

Appendix D Best Management Practices

Introduction

The Forest Service is required by law to comply with water quality standards developed under authority of the Clean Water Act. The Environmental Protection Agency and the State of Washington are responsible for enforcement of these standards. The Colville National Forest Plan states that the Forest will "maintain high quality water to protect fisheries habitat, water based recreation, public water supplies and be within state water quality standards". The use of BMPs is also required in the Memorandum of Understanding between the Forest Service and the State of Washington as part of our responsibility as the Designated Water Quality Management Agency on National Forest System lands. The State's water quality standards regulate nonpoint source pollution from timber management and road construction activities through application of Best Management Practices (BMPs). The BMPs were developed under authority of the Clean Water Act to ensure that Washington's waters do not contain pollutants in concentrations, which adversely affect water quality or impair a designated use. State recognized BMPs that will be used during project design and implementation are contained in these documents:

- a. Water Quality Standards for Surface Waters of the State of Washington Chapter 173-201A WAC
- b. Colville National Forest Temperature, Bacteria, and pH Total maximum Daily Load

The practices described herein are tiered to the practices in FSH 2509.22. They were developed as part of the NEPA process, with interdisciplinary involvement, and meet state and Forest water quality objectives. The purpose of this appendix is to: establish the connection between the Soil and Water Conservation Practice (SWCP) employed by the Forest Service and BMPs identified in Washington Water Quality Standards.

The objective of this appendix is to provide conservation practices for use on National Forest Lands to minimize the effects of management activities on soil and water resources. The conservation practices were compiled from Forest Service manuals, handbooks, contract and permit provisions, to directly or indirectly improve water quality, reduce losses in soil productivity and erosion, and abate or mitigate management effects, while meeting other resource goals and objectives. They are of three basic forms: administrative, preventive and corrective. These practices are neither detailed prescriptions nor solutions for specific problems. They are purposely broad. These practices are action initiating process mechanisms, which designation for the development of requirements and considerations to be addressed prior to and during the formulation of alternatives for land management actions. They serve as checkpoints, which are considered in formulating a plan, a program and/or a project.

Although some environmental impacts may be characteristic of a management activity, the actual effects on soil and water resources will vary considerably. The extent of these management effects on soil and water resources is a function of:

1. The physical, meteorological and hydrologic environment where the activity takes place (topography, physiography, precipitation, channel density, geology, soil type, vegetative cover, etc.).
2. The type of activity imposed on a given environment (recreation, mineral exploration, timber management, etc.) and its extent and magnitude.
3. The method of application and the duration of the activity (grazing system used, types of silvicultural practice used, constant vs. seasonal use, recurrent application or onetime application, etc.).
4. The season of the year that the activity occurs or is applied.

These factors vary within the National Forests in the Pacific Northwest Region and from site to site. It follows then that the extent and kind of impacts are variable, as are the abatement and mitigation measures. No solution prescription, method, or technique is best for all circumstances. Thus the management practices

presented in the following include such phrases as "according to the design", "as prescribed," "suitable for," "within acceptable limits," and similar qualifiers. The actual prescriptions, specifications, and designs are the result of evaluation and development by professional personnel through interdisciplinary involvement in the NEPA process. This results in specific conservation practices that are tailored to meet site specific resource requirements and needs.

BMP Implementation Process

In cooperation with the States, the USDA Forest Service's primary strategy for the control of nonpoint sources is based on the implementation of BMPs determined necessary for the protection of the identified beneficial uses. The Forest Service Nonpoint Source Management System consists of:

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

The District Ranger is responsible for insuring that this BMP feedback loop is implemented on all projects. The Practices described herein are tiered to the practices in the R1/R4 FSH 2509.22. They were developed as part of the NEPA process, with interdisciplinary involvement, and meet State and Forest water quality objectives. The purpose of this appendix document is to: 1) establish the connection between the SWCP employed by the Forest Service and BMPs identified in Washington Water Quality Standards and 2) identify how the SWCP, Standard Specifications for the Construction of Roads, and the Timber Sale Contract provisions meet or exceed the Rules and Regulations Pertaining to the Washington Water Quality Standards WAC (BMPs).

Format of the BMPs

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

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

Objective: Describes the SWCP objective(s) and the desired results for protecting water quality.

Effectiveness: Provides a qualitative assessment of expected effectiveness that the implemented BMP will have on preventing or reducing impacts on water quality. The SWCP effectiveness rating is based on: 1) literature and research (must be applicable to area 2) administrative studies (local or within similar ecosystem); and 3) professional experience (judgment of an expert by education and/or experience). The expected effectiveness of the SWCP is rated either High, Moderate or Low.

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

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

Moderate: Documentation shows that the practice is effective less than 90% of the time, but at least 75% of the time.

Or

Logic indicates that this practice is highly effective, but there is little or no documentation to back it up.

Or

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 to no documentation

Or

Applied logic is uncertain in this case, or the practice is estimated to be less than 75% effective.

Or

This practice is speculative and needs both effectiveness and validation monitoring.

The effectiveness estimates given here are general, given the range of conditions throughout the Forest. More specific estimates are made at the project level when the BMPs are actually prescribed.

Compliance: Provides a qualitative assessment of how the implementation of the specific measures will meet the Forest Practice Act Roles and Regulations pertaining to water quality.

Implementation: This section identifies: (1) the site-specific water quality protection measures to be implemented and (2) how the practices are expected to be applied and incorporated into the Timber Sale Contract.

Items Common to All Soil and Water Conservation Practices

Responsibility For Implementation: The District Ranger (through the Presale Forester or Range Management Specialist) is responsible for insuring the factors identified in the following SWCPs are incorporated into: Timber Sale Contracts through the inclusion of proper B and/or C provisions; or Public Works Contracts through the inclusion of specific contract clauses. This has been carried through to include Range Allotment Management Plans.

The Contracting Officer, through his/her official representative (Sale Administrator and/or Engineering Representatives for timber sale contracts; and Contracting Officers Representative for public works contracts) is responsible for insuring that the provisions are properly administered on the ground.

