APPENDIX B

BEST MANAGEMENT PRACTICES

TROUT VEGETATION MANAGEMENT PROJECT

PT-1. Timber Sale Planning Process: The timber sale planning process will identify problems and provides for administrative controls, corrective treatments, and preventive measures. This process will define and estimate the potential changes to water quality and instream beneficial uses. An analysis of cumulative watershed effects will also be completed. The EA will describe how to avoid potential damage during and following the sale layout and subsequent logging operations. Mitigation of damaging effects for those treated areas where damage is unavoidable will be required. The EA will also preclude treatment of environmentally sensitive areas where damage from proposed treatments cannot be mitigated to conform to Federal, State and Local water quality criteria.

Hydrologists, fish biologists, geologists, and soil scientists will evaluate watershed characteristics and estimate the response to proposed timber harvest and related activities. The timber sale project will be designed to include site-specific prescriptions for each area of water quality concern. The subsequent Timber Sale Contract will include provisions to meet water quality criteria and other resource protection requirements as provided by the EA.

Ability to Implement: High
Effectiveness: High
Monitoring: This is part of the timber sale planning process required by policy and procedures. No additional monitoring is needed.

PT-2. Timber Harvest Unit Design (See INFISH Standards and Guidelines TM-1): The proposed timber harvest units will be evaluated to estimate the response of the watersheds involved to the proposed timber sale. This will include examining the ability of the watershed to absorb the impacts of the proposed harvest. Characteristics to be evaluated will include the recovery from past harvests; wildfire: the allowable area that can be harvested; the protection of channels; the number, size, and location of harvest units; estimated location and size of roads and skid trails; logging system design; and the potential natural recovery rate of the watershed. Where adverse impacts on the water resource can result, the harvest unit design will be modified, and/or watershed treatment measures will be applied to accelerate the natural recovery rate.

The hydrologic survey and evaluation of proposed timber harvest is accomplished through the interdisciplinary process of timber sale planning. Prescriptions to assure acceptable watershed conditions are incorporated into the EA, sale plan or analysis files. The Sale Preparation Forester, the Sale Administrator, and the administrator of post-sale slash disposal and cultural activities carry out on-the-ground accomplishment, with follow-up review by qualified resource specialists (hydrologists, fisheries biologists, soil scientists, and geologists).

Ability to Implement: High
Effectiveness: High
Monitoring: The need for water quality monitoring is identified in the EA when necessary for water quality control. Periodic NEPA field reviews evaluate timber harvest unit design. Also see Forest Plan monitoring plan.

PT-3. Use of Erosion Potential Assessment for Timber Harvest Unit Design: The potential for erosion and mass wasting for an area will be estimated by evaluating the soil, topography, rock type, drainage patterns, water conditions, and plant community. Where the potential for erosion and mass wasting is high, special practices and mitigation measures will be applied. Where the potential is low to moderate, some special practices and mitigation measures would be applied, but generally fewer than for areas having high erosion and mass wasting potential.

In order to minimize erosion from sensitive areas, examine proposed harvest areas to identify highly erodible sites. Propose special mitigation as needed.

The following special mitigation measures were identified for soil erosion:

Alternative B

- Unit 8 – there is an escarpment mid-way in the unit. Keep equipment off the site. Avoid an intense underburn in this area.
- Unit 10 – below FR 2149000 in the NW corner is an escarpment and some evidence of past landslide activity. Keep equipment off the steep slopes. Watch skid trail drainage in this area to prevent concentrating water onto unstable areas.
- Units 13, 14, 42 – there is an inner gorge/escarpment north of FR 2148101/102. The gorge shows evidence of instability in the distant past (spoon-shaped features). The soil scientist recommends keeping these units entirely above the road.
- Unit 19 – there is an escarpment midway in the unit. No equipment on these steep sandy slopes, and avoid an intense underburn in this area.

Alternative C

- Unit 8 – there is an escarpment mid-way in the unit. Keep equipment off the site. Avoid an intense underburn in this area.
- Unit 10 – below FR 2149000 in the NW corner is an escarpment and some evidence of past landslide activity. Keep equipment off the steep slopes. Watch skid trail drainage in this area to prevent concentrating water onto unstable areas.
- Unit 19 – there is an escarpment midway in the unit. No equipment on these steep sandy slopes, and avoid an intense underburn in this area.

The determination of the potential for erosion and mass wasting will be part of the pre-sale planning process and will be evaluated for each timber harvest unit by a watershed specialist. The interdisciplinary team will then use the information to help design the timber sale.

Ability to Implement: High since this is a planning function.
Effectiveness: High
Monitoring: Watershed specialists will evaluate the post-harvest condition of selected harvest units as part of Forest Plan monitoring.

PT-4. Use of Sale Area Maps for Designating Water Quality Protection Needs: The following features will be designated on the Sale Area Map, which is an integral part of the Timber Sale Contract

a. Location of stream courses 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, felling, and yarding methods
h. Sources of rock for road work, riprapping, etc.
i. Water sources available for Purchaser's use
j. Other features required by Division "C" contract provisions

The interdisciplinary team will identify and delineate these and other features on maps which will be included in the sale plan or analysis files, along with a discussion of each area. The Sale Preparation Forester will includes them on the Sale Area Map at the time of contract preparation. The areas will be reviewed on-the-ground by the Purchaser and the Sale Administrator prior to harvesting.

Ability to Implement: High, but depends on field verification of map work.
Effectiveness: High
Monitoring: The Sale Area Map is checked by the Sale Preparation Forester, engineers, and watershed specialists to assure accuracy. Also see Forest Plan monitoring plan.

