benefit soil productivity by providing habitat for beneficial mycorrhizal fungi, nutrient cycling, and soil moisture storage (Harvey et al., 1987). This large woody residue should consist mainly of logs about 3 inches and greater in diameter. A few logs per acre that are somewhat larger are also desirable for wildlife habitat. Land management practices such as timber harvest operations, site preparation, and fuels reduction have the potential to remove too much of this material from the site.

On droughty, harsh sites about 10 to 15 tons per acre of large woody residue as defined above should be left on site. This can include logs that are suspended above the ground. Well decayed woody residue, such as cubical rotted wood, does not count toward this 10 to 15 tons. On some dry sites it may not be possible to achieve these amounts of fresh woody residue because there is not enough of such materials available even before treatment. In such cases the direction is to leave all available large logs on the surface. If the 10 to 15 tons per acre can't be achieved naturally, it may be beneficial to slash a few non-merchantable trees per acre, if they are available, and leave them lying across (perpendicular) to the slope. Other non-merchantable trees and snags left standing to provide vertical diversity for snag dependent wildlife species will eventually fall and ensure the continuity of supply of large woody debris.

On more mesic sites a minimum of about 25 tons per acre of large woody residue as defined above should be left on the soil surface. Again, this does not include existing well rotted wood, but it can include suspended logs. The above woody residue guides are implemented by TSC C(T)6.7#.

The retention of as much of the soil litter layer as possible is also encouraged. This is another source of soil productivity and it also protects the mineral soil from erosion and other degrading processes (Harvey et al., 1987). Research has shown significant reductions in tree growth for moderate to high levels of soil displacement (Clayton et al., 1987). These reductions occurred when more than 25 percent of the activity area had the soil surface layer displaced. It appears that any treatment should retain at least 75 percent of the activity area with a litter cover in order to minimize losses in soil productivity. In addition, small diameter twigs should also be left on site, to the degree acceptable for fuel concerns, to provide nutrients and organic matter to the soil surface.

Experience on the Lolo National Forest has shown that on many sites these guides can best be achieved by spring burning for slash treatment. At that time of year moisture conditions of the organic fraction and the upper mineral soil are higher and the burns tend to be cooler. More woody material and more litter cover are likely to remain on the soil surface. Site objectives for fuels management and wildlife habitat can also be attained under spring burning. Spring burning should be utilized whenever possible, if adequate site prep can be

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achieved. Site prep should retain a litter cover evenly distributed on a minimum of 75 percent of the unit; except that on pinegrass types, 30 to 60 percent bare soil may be needed if broadcast burning is utilized and natural regeneration is being relied upon. Implement through the Burning Plan.

Scarification for stand regeneration should be restricted to the degree necessary to achieve site preparation objectives. Scarification spots should be as small as possible, generally less than 2 feet on a side. Larger scarified spots have the potential to affect soil productivity but may be necessary on pinegrass sites where, scalps 3 feet on a side may be needed to assure regeneration. In order to minimize negative impacts on soil productivity, the sum of these small scarification spots should not exceed about 25 percent of the activity area. Implement through the Silvicultural Prescription.

Soil and Water Conservation Practice 14.02 discusses impacts of skidding on soil productivity and proposes mitigation to minimize those impacts.

References:

Clayton, J.L., G. Kellogg, and N. Forrester. 1987. Soil disturbance-tree growth relations in Central Idaho clearcuts. USDA Forest Service, Intermountain Research Station, Research Note INT-372.

Harvey, A.E., M.F. Jurgensen, M.J. Larsen, and R.T. Graham. 1987. Decaying organic materials and soil quality in the Inland Northwest: a management opportunity. USDA Forest Service, Intermountain Research Station, General Technical Report INT-225.

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

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

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following items, listed and mentioned under several other Practices, are general guidelines for road location and design so as to minimize impacts on water quality (FSH 7709.55, 56; Montana State BMPs):

- a. Review and consult with Resource Specialists when necessary- Review available information and consult with specialists as necessary to help identify problem soil types and unstable areas, and to assist with location and design.
- b. 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.
- c. Locate on stable topography- Avoid slumps and slide-prone areas, steep sidehills with rock layers dipping parallel to the slope, and breakland slopes having sensitive soils, i.e. landclass ss+60 (sensitive soils on slopes greater than 60%).

d. Location with respect to streams 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 entry into any water body. Where possible, locate turn-outs and turn-arounds at least 200 feet from water bodies or within the riparian zone. 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.

e. Stream 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 will be filed with Water Quality Bureau and Department of Fish, Wildlife, and Parks for all crossings.

f. 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. Relief culvert spacing will be determined by local site factors including soil type and by the road grade. 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:

1) Ditch lines and road grades will be designed to minimize unfiltered flow into streams. 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 streams. Route the drainage through vegetated buffer strips or other sediment settling structures where possible.

