APPENDIX 2
BEST MANAGEMENT PRACTICES
Rustler Vegetation Management Project
Rogue River-Siskiyou National Forest

Introduction
Various issues related to site productivity, water quality, are identified in the Rustler Environmental Assessment (Chapters II and III). This Appendix describes the key Best Management Practices (BMPs) for the protection of water quality that will be used to minimize the potential for adverse effects to water quality, fish habitat, and site productivity during implementation of the Rustler Vegetation Management project.

Best Management Practices are the primary mechanism to enable the achievement of water quality standards (U.S. Environmental Protection Agency, 1987). The BMPs discussed below are applicable to all alternatives.

This Appendix is based on a USDA Forest Service Pacific Southwest Region guide: Water Quality Management For National Forest System Lands in California (USFS, 2000), and General Water Quality Best Management Practices, Pacific Northwest Region (November, 1988).

The BMPs were originally compiled from Forest Service manuals, handbooks, contract and permit provisions, and policy statements. Their purpose is to directly or indirectly maintain or improve water quality and abate or mitigate impacts while meeting other resource goals and objectives.

This Appendix was completed in coordination with technical specialists in engineering, fuels management, logging systems, silviculture, hydrology, soils, fisheries, timber management, and others. The BMPs documented in this Appendix describe the methods and procedures that will be used to control non-point sources of pollution from the Rustler Vegetation Management Project and to insure compliance with the:

Federal Clean Water Act (1977, as amended 1980, 1987), Sections 208 and 319. Section 319 of the Clean Water Act Amendments of 1987 contains a section that requires each state to develop a process for identifying Best Management Practices to reduce non-point sources of pollution to the “maximum extent practicable”. This Appendix is designed to meet the intent of the requirements of Section 319, and is consistent with the USDA Forest Service's focus on non-point programs that contain preventive practices (BMPs);

Oregon Administrative Rules (Chapter 340-41-0004,0028, and 0036), Department of Environmental Quality (DEQ). Oregon's Administrative Rules contain water quality
standards for the identified beneficial uses of water in relation to water temperature, turbidity, and the Anti-degradation Policy.

Memorandum of Agreements (MOA) Between The USDA Forest Service, Region 6, and The Oregon Department of Environmental Quality (DEQ), May 2002, and between the USDI Bureau of Land Management, Oregon District, and DEQ, August 2003, To Meet State and Federal Water Quality Rules and Regulations. These MOAs define the process by which the USFS and DEQ, and BLM and DEQ, will cooperatively meet State and Federal water quality rules and regulations, and recognizes both the USFS and BLM as the Designated Management Agencies (DMA) on National Forest System- and Bureau of Land Management lands within Oregon.

Northwest Forest Plan Standards and Guidelines, April 1994. The Northwest Forest Plan (NWFP) record of decision was signed in 1994, contributing to, among other things, the protection and restoration of riparian processes and improved water quality. The NWFP was structured to ensure maintenance and improvement of water quality through a watershed-based approach and attainment of ACS objectives within a network of Riparian Reserves. The NWFP provides a common approach for managing lands administered by the USFS and the BLM.

Record of Decision Amending Resource Management Plans for Seven Bureau of Land Management Districts and Land and Resource Management Plans for Nineteen National Forests Within the Range of the Northern Spotted Owl: Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy, March 2004. The decision clarifies the proper spatial and temporal scale for evaluating progress toward attainment of ACS objectives and clarifies that no project-level finding of consistency with the ACS objectives is required. The decision more specifically and clearly represents the intent of the Northwest Forest Plan by clarifying that fifth-field watershed and larger scales, and the long-term frames, are appropriate for evaluating progress toward attainment of ACS objectives.

DEFINITIONS
Non-point sources of pollution result from natural causes, human actions, and the interactions between natural events and conditions associated with human use of the land and its resources. Silvicultural sources such as erosion from harvest units or surface erosion from the road are considered non-point sources.

Best Management Practices are defined as methods, measures or practices selected by an agency to meet its non-point source control needs. BMPs include but are not limited to structural and nonstructural controls and operation 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).
**BMP IMPLEMENTATION PROCESS**

The USDA Forest Service's primary strategy for the control of non-point sources is based on the design and implementation of preventive practices called BMPs, determined necessary for the protection of the identified uses (beneficial uses). The objective of BMP design should be to maintain water quality at the highest possible level and that implementation is the highest and best practicable means of attaining water quality goals. Water quality goals include water quality standards that adequately reflect needs of identified beneficial uses.

The Non-point Source Management System consists of:

1. Design of site-specific BMPs based on technical, economic, and institutional feasibility.
2. Application of BMPs based on scheduling, intensity, placement, and maintenance.
3. Monitoring to ensure that practices are correctly designed and applied.
4. Monitoring to determine effectiveness of practices in meeting water quality objectives, and the appropriateness of water quality criteria, for describing the needs of water quality dependent resources.
5. A mechanism to adjust BMPs and/or standards as appropriate” (Harper, 1987)

The BMPs are action-initiating mechanisms that call for the development of detailed prescriptions and solutions. They identify management requirements and considerations that are to be addressed prior to and during the formulation of alternatives for land management actions. The BMPs serve as checkpoints that are considered in formulating a plan, a program, and/or a project.

An example of a timber management BMP is Riparian Reserve Designation. The interdisciplinary process the Forest Service follows to develop site-specific stream protection is a **Best Management Practice (see BMP T-7 below)**. The interdisciplinary team's site-specific recommendations for a Riparian Reserve are called a **site-specific prescription**.

Each time a BMP is applied to a new location, there is flexibility to develop completely different site-specific prescriptions depending on the conditions at the site, and the downstream beneficial uses of water to be protected. The process for developing site-specific prescriptions for each location is what makes the BMPs effective tools to maintaining water quality and the downstream beneficial uses of water.

Site-specific BMPs to be used will be defined prior to awarding the Timber Sale Contract. The site-specific BMPs were developed considering the downstream beneficial uses of water and known or expected on-site conditions. Refinement of site specific BMPs for the various resource management activities will continue through project implementation.

Many different BMPs may apply to a particular resource management activity, or in the case of timber harvesting, to a particular logging system. For the Rustler Project, the
BMPs that will apply to each location where various resource management activities are proposed to occur are shown in the table below.

### BMPs Applicable to The Rustler Vegetation Management Project

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>BMP Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber Harvesting</td>
<td>All Timber BMPs except T-3, 6, 23, 24</td>
</tr>
<tr>
<td>Roads</td>
<td>All Road BMPs except R-12, 13, 14, 16,</td>
</tr>
<tr>
<td>Watershed Management</td>
<td>BMPs W-3, W-4, W-5, W-7</td>
</tr>
<tr>
<td>Fuels Management</td>
<td>BMP F-1, F-2, F-3</td>
</tr>
</tbody>
</table>

Many of the Timber Harvesting BMPs are specific to logging systems. A unit-by-unit listing of the type of harvesting system (skyline, ground-based) for each unit is shown in tables located in Appendices 1, 8, and 9. The locations of treatment units are shown on alternative maps in Chapter Two. The Sale Area Maps for the timber sale purchaser will also show the actual harvest units/areas within the Rustler Project where different logging systems will be used. For example, the Sale Area Maps will clearly show which harvest units will be logged using skyline or ground-based harvest systems.

Riparian Reserve protection distances are referred to by the average distances analyzed: for example 156’ is the average of 1 site potential tree in this area, and 312’ is the average of two site potential trees (C-30 through C-38 ROD of the NWFP).

### FORMAT OF THE BMPs

Each BMP consists of the **Title, Objectives, Explanation, Ability to Implement, Effectiveness, Responsibility and Implementation, and Monitoring.** Each section with a brief description follows:

**Title**: Includes the sequential number of the practice and a brief title.

**Objective**: Describes the objectives of the BMP and the desired results for protecting water quality.

**Explanation**: Further defines the brief title, and describes under what conditions and how the practice is applied. Criteria or standards are described when applicable. This section contains a description of the range of site-specific water quality protection measures to be implemented.

**Ability to Implement**: Provides a qualitative estimate of the ability of the Forest Service to implement the BMP. The estimate is either made at the project level or Forest Plan Level; the ability to implement rating for the BMPs described below was specifically made for the site-specific conditions in the Rustler Project area. The criteria for rating the ability to implement are described below.
**High:** Greater than 90 % certainty the BMP can be implemented as planned.

**Moderate:** Greater than 75 %, but less than 90 % certainty the BMP can be implemented as planned.

**Low:** Less than 75 % certainty the BMP can be implemented as planned.

**Effectiveness:** Provides a qualitative assessment of expected effectiveness that the applied measure will have on preventing or reducing impacts on water quality. The effectiveness of each BMP will be evaluated with two indices. For each index, the BMPs will be rated either High, Moderate, or low in effectiveness of preventing or reducing impacts. The indices are:

**High:** Practice is highly effective (> 90 %) and one or more of the following types of documentation are available:

a. Administrative studies (AS) - local or within similar ecosystem.

b. Experience (EXP) - judgment of an expert by education and/or experience.

c. Fact (FCT) - obvious by reasoned (logical) response.

Scientific literature/research may also be available to document the effectiveness of many of the BMPs.

**Moderate:** Documentation (as described for high) shows that the practice is effective less than 90 % of the time, but at least 75 % of the time.

Or

Logic (LGC) indicates that this practice is highly effective, but there is no documentation to support the rating. Implementation and effectiveness of this practice will be monitored and the practice will be modified if necessary to achieve the objective of the BMP.

**Low:** Effectiveness unknown or unverified, and there is little or no documentation.

Or

Applied logic is uncertain in this case, or the practice is estimated to be less than 60 % effective. This practice is speculative and needs both effectiveness and validation monitoring.

Best Management Practices administrative monitoring studies are described in a separate section below.

**Responsibility & Implementation:** Describes how the practices are to be applied and identifies the person(s) responsible for implementing the BMP.

**Monitoring:** This section describes how the site-specific practices for this BMP will be monitored. Implementation and effectiveness monitoring will be done (as described for
each BMP) during the NEPA field review process, plan in hand reviews, design review, progress review during construction, and the road construction review process.

Monitoring sites will be selected at random from a pool of all potential activity sites within the Rustler Project area.

BEST MANAGEMENT PRACTICES ADMINISTRATIVE MONITORING STUDIES

**Wildfire (1987) and Recovery Monitoring, Siskiyou National Forest**: Various administrative monitoring studies were conducted following the 1987 Silver, Longwood, and Galice wildfires (approximately 100,000 acres) on the Siskiyou National Forest to test the effectiveness of many common management practices for resource protection.

Monitoring was performed on a wide variety of elements, ranging from fish habitat surveys to road construction. Monitoring projects were designed to monitor the implementation and effectiveness of the many BMPs and other mitigation measures included as part of the various wildfire recovery projects in the late 1980’s. Site-specific BMPs are steadily improved based on monitoring and experience, so BMP implementation and effectiveness for current projects is expected to be at least as good or better than that achieved during the Silver Fire Recovery Project.

Monitoring results are summarized in the following Siskiyou National Forest internal reports. The reports will be cited below, where applicable, in the BMP narratives using the abbreviation found at the end of each citation, for example, SNF-AS-1.

a. **Summary of Fish Habitat/Water Quality Since the Silver Fire of 1987, Siskiyou National Forest (1995), Elizabeth Kormeier, (SNF-AS-1)**. This report concluded the lack of adverse effects from salvage logging (Silver Fire Recovery Project) is attributed to, protection of the riparian areas, improved road construction practices, and minimizing disturbance through the use of helicopter logging.