Monitoring: Implementation and effectiveness of water quality mitigation measures are also monitored annually. This includes routine monitoring by timber sale administrators, road construction inspectors, and resource specialists which is documented in diaries and project files. Basically, water quality monitoring is a review of BMP implementation and a visual evaluation BMP effectiveness. Any necessary corrective action is taken immediately. Such action may include modification of the BMP, modification of the project, termination of the project, or modification of the state water quality standards.

Abbreviations

TSC = Timber Sale Contract

SAM = Sale Area Map

TSA = Timber Sale Administrator

COR = Contracting Officer Representative

PWC = Public Works Contract

SCA = Stream Channel Alteration Act

SWCP= Soil and Water Conservation Practices

BMP = Best Management Practices

SMZ = Streamside Management Zone

SPS = Special Project Specifications

EPA = Environmental Protection Zone

CFR = Code of Federal Regulations

AMP = Allotment Management Plan

Key Soil and Water Conservation Practices

Class * Soil and Water Conservation Practice (FSH 2509.22)

*** Classes of SWCP (BMP)**

A = Administrative

G = Ground Disturbance Reduction

E = Erosion Reduction

W = Water Quality Protection

S = Stream Channel Protection/Stream Sediment Reduction

11 WATERSHED MANAGEMENT

W 11.01 Determination of Cumulative Watershed Effects

W 11.02 Soil and Water Resource Monitoring and Evaluation

W 11.03 Watershed Improvement Planning and Implementation

W 11.04 Floodplain Analysis and Evaluation

W 11.05 Wetlands Evaluation and Analysis

W 11.06 Public Supply Watershed Management

W 11.07 Oil and Hazardous Substance Spill Contingency Planning

W 11.09 Management by Closure to Use

W 11.11 Petroleum Storage and Delivery Facilities & Management

W 11.14 Management of Snow Survey Sites

13 VEGETATION MANIPULATION

G 13.02 Slope Limitations for Tractor Operation

G 13.03 Tractor Operation Excluded from Wetlands, Bogs, and Wet Meadows

E 13.04 Revegetation of Surface Disturbed Areas

E 13.05 Soil Protection During and After Slash Windrowing

E 13.06 Soil Moisture Limitations for Tractor Operation

14 TIMBER

A 14.02 Timber Harvest Unit Design

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

A 14.04 Limiting the Operating Period of Timber Sale Activities

E 14.05 Protection of Unstable Areas

A 14.06 Riparian Area Designation

G 14.07 Determining Tractor Loggable Ground

E 14.08 Tractor Skidding Design

E 14.09 Suspended Log Yarding in Timber Harvesting

A 14.10 Log Landing Location and Design

E 14.11 Log Landing Erosion Prevention and Control

E 14.12 Erosion Prevention and Control Measures During Timber Sale Operations

E 14.13 Special Erosion Prevention Measures on Areas Disturbed by Harvest Activities

E 14.14 Revegetation of Areas Disturbed by Harvest Activities

E 14.15 Erosion Control on Skid Trails

E 14.16 Meadow Protection During Timber Harvesting

S 14.17 Streamcourse Protection (Implementation and Enforcement)

E 14.18 Erosion Control Structure Maintenance

A 14.19 Acceptance of Timber Sale Erosion Control Measures Before Sale Closure

E 14.20 Slash Treatment in Sensitive Areas

A 14.22 Modification of the Timber Sale Contract

15 ROADS AND TRAILS

A 15.02 General Guidelines for Road Location/Design

E 15.03 Road and Trail Erosion Control Plan

- E 15.04 Timing of Construction Activities
- E 15.05 Slope Stabilization and Prevention of Mass Failures
- E 15.06 Mitigation of Surface Erosion and Stabilization of Slopes
- E 15.07 Control of Permanent Road Drainage
- E 15.08 Pioneer Road Construction
- E 15.09 Timely Erosion Control Measures on Incomplete Road and Stream crossing Projects
- E 15.10 Control of Road Construction Excavation & Sidecast Material
- S 15.11 Servicing and Refueling of Equipment
- S 15.12 Control of Construction In Riparian Areas
- S 15.13 Controlling In-Channel Excavation
- S 15.14 Diversion of Flows Around construction Sites
- S 15.15 Stream crossings on Temporary Roads
- S 15.16 Bridge & Culvert Installation (Disposition of Surplus Material and Protection of Fisheries)
- E 15.17 Regulation of Borrow Pits, Gravel Sources, and Quarries
- E 15.18 Disposal of Right-of-Way and Roadside Debris
- S 15.19 Streambank Protection
- E 15.20 Water Source Development Consistent with Water Quality Protection
- E 15.21 Maintenance of Roads
- E 15.22 Road Surface Treatment to Prevent Loss of Materials
- E 15.23 Traffic Control During Wet Periods
- G 15.24 Snow Removal Controls
- E 15.25 Obliteration of Temporary Roads
- E 15.27 Trail Maintenance and Rehabilitation
- A 16 Minerals

18 FUELS MANAGEMENT

- E 18.02 Formulation of Fire Prescriptions
- E 18.03 Protection of Soil and Water from Prescribed Burning Effects
- E 18.05 Stabilization of Fire Suppression Related Watershed Damage

19 RANGE MANAGEMENT

- A 19.01 Range Analysis, Allotment Management Plan, Grazing Permit System, and Permittee Operating Plan
- G 19.02 Controlling Livestock Numbers and Season of Use
- G 19.03 Controlling Livestock Distribution within Allotments
- W 19.04 Rangeland Improvements

Key Hydrology Definitions:

Perennial Stream = Surface water persists year long.

Ephemeral Stream = Flows only in response to precipitation. Often used in conjunction with intermittent.

Intermittent Stream = One which flows only seasonally or sporadically. Surface sources involve springs, snowmelt, artificial controls, etc. Often this term is associated with flows that reappear along various location of a reach, then run subterranean.

Floodplain = Where out-of-bank flows are able to spread out and dissipate the energy of the floodwaters and trap sediments and build the riparian sponge.