2) Filter windrows (Practice 15.10) will be installed in sediment contributing areas. Use Lolo National Forest Specification Handbook (Section 201, Methods 1,2,3 and 12; Section 299, Method B; Slash Filter Windrows to Reduce Sedimentation From Roads) to determine sediment contributing area. Windrows will also be installed where road derived erosion may be delivered to nearby streams; i.e. outflow area of culverts or rolling dips, etc (Std. FS Spec. Section 201, Clearing and Grubbing; 05- Slash Treatment; 85 SPS 201A; 85 SPS 201).

3) Design objective of cross drainage and ditch relief culvert 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.

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g. Design standards- Design to the minimum standard necessary to accomplish anticipated use and equipment needs safely, balancing long-term and short-term and maintenance needs.

h. 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.

i. For pioneer road and trail construction- After October 1, or earlier if wet conditions are present or are expected, no more than 1000 feet of pioneer construction at a time can have incomplete erosion control work (85 SPS 204).

****PRACTICE 15.03 - Road and Trail Erosion Control Plan**

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

EFFECTIVENESS: 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. To maximize effectiveness, erosion control measures must be in place and functional prior to seasonal precipitation or runoff. The Engineer will certify that the Contractors Erosion Control Plan meets the specifications of Std. FS Spec. Section 204:

- a. 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 FEIS Area will require seeding and fertilization specs to vary. Mulching will be required on erodible slopes where vegetative re-establishment difficulty is anticipated.
- b. Rapid response to potential erosion problems- Prompt attention to potential erosion problems, both anticipated and un-anticipated, before they become a water quality issue, will be required. Stock piling of straw bales on-site for immediate use when needed, and erosion cloth or suitable substitute stored off-site but available will also be required.
- c. Filter 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 and Special Project Specification).
- d. Dewatering of culvert installations and other construction sites, and immediate placement of permanent culverts during road pioneering is required. Measures will be taken to preclude delivery of construction-related turbid water into stream channels, such as pumping to a location where settling can occur.
- e. Cross drains and relief culverts will be installed so as to minimize effects from the intercepted water (see also Practice 15.02 f.(3)).

- f. Equipment shall not be operated when ground conditions are such that excessive ground impacts will occur unless these impacts are mitigated through other Conservation Practices and documented.

Prior to the start of construction, the Contractor shall submit a schedule for proposed erosion control work as required in the Standard Specifications. The schedule shall include all erosion control items identified in the specifications. Erosion control work to be done by the Contractor will be spelled out in Standard Specification 204 and/or in the Drawings. The schedule shall consider erosion control work necessary for all phases of the project. The Contractor's construction schedule and plan of operation will be reviewed in conjunction with the erosion control plan to insure their compatibility before any schedules are approved.

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

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

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following provisions will be implemented:

- a. All roads will be designed to facilitate re-establishment of vegetative cover on disturbed areas within a reasonable time, not to exceed 3 years, after termination of a contract. If the road is necessary as a permanent addition to the National Forest transportation system, then roadbed revegetation is not required.
- b. Machine marks will be left on cut slopes to catch seed and fertilizer. Cut slope seeding and fertilizing shall be completed during the first season of construction and fill slopes immediately after final blading. Native vegetation will be encouraged on permanently and temporarily closed roads. Seed and fertilizer mix will be specified in TSC provision C6.601#.
- c. Sections of roads with soils that may become rutted during wet weather should be surfaced to provide an all-weather surface and prevent erosion. T108

****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 New 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

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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 Existing Roads- 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. Energy dissipaters or downspouts will be placed below problem culvert outlets (Reconstruction Item).
2. In all areas where ditch erosion is significant at this time, relief culverts that drain onto suitable areas will be installed (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 restricted after use, the travelway will be seeded and fertilized; and will have the surface roughened to accept seed germination and establishment where necessary and beneficial (TSC C6.601).