This draft report summarizes the results of the USDA Forest Service, Pacific Southwest Region, Best Management Practices Evaluation Program (BMPEP), from 1992 to 2002. Past monitoring completed as part of the BMPEP program has validated the effectiveness of BMPs in mitigating the effects of forest management activities on water quality.

Onsite field evaluations using twenty-nine onsite evaluation protocols were used to assess the implementation and effectiveness of individual BMPs or groups of closely related BMPs. Approximately 5000 BMP evaluations have been conducted in the Pacific
Southwest Region since 1992; BMPs for timber, engineering, recreation, grazing, mining, fire/fuels management, and vegetation management were monitored.

Monitoring done during the Siskiyou National Forest administrative studies cited (SNF-AS-1 and SNF-AS-2) generally correlates well with the extensive monitoring done during the BMPEP monitoring program in the Pacific Southwest Region. For example, for the Silver Fire Recovery Project (see report SNF-AS-1, page 28), riparian layout and protection was found to be very good, and the protection of riparian areas during salvage logging operation was highly effective in meeting objectives for shade and protection from erosion and sediment.

In the draft Pacific Southwest Region BMPEP evaluation program report, between 1992 and 2002 Streamside Management Zone BMP’s were found to have been implemented 83 % of the time, and were rated as effective 85 % of the time. For the Rustler Project, riparian protection BMPs would be expected to have greater effectiveness due to the highly specific restrictions of operations within wider riparian reserves.

This draft report will be cited below, where applicable, as an indicator of BMP effectiveness in the narratives using the abbreviation, BMPEP-R-5.
WATER QUALITY BMPs
FOR THE
RUSTLER VEGETATION MANAGEMENT PROJECT

TIMBER MANAGEMENT (T)

T-1  Timber Sale Planning Process
T-2  Timber Harvest Unit Design
T-4  Use of Sale Area Maps for Designating Water Quality Protection Needs
T-5  Limiting the Operating Period of Timber Sale Activities
T-7  Streamside Management Unit Designation
T-8  Stream course Protection
T-9  Determining Tractor Loggable Ground
T-10 Log Landing Location
T-11 Tractor Skid Trail Location and Design
T-12 Suspended Log Yarding in Timber Harvesting
T-13 Erosion Prevention and Control Measures During Timber Sale Operations
T-14 Revegetation of Areas Disturbed by Harvest Activities
T-15 Log Landing Erosion Prevention and Control
T-16 Erosion Control on Skid Trails
T-17 Meadow Protection During Timber Harvesting
T-18 Erosion Control Structure Maintenance
T-19 Acceptance of Timber Sale Erosion Control Measures Before Sale Closure
T-20 Reforestation
T-21 Servicing and Refueling Equipment
T-22 Modification of the Timber Sale Contract

ROAD SYSTEMS (R)

R-1  General Guidelines for the Location and Design of Roads
R-2  Erosion Control Plan
R-3  Timing of Construction Activities
R-4  Road Slope Stabilization (Planning)
R-5  Road Slope and Waste Area Stabilization (Preventive)
R-6  Dispersion of Subsurface Drainage Associated with Roads
R-7  Control of Surface Road Drainage Associated with Roads
R-8  Constraints Related to Pioneer Road Construction
R-9  Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects
R-10 Construction of Stable Embankments (Fills)
R-11 Control of Side cast Material
R-15 Disposal of Right-of-Way and Roadside Debris
R-17 Water Source Development Consistent With Water Quality Protection
R-18 Maintenance of Roads
R-19 Road Surface Treatment to Prevent Loss of Materials
R-20 Traffic Control During Wet Periods
R-21 Snow Removal Controls to Avoid Resource Damage
R22 Restoration of Borrow Pits and Quarries
R-23 Obliteration of Temporary Roads and Landings

WATERSHED MANAGEMENT (W)

W-3 Protection of Wetlands
W-4 Oil and Hazardous Substance Spill Contingency Plan and Spill Prevention Control and Countermeasures (SPCC) Plan
W-5 Cumulative Watershed Effects
W-7 Water Quality Monitoring

FUELS MANAGEMENT (F)

F-4 Fire and Fuel Management Activities
F-5 Consideration of Water Quality in Formulating Prescribed Fire Prescriptions
F-6 Protection of Water Quality During Prescribed Fire Operations

VEGETATIVE MANIPULATION (VM)

VM-1 Slope Limitations for Tractor Operation
VM-4 Soil Moisture Limitations for Tractor Operation
ACRONYMS AND ABBREVIATIONS

BLM- Bureau of Land Management
BMP- Best Management Practice
CFR- Code of Federal Regulations
CI- Contract Inspector
CO- Contracting Officer,
COR- Contracting Officer’s Representative
CWE- Cumulative Watershed Effects
DBH- Tree diameter measured at chest height
EA- Environmental Assessment
EPA- United States Environmental Protection Agency
ER- Engineering Representative
EIS- Environmental Impact Statement,
EA- Environmental Assessment
FEIS- Final Environmental Impact Statement
EXP- Professional experience
FSR- Forest Service Representative
LWD- Large woody debris
IDT- Interdisciplinary Team
LRMP- Land and Resource Management Plan
NEPA- National Environmental Policy Act
NFMA- National Forest Management Act
OSHA- Occupational Safety and Health Administration
SA- Sale Administrator
SAM- Sale Area Map
SPCC- Spill Prevention, Control and Countermeasures Plan
TML- Timber Marginal Lands; Timberland unsuitable due to erosion hazard, active landslides, and marginally stable landforms
TMR- Timberlands unsuitable due to poor reforestation success
TSPP- Timber Sale Planning Process
USFS- United States Forest Service
TIMBER MANAGEMENT BMPs

T-1. Title: Timber Sale Planning Process (TSPP)

Objective: To incorporate water quality and hydrologic considerations into the TSPP.

Explanation: The interdisciplinary team (IDT) will address potential water quality problems and provides for administrative controls, corrective treatments, and preventive measures. This process defines and quantifies the potential changes to water quality and in-stream beneficial uses.

The result is an environmental document and sale contracts(s). An analysis of cumulative watershed effects is also completed. These documents describe methods to prevent unacceptable effects to water quality during and following sale layout and logging operations. They document mitigation measures to ameliorate, and/or preclude adverse effects for those treated areas. Silvicultural treatment is excluded from environmentally sensitive areas where adverse environmental effects from the proposed activity cannot be mitigated to conform to Federal, State and Local water quality standards.

Ability to implement: High

Effectiveness: High (EXP) (note: see description of effectiveness rating process above)

Implementation and responsibility: Hydrologists, fish biologists, geologists, and soil scientists participate in the environmental documentation process to evaluate onsite watershed characteristics and evaluate the potential environmental consequences of the proposed timber harvest and related activities. Timber sales are designed to include prescriptions for specific areas of water quality concern. The resulting contract will include those provisions set forth in the environmental document to meet water quality protection objectives.

The IDT also identifies various monitoring projects to monitor the implementation and effectiveness of the BMPs. Specific monitoring projects are described where appropriate in various Timber, Road System, Watershed, and Fuels BMPs, as well as Forest reviews of timber sales.

Monitoring: As described for the remaining Timber, Road System, Watershed, and Fuels BMPs, as well as Forest reviews of timber sale projects.
T-2. **Title: Timber Harvest Unit Design**

**Objective:** To ensure that timber harvest unit design will secure favorable conditions of water quality and quantity, while maintaining desirable stream channel characteristics and watershed conditions for the various beneficial uses of water such as fish habitat.

**Explanation:** This is an administrative and preventive practice. The proposed timber harvest units are evaluated to estimate/predict watershed response to the proposed timber harvest unit design. This includes examining the ability of the watershed to absorb the impacts of the proposed harvest without incurring unacceptable effects on water quality.

Characteristics to be evaluated can include the recovery from past harvests; wildfire: the size and extent of past management activities; the protection of channels; the number, size, and location of harvest units; planned location and size of roads and skid trails; logging system design; the potential natural recovery rate of the watershed; and the needs of associated beneficial uses.

Where it is not possible to mitigate adverse effects on water quality impacts and undesirable stream flow conditions, the harvest unit design will be modified to reduce adverse effects. To the extent possible the timber harvest unit design is made to be amenable to implementation of mitigation measures.

**Ability to implement:** High

**Effectiveness:** High (EXP)

**Implementation and responsibility:** The hydrologic and geologic survey and evaluation of proposed timber harvest units is accomplished through the interdisciplinary process of timber sale planning. The interdisciplinary team leader is responsible for overseeing this process. Prescriptions to assure acceptable conditions of water flow are incorporated into the design of timber harvest units. Mitigations or changes needed to protect unstable slopes and protect or improve stream courses will be incorporated into the harvest unit design.

On the ground implementation of timber harvest unit design is carried out by the Sale Layout Forester. It is the responsibility of the Sale Administrator (SA), and in some cases Contracting Officers (CO) or Forest Service Representatives (FSR) to carry out on-the-ground accomplishments of environmental protection measures, with follow-up review as needed by qualified resource specialists (hydrologists, fisheries biologists, soil scientists, and geologists).

**Monitoring:** See implementation and responsibilities section above for how this BMP is tracked through the timber sale planning process.
Objective: To ensure recognition and protection of areas related to water quality protection are delineated on a Sale Area Map (SAM) or Project Map.

Explanation: This is an administrative and preventative practice. The following are examples of water quality protection features that can be designated by pre-sale foresters and watershed specialist on the SAM (Sale Area or Project Map), thereby ensuring their incorporation into the Timber Sale Contract requirements.
   a. Location of stream courses and riparian zones to be protected
   b. Wetlands (meadows, lakes, bogs, etc.), if any, to be protected
   c. Boundaries of harvest units
   d. Specified roads.
   e. Roads where log hauling is prohibited or restricted.
   f. Structural improvements.
   g. Areas for different skidding and yarding methods
   h. Sources of rock for roadwork, riprapping, etc.
   i. Water sources available for Purchaser's use
   j. Other features required by Division "C" contract provisions

Ability to implement: High

Effectiveness: High (EXP)

Implementation and responsibility: The interdisciplinary team identifies and delineates these and other features on maps as part of the environmental documentation process. The Sale Preparation Forester includes them on the SAM at the time of contract preparation. The identified areas are reviewed on the ground by the Purchaser and the Sale Administrator prior to harvesting.

Monitoring: The SAM is checked by the sale preparation forester, engineers, and resource specialists to assure accuracy.
T-5. Title: Limiting the Operating Period of Timber Sale Activities

Objective: To ensure that the Purchaser conducts their operations, including erosion control work, road maintenance, and so forth in a timely manner, within the time period specified in the Timber Sale Contract (TSC).

Explanation: Contract provision B (T) 6.311 ”Plan of Operations” is required in all TSC’s with 2 or more years between the award date and termination date. This provision states that the operator must submit a general plan of operation which will set forth planned periods for, and methods for, and methods of road construction, timber harvesting, completion of slash disposal, erosion control measures, and other contractual requirements. Forest Service written approval of the Plan of Operations is a prerequisite to commencement of the purchaser’s operation.

Contract clause B (T) 6.31, “Operation Schedule”, requires that the purchaser will provide an annual schedule of anticipated activities such as road maintenance and erosion control work until the sale is closed.