PT-5. Limiting the Operating Period of Timber Sale Activities: The Timber Sale Contract will specifies a Normal Operating Season, during which, operations may generally proceed without resource damage. Operations will be

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 analysis, the Timber Sale Contract will limit operations to specific periods or weather conditions. Operations will not be permitted to continue if damage will occur.

Limited operating periods will be identified and recommended during the Timber Sale Planning Process by the interdisciplinary team and followed through the life of the timber sale, primarily by the Sale Administrator.

Ability to Implement: Moderate, since judgment is needed to identify potential damaging conditions.
Effectiveness: High
Monitoring: Since this is required in the sale contract, the Sale Administrator will ensure compliance.

PT-6. Protection of Unstable Lands: Unstable lands (Timber Marginal Lands, TML) are designated as unsuitable to be managed for timber production, but where appropriate, may be suitable for timber harvest following catastrophic events, such as wildfire or blowdown. Lands designated as unsuitable will be reviewed and analyzed as part of the forest planning process. The final decision regarding suitability will become part of the Forest Plan. Small unstable areas are frequently not identified until project level planning occurs.

The interdisciplinary team will use input provided by the watershed specialists. Where unstable lands are presently classified as suitable forest lands and this is found to be in error, they will be changed to the classification of unsuitable forest lands.

Ability to Implement: High
Effectiveness: High
Monitoring: Watershed and silviculture specialists will assist sale layout personnel in an advisory capacity during sale layout. NEPA field reviews will also be used to evaluate the effectiveness of this BMP. Also see Forest Plan monitoring plan.

PT-7. Streamside Management Unit/Riparian Habitat Conservation Area Designation: Riparian Habitat Conservation Areas (RHCAs) are defined in the Inland Native Fish Strategy (INFISH) Environmental Assessment of 1995.

The streamside management unit requirements will be identified by the interdisciplinary team during the environmental analysis. The timber sale project will be designed to include site-specific BMP prescriptions for the prevention of sedimentation and other stream damage from logging debris. The Timber Sale Contract will be designed to implement the streamside management unit prescriptions and areas of avoidance.

Ability to Implement: High
Effectiveness: High
Monitoring: Watershed Specialists will assist in evaluating the effectiveness of this BMP. NEPA field reviews will also be used to evaluate the effectiveness of this BMP. Also see Forest Plan monitoring plan.

PT-8. Streamcourse Protection (Implementation and Enforcement): The following points are fundamental to protecting streams and streamcourses:

a. Location, method and timing of streamcourse crossings will be agreed to prior to construction. This will be done after locations of skid trails, tractor roads, and temporary roads are agreed on by the Forest Service and the Purchaser.
b. Purchaser shall repair all unavoidable damage to a streamcourse, including damage to banks and channel, to the extent practicable.
c. All project debris shall be removed from streamcourses, unless otherwise agreed, and in an agreed manner that will cause the least disturbance.
d. Equipment shall not operate within streamside management units or protected streamcourses, as identified on the Sale Area Map.
e. Equipment will be permitted to enter streamside areas only at locations agreed to by the Sale Administrator and the Purchaser.
f. Water bars and other erosion control structures will be located so as to prevent water and sediment from being channeled into streamcourses, and to dissipate concentrated flows.

g. Logs will normally be fully or partially suspended in cable log harvesting operations within the streamside management unit of protected streamcourses.

The Sale Administrator will work with the Purchaser's representative to ensure that the Timber Sale Contract provisions covering the above items are carried out on the ground. Specialists can be called upon to help the Sale Administrator with decisions.

Ability to Implement: High
Effectiveness: High
Monitoring: Specialists will assist in evaluating the effectiveness of this BMP. NEPA field reviews will also be used to evaluate the effectiveness of this BMP. Also see Forest Plan monitoring plan.

PT-9. Determining Tractor Loggable Ground: Tractor logging will be restricted to lands that can be harvested with a minimum of soil compaction and erosion. Factors considered when selecting tractor operable land are: slope, topography, soil texture, soil drainage, and drainage pattern.

Limit the slopes where tractors may operate. Tractor and skidder logging would be limited to slopes less than 35%. Short pitches may be steeper. Avoid long steep skid trails. Applies to all units.

Limit the slopes where CTL (cut-to-length) equipment may operate. Cut-to-length logging would be limited to slopes less than 40%. Short pitches may be steeper, such as the access from the road. Applies to all units.

Land suitable for tractor logging will be identified in the pre-sale phase of the timber sale planning process. Provisions in the Timber Sale Contract specify the areas and conditions upon which tractors can operate. Requirements governing tractor operations are incorporated in the Timber Sale Contract.

Ability to Implement: High
Effectiveness: High
Monitoring: The Sale Administrator oversees the operation to ensure compliance. Specialists will conduct field evaluations of selected tractor logging units. Also see Forest Plan monitoring plan.

PT-10. Log Landing Location: All landings will be approved prior to clearing, or will be located by the Forest Service, under provisions of the Timber Sale Contract. The following criteria are used in evaluating landings:

a. The cleared or excavated size of landings shall not exceed that needed for safe and efficient yarding and loading operations.
b. Landing locations will be selected on the basis of the least amount of excavation and erosion potential, where sidecast will neither enter drainages nor damage other sensitive areas.
c. Landings will be located so that designated timber can be yarded with minimal disturbance to stream channels or violating the streamside management unit requirements.
d. Reuse landings that are already detrimentally compacted to the extent possible in order to avoid detrimentally compacting additional new areas. The landings that are easily recognized are detrimentally disturbed. In most of the treatment areas landings were located in reasonably appropriate areas. This applies to all proposed timber sale treatment areas.
e. Prevent compaction of areas outside of designated landings. Mechanized felling equipment would not be allowed to operate off of designated landings. Use of mechanized felling equipment off of designated landings would require a site specific analysis by the Forest Soil Scientist. Applies to all units.