Site Specific Best Management Practices for the Summit Pierre Project

PRACTICE 11.01 – Determination of Cumulative Watershed Effects

PRACTICE 11.02 – Soil and Water Resource Monitoring and Evaluation

PRACTICE 11.03 – Watershed Improvement Planning and Implementation

Objectives: To determine the cumulative effects or impacts on beneficial water uses by multiple land management activities. Past, present or reasonably foreseeable future actions in watershed are evaluated relative to natural or undisturbed conditions. To monitor baseline watershed conditions for comparison with State standards, Forest Plan Standards, and estimation of long-term trend; to ensure the health and safety of water users; to evaluate SWCP's effectiveness; and to determine the adequacy of data, assumptions, and coefficients. To improve degraded watershed conditions, to minimize soil erosion, and to improve water availability or quality.

Effectiveness: High

Compliance: Meets FPS rules

PRACTICE 11.04 – Floodplain Analysis and Evaluation

PRACTICE 11.05 - Wetlands Analysis and Evaluation

Objectives: To delineate floodplains and wetlands within sale areas in order to prevent damage to facilities or degradation of soil and water resources. To protect floodplains and wetlands and avoid, where possible, the long and short-term adverse impacts to soils and water resources associated with the occupancy and modification of such.

Effectiveness: High

Compliance: FPA Rule 4.d.v(c) – Meets

PRACTICE 11.06 – Public Supply Watershed Management

Objectives: To manage community and noncommunity public supply watersheds to comply with State water quality standards.

Effectiveness: High

Compliance: Meets FPA rules

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

Objective: To reduce gully and sheet erosion and associated sediment production. To maintain wetland functions and avoid adverse soil and water resource impacts, turbidity, and sediment production associated with the destruction or modification of wetlands, bogs and wet meadows. To reduce sediment production resulting from compaction, rutting, runoff concentration, and subsequent erosion.

Effectiveness: Much of this mitigation consists of avoiding the impact [40 CFR 1508.20(a)]. The Forest Service has near-complete control over construction operations. Effectiveness is expected to be high.

Compliance: FPA Rule 3.h.iii - Meets

Implementation: At a minimum, the following specific protective requirements for wetlands identified on the Sale Area Map (SAM) will be incorporated into the appropriate contract. (Wetlands Protection):

1. Soil and vegetation along lakes, bogs, swamps, wet meadows, springs, seeps, or other sources where the presence of water is indicated will be protected from disturbance which would cause adverse effects on water quality, quantity, and wildlife and aquatic habitat (FPA Rule 3.h.iii).
2. An equipment exclusion zone shall extend a minimum of 50 feet from the wetlands, bogs, and wet meadows.

PRACTICE 13.04 - Revegetation of Surface Disturbed Areas

PRACTICE 14.13 – Special Erosion Prevention Measures on Areas Disturbed by Harvest Activities

PRACTICE 14.14 - Revegetation of Areas Disturbed by Harvest Activities

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

To establish a vegetative cover on disturbed sites in order to reduce erosion and sedimentation on disturbed areas that are not to be replanted.

Effectiveness: Revegetation can be moderately effective at reducing surface erosion after one growing season following disturbance and highly effective in later years. Effectiveness has been shown to vary from 10 percent on 3/4:1 slopes to 36 percent on 1:1 slopes to 97 percent on 1:1 slopes in later years (King, John G. and E. Burroughs. Reduction of Soil Erosion on Forest Roads. Intermountain Research Station General Technical Report, 1988).

Compliance: FPA Rules 3.d.iii & e.i, ii - Meets

Implementation: All temporary roads, landings, and skid trails in the sale area will be seeded within one year after harvesting is completed. Seed mixes will be incorporated into Timber Sale Contract provisions (Erosion Control Seeding). Timber Sale Contract provisions (Temporary Road, Skid Trail/Skid Road and Landing) will identify where scarification and/or ripping of compacted landings and closed roads will occur. If erosion problems still occur on these areas, or other problem areas are discovered or are brought to the attention of the Sale Administrator, KV Plans will be revised to reseed and/or fertilize, or provide for other control measures. If KV Funds are not available, Appropriated Funds will be used.

- a. Native plant materials are the first choice in re-vegetation, but non-native, non-invasive plant species may also be used (USDA Forest Service 2005a).

PRACTICE 14.03 – Use of Sale Area Maps for designing Soil and Water Protection Needs.

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

Effectiveness: High

Compliance: No related FPA rule

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

The stream courses (perennial, intermittent, and ephemeral) listed below will be designated as Stream Course Protection areas to be protected under the TSC. During layout of the units these areas will be excluded where possible. Where these areas cannot be easily excluded from the unit, these areas will be excluded by designating the timber as leave trees. Inland Native Fish Strategy standards and protected stream courses will be applied to the following areas:

1. Any unnamed channels that are shown on the sensitive landtype map.
 - a. Wetlands (meadows, lakes, potholes, etc.) to be protected per the timber sale contract clauses and those designated on the project wetland map.
 - b. Ephemeral channels will be protected through unit layout, marking plans, and/or designation on sale area maps.

The Purchaser and the Sale Administrator prior to harvesting will review these features on the ground. A hydrologist, soils scientist, or fisheries biologist will work with the Presale Forester to insure that the above features have been designated on the Sale Area Map during contract development.

PRACTICE 14.06 - Riparian Area Designation

PRACTICE 15.12 - Control of Construction in Riparian Areas

Objective: To minimize the adverse effects on Riparian Areas with prescriptions that manage nearby logging and related land disturbance activities.

Effectiveness: Moderate

Compliance: FPA Rules 3.g.ii, iii, & iv; 3.f.iv - Meets

Implementation: Riparian areas will be protected through the following requirements that will be incorporated into timber sale layout, or into the timber sale contract as identified below:

1. Provide the large organic debris, shading, soil stabilization, wildlife cover, and water filtering effects of vegetation along Class I streams [FPA Rule 3.g.i-iii]. The following measure(s) are implemented during sale layout:
 - (a) A Stream Protection Zone that consists of a buffer of 300 feet slope distance from the edge of the channel for specified Creeks. No timber harvest activities shall occur within the Stream Protection Zone or INFS Buffers.
 - (b) A Stream Protection Zone that consists of a buffer of 150 feet slope distance from the edge of the channel for the perennial tributaries to specified creeks or channels. No timber harvest activities shall occur within the Stream Protection Zone.
 - (c) A Stream Protection Zone that consists of a buffer of 100 feet slope distance from the edge of the channel for the intermittent tributaries to specified creeks or channels. No timber harvest activities shall occur within the Stream Protection Zone.