The TSC also specifies a Normal Operating Season (AT18 or A21), during which, operations may generally proceed without resource damage. Operations are permitted outside the Normal Operating Season only when they can be conducted without damage to soil, water, and other resources. Where determined to be necessary through the Environmental Assessment, the TSC will limit operations to specific periods or weather conditions. Operations are not permitted to continue if resource damage will occur.

Ability to implement: High

Effectiveness: High (EXP)

Implementation & Responsibility: Limited operating periods are identified and recommended during the Timber Sale Planning Process (TSPP) by the interdisciplinary team and followed through the life of the timber sale primarily by the Sale Administrator (SA). The purchaser must submit a general plan and annual plans to the Forest Service. The purchaser may commence operations only after written approval of the general plan of operations.

Monitoring: During implementation of timber sale activities by the SA, Contracting Officer (CO), Forest Service Representatives (FSR), and physical scientists as needed, will monitor the effectiveness of this measure.
**Title: Riparian Reserve Designation**

**Objective:** To designate a zone along permanently flowing streams, intermittent streams, lakes, and wetlands that will minimize potential for adverse effects to water quality and riparian values from adjacent management activities. Any management activities occurring within these zones should be designed for the purpose of either maintaining or improving riparian values.

**Explanation:** As a preventive measure, roads, skid trails, landings and other timber harvesting facilities will be kept at a prescribed distance from designated stream courses (also see Road System BMPs R-12, R-13, and R-14). Standards and Guidelines for Riparian Reserves are described on pages C-30 through C-38 of the Record of Decision for the Northwest Forest Plan (April, 1994). The interim riparian reserve widths can then be refined during watershed and project analysis. Watershed and project analysis teams consider various factors in deciding whether to modify the interim riparian reserve width guidelines in the Northwest Forest Plan. Some examples of site specific factors evaluated during the determination of riparian reserve widths include, stream order, channel stability, vegetative composition, side-slope steepness, and slope stability. Aquatic and riparian habitat, beneficial riparian zone functions, their condition and their estimated response to the proposed timber sale are also evaluated in determining the width of the Riparian Reserve.

Riparian Reserves are an area that acts as an effective filter and absorptive zone for sediment; maintains shade; protects aquatic and terrestrial riparian habitats; protects the channel and stream banks; and promotes floodplain stability.

**Ability to implement:** High

**Effectiveness:** High (EXP, SNF-AS-1 and SNF-AS-2)

**Implementation and responsibility:** Specific riparian reserve widths and management prescriptions are identified during the environmental documentation process. The TSC will be designed to implement the Riparian Reserve prescriptions and areas of avoidance. The timber sale preparation officer is responsible for the inclusion of these areas in the TSC and Sale Area Map, as identified in the sale planning records. The SA is responsible for contract compliance during harvest operations.

**Monitoring:** Watershed specialists will assist in evaluating the effectiveness of this BMP. A sampling of harvest units with riparian reserves will be monitored for BMP implementation and effectiveness. **Note:** Ephemeral streams are included if they have a definable channel and show evidence of annual scour/deposition.
T-8. Title: Stream course and Aquatic Protection

Objective: (1) To conduct management actions within these areas in a manner that maintains or improves riparian and aquatic values. (2) To provide unobstructed passage of storm flows (3) to control sediment and prevent other pollutants from entering stream courses. (4) To restore the natural course of any stream as soon as practicable, where diversion of the stream has resulted from timber management activities.

Explanation: This management practice employs administrative, preventive, and corrective measures to meet the objectives.

Streams within proposed timber sale areas are surveyed and Riparian Reserves/protection zones are prescribed during the TSPP. The IDT formulates the Riparian Reserve/stream protection requirements, and includes the prescription in the decision document. The requirements are then included in the TSC and identified on the SAM.

The following points are fundamental to protecting stream courses and aquatic resources:

a. Prior to construction, the SA must agree to the location and method of stream crossings. This is done at the same time as agreements with the purchaser or purchaser’s representative for the locations of landings skid trails, tractor roads, and temporary roads.

b. Repair all unavoidable damage to a stream course, including damage to banks and channel, to the extent practicable.

c. All sale generated debris is removed from stream courses, unless otherwise agreed to by the SA, and in an agreed upon manner that will cause the least disturbance.

d. Exclude equipment used in designated Riparian Reserves. Widths of Riparian Reserves and restrictions pertaining to equipment use are defined by onsite project investigation and are included in the TSC. These areas are identified by the agency on the Sale Area Map prior to advertising the timber sale. Boundaries of these zones will be modified by agreement between the contract and SA, to compensate for unforeseen conditions.

e. Methods for protecting water quality while utilizing skid trail design in stream course areas where harvest is approved include: 1) end lining, 2) falling to the lead, and 3) utilizing specialized equipment with low ground pressure such as a feller buncher harvester.

f. Water bars and other erosion control structures will be located so as to disperse any concentrated flows and filter out suspended sediments prior to entry into stream courses and riparian reserves.

g. In cable log yarding operations logs, will be fully airborne within Riparian Reserves, when required by the TSC.

h. Special slash treatment site preparation activities will be prescribed in sensitive areas to facilitate slash disposal without the use of mechanized equipment.

Ability to implement: High

Effectiveness: High (EXP, SNF-AS-1, and SNF-AS-2)
**Implementation and responsibility:** The SA, and in some cases CO or FSR, works with the purchaser's representative to ensure that the TSC clauses covering the above items are carried out on the ground. Resource Specialists can be called upon to help the SA with decisions. In the event the purchaser causes debris to enter stream courses in amounts which may adversely affect the natural flow of the stream, water quality, or fishery resource, the purchaser will remove such debris as soon as practicable, but not to exceed 48 hours and in an agreed upon manner that will cause the least disturbance to stream courses.

**Monitoring:** Watershed specialists will assist in evaluating the effectiveness of this BMP. A sampling of harvest units with riparian reserves will be monitored for BMP implementation and effectiveness.
**T-9. Title: Determining Tractor Loggable Ground**

**Objective:** To minimize erosion and sedimentation resulting from ground disturbance of tractor logging systems.

**Explanation:** This preventative practice is intended to minimize accelerated soil erosion and sedimentation, and water quality degradation.

Tractor logging is restricted to lands that can be harvested with a minimum of soil compaction and erosion. Factors considered when selecting tractor operable land are: slope, slope stability, topography, soil texture, soil moisture, erosion hazard, and drainage pattern.

**Ability to implement:** High

**Effectiveness:** High (EXP)

**Implementation and responsibility:** Land suitable for tractor logging is identified during the environmental assessment process and described in the environmental assessment. Where necessary, and in consultation with resource specialists, any needed modifications are made during the sale layout phase of the TSPP. Requirements governing tractor operations are incorporated in the TSC.

**Monitoring:** The CO/FSR, and SA oversees the operation to insure compliance with the provisions of the TSC.
T-10. Title: Log Landing Location

Objective. To locate landings or reuse old landings in such a way as to avoid watershed impacts and associated water quality degradation.

Explanation: This practice is both administrative and preventive. The location of and clearing limits for log landings are commonly evaluated by the IDT and are agreed to by the SA prior to their construction. The SA will use the following criteria in evaluating landings:

a. The cleared or excavated size of landings shall not exceed that needed for safe and efficient yarding and loading operations. Trees considered dangerous will be removed around landings to meet the safety requirements of OSHA.

b. To the extent feasible, locate landings that involve the least amount of excavation and the least erosion potential and are well outside of Riparian Reserves.

c. Where feasible, locate landings near ridges away from headwater swales in areas that will allow skidding without crossing stream channels, infringing on Riparian Reserves, or causing direct deposit of soil and debris into streams.

d. Locate landings where the least amount of skid trails will be required, and side-cast can be stabilized without entering drainages or affecting other sensitive areas.

e. Position landings such that the skid road approach will be as nearly level as feasible, to promote safety, and protect the soil from erosion.

f. Keep the number of skid trails entering a landing to a minimum.

g. No landings should be constructed on old landslide benches.

h. Construct stable landing fills or improve existing landings by using appropriate compaction and drainage specifications. Engineered fills will be needed under certain conditions.

Ability to implement: High

Effectiveness: High (EXP, BMPEP-R-5)

Implementation and Responsibility: The majority of landings are constructed by the Forest Service during road construction of specified roads. Landing locations proposed by the purchaser or their representatives must be agreed to by the CO/FSR or SA. Relying on IDT input and the stated criteria, the SA can negotiate to select mutually acceptable landing locations other than those identified in the NEPA document. To be an acceptable landing, it must meet the above criteria. Should agreement not be reached, the decision of the Forest Service will prevail within the limitations of the TSC. The Sale Administrator insures that the landings are located and constructed according to the TSC.

Monitoring: Sale administrator verify that the timber sale purchasers TSC responsibilities in terms of log landing erosion potential and control are met.
T-11. Title: Tractor Skid Trail Location and Design

Objective: By designing skidding patterns to best fit the terrain, the volume, velocity, concentration, and direction of runoff water can be controlled in a manner that will minimize erosion and sedimentation.

Explanation: This is a preventive practice. The watershed factors that are considered in the design and location of skid trails include, slope, soil stability, exposure, proximity to Riparian Reserves, meadows, and other factors that may affect the surface water runoff and sediment yield potential of the land. The careful control of skidding patterns can minimize on-site compaction and off-site water runoff. Methods for protecting water quality while utilizing tractor skid trail systems are:

- **End Lining:** This method involves winching the log directly out of the sensitive areas (Riparian Reserves, meadows) with a cable operated from outside the sensitive area, while keeping the tractor, skidder, etc. outside of the sensitive area.
- **Felling To The Lead:** This method involves felling trees toward a predetermined skid pattern and away from the sensitive areas. Soil disturbance and compaction are consequently lessened, and residual stand and site damage is minimized.
- **Tractor or skidder use is limited to skid trails.**
- **Specialized Equipment Access:** Specialized equipment (harvesters, feller-bunchers) having low ground pressures can move in and out of selected Riparian Reserves without turning and leaving disturbed ground.

Ability to implement: High

Implementation and Responsibility: For skid trail design, sensitive areas will be identified and evaluated in the environmental documentation process during the TSPP. When needed to protect water quality, prescriptions must be included in the basic TSC by the use of special contract provisions (C clauses). The SA executes the prescription on the ground by locating the skid trails with the timber Purchaser or by agreeing to the Purchaser's proposed locations prior to construction. Guidelines for skid trail location are referenced in the Timber Sale Administration Handbook (FSH 2409.15), and will be in the environmental documentation and the TSC.

Monitoring: The SA observes operations to make sure timber sale contract provisions are met. Watershed specialists also visually monitor this BMP periodically throughout project implementation.
T-12. Title: Suspended Log Yarding In Timber Harvesting

**Objective:** To protect soils from excessive disturbance. To maintain the integrity of Riparian Reserves and other sensitive watershed areas. To control erosion on cable corridors.

**Explanation:** Suspended log yarding includes all yarding systems, which suspend logs either partially or completely off the ground. These systems include, but are not limited to, skyline, helicopter, and balloon yarders. The systems are used on steep slopes where tractors cannot operate. All of the systems result in less soil disturbance since heavy machinery is not used over the sale area. Erosion control measures are applied as necessary in cable corridors to control erosion and runoff. Ground disturbance is reduced by suspending logs either partially or wholly above the ground while transporting them to the landing. These yarding systems also require fewer truck roads. Less soil disturbance and fewer truck roads will result in less impact on the water resource.