The majority of landings will be constructed during road construction of specified roads. The Sale Administrator will ensure that the landings are located and constructed according to the Timber Sale Contract.

Ability to Implement: High
Effectiveness: High
Monitoring: Watershed specialists will assist in evaluating the effectiveness of this BMP. Also see Forest Plan monitoring plan.

PT-11. Tractor Skid Trail Location and Design: Factors that will be considered in the design and location of skid trails include size of logs, slope, aspect, soil drainage and stability, exposure, streamside management units, meadows, and other factors that affect compaction, erosion, runoff, and sediment yield. The careful control of skidding patterns can minimize on-site compaction and off-site damage.

Some complementary methods of protecting water quality when tractor yarding are:

End-Lining: This method involves winching the log directly out of the sensitive areas while keeping the tractor outside of the sensitive area. Bull line is pulled from the tractor to each log.

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 use is limited to skid trails.

Reuse areas that are already compacted. To the extent possible, use existing detrimentally compacted skid trails and skid roads. The skid trails that are easily recognized are detrimentally disturbed. In most of the treatment areas the skid trails were located in reasonably appropriate areas. This applies to all proposed timber sale treatment areas with the following modifications --

- Alternative B
  - → Unit 4 – some of the skid trails are too steep. Use only the suitable skid trails.
  - → Unit 10 – several steep skid trails in the north end of the unit. Don't use all of them. Pick the best and allow the others to move toward natural restoration.
  - → Unit 12 – don't use the steep skid trails at the very bottom of the unit. Endline from this area.
  - → Unit 21—some steep areas especially below the road.
- Alternative C
  - → Unit 10 – several steep skid trails in the north end of the unit. Don't use all of them. Pick the best and allow the others to move toward natural restoration.
  - → Unit 12 – don't use the steep skid trails at the very bottom of the unit. Endline from this area.
  - → Unit 21—some steep areas especially below the road.

Minimize the compaction of new areas by designating trail spacing for tractor logging equipment. For tractor units, the skid trails should be at least 130 feet apart except when converging i.e., at landings or to avoid streams or rock outcrops. This applies to all units.

Minimize the compaction of new areas by designating trail spacing for CTL (cut-to-length) equipment.
For CLT units, forwarder trails should be about 40 feet apart and effectively buffered with slash or snow. This applies to all units.

Prevent compaction of areas outside of designated skid trails. Mechanized felling equipment would not be allowed to operate off of designated skid trails. Use of mechanized felling equipment off of designated skid trails would require a site-specific analysis by the Forest Soil Scientist. Applies to all units.

Sensitive areas, including steep and unstable ground, drainages, and high water table soils will be identified in silvicultural prescriptions and logging plans. Prescriptions, including skid trail patterns, may be included in the Timber Sale Contract and on the Timber Sale Map. The Sale Administrator will execute 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.

Ability to Implement: High
Effectiveness: High
Monitoring: The Sale Administrator observes operations and watershed specialists visually monitor implementation of this BMP periodically throughout implementation. Also see Forest Plan monitoring plan.

PT-12. Suspended Log Yarding in Timber Harvesting: Suspended log yarding applies only to skyline yarding systems. Ground disturbance will be reduced by suspending logs either partially or wholly above the ground while transporting them to the landing. Skyline yarding systems require fewer truck roads. Less soil disturbance and fewer truck roads will result in less impact on the water resource.

Suspend logs while cable, or skyline yarding. One end would generally be suspended to keep the forest floor in tact. One-end suspension may not be feasible in the vicinity of rock outcrops and "knobs". Applies to all skyline and cable units, and portions thereof.

- Alternative B cable/skyline units 1, 17, 20, 32, and 43.
- Alternative C cable/skyline units 17 and 32.

Sensitive areas, including steep and unstable ground, drainages, and high water table soils will be identified in silvicultural prescriptions and logging plans. Prescriptions, including skid trail patterns, may be included in the Timber Sale Contract and on the Timber Sale Map. The Sale Administrator will execute 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.

Ability to Implement: High
Effectiveness: High
Monitoring: Watershed specialists periodically evaluate on-going harvest operations. Also see Forest Plan monitoring plan.

PT-13. Erosion Prevention and Control Measures During Timber Sale Operations: Equipment will not be operated when ground conditions are such that excessive damage will result. The kinds and intensity of control work done by the timber sale purchaser will be adjusted to ground and weather conditions and the need for controlling runoff. Erosion control work will be kept current immediately preceding expected seasonal periods of precipitation or runoff. The Sale Administrator and Forest Service Representative will oversee implementation by the purchaser. Specialists will be consulted for advice, as needed. Applies to all units.

Ability to Implement: High
Effectiveness: High
Monitoring: In addition to responsibilities for implementation described above, watershed specialists will evaluate the effectiveness of seasonal erosion control work. Also see Forest Plan monitoring plan.

PT-14. Revegetation of Areas Disturbed by Harvest: Where soil has been severely disturbed by the Purchaser's operations, and the establishment of vegetation/cover is needed to minimize erosion and protect water quality, the Purchaser shall take appropriate measures normally used to establish an adequate cover of grass or other vegetation, including the application of seed, mulch, and fertilizer as necessary, or take other agreed upon stabilization measures.

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

For cable/skyline units, seed and scarify landings and seed any highly disturbed skyline corridors.

An estimate of the need will be included in the sale plan or sale planning records, and in the timber sale appraisal. Where the establishment of vegetation is needed, appropriate language will be included in the Timber Sale Contract. The Forest Service will annually designate on the ground the disturbed soils, such as logging areas and temporary roads that must be treated.