2. Waste resulting from logging operations, such as crankcase oil, filters, grease and fuel containers, shall not be placed inside the Stream Protection Zones [FPA Rule 3.f.iv].

PRACTICE 14.16 – Meadow Protection During Timber Harvesting

Objective: To avoid damage to the ground cover, soil and water in meadows.

Effectiveness: High

Compliance: No Related FPA Rule

Implementation: Vehicular or skidding equipment shall not be used on meadows except where roads, landings, and tractor roads are approved. In all cases, soil and vegetation will be protected from disturbance which would cause adverse affects on water quality, quantity and aquatic habitat. The TSC Provision B6.61 (Meadow Protection) is a standard provision in all contracts. Unless otherwise agreed, trees felled into meadows shall be removed by end-lining, and resulting logging slash shall also be removed. Damage to meadows, stream courses, and riparian areas caused by unauthorized Purchaser's operations shall be repaired by the Purchaser in a timely manner to restore and prevent further damage.

PRACTICE 14.17 – Streambank Channel Protection (Implementation and Enforcement)

PRACTICE 15.19 – Streambank Protection

Objective: To protect stream beds and streamside vegetation, during and after forest practice operations and road construction, by (1) maintaining unobstructed passage of stormflows; and (2) reducing sediment and other pollutants from entering streams.

Effectiveness: Much of this mitigation consists of avoiding the impact, minimizing the impact, or rectifying the impact [40 CFR 1508.20 (a-c)]. The Forest Service has near-complete control over construction operations. Effectiveness is expected to be high.

Compliance: FPA Rules 3.f.i, ii; 3.g.i,ii - Meets SCA Rules

Implementation: To reduce sediment and channel bank degradation at sites disturbed by construction of stream crossing or roadway fill, it may be necessary to incorporate "armoring" in the design of a structure to allow the water course to stabilize after construction. Riprap, gabion structures, and other measures are commonly used to armor stream banks and drainage ways from the erosive forces of flowing water. These measures must be sized and installed in such a way that they effectively resist erosive water velocities. Stone used for riprap should be free from weakly structured rock, soil, organic material and materials of insufficient size, all of which are not resistant to stream flow and would only serve as sediment sources. Outlets for drainage facilities in erodible soils commonly require rip-rapping for energy dissipation (FSH 7709.56B).

The intent of the regulations and clauses is to protect the integrity of stream channels, and minimize adverse impacts to the channel and downstream resources and beneficial uses. To list all of the regulations that would be implemented to protect and restrict channel alterations, would require a small book. The following items however, highlight some of the principal provisions incorporated into the TSC that will govern channel protection in the sale area.

1. Care shall be taken to cause only the minimum necessary disturbance to the natural appearance of the area. Streambank vegetation shall be protected except where its removal is absolutely necessary for completion of the work [SCPA Rule 9,1(c)].
 - a. All streambanks will be avoided by design.
2. If the channel is damaged during construction, it will be restored as nearly as possible to its original configuration without causing additional damage to the channel.
3. Purchaser shall repair all damage to a streamcourse if the Purchaser is negligent in their operations, including damage to banks and channel, to an acceptable condition as agreed to by the certified Sale Administrator and Purchaser's representative.
4. All project debris shall be removed from streamcourse, in an agreed manner that will cause the least disturbance. (Streamcourse Protection Provision). Specifically:
 - a. Whenever possible trees shall be felled, bucked, and limbed in such a manner that the tree or any part thereof will fall away from any Class I streams. Slash that enters Class I streams as a result of harvesting operations shall be continuously removed, as will other debris that enters Class I streams whenever there is a potential for stream blockage or if the stream has the

ability for transporting such debris. Material removed shall be placed five feet slope distance above the ordinary high water mark [FPA Rule 3.f.i].

- 1) Material to be removed will be all logging debris that is less than six inches in diameter and less than six feet long.
- b. Slash and other debris that enters Class II streams whenever there is a potential for stream blockage or if the stream has the ability for transporting the debris shall be removed immediately following skidding and placed above the ordinary high water mark [FPA Rule 3(f)(ii)].
 - 1) Material to be removed will be all logging debris that is less than six inches in diameter and less than six feet long.

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

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

Effectiveness:

1. Route location ground-truths the results of transportation planning and provides site-specific information on possible problem areas (Gray and Megahan, 1981; Cline *et. al.*, 1981; Megahan and Kidd, 1972; King and Gonsior, 1980).

2. Designed and controlled cut slopes, fill slopes, road width, and road grades effectively reduce sediment production by fitting the roads to the land (Bethalmy and Kidd, 1966; Burroughs, Watts, King, and Hanson, 1985; King, 1979; Megahan, 1978).

Compliance: FPA Rules 4.b.i,ii,iii & 4.c.i – Meets; SCA Rules 9,7 - Meets

Implementation: The following listed items are incorporated in general road location and design guidelines for minimizing impacts on water quality:

Design:

1. Roads shall be planned no wider than necessary to safely accommodate the anticipated use and equipment needs. Cut and fill volumes shall be minimized by designing the road to fit natural terrain features as closely as possible. As much of the excavated material as possible shall be used in fill sections. Minimum cuts and fills shall be planned, particularly near stream channels [FPA Rule 4.b.ii]
2. At a minimum, windrows would be installed 100 feet on both sides of live stream crossings and where installation would minimize sediment delivery to nearby streams or channels. Windrows would also be installed where fill slope erosion is possible, or where road derived erosion may be delivered; (i.e. outflow area of culverts or rolling dips, etc.). Openings for wildlife corridors would be incorporated at regular and appropriate intervals. No breaks in the windrow would occur within 150 feet of any streamcourse.
3. Seeding of erodible surfaces exposed during construction would be accomplished. Next season seeding would be done where original treatment is less than 50% successful.
4. Road construction occurring outside the normal operating season would have additional restrictions on the amount of pioneered road and additional erosion control measures.