**Ability to implement:** High

**Effectiveness:** High (EXP, SNF-AS-1, SNF-AS-2, BMPEP-R-5)

**Implementation and Responsibility:** The areas where suspended log yarding is required will be determined during the pre-sale planning process and will be included in the sale plan. These specific systems must be included in the TSC, and designated on the SAM by the Sale Preparation Forester.

**Monitoring:** The SA, and in some cases CO/FSR oversees project operations using the guidelines and standards established in the TSC. Watershed specialists periodically evaluate on-going harvest operations to ensure resource management objectives are being met.
T-13. Title: Erosion Prevention and Control Measures During Timber Sale Operations

Objective: To ensure that the Purchaser's operations shall be conducted to minimize soil erosion.

Explanation: Timber is purchased by individuals or companies who either harvest the timber themselves or contract harvest to other parties. Therefore, it is necessary to ensure that purchasers understand and adhere to water quality prescriptions specified in the TSPP. This is accomplished by setting forth the purchaser's responsibilities in the TSC.

Ability to implement: High

Effectiveness: Moderate (Exp, BMPEP-R-5)

Implementation and responsibility: Equipment shall not be operated when ground conditions are such that excessive damage will result. The kinds and intensity of control work done by the purchaser shall be adjusted to ground and weather conditions and the need for controlling runoff. Erosion control work shall be kept current immediately preceding expected seasonal periods of precipitation or runoff. The SA, CO, or FSR oversee implementation by the purchaser. Resource specialists are available for advice as needed.

Monitoring: In addition to responsibilities for implementation described above, watershed specialists will evaluate the effectiveness of seasonal erosion control work.
T-14. Title: Re-vegetation of Areas Disturbed by Harvest Activities
Objective: To establish a vegetative cover on disturbed sites to prevent erosion and sedimentation.

Explanation: Where soil has been severely disturbed by the purchaser's operations, and the establishment of vegetation/cover is needed to minimize erosion, the purchaser will be required to take appropriate measures normally used to establish an adequate ground cover of grass or other vegetative stabilization measures acceptable to the Forest Service. The type and intensity of treatment to establish ground cover is prescribed by the SA, with assistance from watershed specialists and botanists as needed.

This measure is applied in contracts where it is expected that disturbed soils in parts of the sale area will require vegetative cover for stabilization and other contract provisions will not mitigate the problem.

Ability to implement: High
Effectiveness: Moderate (EXP, BMPEP-R-5)

Implementation and responsibility: An estimate of the need for re-vegetation is included in the sale planning records, and in the timber sale appraisal. Where the re-vegetation is prescribed, appropriate language must be included in the TSC. The SA will designate on the ground the disturbed soils, such as logging areas and temporary roads that must be treated.

The Forest Service will provide advice as to soil preparation and the application of suitable seed mixtures, mulch, and fertilizer, and the timing of such work. It is the responsibility of the SA to make sure that re-vegetation work is done correctly and in a timely manner.

Monitoring: Watershed specialists will assist the sale administrator during implementation, and also in evaluating the effectiveness of this BMP.
T-15. Title: Log Landing Erosion Prevention and Control

**Objective.** To reduce the impacts of erosion and subsequent sedimentation associated with log landings by use of mitigating measures.

**Explanation:** This practice uses administrative, preventive, and corrective controls to meet the objective. The Sale Planning Forester and SA assess the need for stabilization, with the assistance of earth scientists as needed.

**Effectiveness:** High (BMPEP-R-5)

**Implementation and responsibility:** TSC requirements provide for erosion prevention and control measures on all landings. Provisions are made in the TSC for landings to have proper drainage.

After landings have served the Purchaser's purpose, the Purchaser shall ditch or slope the landings and may be required to rip or subsoil and make provisions for re-vegetation to permit the drainage and dispersion of water. Erosion prevention measures such as water bars will be constructed in such a manner as to divert water away from landings. Other provisions may include aggregate surfacing, scarifying, smoothing and sloping, construction of drainage ditches, spreading slash, covering with mulch, wood chips, or applying weed-free straw mulch.

Prevent road drainage from reaching landings. Unless agreed otherwise, cut and fill banks around landings will be reshaped to stabilize the area.

The specific work needed on each landing will depend on the actual onsite conditions. It is the responsibility of the SA to insure that this practice is properly implemented on the ground. The SA will agree upon the location and size of log landings proposed by the purchaser before clearing and construction begins.

**Monitoring:** Sale administrator verify that the timber sale purchasers TSC responsibilities in terms of log landing erosion potential and control are met.
T-16. Title: Erosion Control on Skid Trails

Objective: To protect water quality by minimizing erosion and sedimentation derived from skid trails.

Explanation: This practice employs preventive controls to reach the objective. The TSC requires the installation of erosion control measures on skid trails, tractor roads, and temporary roads. Normally, the work involves constructing cross ditches and water spreading ditches. Other methods such as back-blading may be agreed to in lieu of cross drains. Grass seeding or other erosion control measures may also be required by a “C” provision, which will be added to the TSC. Areas to be treated are shown on the Sale Area Map legend. During the life of the contract, these areas are designated on the ground annually as logging and temporary access construction progresses.

Ability to implement: High

Effectiveness: High (EXP,BMPEP-R-5)

Implementation and responsibility: Location of all erosion control measures are designated and agreed to on-the-ground by the SA. The Timber Sale Administration handbook section on Skid Trails and Fire lines contains guidelines for spacing of cross drains, construction techniques, and cross drain heights.

The SA should use these guidelines on the ground to identify site-specific preventive work that is required of the purchaser. The Purchaser is obligated to complete and maintain erosion control work specified in contract provisions during the life of the contract.

Monitoring: Watershed specialists assist the sale administrator, as needed, with ongoing operations, and will also evaluate the effectiveness of this BMP.
T-17. Title: Meadow Protection During Timber Harvesting

Objective: To avoid damage to the ground cover, soil, and the hydrologic function of meadows.

Explanation: This is an administrative and preventive action. These sensitive environments are identified by the IDT during the scoping and onsite evaluation portion of the environmental document preparation process. As a minimum, meadow protection requirements contained in the Forest Land and Resource Management Plans and Northwest Forest Plan must be identified and implemented.

Protection zones and tree directional falling are prescribed according to site conditions and within guidelines prescribed by the Forest Service Directives System and Forest Plan/Northwest Forest Plan guidelines.

Unauthorized operation of vehicular or skidding equipment in meadows or in protection zones designated on Sale Area Maps and marked on the ground is prohibited by the TSC. Vehicular or skidding equipment is not to be used on meadows except when specifically approved by the SA, CO, or FSR. Where feasible, directional falling will be used to avoid falling trees into meadows. Unless otherwise agreed, trees felled into meadows will be removed by end-lining, slash removal and resulting disturbance will be repair where necessary to protect vegetative cover, soil, and water quality.

To protect watershed and wildlife values, roads should not be located in meadows. Vehicular or skidding equipment should not be used in meadows.

Ability to implement: High

Effectiveness: High (EXP, BMPEP-R-5)

Implementation and responsibility: The concerns and constraints mentioned above are set forth in TSC requirements and administered by the SA.

Monitoring: All units where salvage harvest activities are proposed adjacent to meadows will be monitored for BMP implementation and effectiveness.
T-18. Title Erosion Control Structure Maintenance

**Objective:** To ensure that constructed erosion control structures are stabilized and working.

**Explanation:** Erosion control structures are only effective when they are in good repair and stable condition. Once the erosion control structures are constructed and seeded, there is a possibility that they may not become adequately vegetated or they may become damaged by subsequent harvest activities. It is necessary to provide follow-up inspection and structural maintenance in order to avoid these problems and ensure adequate erosion control.

**Ability to implement:** High

**Effectiveness:** Moderate (EXP)

**Implementation and responsibility:** During the period of the TSC, the Purchaser shall provide maintenance of soil erosion control structures constructed by the Purchaser. The Sale Administrator oversees the Purchaser’s implementation of this BMP. After one year, erosion control structures maintenance work may be accomplished through watershed restoration practices by the Forest Service.

**Monitoring:** Watershed specialists will evaluate the effectiveness of the erosion control structures and recommend additional maintenance or erosion control work.
T-19. Title: Acceptance of Timber Sale Erosion Control Measures Before Sale Closure

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

Explanation: The effectiveness of soil erosion prevention and control measures is determined by the conditions found after sale areas have been exposed one or more years to the elements. The evaluation is to ensure that erosion control treatments are in good repair and functioning as designed before releasing the purchaser from contract responsibility.

Although a careful check is required before a timber sale is closed to assure that planned erosion work has been completed to the standard prescribed, the erosion prevention work done in previous years should be periodically inspected during the life of the timber sale. These inspections will help determine whether the planned work was adequate, if maintenance work is needed, the practicability of the various treatments used, and the necessity for modifying present standards or procedures.

Ability to implement: High

Effectiveness: High (EXP, BMPEP-R-5)

Implementation and responsibility: “Acceptable” erosion control means only minor deviations from established objectives, provided no major, or lasting damage is caused to soil, or water. SA’s will not accept erosion control measures that fail to meet these criteria. Specific requirements for erosion control are included in each TSC. SA’s will assure erosion control measures conform to the applicable provisions.

Monitoring: Watershed specialists will evaluate the effectiveness of the soil erosion prevention and control measures prior to closure of the timber sale.
**T-20. Title: Five-Year Reforestation Requirement**

**Objective:** To assure a continuous forest cover, and to limit disturbance on areas with limited regeneration potential where there is no assurance that the site can be reforested within 5 years.

**Explanation:** When trees are cut to achieve timber production objectives, the cuttings shall be made in such a way as to assure that the technology and knowledge exists to adequately restock the lands within 5 years after harvest. Adequate stocking means that the cut area will contain the minimum number, size, distribution, and species composition of regeneration as specified in regional silvicultural guidelines for each forest type. Five years after final harvest means 5 years after clear cutting, 5 years after final overstory removal in shelterwood cutting, 5 years after seed tree removal in seed tree cutting, or 5 years after selection cutting (36 CFR Part 219.27 (c)(3)).

The implementation of this practice affects water quality by helping to stabilize soils, increasing ground cover, and providing improved infiltration, but is intended for green timber sales involving the cutting of live trees. Post fire reforestation direction will be followed for the Biscuit Fire Recovery Project.

**Ability to implement:** High

**Effectiveness:** Moderate (SNF-AS-2)

**Implementation and responsibility:** During the timber sale planning process, the interdisciplinary team assesses the capability of proposed areas to achieve reforestation within the prescribed period. The silviculturist is uses information collected by the IDT, including soil productivity, soil depth, and available soil moisture holding capacity to determine harvesting and regeneration methods.

**Monitoring:** Regeneration and stocking surveys will be done by the Forest Service to verify the success of the reforestation and effectiveness of this BMP.
T-21. Title: Servicing and Refueling of Equipment

Objective: To prevent pollutants such as fuels, lubricants, bitumen’s, raw sewage, wash water and other harmful materials from being discharged into or near rivers, streams and impoundments or into natural or man-made channels.

Explanation: During servicing or refueling of logging and road construction equipment, any spilled pollutants can be transported by runoff to surface waters. Contaminated upland soils can be a long-term threat to surface and ground water quality.

This threat must be managed by disposing of waste material properly, selecting service and refueling areas well away from wet areas and surface water, and by using berms around such sites and by utilizing impermeable liners or other techniques to contain spills according to the Forests SPCC plan. A Spill Prevention, Control and Countermeasures (SPCC) Plan, certified by a registered professional engineer, is required if the volume of fuel exceeds 660 gallons in a single container or if total storage at a site exceeds 1320 gallons (also see Watershed BMP W-5).