Forest Service will provide requirements 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 Sale Administrator to make sure that revegetation work is done correctly and in a timely manner.

Ability to Implement: High
Effectiveness: High
Monitoring: Watershed specialists will assist the Sale Administrator during implementation and also in evaluating the effectiveness of this BMP. Also see Forest Plan monitoring plan.

PT-15. Log Landing Erosion Prevention and Control: The Sale Preparation or Planning Forester and Sale Administrator will assess the need for stabilization, with watershed specialist input as needed.

Timber Sale Contract requirements provide for erosion prevention and control measures on all landings. Provisions are made in the Timber Sale Contract for landings to have proper drainage. After landings have served the Purchaser's purpose, the Purchaser shall ditch or slope the landings to permit the drainage and dispersion of water. Provisions will also be made for revegetation, if necessary. The specific work needed on each landing will depend on the actual ground conditions. It is the responsibility of the Sale Administrator to ensure that this practice is properly implemented on the ground.

Ability to Implement: High
Effectiveness: High
Monitoring: Watershed specialists will assist in evaluating the effectiveness of this BMP. Also see Forest Plan monitoring plan.

PT-16. Erosion Control on Skid Trails: The Timber Sale Contract will require the installation of erosion control measures on skid trails, tractor roads, and temporary roads. Normally, the work will involve constructing cross ditches and water spreading ditches. Other methods such as backblading may be agreed to in lieu of cross drains. Grass seeding may also be required in the Timber Sale Contract. These areas will be designated on the ground annually as logging and temporary access construction progresses.

Design the skid trails to facilitate drainage (not long straight trails) and install cross-drain structures (e.g., waterbars) to dewater the trail. This work is done in conjunction with seeding for revegetation. Applies to all units.

Location of all erosion control measures will be designated and agreed to on the ground by the Sale Administrator. The Purchaser will be obligated to complete and maintain erosion control work specified in contract provisions. The Sale Administrator will ensure that the Purchaser completes and maintains the erosion control work specified in the Timber Sale Contract.

Ability to Implement: High
Effectiveness: High
Monitoring: Watershed specialists assist the Sale Administrator, as needed, with on-going operations and also evaluate the effectiveness of this BMP. Also see Forest Plan monitoring plan.

PT-18. Erosion Control Structure Maintenance: During the period of the Timber Sale Contract, the Purchaser shall provide maintenance of soil erosion control structures constructed by the Purchaser. The Sale Administrator will oversee the Purchaser's implementation of this BMP. After one-year, erosion control structure maintenance work may be accomplished through watershed restoration practices by the Forest Service.

Ability to Implement: High
Effectiveness: High
Monitoring: Watershed specialists will evaluate the effectiveness of the erosion control structures and recommend additional maintenance or erosion control work. Also see Forest Plan monitoring plan.

PT-19. Acceptance of Timber Sale Erosion Control Measures Before Sale Closure: Specific requirements for erosion control are included in the Timber Sale Contract. Sale Administrators, with assistance as needed from watershed specialists, will ensure erosion control measures conform to the applicable provisions.

Ability to Implement: Moderate
Effectiveness: High
Monitoring: Watershed specialists will evaluate the effectiveness of the soil erosion prevention and control measures. Also see Forest Plan monitoring plan.

PT-20. Reforestation: Regeneration harvest areas will be regenerated with trees within five years after cutting. Natural regeneration will be used to supplement planting wherever possible. The implementation of this practice affects water quality by helping to stabilize soils, increase ground cover, and provide improved infiltration.

During the timber sale planning process, the interdisciplinary team will assess the capability of proposed areas to achieve reforestation within the prescribed period. The silviculturist is responsible for this work and will use information collected by the interdisciplinary team, such as; soil productivity, depth, available moisture holding capacity, microclimate, plant indicators, slope, aspect, shape of slope, position on slope, percent of course rock fragments, moisture regime and potential for natural regeneration. This information will be used to determine regeneration methods.

Ability to Implement: High
Effectiveness: High
Monitoring: Regeneration and stocking surveys will be done by the Forest Service to verify the success of the reforestation.

PT-21. Servicing and Refueling of Equipment: During servicing or refueling, pollutants from logging or road construction equipment have the potential, in some instances, to enter a watercourse. This threat will be minimized by selecting service and refueling areas well away from wet areas and surface water, and by using berms around such sites to contain spills. A Spill Prevention Control and Countermeasures (SPCC) Plan, certified by a registered professional engineer, will be required if the volume of fuel exceeds 660 gallons in a single container or if total storage at a site exceeds 1320 gallons (see BMP W-5).

The Contracting Officer's Representative, the Engineering Representative, or Sale Administrator will designate the location, size and allowable uses of service and refueling areas. They will also be aware of emergency notification procedures and actions to be taken in case of a hazardous substance spill.

Ability to Implement: Moderate
Effectiveness: High
Monitoring: Watershed specialists will assist in evaluating the effectiveness of this BMP. Also see Forest Plan monitoring plan.

PT-22. Modification of the Timber Sale Contract: At times it may be necessary to modify a Timber Sale Contract when it is determined that operations would cause serious environmental damage. If new evidence indicates that unacceptable damage is likely to occur, an interdisciplinary team will be assigned to assess the evidence and implications. The EA prepared for the timber sale may then be amended to reflect the findings of the interdisciplinary team. The team will make recommendations to the appropriate line officer on whether the timber sale, as currently planned, will: (1) irreversibly damage soil, water or watershed conditions, or (2) inadequately protect streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of watercourses, and deposits of sediment.