Location:

1. Fit the road to the topography - Utilize natural benches, follow contours, avoid long, steep road grades. Balance cut/fill where possible to avoid waste areas.
2. Locate on stable topography. Embankments and waste shall be designed so that excavated material may be disposed of on geologically stable sites [FPA Rule 4.b.iii].
3. Avoid slumps and slide-prone areas, and steep sidehills.
4. Road construction shall be minimized within stream protection zones. Areas of vegetation shall be left or re-established between roads and streams [FPA Rule 4.b.i and Standard Road Specifications-Special Project Specification].
5. Where possible, locate turn-outs and turn-arounds at least 200 feet from water bodies or riparian zones. Where placement within 200 feet is necessary due to safety considerations, emphasize erosion control measures to protect water quality; i.e additional windrowing, seeding, etc.

Stream crossing sites:

1. Minimize the number of stream crossings, and choose stable sites. Major culverts will be sized, based on hydrologic analysis, to function effectively at 50 year peak flows, without water backing

up. These culverts will be tested to withstand 100 year peak flows without failing. All other live streams will be sized, based on hydrologic analysis, for 20 year peak flows with maximum headwater depth ratios of 1.2, and withstand 50 year peak flows without failing.

Road drainage: SEE SWCP 15.07

- a. Locate and design roads and trails to drain naturally by appropriate use of out-sloping, rolling dips, and grade changes, where possible. Cross drains will be installed in ditched areas to 1) carry intercepted flow across constructed areas; 2) to relieve the length of undrained ditch; and 3) to reduce disruption of normal drainage patterns. Road and trail drainage should be channeled to effective buffer areas, either natural or manmade, to maximize sediment deposition prior to entry into live water.
- b. Ditch lines and road grades will be designed to minimize unfiltered flow into streams. A rolling dip, relief culvert or similar structure will be installed as close as practical to crossings to minimize direct sediment and/or water input directly into streams. Route the drainage through SMZ, buffer strips, or other sediment settling structures where possible.
- c. Roads shall be planned to drain naturally by out-sloping or in-sloping with cross drainage and by grade changes where possible. Dips, water bars and/or cross drainage will be planned when necessary [FPA Rule 4(b)(iv)].
- d. Relief culverts and roadside ditches shall be planned whenever reliance upon natural drainage would not protect the running surface, excavation, or embankment. Culvert installations shall be designed to prevent erosion of the fill. Drainage structures shall be planned to achieve minimum direct discharge of sediment into streams [FPA Rule 4.b.v].

PRACTICE 15.03 - Road and Trail Erosion Control Plan

Objective: To minimize the effects of erosion and the degradation of water quality through erosion control work and road design.

Effectiveness: Moderate

Compliance: No Related FPA Rule

Implementation: Prior to the start of construction, the Contractor shall submit a schedule for proposed erosion control work as required in the Standard Specifications. The schedule shall include all erosion control items identified in the specifications. Erosion control work to be done by the Contractor will be defined in Standard Specifications and/or in the Drawings. The schedule shall consider erosion control work necessary for all phases of the project. The Engineer will certify that the Contractors Erosion Control Plan meets the specifications of Std. FS Spec. Section 204.

PRACTICE 15.06 - Mitigation of Surface Erosion and Stabilization of Slopes

Objective: To prevent, limit, and mitigate erosion, sedimentation, and resulting water quality degradation prior to the initiation of construction and to minimize erosion from road cutslopes, fillslopes, and travelways during and after construction.

Effectiveness: Moderate Seeding of cut slopes, fill slopes, and other disturbed areas reduces erosion from these sources after one growing season. Effectiveness has been rated at 85 percent or better once the vegetation has become established (King and Burroughs, 1988).

Compliance: FPA Rule 4.c.iii & d.ii - Meets

Implementation: The following erosion control objectives and mitigation measures have been developed by the IDT and will be reflected in contract specifications and provisions:

1. Areas where exposed material is potentially erodible, and where sediment would enter streams, shall be stabilized prior to fall or spring runoff by seeding, compacting, riprapping, benching, mulching, or other suitable means [IFPA Rule 4(c)(iii), and Standard Road Specifications-Special Project Specification].
 - a. These areas are avoided by design.
2. Slumps, slides, and other erosion features causing stream sedimentation shall be stabilized [FPA Rule 4.d.ii].
 - a. These sites have been identified and will be avoided.
3. Slash and debris may be windrowed along the toe of the fill [FPA Rule 4(c)(iv) and General Road Specifications].
 - a. Measures to reestablish vegetation will be accomplished by November 1 on exposed cut and fill slopes. Various operating seasons on varied units and sales within the FEIS Area will

require seeding specs to vary. Mulching will be required on erodible slopes where difficulty in re-establishing vegetation is anticipated.

b. Prompt attention to potential erosion problems, both anticipated and un-anticipated, before they become a water quality issue, will be required. On-site stock piling of straw bales for immediate availability and erosion cloth or a suitable substitute stored off-site but available will also be required.

Areas requiring mitigation of surface erosion will occur during the life of the timber sale contract. When these are found, the following provisions will be implemented.

- a. All disturbed areas associated with road construction and reconstruction will be seeded. The first seeding will be applied as soon as practical after cuts and fills are brought to grade within seeding seasons as established per appropriate specifications. A second seeding in the fall or spring season following road construction will be required where original seeding did not adequately revegetate exposed soil area.
- b. Where surface erosion is occurring because of inadequate vegetative cover, additional seeding and fertilization will occur using recommended seed and fertilizer mixes. Specifications cover re-seeding of cut slopes if bared by the purchaser's maintenance operation. If the purchaser has done his required seeding, or bare spots are not caused by the purchaser, revise the KV Plan to cover costs.
- c. Where ditches are carrying erosion products into stream channels, straw bale and erosion cloth ditch blocks will be installed to "short-circuit" the delivery. Seeding of the eroding surfaces, and seeding of the stored sediment in the ditch will also be accomplished. If problem areas are known before contract award required cross ditching on segments of road.
- d. Where either straw bale/erosion cloth structures are not felt to be effective, underdrains or other measures will be installed to drain the ditches onto suitable ground, or at least reduce erosion impacts to the stream. If problem areas are known before contract award, add provisions to require cross ditching on segments of road.
- e. Slumping of cutslopes will require a combination of both mechanical and vegetative controls. If/when this problem is found, a solution will be determined in consultation with Engineers and resource specialists and appropriate actions taken to remedy the situation or minimize adverse impacts.
- f. Additional underdrains and/or french drains will be constructed where intercepted moisture is encountered on incised stream approaches. Erosion control blankets and straw bales will be used to dissipate ditch scour and stabilize fill slopes.