Ability to implement: High

Effectiveness: High (EXP)

Implementation and Responsibility: The COR, CI, CO/FSR, ER, or SA are authorized to designate the location, size, and allowable uses of service and refueling areas. Operators are required to remove service residues, waste oil, and other materials from National Forest land. They must also take responsible actions in case of a hazardous substances spill. They will also be aware of emergency notification procedures and actions to be taken in case of a hazardous substance spill.

Monitoring: The Sale Administrator and Engineering Representative will track the implementation of this BMP throughout the timber sale. In the event of a spill, watershed specialists will be on hand to monitor the situation and provide advice.
T-22. Title: Modification of the Timber Sale Contract (TSC)

Objective: To modify the TSC if new circumstances or conditions arise and indicate that the timber sale will damage soil, water or watershed values.

Explanation: Once timber sales are sold, they are harvested as planned via the TSC. At times, however, it will be necessary to modify a TSC because of new concerns about the potential effects of land disturbance on the water resource. If new evidence raises serious concerns to the FSR, an interdisciplinary team will be assigned to assess the evidence and implications. The team will report to the appropriate line officer on whether the timber sale, as currently planned will (1) damage soil, water or watershed conditions, or (2) inadequately protect stream courses, stream banks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of watercourses, and deposits of sediment. The IDT will also make recommendations of mitigation and corrective actions. The environmental document prepared for the timber sale will then be amended to reflect the findings of the IDT.

Ability to implement: High

Effectiveness: High (EXP, BMPEP-R-5)

Implementation and responsibility: Where the project is determined to unacceptably affect watershed values, the appropriate line officer will take corrective actions, which may include contract modification. The Timber sale modification can be accomplished by agreement with the timber sale purchaser, or unilaterally by the Forest Service (with suitable compensation to the purchaser) using the environmental document prepared by the IDT.

Monitoring: N/A, see implementation and responsibility section.

Vegetative Manipulation

VM-1 Title: Slope Limitations for Tractor

Objective: To reduce gully and sheet erosion and associated sediment production by limiting tractor use.

Explanation: This is a preventive measure that limits excessive surface disturbance and prevents surface water from concentrating. The measure limits tractor operation to gentle slopes to prevent disturbance and erosion. Evaluation criteria used to determine slope restrictions are climate, soil condition, soil stability and mass stability, as determined by field and office analysis. These determinations made during the environmental analysis.

Implementation and Responsibility: The Sale Administrator or COR is responsible for ensuring implementation of the contract provisions that apply to tractor operation on steep slopes. Project planners have the responsibility to ensure that appropriate tractor operation provisions are included in the contract. This practice is implemented on vegetative manipulation projects where appropriate. For in-service projects, the project
supervisor is responsible for the project and for identifying areas where operations should be limited. The supervisor’s direction is taken from the project work plan and project EA or EIS.

**Monitoring:** Implementation monitoring will be done by the COR, Project Supervisor, Sale Administrator, FSR and Watershed specialists. Watershed specialists will evaluate post-project soil condition on selected projects to verify the effectiveness of the site specific project BMPs. Also see Forest Plan monitoring plan.

**Ability to implement:** High

**Effectiveness:** High (EXP)

**VM-4 Title:** Soil Moisture Limitations for Tractor Operation

**Objective:** The objective of this measure is to prevent compaction, rutting and gullying and production of sediment and turbidity.

**Explanation:** This is a preventative measure that reduces surface disturbance during wet soil conditions which would result in compaction, rutting and gullying. This measure reduces the need to later correct rutting and gullying problems. Soil erodibility, climatic factors, soil/water relationships and mass stability are constraining factors which are identified by soil scientists, geologists and hydrologists during the environmental analysis (NEPA) process.

**Implementation and Responsibility:** The Sale Administrator and COR is responsible for determining when the soil surface is unstable and susceptible to damage and is responsible for suspending or terminating operations for contracted projects. For in-service projects, the project supervisor is responsible for determining when the soil surface is unstable and susceptible to damage, and is then responsible for terminating operations. Project planners are responsible for including appropriate contract provisions and management requirements in project work plans and EAs.

**Monitoring:** Implementation monitoring is done either by the Sale Administrator, COR or project supervisor, with assistance as needed from watershed specialists. Also see Forest Plan monitoring plan.

**Ability to implement:** High

**Effectiveness:** High (EXP)
ROAD SYSTEM BMPs

R-1. Title: General Guidelines for the Location and Design of Roads

Objective: To locate and design roads with minimal resource damage.

Explanation: The following are some general considerations, which must be incorporated into the planning of road locations and design. These measures are preventive, and apply to all transportation activities, and indirectly protect water quality.

a) A basic requirement for transportation facility development and operation will be the formulation and evaluation of alternatives that will best meet resource management objectives with the least adverse effect on environmental values.

b) In the location, design, and construction of roads, an interdisciplinary team is used to evaluate the effects of transportation development and operations and minimize adverse economic, environmental, and social impacts.

c) All resource-coordinating instructions for the protection and prevention of damage to National Forest resources shall apply to the planning, development, and operation of transportation facilities. The following instructions apply to system roads:

   a) Roads should be located to facilitate completion of the area transportation system, fit the terrain, and minimize damage to improvements and resources. Fragile and special areas should be avoided.
   
   b) Road design standards and design criteria are based on road management objectives such as traffic requirements of the sale and the overall transportation plan, an economic analysis, safety requirements, resource objectives, and the minimization of damage to Forest resources.
   
   c) Stream crossing structures shall be designed to provide the most efficient drainage facility consistent with resource protection, importance of the road, legal obligations, and costs. The design may involve a hydrologic analysis to determine runoff volumes, flood conditions, velocities, scour, and open channel shapes.

Process and timing of culvert installation will be coordinated with fisheries life history information to avoid potential adverse impacts to spawning, rearing, or migration.

Ability to implement: High

Effectiveness: High (EXP, SNF-AS-1, SNF-AS-2)

Implementation and Responsibility: An interdisciplinary team aids the responsible official in locating the road to best fit resource objectives, and in developing detailed mitigation measures. Contracted projects are implemented by the contractor or operator. Compliance with project plan requirements and the operating plan is assured by the Forest Service Contracting Officers Representative (COR), Contract Inspector (CI), Engineering Representative (ER), Contracting Officer (CO) or Forest Service Representative (FSR).
For more information please see the Introduction to this section.

**Monitoring:** EA review process, tagline reviews, plan in hand reviews, progress reviews during construction and final inspection. Also see monitoring for other Road System BMPs.
R-2. Title: Erosion Control Plan  
Objective: To limit and mitigate erosion and sedimentation through effective planning prior to initiation of road construction activities and through effective contract administration during construction.

Explanation: Land disturbing activities, such as road construction, can result in short term erosion. By effectively planning for erosion control, sedimentation can be controlled or prevented. Within a specified period after award of the contract, the Purchaser (Contractor) shall submit a general plan, which, among other things, sets forth erosion control measures to be used. Operations cannot begin until the Forest Service has given written approval of the plan. The plan recognizes the mitigation measures required in the contract. A similar plan is required of miners and special use permittees.

Ability to implement: High

Effectiveness: High (EXP, BMPEP-R-5)

Implementation and Responsibility: Detailed mitigation measures are developed by design engineers and watershed specialists, using an interdisciplinary approach; the measures are reflected in the contract's specifications and provisions. The intent of mitigation is to prevent construction-generated erosion, as well as that generated from the completed road, from entering watercourses. Contracted projects are implemented by the contractor or operator. This practice is commonly applied to all road construction through contract clauses and specifications and will apply to road construction for timber sales, mining, recreation, special uses, and other roadwork on NFS lands.

Monitoring: Compliance with contract specifications and operating plans is assured by the COR, CI, ER, CO, or FSR through field inspection during implementation of the project.
R-3. Title: Timing of Construction Activities

**Objective:** To minimize erosion by conducting temporary road construction or reconstruction of existing roads periods of minimal runoff.

**Explanation:** Since erosion and sedimentation are directly related to the amount of runoff, scheduling operations during periods when the probabilities for rain and runoff are low is an essential element of effective erosion control. Purchasers will be required to schedule and conduct operations to minimize erosion and sedimentation. Equipment will not be allowed to operate when ground conditions are such that excessive rutting and soil compaction could result. Such conditions are identified by the COR, CI, CO, FSR, or ER with the assistance of other watershed specialists as needed.

In addition, it is important to keep erosion control work as current as practicable with active road construction projects. Construction of drainage facilities and performance of other contract work to control erosion and sedimentation will be required in conjunction with earthwork projects. The operator should limit the amount of area being graded at a site at any one time, and should minimize the time that an area is laid bare. Erosion control work must be kept current when road construction occurs outside of the normal operating season.

**Ability to implement:** High

**Effectiveness:** High (EXP)

**Implementation and Responsibility:** Detailed mitigations developed by design engineers and an IDT will be included in the environmental analysis and in subsequent project plans and contracts.

Contracted projects are implemented by the contractor or operator. Compliance with plans, specifications, and the operating plan is assured by the COR, CI, CO, FSR, or ER through inspection.

This practice is required by Contract Provisions.

**Monitoring:** Road construction review process.
R-4. Title: Stabilization of Road Slope Surfaces and Spoil Disposal Areas

Objective: To minimize erosion from exposed cut slopes, fill slopes, and spoil disposal areas.

Explanation: This is a preventive practice using bioengineering and other techniques to prevent or minimize erosion. Depending on site factors such as slope angle, soil type, climate, and proximity to waterways, many fill slopes, some cut slopes, and some spoil disposal areas will require vegetative and/or mechanical measures to provide for adequate surface soil stability. The level of stabilization effort needed must be determined on a case-by-case basis by qualified employees.

Vegetation measures include the seeding of herbaceous species (grass, legumes, or browse species), or the planting of brush or trees. A combination of native vegetation often produces a better result than a more simplistic treatment; e.g., grass seeding alone. Vegetative measures may include fertilization, and mulching to ensure success. Mechanical measures may include, but are not limited to: wattling, erosion nets, terraces, side drains, blankets, mats, rip-rapping, mulch, tackifiers, pavement, and soil seals.

Ability to implement: High

Effectiveness: High (EXP, SNF-AS-1, SNF-AS-2, BMPEP-R-5)

Implementation and Responsibility: Vegetation measures can improve the effectiveness of mechanical measures, but can be effective and complete by themselves. They may not take effect for several seasons, depending on the timing of project completion in relation to the growing season.

Mechanical and vegetative surface stabilization measures will be periodically inspected as necessary to determine effectiveness. In some cases, additional work may be needed to ensure that the vegetative and/or mechanical surface stabilization measures continue to function as intended.

Initial project location, mitigation measures, and management requirements and needs are normally developed during the environmental analysis process. These requirements and needs are translated into project plans, contract provisions and specifications.

Monitoring: Project road inspectors, and their supervisors monitor work accomplishment and effectiveness, to ensure that design standards, project plan management requirements, and mitigation measures are met.
R-5. Title: Road Slope Stabilization Construction Practices  
**Objective:** To reduce sedimentation by minimizing erosion from road slopes and slope failures along roads.