If the timber sale, as determined by the appropriate line officer, will unacceptably affect watershed values, the sale will be modified to protect the watershed through agreement with the timber sale Purchaser; or, the contract may be terminated by the Chief of the Forest Service if the Purchaser does not agree to the terms of the environmental modification.

Ability to Implement: High
Effectiveness: High
Monitoring: NEPA review process. Also see Forest Plan monitoring plan.

PR-1. General Guidelines for the Location and Design of Roads: General road location Standards will include the following:

a. New Traffic Service Level (TSL) "D" roads with design speed of 10 mph or less will be located on a predominately non-geometrical horizontal and vertical alignment to minimize the amount of excavated material needed to construct the road.
b. The road grade will be rolling when possible between control points to provide roadbed drainage.
c. Generally roads should be located on flatter side slopes over steeper side slopes to limit soil movement outside of the road clearing limits.
d. Generally roads should be located to utilize existing old road prisms rather than on "undisturbed" ground to minimize the amount of new slope construction.

e. New road alignments should enter and leave Riparian Habitat Conservation Areas (RHCA) in as short a length as possible given the constraints at the crossing location for relieving roadway drainage and road alignment into and out of the RHCA.
f. Road location should take into account grade "runout" to facilitate design of sag curves in Category 1,2 and 4 RHCA.
g. Generally new stream crossings should be located in areas of lower stream gradient over areas of higher stream gradient, to limit the amount of scour protection needed at the drainage structure outlet and in Category 1 RHCA, and make it easier to provide for upstream fish passage through the drainage structure.
h. Generally limit the location of roads in RHCA to stream crossings unless specific site analysis determines otherwise.
i. Generally try to minimize the number of stream crossings as determined by site specific analysis.

Road design standards will include the following:

a. Road design standards will be the minimum necessary to meet user and resource needs.
b. Culverts in SMU Class 1 through 4 streams will be designed to pass a 100-year flood flow with no damage to the road fill. In lieu of sizing a culvert so that the fill will not be overtopped, the 100-year flood may be accommodated in a high water bypass design. Culverts in Class 3 and 4 streams should also be designed to pass a 25-year flood with a headwater equal to or less than the height of the culvert. Culverts in Class 1 and 2 streams should also be designed with a minimum of 2' freeboard between the top of the culvert and the headwater surface at a 50-year flood flow to accommodate the passage of debris.
c. Culverts in Category 1 RHCA will be installed to provide for upstream fish passage.
d. Roadway drainage should be designed so that water concentrated by the road prism is dispersed prior to entering stream channels.
e. Roads in Category 1,2 and 4 RHCA will be designed in such a way that stream flow will not be diverted down the road in the event of a crossing failure.
f. In ephemeral draws (swales) the designed drainage should generally be a self-maintaining type such as a drain dip or outslope drain (OSD). Generally use culverts in ephemeral draws where the cost of stabilizing the roadbed and fill slope on drain dips and OSD are greater than for the culvert installation with scour protection.

Ability to Implement: Moderate for “location” in that site-specific analysis may allow deviating from the general guidelines. High for “design” in that there are set tightly controlled processes for checking design work.
Effectiveness: High where the new construction road location can limit the area of cut and fill slopes and the number of stream crossings.
Monitoring: The Forest Engineer or his designate will monitor location and design standards in tagline reviews and the engineering road contract review process.

PR-2. Erosion Control Plan Submittal, Approval and Application: Contract provision CT6.311 will be included, which will require the Purchaser to submit a plan of operation for road construction, which sets forth general erosion control measures to be used, prior to starting road construction work. As a minimum, the plans will include language sufficient to designate Category 1,2 & 3 RHCAs as "Sensitive" on new construction, and where drainage structure work is required in the RHCA on reconstruction. Category 4 RHCAs may also be designated as "Sensitive" construction areas when called for in the site specific analysis.

Require and approve, with any needed negotiation, the Purchaser's methods for construction in these "Sensitive" areas.

As a minimum, the plan of operation for road construction should include:

a. Interim drainage structure scheduling and spacing on pioneer road construction. Spacing should be based on pioneer road grade.
b. Allowable lengths of pioneer road construction opened up but not built to grade with permanent drainage installed. Also the schedule that pioneer road construction will occur will be included.
c. How sub-surface water encountered in the earthwork construction will be diverted and treated until the road is cut to grade and the permanent drainage is installed.
d. The schedule for pioneer road construction through "Sensitive" areas.
e. Erosion control measures for roads not completed prior to seasonal shutdown.

As a minimum, the methods for construction through "Sensitive" areas will include:

a. How water is to be diverted from construction area in non-erodable conduits or ditches.
b. How diverted water will be filtered if sediment enters the stream.
c. How earthwork construction will proceed across the drainage as the drainage structure is installed.
d. How sediment will be contained within the clearing limits during construction.

Ability to Implement: Moderate given that the Engineering Representative and purchaser need to negotiate an agreed upon operating plan with methods of construction.
Effectiveness: Moderate depending on the amount of precipitation encountered during construction.
Monitoring: The Engineering Representative will monitor the effectiveness of the operating plan and construction methods in "Sensitive" areas in reducing erosion, and will document his/her findings in the contract daily diary or final inspection report.

PR-3. Timing of Construction Activities: Road construction and reconstruction work will predominately be done within the normal operating season dates of 1 June and 31 Oct. Work may be accomplished outside this time period subject to the approval of the Engineering Representative. Specification 204 and Special Project Specification (SPS) 204.01F1 will be included in the contract to require the following work scheduling as a minimum:

a. Limit the length of road not built to grade and surfaced, to 1000' outside the appropriate road construction operating season.
b. Limit the length of road not built with permanent drainage to 1000' outside the appropriate road construction operating season.
c. The above limitations may be adjusted at the discretion of the Engineering Representative based on current weather and ground conditions.
d. Limit the work as noted in Category 1 RHCA to times outside the spawning season for fish present in the RHCA.