PRACTICE 15.07 - Control of Permanent Road Drainage

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

Effectiveness: Moderate. Designed and controlled ditches, cross drain spacing, and culvert discharge prevent water from running long distances over exposed ground.

Compliance: FPA Rules 4.c.viii; 4.d.iii(a) & (b) - Meets

Implementation: The following items will be included in the timber sale contract provisions or road contract special project specifications.

- a. Temporary roads will be constructed as an outsloped road that follows the natural terrain. Following use, the purchaser will decommission (which may require obliteration) this road by restoring natural slope contours and placing slash and logs on top of the disturbed soil, and use of seeding if needed. The purpose of this requirement is to minimize potential for increasing sediment production and delivery (see Hydro Appendix).
- b. Reconstruction will include increasing pipe sizes or changing design on many of the existing stream crossings to provide fish passage (if needed) and pass 100 year flood discharges and prevent diversion of streamflow by the road.
- c. Unstable cut and fill slopes will be stabilized.
- d. Additional relief culverts will be installed to very frequently cross drain the roads. Distances between relief pipes will generally not exceed 200 to 250 feet.

- e. The grade of outsloped and insloped roads will be varied with graded rolling dips, drivable dips, or drivable waterbars to frequently cross drain surface water and to safely return water to stream channels in the event the culvert plugs.
- f. Gravelling will be used on native road surfaces to reduce surface erosion - especially near stream crossings. A minimum of a 4 inch lift is recommended.
- g. During and following operations on out sloped roads, retain out slope drainage and remove berms on the outside except those intentionally constructed for protection of road grade fills [IFPA Rule 4(c)(vi)].
- h. Construct cross drains and relief culverts to minimize erosion of embankments. Minimize the time between construction and installation of erosion control devices. Use riprap, vegetative matter, downspouts and similar devices to minimize erosion of the fill.
- i. Prior to fall or spring runoff, install drainage structures or cross drain uncompleted roads that are subject to erosion.
- j. Install relief culverts at a minimum grade of 1 percent greater than road gradient [IFPA Rule 4(c)(viii)].
- k. Energy dissipaters or downspouts will be placed below problem culvert outlets (Reconstruction item).
- l. Roads restricted after use will also have erosion control measures in place prior to final pull-out. Roads to be closed by any closure device other than a gate will be decommissioned.
- m. Drainage ways shall be cleared of all debris generated during construction and/or maintenance that potentially interfere with drainage or water quality [IFPA Rule 4(c)(ii)].

PRACTICE 15.10 - Control of Road Construction Excavation and Sidecast Material

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

See also Practice 13.05

Objective: To insure that unconsolidated excavated and sidecast material, construction slash, and roadside debris, generated during road construction, is kept out of streams and to prevent slash and debris from subsequently obstructing channels.

Effectiveness: High

Compliance: FPA Rule 4.c.iii,iv; & 4.d.i,ii,iii

The slash windrow and other erosion control devices will not be placed in existing stream channels or obstruct culvert outfalls. Large limbs and cull logs may be bucked into manageable lengths and piled alongside the road for fuelwood.

Implementation: In the construction of road fills near streams, compact the material to reduce the entry of water, minimize the amount of snow, ice, or frozen soil buried in the embankment. No significant amount of woody material shall be incorporated into fills. Slash and debris may be windrowed along the toe of the fill, but in such a manner as to avoid entry into a stream and culvert blockage.

Where slash windrows are not desirable or practical, other methods of erosion control such as erosion mats, mulch, and straw bale or fabric sediment fences will be used (Must be agreed upon by the hydrologist, soils scientist, or fisheries biologist). Where exposed material (excavation, embankment, borrow pits, waste piles, etc.) is potentially erodible, and where sediments would enter streams, the material will be stabilized prior to fall or spring runoff by seeding, compacting, rip-rapping, benching, mulching or other suitable means.

The following standard specs will be included in all road contracts that include clearing and excavation.

1. Standard Specification for Slash Treatment
2. Standard Specification for Excavation and Embankments

PRACTICE 15.13 - Controlling In-Channel Excavation

Objective: To minimize downstream sedimentation by insuring that all in-channel excavations are carefully planned.

Effectiveness: High

Compliance: SCA Rule 9,1(a) - Meets

Implementation: Location and method of stream crossings will be designed and agreed to prior to construction. The following items highlight some of the principal provisions incorporated into the TSC that will govern channel protection:

1. Construction equipment may cross, operate in, or operate near streamcourses **only** where so agreed to and designated by the Forest Service prior to construction. Crossing of perennial stream channels will be done in compliance with the specifications in the Stream Channel Alteration Act Rules and Regulations and included in the project specifications.
2. No construction equipment shall be operated below the existing water surface except that fording the stream at one location only will be permitted, and work below the water level that is necessary for culvert bedding or footing installations will be permitted to the extent that it does not create unnecessary turbidity or stream channel disturbance [SCA Rule 9,1 (a) and Standard Road Specifications-Special Project Specification].
3. Wheeled or track laying equipment shall not be permitted to operate within 5 feet slope distance of the apparent high water mark of Class II streams and 75 feet of Class I streams.
4. Construction of any hydraulic structures in stream channels will be in compliance with the Rules and Regulations pertaining to the Stream Channel Protection Act, Title 42, Chapter 38).