**Explanation:** This is an administrative and construction practice. It is prohibitively expensive to immediately and completely prevent erosion from road cut and fill slopes. However, plan all road construction considering adequate stabilization needs. The first planning requirement is for an adequate soils and geologic investigation, to provide data necessary for proper cut and fill design considerations such as:

1) The correct cut and fill slope steepness according to the stable angle of repose for the type of material.
2) Methods to handle surface and subsurface runoff.
3) Necessary compaction standards and surfacing needs.

A prerequisite for stabilization is to provide basic mechanical stability of the soils, using data from soils and geologic investigations to develop requirements for proper slope angles, compaction, and adequate drainage.

**Ability to implement:** High  
**Effectiveness:** High (EXP, SNF-AS-1, SNF-AS-2, BMPEP-R-5)  
**Implementation and Responsibility:** Include erosion prevention considerations in planning for all road construction and reconstruction contracts. Application is commonly in conjunction with BMP R-4.

Most, if not all, of the stabilization measures must be completed prior to the first winter rains. At especially critical locations with a high erosion and/or sedimentation potential, extensive and reliable remedies may be necessary.

Project location and detailed mitigation measures are determined during the EA process and included in the project plan.

Contracted projects are implemented by the contractor or operator. Compliance with project plan requirements, and the operating plan is assured by the COR, CI, CO, FSR, or ER through inspection.

**Monitoring:** Engineering Representatives monitor work accomplishment and effectiveness, to ensure that design standards, project plan constraints, and mitigation measures are met. Watershed specialists also assist in implementation and effectiveness evaluation.
Objective: To minimize the possibilities of cut or fill slope failure and the subsequent production of sediment.

Explanation: Roadways may change the subsurface drainage characteristics of a slope. Since the angle and height of cut and fill slopes increase the risk of instability, it is sometimes necessary to provide subsurface drainage to avoid moisture saturation and subsequent slope failure. Where ground water dispersion is necessary because of slopes, soil, aspect, precipitation amounts, inherent instability, or other related characteristics, dispersion methods would include:
   a. Under-drains or sub-drains (e.g., pipes, geo-textiles)
   b. Horizontal drains
   c. Stabilization trenches
   d. Drainage blankets or rock drains
   e. Specialized treatment for the specific site

Dispersal of collected water should be accomplished in an area capable of withstanding increased flows.

On erosive soils, energy dissipaters or other slope stabilization treatments or conveyance devices need to be placed below pipes carrying large volumes of water. Road surfaces may be designed to dissipate the intercepted water in a uniform manner along the road.

Ability to implement: High

Effectiveness: High (EXP, SNF-AS-1, SNF-AS-2)

Implementation and Responsibility: Project location and detailed mitigation measures are determined by the design engineers, and the IDT, documented and incorporated into subsequent project plans and contracts.

Contracted projects are implemented by the contractor or timber sale operator. Compliance with project plan and specifications requirements, and operating plans is assured by the COR, CI, CO, FSR, or ER.

This practice is applied when necessary as determined by the Forest Service planning process, and documented in the project plan.

Monitoring: Plan in hand review, design review, and road construction review process. Also see monitoring section for BMP R-7.
R-7. Title: Control of Road Drainage

Objective: To minimize the erosive effects of water concentrated by road drainage features. To disperse runoff from disturbances within the road clearing limits. To lessen the sediment generated from roaded areas. To minimize erosion of the road prism by runoff from road surfaces and from uphill areas.

Explanation: This is a preventive practice. A number of measures can be used (alone or in combination) to control unacceptable effects of road drainage. Methods used to reduce erosion may include, but are not limited to such controls as construction of properly spaced cross drains, water bars or rolling dips, installing energy dissipaters, aprons, downspouts, over side drains, gabions, debris racks and armoring of ditches and drain inlets.

Dispersal of runoff can be accomplished by such means as rolling the grade, in-sloping, out-sloping or crowning. Installing water spreading ditches or contour trenching can disperse water after it leaves the road. Dispersal of runoff reduces downstream peak flows and associated scouring of the channels and sediment transport.

Reduce sediment loads from road surfaces by adding aggregate or paving surfaces or by installing such controls as: sediment filters, settling ponds, and contour trenches. Soil stabilization can reduce sedimentation by lessening erosion on borrow and waste areas, on cut and fill slopes, and on road shoulders.

Ability to implement: High

Effectiveness: High (EXP, SNF-AS-1, SNF-AS-2, BMPEP-R-5)

Implementation and Responsibility: Project location, design criteria and detailed mitigation are determined during the environmental assessment process. These are then documented in the project plan.

Contracted projects are implemented by the contractor or operator. Compliance with plans, specifications, and operating plans is assured by the Forest Service COR, CI, CO, FSR, or ER.

This practice is required in contracts when identified, as needed, in the Forest Service Planning Process.

Monitoring: Design review and road construction review process.
R-8. Title: Constraints Related to Pioneer Road Construction

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

Explanation: Pioneer roads are built to allow equipment access for removal and treatment of clearing debris, installation of drainage structures, haul of construction materials, and access to special sites. Pioneering is usually done within the prism of the planned road. To meet the objective of minimizing sediment, the following constraints should be followed:

a. Construction of pioneer roads shall be confined to the final roadway construction limits, unless otherwise approved by the ER or COR. Excavation shall be conducted so as to prevent undercutting the final cut slope and to minimize depositing materials outside the designated roadway limits.

b. Erosion control work will be completed prior to periods of seasonal precipitation and then kept up daily as work progresses.

c. Sites on live streams crossed by pioneer roads will be protected with temporary culverts or log structures unless approved otherwise (see Road System BMP R-13).

Ability to implement: High

Effectiveness: Moderate (EXP)

Implementation and Responsibility: Special access needs and mitigative measures are determined during the environmental analysis process using an interdisciplinary approach.

Contracted projects are implemented by the Contractor or timber sale Purchaser. Compliance with plans, specifications, and operating plans is determined with tests, measurements, and observations by the COR or ER.

Monitoring: Progress reviews during construction and road construction review process.
R-9. Title: Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects

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

Explanation: The best drainage design can be ineffective if erosion control has not been completed by the end of the normal operating season. Affected areas can include roads, fills, tractor trails, skid trails, landings, stream crossings, bridge excavations, and fire lines. Preventive measures include:

a. The removal of temporary culverts, culvert plugs, diversion dams or elevated stream crossings;

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

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

d. Planting vegetation, mulching, and/or covering exposed surfaces with jute mats or other protective material.

Ability to implement: High

Effectiveness: Moderate (EXP)

Implementation and Responsibility: Apply protective measures to all areas of disturbed, erosion prone, unprotected ground that is not to be further disturbed in the present year. When conditions permit operations outside of the normal operating season, erosion control measures must be kept current with ground disturbance, to the extent that the affected area can be rapidly "closed," if weather conditions deteriorate. Do not leave project areas for the winter with remedial measured incomplete.

Develop project mitigation measures and layout requirements during the environmental analysis process. Incorporate them into subsequent project plans and/or contracts. Contracted projects are implemented by the contractor or operator. Compliance with project plan criteria, contract specifications, and operating plans is assured by the COR, CI, CO, FSR, or ER.

Monitoring: Monitoring is done during the road construction review process and observation after project completion.
R-10. Title: Construction of Stable Embankments (Fills)

**Objective:** To construct embankments with materials and methods which minimize the possibility of failure and subsequent water quality degradation.

**Explanation:** The failure of road embankments and the subsequent deposition of material into waterways may result from the incorporation of slash or other organic matter into fills, from a lack of compaction during the construction of the embankment, as well as from the use of inappropriate placement methods.

To minimize fill failures, the roadway should be designed and constructed as a stable and durable earthwork structure with adequate strength to support the roadway, shoulders, and the roads traffic load.

Proper slope ratio design will promote stable embankments. Embankments will be constructed of inorganic material and may be placed by one or more of the following methods:

a. Layer placement  
b. Layer placement (roller compaction)  
c. Controlled compaction  
d. Special project controlled compaction  
e. In some situations it will be necessary to minimize fill volumes and/or strengthen fills using retaining walls, confinement systems, plantings or a combination of techniques.

On projects, where required densities are specified, some type of moisture compaction control will be necessary. Where outer faces of embankments are not stabilized, due to equipment access difficulty, unfinished slopes subject to erosion and slipping will be stabilized following BMP R-4.

**Ability to implement:** High

**Effectiveness:** High (EXP, SNF-AS-1, SNF-AS-2, BMPEP-R-5)

**Implementation and Responsibility:** Project constraints and mitigation measures are developed through the environmental analysis and road design process. The appropriate method of embankment placement is chosen during the design process.

Contracted projects are implemented by the contractor or operator. Compliance with project plan specifications, and the operating plan is assured by the COR, CI, CO, FSR, or ER through inspection.

**Monitoring:** Design review, progress reviews during construction and road construction review process.
R-11. Title: Control of Side Cast Material

Objective: To minimize sediment production originating from sidecast material during road construction or maintenance.

Explanation: Unconsolidated sidecast material can be difficult to stabilize and is susceptible to erosion, settling, and mass instability. Site-specific limits or controls for sidecasting uncompacted material should be developed through interdisciplinary input. Sidecasting is not an acceptable embankment placement alternative in areas where it will adversely affect water quality. Road widths on full bench ground should not include any width on sidecast material without prior approval of COR or ER.

Waste areas should be located where excess material can be deposited and stabilized. The location and provisions for disposal of waste materials are included in construction contracts. During road maintenance operations, the deposition of sidecast material shall be done where it will not weaken stabilized slopes. Disposal of slide debris shall be done only at designated waste areas where deposited material can be stabilized or approved for sidecast placement, which may include the road surface and fill slopes.

Ability to implement: High

Effectiveness: Moderate (EXP)

Implementation and Responsibility: Mitigative measures are developed through the environmental analysis and road design process, using an interdisciplinary approach, and are included in the project specifications, drawings, or guidelines.

Contracted projects are implemented by the Contractor or timber sale operator. Compliance with project criteria, contract specifications, and operating plans is determined with tests, measurements, and observations by the COR, ER, or maintenance engineer.

Contracts and guidelines address slid and slump repair, surface blading, and the placement of waste road material to reduce sidecasting.

Monitoring: Monitoring is done during the road construction review process and observation after project completion.
R-15. Title: 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 stream channels. To insure debris dams are not formed which obstruct fish passage, or which could result in downstream damage from high water flow surges after dam failure.

**Explanation:** As a preventive measure, construction debris and other newly generated roadside slash developed along roads near streams or in the Riparian Reserves will be disposed of by the following means as applicable:

a. On-Site
   1. Piling and Burning
   2. Scattering
   3. Chipping
   4. Windrowing at the base of fill slopes.
   5. Burying
   6. Disposal in Cutting Units
b. Removal to agreed upon locations (especially stumps from the road prism).
c. A combination of the above.
d. Large limbs and cull logs are removed to designated sites outside the Riparian Reserve, or relocated within the zone to meet aquatic resource management objectives.

**Ability to implement:** High

**Effectiveness:** High (EXP)

**Implementation and Responsibility:** Criteria for the disposal of right-of-way and roadside debris will be established during onsite evaluation by an IDT. Project location and detailed mitigation measures are developed and set forth in the environmental analysis and incorporated into project plans and contracts.

Contracted projects are implemented by the contractor or operator. Compliance with plans, specifications, and operating plans is assured by the COR, CI, CO, FSR, or ER.