Ability to Implement: Moderate since the Engineering Representative does not have 100% control over the timely placement of erosion control structures.
Effectiveness: High compared to having an uncontrolled amount of road in an incomplete state outside the normal operating season.
Monitoring: The Engineering Representative will monitor the effectiveness of this BMP and document his/her findings in the contract daily diary.

PR-4. Location, Design and Construction of Stable Road Cut and Fill Slopes: General road location standards which would affect the stability of constructed cut and fill slopes, and waste areas will include the following:

a. As with BMP PR-1, generally locate roads and waste areas on flatter side slopes over steeper side slopes to minimize the cut and fill slope area.
b. Avoid where possible, road locations on inner gorge areas with side slopes over 60% to minimize cut and fill slope area and the risk of intercepting subsurface water in or adjacent to RHCA.
c. Avoid where possible, road locations which would intercept subsurface water on side slopes over (approximately) 30% to minimize the risk of long term failure in constructed cut slopes.
d. Avoid road locations through land forms which show mass movement where the Forest Geotechnical Engineer estimates there is a high probability of continued mass soil movement.

Road design standards for stable cut and fill slopes, and waste areas will include the following:

a. The road designer will design to the steepest slope ratio for a given soil type which is mechanically stable given dry conditions and gives a seed bed which will reliably hold seed on the slope given a seed application method.
b. Revegetate cut and fill slopes, waste areas and ditches as a minimum. Areas where cut and fill slopes are to be constructed in highly erodable material should be identified in the preconstruction design walk phase, and special revegetation measures should be designed for these areas.
c. Seed concentrations and application methods should be sufficient to achieve revegetation of the roadway within 3 years of application.
d. Where roadbed drainage is concentrated on fill slopes the slope will be armored or filter material placed on it. This standard applies to new road construction. The road designer should evaluate the need for existing fill slope protection when adding drainage structures to existing roads.
e. Cut-slopes with subsurface water present may be stabilized by flattening the slope ratio for slopes under 2' in

height or buttressed for slope heights over 2'. Where buttressing is utilized, water coming out of the slope should be filtered to prevent piping of material from the slope into roadway drainage.

f. Generally waste areas should be located on flatter side-slopes instead of steeper side-slopes. Concentrated side-hill or roadway drainage should not be dumped onto the waste area. Waste area slopes should be graded so as not to concentrate water. Waste area slopes should be constructed no steeper than 1.5:1. Waste material should be compacted to a layer placed specification as a minimum with special attention given to compacting the fill faces leaving the slope face in a roughened condition.
g. Embankments will generally be placed using side-cast and end-haul methods. Added compaction requirements may be required by the Forest Geotechnical Engineer for construction of major embankments to assure the mass stability of the embankment. Major embankments are those that are over 8 ft high and 100 ft long.
h. Embankments should not be designed on side slopes over 70% for those materials whose angle of repose is at 1.25:1.

Construction standards for stable cut and fill slopes include the following:

a. Excavated material should be controlled inside the construction limits as required in Specification 203. Special construction practices should be applied in areas where the ground slope is too steep to construct a stable fill (generally ground slopes over 70%). The excavated material from these "Full-bench" areas should be end-hauled to a road embankment or waste area as designated in the plans, and not sidecast outside the construction limits (unless site specific analysis determines otherwise).
b. Cut slopes should not be "undercut" at the bottom of the slope to create material for roadbed finishing thereby destabilizing the whole slope.
c. Cut slopes should be left in a roughened condition as cut by the cat or excavator to give places for erosion control seed to catch and sprout.

Ability to Implement: Moderate given the variability of subsurface water conditions.
Effectiveness: High
Monitoring: The Forest Engineer will monitor the effectiveness of these design standards.

PR-6. Dispersion of Subsurface Drainage Associated with Roads: On existing roads where seasonal subsurface flow occurs in the roadbed and traffic use would produce soil movement outside the clearing limits, traffic management will be the first action taken to limit soil movement. Where traffic management will not have sufficient effect on subsurface flow in the roadbed to limit soil movement to the clearing limits, the road will be reconstructed to achieve this goal. Reconstruction could include constructing a cutoff ditch on the uphill side of the road to lower the water table and intercept subsurface drainage, installing subsurface blanket or trench drains to achieve the same objective, or leaving the subsurface drainage net as is and stabilizing the roadbed with stabilization fabric and ballast material.

On new construction roads where subsurface flow is evident, it should be avoided by the road location where feasible. If subsurface flow is not feasible to avoid through site-specific analysis, similar design solutions may be used as for reconstruction of existing roads. See further direction for cut slope excavation in BMP PR-4.

Ability to Implement: High since these are standard forest practices.
Effectiveness: Moderate due to some subsurface drainage problems not being evident until roads are constructed.
Monitoring: The effectiveness of design methods will be evaluated and documented by the Engineering Representative or Forest Hydrologist during BMP monitoring trips. The effectiveness of traffic management will be documented by the Engineering Representative or Forest Service Representative in their contract daily diaries.