PRACTICE 15.14 – Diversion of Flows around Construction Sites

Objective: To minimize downstream sedimentation by insuring that all stream diversions are carefully planned.

Effectiveness: High

Compliance: Meets SCA Rules

Implementation: Flow in stream courses may only be diverted if the Forest Service deems it necessary for the contractor to meet contractual specifications. Such a diverted flow shall be restored to the natural stream course as soon as practicable. Stream channels impacted by construction activity will be restored to their natural grade, condition, and alignment.

PRACTICE 15.15 - Stream Crossings on Temporary Roads

See also Practice 15.13

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

Effectiveness: Moderate

Compliance: SCA Rules - Meets

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

- a. Temporary crossings on temporary roads will be removed when no longer needed, and any fills will be removed and the channel restored to pre-project condition.
- b. Material from temporary road and skid trail stream crossings will be removed and streambanks restored to an acceptable condition.
- c. Temporary crossings on temporary roads will only be allowed where anticipated or calculated flow is 40 CFS or less (approx. 48" CMP). Flow situations greater than this will normally not allow temporary crossings. Larger temporary crossing structures may be allowed following IDT review.

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

See also Practice 15.13.

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

Effectiveness: High

Compliance: SCA Rule - Meets

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

1. Diverting stream flow through or around project sites if needed during construction in order to minimize erosion and downstream sedimentation. Active streams will be de-watered or diverted during culvert installations.
2. Erodible material shall not be deposited into live streams.
3. Any material stockpiled on floodplains shall be removed before rising waters reach the stockpiled material.
4. During excavation in or near the streamcourse, it may be necessary to use suitable coffer dams, caissons, cribs or sheet piling. This will usually be the case where groundwater is contributing a significant amount of water to the immediate excavation area. If any of the aforementioned devices are used, they will be practically watertight and no excavation will be made immediately outside of them.
5. Water pumped from foundation excavation shall not be discharged directly into live streams, but shall be pumped into settling ponds or into locations where water will not re-enter water.
6. All fill material shall be placed and compacted in horizontal lifts. Areas to be filled shall be cleared of all vegetation, debris, and other materials that would be objectionable in the fill [SCPA Rule 9,1(d) and Standard Road Specifications].

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

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

Effectiveness: High

Compliance: No Related FPA Rule

Implementation: Minimize opportunities for erosion from Borrow pits and gravel sources from entering streams.

1. Complete any crushing and/or screening of excavated bedload away from any active stream channels and minimize future opportunities for waste materials to enter area streams, even under flood conditions.
2. Identify opportunities to minimize erosion from existing borrow pits within the drainage.
3. If development of new rock sources are needed within the watershed, complete a pit development plan or rock source development plan which outlines all mitigation measures needed to control future erosion at the rock source.

PRACTICE 15.21 - Maintenance of Roads

Objective: To conduct regular preventive maintenance operations to avoid deterioration of the roadway surface and minimize disturbance and damage to water quality, and fish habitat.

Effectiveness: Moderate

Compliance: FPA Rule 4.d.i, ii, iii, iv, v - Meets

Implementation: For roads in active timber sale areas standard Road Maintenance provisions require the purchaser to perform or pay for road maintenance work commensurate with the purchaser's use. Purchaser's maintenance responsibility shall cover the before, during, and after operation period during any year when operations and road use are performed under the terms of the timber sale contract. Purchaser shall perform road maintenance work, commensurate with purchaser's use, on roads controlled by Forest Service and used by purchaser in connection with this sale except for those roads and/or maintenance activities which are identified for required deposits. All maintenance work shall be done concurrently, as necessary, in accordance with Timber specifications set forth herein or attached hereto, except for agreed adjustments.

1. Sidecast all debris or slide material associated with road maintenance in a manner to prevent their entry into streams [IFPA Rule 4(d)(i) and Standard Road Specification-Special Project Specification].
2. Repair and stabilize slumps, slides, and other erosion features causing stream sedimentation [IFPA Rule 4(d)(ii) and Special Project Specification], to be approved by the hydrologist, soils scientist, or fisheries biologist.
3. Active Roads. An active road is a forest road being used for hauling forest products, rock and other road-building materials. The following maintenance shall be conducted on such roads.
 - (a) Culverts and ditches shall be kept functional.

- (b) During and upon completion of seasonal operations, the road surface shall be crowned, out-sloped, in-sloped or water barred, and berms removed from the outside edge except those intentionally constructed for protection of fills.
- (c) The road surface shall be maintained as necessary to minimize erosion of the subgrade and to provide proper drainage.
- (d) If road oil or other surface stabilizing materials are used, apply them in such a manner as to prevent their entry into streams [IFPA Rule 4(d)(iii)].

Effectiveness: These measures should effectively minimize erosion from roads.

4. Inactive roads. An inactive road is a forest road no longer used for commercial hauling but maintained for access (e.g., for fire control, forest management activities, recreational use, and occasional or incidental use for minor forest products harvesting). The following maintenance shall be conducted on inactive roads.
 - (a) Following termination of active use, ditches and culverts shall be cleared and the road surface shall be crowned, out-sloped or in-sloped, water barred or otherwise left in a condition to minimize erosion. Drainage structures will be maintained thereafter as needed.
 - (b) The roads may be permanently or seasonally blocked to vehicular traffic [FPA Rule 4.d.iv].
 - (c) Roads will be seeded.
 - (d) The roads may be permanently or seasonally blocked to vehicular traffic.
5. Abandoned Roads. An abandoned road is not intended to be used again. No subsequent maintenance of an abandoned road is required after the road is made hydrologically inert:
 - (a) The road is left in a condition suitable to control erosion by out-sloping, water barring, seeding, or other suitable methods.
 - (b) Ditches are cleaned.
 - (c) The road is blocked to vehicular traffic.
 - (d) The department may require the removal of bridges and culverts except where the owner elects to maintain the drainage structures as needed.

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

PRACTICE 15.25 – Obliteration of Existing and Temporary Roads

Objective: To reduce sediment generated from existing and temporary roads by decommission or obliterating them at the completion of their intended use.