**Monitoring:** Monitoring is accomplished during road design review, progress review during construction, and maintenance activity reviews.
R-17. Title: Water Source Development Consistent With Water Quality Protection

Objective: To supply water for roads and fire protection while maintaining existing water quality.

Explanation: Water source development is normally needed to supply water for road construction, dust control, and fire control. Problems may arise when cofferdams or water holes are built in streams. Use of earth fill for dam construction will be avoided as it creates sediment problems during installation and removal. Cofferdams and water holes should be built out of sandbags filled with clean sand or gravel, or other methods that will not contribute to non-point source pollution. Also at no time shall down stream water flow be reduced to a level that may be detrimental to aquatic resources, fish passage, or other established uses. The structure is not allowed to create a situation where dam failure would occur due to excessive impoundment flow.

Water source development shall aim toward the construction of durable, long-term water sources (under the Sale Area Improvement Plan) rather than the construction of a succession of hasty, expedient developments that are rapidly abandoned. Permanently designed sources, such as small piped diversions to off-site storage tanks or ponds will result in the lowest, long-term effects.

Damages to resources at such locations caused by the purchaser’s, or contractor’s operations, or fire suppression activities will be repaired by the purchaser, contractor, or fire suppression crews in a timely and agreed upon manner to the extent practical to restore and prevent further resource damage.

Overflow from water holding developments will be returned to the stream. Approaches should be kept as close to perpendicular as possible to the stream. Stream bank excavation should be kept to a minimum needed for entry and exit, and may be aggregate surfaced as appropriate.

Ability to implement: Moderate

Effectiveness: Moderate (EXP, BMPEP-R-5)

Implementation and Responsibility: Ci’s, SA’s and ER’s in conjunction with a hydrologist and fisheries biologist should evaluate streams in which water developments may be constructed. Water holes and other improvements will be restored to a stable condition by the end of the normal operating season. Project location and detailed mitigation will be developed by the design engineer, using the interdisciplinary approach to meet project criteria.

Contracted projects are implemented by the contractor or operator. Compliance with project criteria, and the operating plan is assured by the Forest Service COR, CI, CO, FSR, or ER.
**Monitoring:** NEPA field review process, plan in hand review, design review, and road construction review process. Engineering representatives directly monitor implementation of this BMP.
R-18. Title: Maintenance of Roads

Objective: To maintain roads in a manner which provides for water quality protection by minimizing rutting, failures, side casting, and blockage of drainage facilities (all of which can cause sedimentation and erosion, and deteriorating watershed conditions).

Explanation: Roads normally deteriorate because of use and weather impacts. This deterioration can be minimized through adequate maintenance and/or restriction of use. Occasionally new groundwater springs and seeps appear after a wildfire or unusually wet periods and saturate road surfaces. After wildfires, roads are more susceptible to erosion and fill slope failures because loss of vegetation.

All system roads will be maintained during timber haul to at least the following level:

1. Provide the basic maintenance required to protect the road investment and to ensure that damage to adjacent land and resources is prevented. This level of maintenance often requires an annual inspection to determine what work, if any, is needed to keep drainage functional and the road stable. This level is the normal prescription for roads that are closed to traffic. Higher levels of maintenance may be chosen to reflect greater use or resource protection. Additional maintenance measures could include resurfacing, out-sloping, clearing debris from dips and cross drains, armoring of ditches and spot rocking.

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

Ability to implement: Moderate

Effectiveness: High (EXP, BMPEP-R-5)

Implementation and Responsibility: The work is managed by the Forest Engineers and other resource specialists who develop a road maintenance plan and a road condition survey. Maintenance levels for each road are documented in the road maintenance objective. On timber sales, maintenance is a purchaser responsibility commensurate with road use, and compliance with the contract provisions is assured by the CO, FSR, or ER. On system roads outside of active timber sales, Forest Service crews or contract crews perform road maintenance under supervision of an ER, or maintenance supervisor.

This practice is required by contract provisions.

Monitoring: will be done by Timber Sale road package review, and on the ground review of road maintenance practices in the Rustler Project area.
R-19. Title: 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 from those areas.

Explanation: Unconsolidated road surface material is susceptible to erosion during precipitation events.

Likewise, dust derived from road use may settle onto adjacent water bodies and stream courses.

Contractors, purchasers, special users, and Forest Service project leaders undertake measures to minimize loss of road material when the need for such action is identified. Road surface treatments include watering, dust oiling, penetration oiling, sealing, aggregate surfacing, chip sealing, or paving, depending on traffic, soils, geology, road design specifications.

Ability to implement: High

Effectiveness: Moderate (EXP, BMPEP-R-5)

Implementation and Responsibility: Using an interdisciplinary approach, project locations and detailed mitigation measures are developed by the design engineer to meet project criteria.

Contracted projects are implemented by the contractor or operator. Compliance with project criteria, contract specifications, and operating plans is assured by the COR, CI, CO, FSR, or ER.

Monitoring: COR’s, CI’s, CO’s, FSR’s, or ER’s all monitor implementation of this BMP.
R-20. Title: Traffic Control During Wet Periods

Objective: To reduce road surface damage and rutting of roads. To lessen sediment washing from damaged road surfaces.

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

Rutting, oiling, paving, and armoring are measures that may be necessary to protect the road surface and reduce soil loss. Roads that are not needed for public access or forest administrative use should be closed to use during the wet season. In many cases, use can be discouraged, but not eliminated. Where wet season field operations are planned, roads may need to be upgraded, use restricted to low ground pressure vehicles or frozen ground conditions, or maintenance intensified to handle the traffic without creating excessive erosion and damage to the road surface.

Ability to Implement: High

Effectiveness: Moderate (EXP, BMPEP-R-5)

Implementation and Responsibility: Road closures and traffic control measures should be used outside active timber sale areas. Project-associated implementation procedures can be enforced by Forest Service personnel. Hauling activity can be controlled by the SA, CO, or FSR within active timber sales.

The decision for closure is based on local soil moisture conditions and other criteria.

Detailed mitigation is developed by design engineers, using an interdisciplinary approach as necessary.

Contracted projects are implemented by the contractor or operator. Compliance with plans, specifications, and operating plans is assured by the Forest Service CO, FSR, or ER.

Monitoring: CO’s, FSR’s, and ER’s all may monitor implementation of this BMP.
R-21. Title: Snow Removal Controls to Avoid Resource Damage

Objective: To minimize the impact of snowmelt runoff on road surfaces and embankments and to consequently reduce the probability of sediment production resulting from snow removal operations.

Explanation: This is a preventive measure used to protect resources and indirectly to protect water quality. Forest roads are sometimes used throughout the winter for a variety of reasons. For such roads, the following measures are employed to meet the objectives of this practice:

a. The contractor will be responsible for snow removal in a manner that will protect roads and adjacent resources.

b. Rocking or other special surfacing and/or drainage measures may be necessary, before the operator is allowed to use the roads.

c. Snow berms will be removed where they result in accumulation or concentration of snowmelt runoff on the road and erosive fill slopes.

d. Snow berms will be installed where such placement will preclude concentration of snowmelt runoff and serve to rapidly dissipate water. If the road surface is damaged during snow removal, the purchaser or contractor will be required to replace lost surface material with similar quality material and repair structures damaged in removal operations as soon as practicable, or unless otherwise agreed to in writing.

Ability to implement: Moderate

Effectiveness: Moderate (EXP, BMPEP-R-5)

Implementation and Responsibility: Project location and detailed mitigation measures are developed by the IDT during the environmental analysis and incorporate into the project plan and/or contracts.

Contracted projects are implemented by the contractor or operator. Compliance with criteria in the project plan specifications, and the operating plan is ensured by the CO, ER and FSR.

Monitoring: BMP implementation and effectiveness monitoring for this BMP will be done at randomly selected sites by ER’s.
R-22. **Title: Restoration of Borrow Pits and Quarries**

**Objective:** To minimize sediment production from borrow pits and quarry sites.

**Explanation:** Borrow pits and quarries can be susceptible to erosion due to steep side-slopes, lack of vegetation, and/or their proximity to watercourses. Wherever necessary, prior to excavation of the site topsoil should be removed and stockpiled for surface dressing in the post-operation rehabilitation period.

Once excavation has been completed on all or part of the area, the sides will be sloped and graded to ensure proper drainage, and the general pit area smoothed and stabilized. Finer material will be spread over the bottom of the pit prior to spreading stockpiled or imported soil.

Seeding, soil amendments and mulching may be required and will be carried on as referenced in Standard Specification 625 (1996 Forest Service Standard Specifications For Roads and Bridges).

Installation of sediment basins and/or upslope diversions and berms or other sediment reduction measures will be considered. Temporary access roads to the site will be obliterated or decommissioned according to BMP R-23, unless other treatment is required by design. System roads to quarries or borrow pits are maintained in accordance with BMP R-18.

**Ability to implement:** High

**Effectiveness:** High (EXP, BMPEP-R-5)

**Implementation and Responsibility:** Project location and mitigation will be developed through environmental analysis. Contracted projects are implemented by the contractor or operator.

Compliance with project criteria, contract specifications, and operating plans is assured by the Forest Service CI, COR, CO, FSR, or ER.

**Monitoring:** Monitoring is done during the NEPA field review process; plan in hand reviews, design reviews, progress review during construction, and the road construction review process. COR’s, CI’s, CO’s, FSR’s, and ER’s all may monitor implementation of this BMP.
R-23. **Road Decommissioning**

**Objective:** To reduce sediment generated from temporary roads or unneeded system roads by decommissioning them at the completion of their intended use.

**Explanation:** Many unplanned, unauthorized, and unclassified travel ways exist within National Forest System and BLM lands that are high priority candidates for decommissioning. Other priorities for decommissioning include temporary roads and roads previously classified as part of the forest transportation system based on anticipated management needs where use and needs have not materialized. An open and public roads analysis process is used to help identify roads that should be decommissioned, to identify restoration needs, and to establish decommissioning priorities. It may be necessary to regulate use on some unneeded roads until decommissioning or other approved uses, such as conversion to trails, can be achieved.

Decommissioning includes applying various treatments, which may include one or more of the following measures:

a. Re-establishing former drainage patterns, stabilizing slopes, and restoring vegetation;

b. Effectively blocking the entrance to a road to vehicle access; installing water bars;

c. Removing culverts, re-establishing drainage-ways, removing unstable fills, pulling back road shoulders, and scattering slash on the roadbed (See also BMP 2-24)

d. Completely eliminating the roadbed by restoring natural contours and slopes; or

e. Other methods designed to meet the specific conditions associated with the unneeded roads.

**Effectiveness:** High (EXP, BMPEP-R-5)

**Implementation:** For timber sales, the timber purchaser accomplishes temporary road closure stabilization and removal of temporary structures. The SA will enforce compliance with plans and TSC.

Decommissioning of the road to the level that it is blocked to vehicular traffic culverts and bridges removed, and the roadway stabilized as required by the TSC. Further re-vegetation needs are addressed in sale area improvement plans to achieve resource production above that required for stabilization of the road bed surface.

The ER or SA determines temporary road location and stabilization measures by agreement with the purchaser. The SA may request the advice of an earth scientist in determining the most appropriate location for stabilization measures and which measures are required.

Project crew leaders and supervisors will be responsible for ensuring that other temporary roads, developed by force account, meet construction, specifications and project criteria.
Temporary roads on NFS lands that are allowed through special use permits or easements will be subject to the same decommissioning requirements as temporary roads on timber sales. District Rangers or their representatives will be responsible for assuring the decommissioning of such roads is accomplished.