****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:

- a. Construction of pioneer roads shall be confined to the roadway limits unless otherwise approved by the Contracting Officer (Std. FS Spec. 203.11).
- b. 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).
- c. 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).
- d. 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. Live streams will be dewatered by diversion devised during installation. (SPS 603)

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

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

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following preventive measures will be implemented prior to pull-out at incomplete road and crossing locations:

- a. Temporary culverts, culvert plugs, diversion dams, or elevated streamcrossing causeways will be removed.
- b. Cross drains, diversion ditches, energy dissipaters, dips, bale and/or erosion cloth sediment basins, berms, debris racks, or other facilities where needed to control erosion will be installed;
- c. Debris, obstructions, and spoil material from channels and annual floodplains will be removed;
- d. Grass seeding, planting deep rooted vegetation (such as sweet clover and alder, cottonwood, or other shrub cuttings), and/or mulching.
- e. Where a project is left in an incomplete stage for a significant period of time (weeks), and following or during significant rainfall or runoff events, inspection will be made by the Engineer to ascertain that the temporary preventive measures are still functioning properly. Where problems are detected, mitigation will be planned.
- f. Where heavy concentrations of silt are found during road location and/or construction, field review, evaluation, and mitigation design will be developed and applied. Review will normally include a Geotechnical Engineer and a Soil Scientist. Example of a mitigation package to be considered would include installing a vertical cutbank, rock buttressing or armor facing, mulching or netting of the fill-slope, and straw bale sediment traps in the ditches where slope toe is within 100' of live water or a stream channel. Other combinations and practices may also be considered by the review team.

****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.

EFFECTIVENESS: High

IMPLEMENTATION: Slash filter windrows (practice 15.02) will be installed in sediment contributing areas. Use Lolo National Forest Plan Note No. 212, 7/29/87, **Slash Filter Windrows to Reduce Sedimentation from Roads**, to determine the sediment contributing area. 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, 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) TSC B6.34, C6.341, and C6.34.

****PRACTICE 15.12 - Control of Construction in Riparian Areas**

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

EFFECTIVENESS: Moderate

IMPLEMENTATION: The following practices for minimizing the effects of road building on Riparian Areas are recommended in the Lolo National Forest Plan:

1. Plan transportation systems to minimize roads crossing or running parallel to streams.
2. Avoid beaver habitat and elk wallows.
3. Except at stream crossings, vegetative buffer strips shall be maintained between the toe of the road fill and the stream on soils that are likely to produce sediment above natural levels. In sandy soils, the minimum buffer strip should be 100 feet with an added 5 feet for each percent of land slope between the road and stream. In other soils, the width of the strip will vary by geomorphology, but as a guideline, the buffer strip should be a minimum of 25 feet wide with an added 2 feet for each percent of land slope between the road and stream. (Trimble and Sartz, 1957).
4. Windrows of baled straw, slash or other effective material shall be placed at the toe of the fill slope as sediment filters where needed. They shall be constructed during clearing operations and prior to culvert installation (Forest Plan Note No. 212).
5. Road gradients should be 5% or less within 400 feet of streams or stream crossings. Where gradients exceed 5%, the road surface will be stabilized unless the native material resists erosion.
6. Road surface runoff should be channeled off the road outside of riparian area. Drive through dips, in or out slopes or cross drains with ditches may be appropriate. Some cross drainage and/or surfacing will normally be provided within 200 feet of all stream channel crossings unless native material resists erosion.

****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, 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 Forest 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 Forest 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 the State of Montana Stream Preservation Act using Fish, Wildlife, and Parks form FG-124 criteria, including timing restrictions. (as well as Std. FS Spec 206, 206A, and applicable SPSs).

****PRACTICE 15.14 - Diversion of Flows Around Construction Sites**

OBJECTIVE: To minimize downstream sedimentation by insuring that all stream diversions are carefully planned and executed.

EFFECTIVENESS: High

IMPLEMENTATION: Flow in streamcourses may only be diverted if the Forest Service deems it necessary for the Contractor to do the job. Such a diverted flow shall be restored to the natural streamcourse as soon as practicable and, in any event, within period stated in FG-124. Stream channels impacted by construction activity will be restored to their natural grade, condition, and alignment. The FG-124 will be filed as specified in Practice 15.13 (Std. FS Spec. 206, 206A, and applicable SPSs).