PR-7. Control of Surface Roadway Drainage: Water concentrated by road drainage features will be relieved from the roadway at short enough intervals (based on soil type) that soil movement will be minimized outside the road clearing limits. Where it is impractical to relieve drainage in short enough intervals, ditches and roadbeds should be armored to achieve a more practical spacing of drainage structures. The old drainage structure handbook chart will be used as a guide to determine spacing of drainage structures based on soil type. Where roadbeds and ditches are armored, concentrated water may still need to be relieved at selected intervals less than those shown on the handbook chart to adequately disperse runoff from the road. Refer to BMP PR-4 for slope protection requirements where concentrated water is channeled onto cut and fill slopes. Filter concentrated water channeled directly into an RHCA to minimize soil movement outside the road clearing limits. Minimize the size of drainage area draining directly into RHCA. Generally

space roadbed and ditch relief drainage so that drainage structures are located in ephemeral draws where possible. Revegetate new traffic service level "D" roadbeds and ditches to minimize soil movement in the mid- to long-term by grass seeding as part of the construction contract. Roads to be closed after the Timber Sale should have their roadbeds seeded at the time of closure.

Ability to Implement: High since this is standard forest practice.
Effectiveness: High
Monitoring: The Engineering Representative or Forest Hydrologist will be responsible for monitoring and documenting the effectiveness of these measures.

PR-8. Constraints Related to Pioneer Road Construction: To meet the objective of minimizing sediment, the following constraints should be followed when constructing pioneer roads in the Project Planning Area:

a. Construction of pioneer roads shall be confined to the final roadway construction limits, unless otherwise approved by the Engineering Representative. 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. The amount of pioneer road open in construction area outside the normal operating season will be limited by use of specification 204.
c. RHCAs will not be crossed with a pioneer road without approval of the Purchaser's construction methods as required in BMP PR-2. Specification 204 will require that the contractor divert live water in RHCAs in non-erodable channels or conduits and specification 603 will require that the purchaser install the drainage structure before crossing the RHCA.

Ability to Implement: Moderate since the Engineering Representative is not on site at all times.
Effectiveness: Moderate
Monitoring: The Engineering Representative is responsible for monitoring the effectiveness of the above requirements. Monitoring will be documented in the contract daily diaries.

PR-9. Timely Erosion Control Measures on Incomplete Roads and Stream Crossing Projects: The best drainage design can be ineffective if projects are incomplete at the end of the dry season. Affected areas can include roads, waste areas, tractor trails, skid trails, landings, fills, stream crossings, and bridge excavations. Preventive measures include:

a. Removal of temporary culverts, culvert plugs, diversion dams or elevated stream crossing causeways.
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. Removal of debris, obstructions, and spoil material from channels and floodplains.
d. Grass seeding, placement of hay bales or silt fencing, and mulching.

Ability to Implement: High
Effectiveness: High
Monitoring: Road construction review process and observation during and after project completion. Also see Forest Plan monitoring plan.

PR-10. Construction of Stable Embankments (Fills): 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 necessary compaction during the construction of the embankment, from unsuitable soils, and from the use of inappropriate placement methods. To minimize this occurrence, the roadway should be designed and constructed as a stable and durable earthwork structure with adequate strength to support the pavement structure, shoulders, and traffic. Proper slope ratio design, moisture content of soils, and compaction will normally promote stable embankments, as long as the soil is suitable. Embankments will be constructed of appropriate material and may be placed by one or more of the following methods:

a. Controlled compaction using density controlled strips
b. Controlled compaction (with normal testing procedures)
c. Special project controlled compaction
d. Layer placement (roller compaction)
e. Layer placement (hauling and spreading equipment operated uniformly over the entire width)
f. Side casting and end dumping

Method "f" is rarely specified for road construction, except on the lowest construction tolerance and to obtain adequate width for equipment to operate, and only in conformance with BMP PR-11.

Ability to Implement: High
Effectiveness: High
Monitoring: Implementation of this BMP will be documented by the Engineering Representative in the contract daily diary.

PR-11. Control of Sidecast Material: Unconsolidated sidecast material can be difficult to stabilize and is susceptible to erosion, settling, and mass instability. Site-specific limits or controls for side casting uncompacted material should be developed through interdisciplinary input. Side casting 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 side cast material without prior approval of the Contracting Officer's Representative or Engineering Representative. 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: High
Monitoring: Road design review, progress review during construction, and maintenance activity reviews. Also see Forest Plan monitoring plan.

BMP PR-12. Location, Design and Control of Construction in Riparian Habitat Conservation Areas (RHCA): RHCAs are described in BMP PT-7. They include contributing areas along intermittent stream channels. See BMP PR-1, PR-4 and PR-7 for additional measures that refer to road work in RHCAs. Location, design and construction practices within these areas will include the following:
Road location standards for RHCA will include the following:

a. Locate waste areas outside of RHCAs.
b. Road locations in RHCAs will be avoided based on site specific analysis.

Road design standards for RHCAs will include the following:

a. Water concentrated by the road prism should be filtered prior to entering the stream channel where run-off is not effectively filtered by the forest floor. Brush blankets, filter windrows or fences, riprap blankets or sediment basins are some examples of filtering methods.
b. Minimize the amount of concentrated water channeled into the RHCA from the road prism to reduce the sediment carrying capacity of water flowing into the RHCA.
c. Minimize the amount of concentrated water from ditches and roadbed flowing over fill slopes to reduce the sediment carrying capacity of water flowing into the RHCA over material that is more easily moved than undisturbed soil.
d. Protect cut and fill slopes within the 100-year flood plain from erosion to create a stream crossing which will not fail when subjected to a 100-year flood flow.
e. Protect roadbeds within RHCAs or contributing areas by armoring with aggregate surfacing, unless the native material provides adequate protection.
f. The streambed at culvert outlets should be protected from scour for velocities expected in the 100 year flood flow.
g. Added mid to long term erosion protection and stabilization measures may be required adjacent to streams in RHCAs based on site specific analysis. This could include items such as planting riparian vegetation or other "bio-engineering" techniques.