**Monitoring:** Monitoring is done during the NEPA field-review process, plan-in-hand reviews, design reviews, progress review during construction, and the road construction review process. COR’s, CI’s, CO’s, FSR’s, and ER’s all may monitor implementation of this BMP.
FUELS MANAGEMENT BMPs

F-1. Title: Fire and Fuel Management Activities

Objective: To reduce the potential public and private losses and environmental impacts which result from wildfire and/or subsequent flooding and erosion, by reducing the frequency, intensity and duration of uncharacteristic wildland fire.

Explanation:

Fuels Management Zones (FMZ) are designed to be defensible spaces where fire management resources could safely create fire-lines and initiate prescribed burns to stop wild land fires or meet prescribed fire goals.

Fuels Management Zones are initially established by cutting brush and small trees and removing slash by lopping and scattering, hand piling and burning, or under burning with prescribed fire.

Maintenance of FMZ’s will be conducted on five to ten year intervals using the same mechanical fuel treatments and prescribed fire used to create them.

Critical Habitat and Essential Fish Habitat: In addition to the site-specific BMPs described below for perennial and fish bearing streams (non-critical habitat), a 25-foot wide no-treatment buffer along streams will be maintained.

Perennial and Fish bearing streams (Non-critical habitat): When constructing FMZs within 25 feet of streams, limbing of mature trees and thinning of green trees and shrubs <9” DBH is permitted providing these activities are needed to reduce ladder fuels which could carry fire into the riparian overstory canopy, the overstory canopy is not reduced, and any shrub and hardwood species to be cut are capable of root-sprouting. No ignition within 25 feet of stream channels for fuels management, but fire will be allowed to back down to within 25 feet of streams. Within 100 feet of the stream channel, do not cause any mechanical ground disturbance (e.g. mineral soil exposure) unless it is considered necessary to build short lengths of hand fire line around large woody debris or snags to be retained if it is anticipated that they will be consumed by prescribed fire that is allowed to back into the Riparian Reserve.

Intermittent, non-fish bearing streams: No ignition within 100 feet of stream channels for fuels management, but fire may be allowed to back down toward the channel if all other project design criteria can be achieved. No slash piles will be burned within 100 feet of the stream channel. No mechanical or ground disturbance should occur across the stream channel.

Wild and Scenic Rivers: There would be no ground disturbance or exposure of mineral soil within 100 feet of these rivers.
Special Treatment Measures for Landslides, Potentially Unstable Areas, and Areas of High Erosion Potential: In stands with a basal area of less than 180 square feet/acre, retain all trees greater than 8 inches DBH. Do not fall trees in areas of active landslides and ravelly terrain. In these unstable or potentially unstable areas minimize FMZ width.

**Ability to implement:** High

**Effectiveness:** Moderate (EXP, BMPEP-R-5)

**Implementation and Responsibility:** Fuel Management is implemented through normal program planning and budgeting and NEPA processes, predominantly but not exclusively by the agency fire management organization. The interdisciplinary team will evaluate fuel management projects. The management requirements, mitigation measures, and multiple resource protection prescriptions are documented in the project EIS.

Application of mitigation measures and prescriptions are the responsibility of the project planners and supervisor.

**Monitoring:** Implementation and Effectiveness monitoring is done by the fuel management and other specialists within the agency fire organization. Watershed specialists evaluate the effectiveness of the soil and water mitigations for selected projects. BMP implementation and effectiveness monitoring for Fuel Management Zone construction will be done, at random locations during implementation.
F-2. Title: Consideration of Water Quality In Formulating Fire Prescriptions

Objective: To provide for water quality protection while achieving the management objectives through the use of prescribed fire.

Explanation: Prescription elements include such factors as fire weather, slope, aspect, soil moisture, and fuel moisture which influence the fire intensity and thus have a direct effect on whether or not a litter and/or debris layer remains after burning, and whether or not a water repellent layer is formed. The prescription will include at the watershed and sub-watershed scale the optimum and maximum burn block size, aggregate burned area, acceptable disturbance for continuous and aggregate length for the riparian/SMZ; and expected fire return intervals and maximum expected area covered by water repellent soils.

BMPs F-1 and F-2.

Ability to implement: High

Effectiveness: High (EXP, BMPEP-R-5)

Implementation and Responsibility: Field investigations are conducted as required to identify site-specific conditions, which may affect the prescription. Both the optimum and allowable limits for the burn to insure water quality protection will be established prior to preparation of the burn plan. The prescription elements and the optimum and maximum acceptable disturbance will be assessed by an IDT, and the prescription will be reviewed by the IDT and approved by the appropriate line officer.

Monitoring: Agency fire organization and watershed specialists will monitor BMP implementation and effectiveness at randomly selected sites.
F-3. Title: Protection Of Water Quality From Prescribed Burning Effects

Objective: To maintain soil productivity, minimize erosion, and minimize ash, sediment, nutrients, and debris from entering water bodies.

Explanation: Some of the techniques used to prevent water quality degradation are:

1. Constructing water bars in fire lines;
2. Maintaining the integrity of the Riparian Reserve or stream course;
3. Reduce fuel loadings in drainage channels.
4. Plan prescribed fires for burn intensities that when water repellant soils are formed, they are within the limits and at locations described in the burn plan.
5. Retain, or re-establish ground cover as needed to keep erosion of the burned site within the limits of the burn plan.

Ability to implement: High

Effectiveness: High (EXP, BMPEP-R-5)

Implementation and Responsibility: Forest Service and/or other crews are used to prepare the units for burning. This will include, but not be limited to, water barring fire lines, reducing fuel concentrations, and moving fuel to designated disposal and burning areas. The IDT will identify the Riparian Reserve/stream protection, and soils with high risk of becoming water repellant as part of project planning.

Monitoring: Monitoring will be done by agency fire organization staff and watershed specialists. BMP implementation and effectiveness monitoring for this BMP will also be done at randomly selected sites.
WATERSHED MANAGEMENT BMPs

W-3. Title: Protection of Wetlands
Objective: To avoid adverse water quality impacts associated with destruction or modification of wetlands.

Explanation: The Forest Service does not permit the implementation of activities and new construction in wetlands whenever there is a practical alternative. Evaluation of proposed actions in wetlands will consider factors relevant to the proposals effect on the survival and quality of the wetlands. Factors to be considered include water supply, water quality, recharge areas, flood and storm hazards, flora and fauna species, habitat diversity and stability, and hydrologic utility.

Ability to implement: High

Effectiveness: High (EXP)

Implementation and Responsibility: The Regional Forester is responsible for ensuring that wetland values are considered and documented as an integral part of all planning processes. The Forest Supervisor, through the use of earth scientists, will determine whether proposed actions will be located in wetlands, and if so, whether there is a practical alternative.

During project planning, the Forest Supervisor will establish communications with other agencies legislatively responsible for the protection of wetlands, Corps of Engineers, etc. at the minimum, to ensure that local requirements are identified and incorporated into the project plan.

If there are no viable alternatives, the Forest Supervisor must ensure that all mitigating measures are incorporated into the plans and designs and that the actions maintain the function of the wetlands.

Identification and mapping of wetlands are part of the land management planning data inventory process.

Monitoring: N/A, see explanation section.
Objective: To prevent contamination of waters from accidental spills.

Explanation: A contingency plan is a predetermined organization and action plan to be implemented in the event of a hazardous substance spill. Factors considered for each spill are the specific substance spilled, the quantity, its toxicity, proximity of the spill to waters, and the hazard to life and property. The SPCC Plan is a document that requires appropriate measures (40 CFR 112) to prevent oil products from entering the navigable waters of the United States. A Spill Prevention Control and Countermeasures (SPCC) Plan is needed if the total oil products on site above-ground storage exceeds 1320 gallons or if a single container exceeds a capacity of 660 gallons.

Ability to implement: High

Effectiveness: Moderate (EXP)

Implementation and Responsibility: The Rogue River-Siskiyou National Forest Hazardous Material Spill/Dumps/Discovery Emergency Action Plan (2/5/2004) contains the Forest's hazardous spill contingency plan. The spill plan identifies coordination responsibilities for various kinds of spills, as well as the names and telephone numbers of agencies to call for spill reporting and cleanup. Most spills are cleaned up by agencies or spill cleanup contractors specially equipped for the job. Disposal methods and sites will be coordinated with EPA, State, and local officials responsible for safe disposal.

SPCC Plans are required for Forest Service owned and special use permitted facilities, as well as by timber sale operators and other contractors who store petroleum products. They must be reviewed and certified by a registered professional engineer.

Monitoring: The Sale Administrator and Engineering Representative will track the implementation of this BMP throughout the timber sale. In the event of a spill, watershed specialists will be on hand to monitor the situation and provide advice.
W-5. Title: Cumulative Watershed Effects

**Objective:** To protect the beneficial uses of water and streams from the cumulative effects of multiple land management activities which individually do not create unacceptable effects, but collectively may result in adverse (degraded) water quality or stream habitat conditions.

**Explanation:** Cumulative, off-site watershed effects (CWE) include all adverse impacts on beneficial uses of water occurring away from the sites of actual land use activities, and which are transmitted by the drainage system. Because of the spatial and temporal variability of these effects, and the minor effects created at the point of activity, it is often difficult to evaluate cause and effect relationships and relate them to management practices.

**Ability to implement:** High

**Effectiveness:** Moderate (EXP)

**Implementation and Responsibility:** To ascertain the extent of additional management activity that can take place in a given watershed, a cumulative effects analysis is completed by the IDT.

**Monitoring:** N/A.
W-7. Title: Water Quality Monitoring

Objective: To determine effects of land management activities on the beneficial uses of water; to monitor baseline watershed conditions for comparison with State Water Quality Standards, Forest Plan Standard, and estimation of long-term trends; to ensure the health and safety of water users; to evaluate BMP effectiveness; and to determine the adequacy of data, assumptions, and coefficients in the Forest Plan.

Explanation: The Forest will manage watersheds to produce water of quality and quantity sufficient to maintain beneficial uses and comply with applicable State requirements for protection of waters.

Ability to implement: High

Effectiveness: Moderate (EXP)

Implementation and Responsibility: A water quality monitoring plan is written, reviewed, and implemented by qualified Forest personnel. Interpretation of the data and any reporting is also done by qualified personnel. The EPA STORET system should be used for computer storage of most water quality data collected.

Specific monitoring and evaluation plans should include such items as:
   a. Monitoring objectives
   b. Review of existing data and information
   c. Location of monitoring sites
   d. Soil or water quality characteristics that are to be monitored and evaluated
   e. Types(s) or techniques(s) of monitoring
   f. Responsibilities and roles of monitoring personnel
   g. Methodology for analysis and evaluation
   h. Estimated Cost
   i. Report preparation

When changes and effects from management activity are detected, the Forest will evaluate their significance and determine appropriate action. Where project level activities will not meet Forest plan standard or water quality objectives requirements for the protection of waters of the state, they will be redesigned, rescheduled, or dropped.

Monitoring: Project environmental documents are reviewed prior to approval to ensure that adequate monitoring is proposed. Water quality monitoring plans are developed or reviewed by Forest Watershed personnel and/or Forest NEPA coordinator and/or Forest Watershed Staff Officer. Also see Forest Plan monitoring Plan.
Literature Cited

USDA Forest Service, Timber Sale Administration Handbook (FSH 2409.15)


USDA Forest Service and USDI Bureau of Land Management. 1994. Standards and Guidelines for Management of Habitat for Late Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.