****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 be kept to the minimum needed for access.

- a. 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). A Stream Preservation Act form FG-124 will also be required.

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b. Temporary crossings on system roads will be removed following use but protected fills, including constructed abutments, may remain.

c. Temporary crossings on temporary roads will only be allowed where anticipated or calculated flow is 40 CFS or less (approximately 48 inch diameter culverts will carry 40 CFS). Flow situations greater than this will normally not allow temporary crossings. Larger temporary crossing structures may be allowed following IDT review.

****PRACTICE 15.16 - Bridge and Culvert Installation (Disposition of Surplus Material and Protection of Fisheries)**

OBJECTIVE: To minimize sedimentation and turbidity resulting from excavation for in-channel structures.

EFFECTIVENESS: High

IMPLEMENTATION: The following preventive measures will be included in contract specifications for such installations:

a. Diverting stream flow through or around project sites during construction in order to minimize erosion and downstream sedimentation. Live stream culvert installations will be de-watered.

b. Erodible material shall not be deposited into live streams.

c. No material shall be stockpiled on floodplains.

d. During excavation in or near the streamcourse, it may be necessary to use suitable coffer dams, caissons, cribs or sheet piling. This will usually be the case where groundwater is contributing a significant amount of water to the immediate excavation area. If any of the aforementioned devices are used, they will be practically watertight and no excavation will be made immediately outside of them.

e. Water pumped from foundation excavation shall not be discharged directly into live streams, but shall be pumped into settling ponds or into locations where sediment will not re-enter water.

f. When needed, bypass roads should be located to have the minimal disturbance on the streamcourse.

g. The construction activity in or adjacent to the stream will be limited to specific times to protect beneficial water uses (i.e., fisheries).

h. Operation of mechanical equipment in live streams shall be kept to the amount agreed upon through the FG-124 Process. (TSC B 5.2, B6.5, C5.2; FG-124; Std. FS Spec. 206, 206A, and 203).

****PRACTICE 15.18 - Disposal of Right-of-Way and Roadside Debris**

OBJECTIVE: To insure that debris generated during road construction is kept out of streams and to prevent slash and debris from subsequently obstructing channels.

EFFECTIVENESS: High

IMPLEMENTATION: Construction debris and other newly generated slash developed along roads near streams shall be disposed of by the following means as applicable:

- a. On-Site
 - 1. Windrowing
 - 2. Scattering
 - 3. Burying
 - 4. Chipping
 - 5. Disposal in Cutting Units
 - 6. Piling and Burning
 - 7. Embankment Placement
- b. Removal to agreed upon locations.
- c. A combination of the above. (Std. FS Spec. 210, and SPS 201)

****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:

A. 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 Purchaser's 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 timber sale contract road maintenance specifications, called T-specifications, except for agreed adjustments (TSC C5.4- T301, 310).

B. 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

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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 15.22 - Road Surface Treatment to Prevent Loss of Materials**

OBJECTIVE: To minimize the erosion of road surface materials and consequently reduce the likelihood of sediment production.

EFFECTIVENESS: Moderate

IMPLEMENTATION: On timber sale roads, the Purchaser shall undertake measures to prevent excessive loss of road material if the need for such action has been identified. Road surface treatments may include: water, dust abatement, penetration oiling, sealing, aggregate surfacing, chip-sealing, or paving.

****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 and traffic use on the aggregate and native surfaced roads. Haul restrictions are placed on asphalt-surfaced roads, based on interpretation of thermistor data. Restrictions are placed on native and aggregate-surfaced roads when a FS Rep 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 15.24 - Snow Removal Controls**

OBJECTIVE: To minimize the impact of snow melt on road surfaces and embankments and to reduce the probability of sediment production resulting from snow removal operations.