Effectiveness: High

Compliance: Meets FPA Rules

Implementation: Effective obliteration is generally achieved through a combination of the following measures (Hydrology Appendix H):

1. Recontouring stream crossings to natural gradient and width restoring full floodplain and valley features to natural contour.
2. Recontour unstable fill or cutslopes to natural contours. Decompact the bench portion of the road prism a minimum of 14 inches before placing excavated fill against the cutslope and on the prism.
3. Provide adequate cross drainage for the road. Waterbars placed on a maximum spacing of 30 feet will be the primary means of cross draining roads with stable cut and fill slopes. Outsloping will be the primary means of cross draining unstable road segments.
4. Road returned to resource production through revegetation. Stream crossings will be seeded with a seed mix approved for erosion prevention and covered with straw mulch. Natural regeneration of grass, brush, and trees can usually be relied upon to revegetate the portions of the road prism between stream crossings. Available or recruited wood debris, vegetation, and slash will be used to promote revegetation and protection of disturbed soil surfaces.

PRACTICE 18.02 – Formulation of Fire Prescriptions**PRACTICE 18.03 – Protection of Soil and Water from Prescribed Burning****PRACTICE 18.05 – Stabilization of Fire Suppression Related Watershed Damage**

Objective: To maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients and debris from entering surface water. To stabilize all areas that have had their erosion potential significantly increased, or their drainage pattern altered by suppression related activities.

Effectiveness: High

Compliance: No Related FPA Rule

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

1. Foaming agent will not be used in project area creeks above diversions for water. Foaming agents will not be used for water control lines where any of the ephemeral channels could carry the material to intermittent or perennial streams.
2. Machine constructed firelines will not be used on the sensitive landtypes displayed on the Soils Map.
3. Firelines must be frequently waterbarred (not to exceed 50 foot spacing when going up and down the hill).
4. Maintain large organic debris appropriate to the habitat type (see "Managing Coarse Woody Debris in the Forests of the Rocky Mountains" by Graham et. al. 1994).
5. Limit prescribed burning to those times when surface soil moisture is usually above 25 percent to reduce the potential for damage from hot burns.

PRACTICE 11.07 – Oil and Hazardous Substance Spill Contingency Planning**PRACTICE 11.11 – Petroleum Storage and Delivery Facilities & Management****PRACTICE 15.11 – Servicing and Refueling of Equipment**

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

Effectiveness: Although SPCC Plans cannot eliminate the risk of materials being spilled and escaping into waters, they can if followed be effective at reducing adverse effects to tolerable levels. Depending on the location and quantity of a spill, a properly implemented Plan can provide for up to 100 percent containment of a spill.

Compliance: FPA Rule 2.j.i,ii - Meets

Implementation: A provision will hold the purchaser responsible for taking appropriate preventive measures to insure that any spill of oil or oil products does not enter any stream or other waters of the United States. If the total oil or oil products storage exceeds 1320 gallons or if any single container exceeds a capacity of 660 gallons, the purchaser will prepare a Spill Prevention Control and Countermeasures Plan. The plan shall meet EPA requirements including certification by a registered professional engineer. If necessary, specific requirements for transporting oil to be used in conjunction with the contract will be specified in the appropriate contract provisions.

The Sale Administrator will agree to the location, size and allowable uses of service and refueling areas. The criteria below will be followed at a minimum:

1. Petroleum product storage containers with capacities of more than 200 gallons, stationary or mobile, will be located no closer than 100 feet from stream, water course, or area of open water. Dikes, berms, or embankments will be constructed to contain the volume of petroleum products stored

within the tanks. Diked areas will be sufficiently impervious and of adequate capacity to contain spilled petroleum products. [FPA RULE 2(j)]

2. Transferring petroleum products: During fueling operations or petroleum product transfer to other containers, there shall be a person attending such operations at all times [FPA Rule 2(j)(i)].

3. Equipment used for transportation or storage of petroleum products shall be maintained in a leakproof condition. If the Forest Service Representative determines there is evidence of petroleum product leakage or spillage he/she shall have the authority to suspend the further use of such equipment until the deficiency has been corrected. [FPA Rule 2(j)(ii)]

4. For longer term storage, a sump pond lined with plastic will be constructed equal to the volume of fuel stored on the site.

In the event any leakage or spillage enters any stream, water course or area of open water, the operator will immediately notify the COR who will be required to follow the actions to be taken in case of hazardous spill, as outlined in the Forest Hazardous Substance Spill Contingency Plan.

PRACTICE 15.20 – Water Source Development Consistent With Water Quality Protection

Objective: To supply water for road construction and maintenance and fire protection while maintaining water quality.

Explanation: Water source development is normally needed to supply water for road construction, dust control, mixing surface, compaction, planting and for fire control requirements of the timber Purchaser. Water source development should aim toward the construction of durable, long term water sources rather than the construction of hasty, expedient developments. Permanently designed sources, such as tanks, will result in the lowest, long term impact to the affected streams.

Other considerations in the development of water sources should be:

- a. Downstream flow should not be reduced so as to detrimentally affect aquatic resources, fish passage, or other uses.
- b. Temporary cofferdams should be constructed of sandbags containing sand or clean gravel, or of other materials and means which will not induce sediment in the stream.
- c. Overflow should go directly back into the stream.
- d. All temporary facilities for gathering water will be removed prior to causing any resource damage.

Implementation: Certified Sale Administrators and Engineering Representatives in conjunction with technical resource staffs should evaluate streams in which water developments may be constructed. Project location and detailed mitigation measures are developed by the interdisciplinary approach during the environmental analysis. Forest Service supervisors are responsible for insuring that In-Service projects meet design standards and management requirements. For contracted projects, compliance with contract specifications and the operating plan is assured by the Contracting Officer and/or engineering Representative.

Any damage to resources caused by Purchaser's operations or fire suppression activities shall be retired by purchaser or fire suppression crews in a timely and agreed manner to the extent practical to restore and prevent further resource damage.

References: Standard Specifications; Timber Sale Contract Provisions; SWCP 14.03; Timber Sale Administration Handbook (FSH 2409.150; see references in "Best Management Practice" Definition (05--2 and 3).