EFFECTIVENESS: High

IMPLEMENTATION: The following measures will be followed:

- a. The Purchaser is responsible for snow removal in a manner which will protect roads and adjacent resources.
- b. The timber sale administrator and/or watershed specialist will determine if rocking or other special surfacing and/or drainage measures may be necessary, before the operator is allowed to use the roads.
- c. During snow removal operations, banks shall not be undercut nor shall gravel or other selected surfacing material be bladed off the roadway surface. Ditches and culverts shall be kept functional during and following roadway use. If the road surface is damaged, the Purchaser shall replace lost surface material with similar quality material and repair structures damaged in blading operations.

d. Snow berms shall not be left on the road surface or shall be placed to avoid channelization or concentration of melt water on the road or erosive slopes. Berms left on the shoulder of the road shall be removed and/or drainage holes opened at the end of winter operations and before the spring breakup. Drainage holes shall be spaced as required to obtain satisfactory surface drainage without discharge on erodible fills. On insloped roads, drainage holes shall also be provided on the ditch side, but care taken to insure that culverts and culvert inlets are not damaged. (TSC C5.46; Std. FS Spec. 203)

****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:

- a. Road effectively drained and blocked.
- b. Temporary culverts and bridges removed and any modified channel slopes stabilized and revegetated.
- c. Road returned to resource production through revegetation (grass, browse, or trees).
- d. Sideslopes reshaped and stabilized.
- e. Armor highly erosive slopes with rock or logging debris.
- f. Construct slash windrows or silt-fence in areas of high erosion probability from obliteration operations. (TSC B6.62, C6.62, C6.622, C6.623)

****PRACTICE 18.02 - Formulation of Fire Prescriptions**

OBJECTIVE: To provide for soil and water resource protection while achieving the management objective through the use of prescribed fire.

EFFECTIVENESS: High

IMPLEMENTATION: Field investigations are conducted to identify site specific conditions which may affect the prescription. Both the optimum and tolerable limits for soil and water resource needs should be established. Prescription elements will include such factors as fire weather, slope, aspect, soil moisture, and fuel moisture which influence the fire intensity. These elements have a direct effect on whether or not a litter layer remains after burning and whether or not a water repellent layer is formed. The amount of remaining litter significantly affects erosion rates, water quality and runoff volumes.

****PRACTICE 18.03 - Protection of Soil and Water from Prescribed Burning Effects**

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

EFFECTIVENESS: High

IMPLEMENTATION: Forest Service and/or other crews are used to prepare the units for burning. This includes water barring firelines and reducing fuel concentrations. The interdisciplinary team identifies Riparian Areas and soils with water repellent tendencies as part of the environmental analysis. Some of the techniques used to prevent soil erosion and water quality degradation are: (1) construct water bars in fire lines; (2) reduce fuel loadings in drainage channels; (3) maintain the integrity of the Riparian Area; (4) avoid intense fires, which may promote water repellency, nutrient leaching, and erosion; (5) retain or plan for sufficient ground cover to prevent erosion of the burned sites; and (6) removal of all debris added to stream channels as a result of prescribed burning, unless debris is prescribed to improve fisheries habitat.

****PRACTICE 18.04 - Minimizing Watershed Impacts from Fire Suppression Efforts**

OBJECTIVES: To avoid watershed impacts in excess of that which would be caused by the fire itself.

EFFECTIVENESS: Moderate

IMPLEMENTATION: A Resource Advisor is assigned by the Forest Supervisor and works for the Incident Management Team. Technical resource staffs identify fragile soils, sensitive areas, and unstable areas and are assigned to the fire as technical experts. Heavy equipment operation on fragile soils, sensitive areas, and steep slopes should be avoided when possible. Water quality measures for re-opening of roads, temporary road/trail construction, and for dust abatement on heavily used routes will be included in fire-suppression operations as soon as practicable.

****PRACTICE 18.05 - Stabilization of Fire Suppression Related Watershed Damage**

OBJECTIVE: To stabilize all areas that have had their erosion potential significantly increased, or their drainage pattern altered by suppression related activities.

EFFECTIVENESS: Moderate

IMPLEMENTATION: Treatments for fire-suppression damages include, but are not limited to: (1) installing water bars and other drainage diversions in fire roads, firelines, and other cleared areas; (2) seeding, planting and fertilizing to provide vegetative cover; (3) spreading slash or mulch to protect bare soil; (4) repairing damaged road drainage facilities; and (5) clearing stream channels of debris that is deposited by suppression activities.

This work is done by the fire fighting forces either as a part of the suppression effort or before fire personnel and equipment are taken off the fire lines. The Incident Commander is responsible under the direction of the local Line Officer for repair of suppression-related resource damage.