Road construction standards for RHCAs will include the following:

a. See BMP PR-2 for minimum construction methods required for construction in sensitive areas.
b. Live water flowing into the construction area will be diverted around the area prior to pioneer road construction across the RHCA. Water will be contained by non-erodable dams or a sump. Water will be

diverted by piping or a non-erodable ditch. Where a sump is used to contain water for diversion around the construction site, the water will be filtered prior to diversion back into the streambed.

c. No sediment producing materials should be left within the 100-year flood plain unless they are designated to be placed there such as road embankment.
d. Temporary bypass roads at creek crossings will be stabilized and revegetated with grass as a minimum.

Ability to Implement: High for location and design due to the forest's review procedures. Moderate in construction since the Engineering Representative is not present on the construction site at all times.
Effectiveness: High
Monitoring: In signing the road plans for the sale, the reviewing engineer attests that they incorporate the standards in this BMP. The Engineering Representative will monitor the effectiveness of construction standards in his/her contract daily diaries.

PR-13. Diversion of Flows Around Construction Sites: Flow must sometimes be guided or piped around streamside project sites. Typical examples are bridge and dam construction, or large culvert installation. Flow in stream courses will be diverted if the Forest Service deems it necessary due to expected sediment production during construction. Such a diverted flow shall be restored to the natural streamcourse as soon as practicable and, in any event, prior to normal periods of precipitation runoff.

Ability to Implement: High
Effectiveness: High
Monitoring: Progress review during construction and road construction review process. Also see Forest Plan monitoring plan.

PR-15. Disposal of Right-of-Way and Roadside Debris: As a preventive measure, construction debris developed along roads near streams or in the RHCA shall be disposed of by the following means, as applicable:

a. On-Site
   (1) Piling and Burning
   (2) Chipping
   (3) Burying
   (4) Scattering
   (5) Windrowing
   (6) Disposal in Cutting Units
b. Removal to agreed-upon locations
c. A combination of the above.
d. Large limbs and cull logs may be bucked into manageable lengths and piled alongside the road for fuel wood.

Ability to Implement: High
Effectiveness: High
Monitoring: The Engineering Representative will document implementation in the contract daily diary

PR-18. Maintenance of Roads: Road maintenance will be a required work activity under contract provisions CT5.4, CT5.42 and CT5.43 where applicable on this timber sale. Standard maintenance specifications with specific work requirements will be included in this timber sale contract, as applicable, for roadbed blading, ditch cleaning, culvert cleaning, roadbed clearing and slide removal.

On road segments in or immediately adjacent to RHCAs, excess material removed from sloughed cutslopes or ditches, which cannot be worked into the road surface, will be hauled to a disposal site designated by the Engineering Reprersentative or Sale Administrator.

Ability to Implement: Moderate since the Sale Administrator and Engineering Representative are not present at all times to monitor road conditions and maintenance work.
Effectiveness: High
Monitoring: The implementation of road maintenance requirements is monitored by the Sale Administrator through the life of the sale, and documented in the contract daily diaries.

PR-20. Traffic Control During Wet Periods: The purchaser's operations will be limited by the operating season provisions in the timber sale contract (BT 6.3, 6.31, 6.6, 6.65, CT 6.3, 6.311, 6.6). Purchaser's operations are limited

under these provisions to situations where resource damage will not occur. Resource damage that would limit the purchaser's operations includes local damage that may occur at a single soft, moist spot where displaced soil would move out of the roadway, even when the majority of a road system is drivable. These weak links in contributing areas to RHCA will be identified and their condition will limit the use of the road by the purchaser.

Ability to Implement: Variable since the Sale Administrator is not constantly on the project to react to changes in weather and purchaser's timely response to changes in road stability.
Effectiveness: High but dependent on implementation.
Monitoring: The Sale Administrator will monitor the purchaser's implementation of this BMP and document his findings in the contract daily diaries.

PR-23. Obliteration of Temporary Roads and Landings: Temporary roads are constructed for a specific short-term purpose, such as logging spurs on a timber sale. In order to prevent continued resource impacts, such roads and landings will be obliterated at the completion of their intended use. Due to the location, grades, and drainage, such roads are often inadequate for long-term use and maintenance. Temporary roads that are allowed to remain in use beyond their prescribed time are subject to causing continued resource damage, and they can become chronic sediment sources. Effective obliteration is generally achieved through a combination of these measures:

a. Temporary culverts and bridges removed and natural drainage configuration reestablished.
b. Road surface deep ripped.
c. Cutslopes reshaped and stabilized.
d. Road effectively drained and blocked.
e. Road returned to resource production through revegetation (grass, browse, or trees).

The National Forest Management Act requires that all temporary roads be returned to resource production within ten years.

Monitoring: Post-sale reviews by the Sale Administrator. Also see Forest Plan monitoring plan.

PF-1. Fire and Fuel Management Activities: An objective of fire management activities is to reduce the potential public and private losses that could result from wildfire and/or subsequent flooding and erosion, by reducing the frequency, intensity and destructiveness of wildfire. Administrative, corrective and preventive measures may include:

a. Fuelbreak construction.
b. Vegetation type conversions or manipulation.
c. Greenbelt establishment to separate urban areas from wildlands.
d. Fuel reduction units.
e. Access roads for rapid ingress and egress.
f. Fire suppression activities.
g. Fuel utilization and modification programs.
h. Public information and education programs.

Ability to Implement: Moderate
Effectiveness: Moderate
Monitoring: Implementation and effectiveness monitoring is done by fuel management and other specialists within the Forest Service fire organization. Watershed specialists evaluate effectiveness of the soil and water mitigation measures for selected projects. Also see Forest Plan monitoring plan.

PF-2. Consideration of Water Quality in Formulating Prescribed Fire Prescriptions: Prescription elements include, but are not limited to such factors as, fire weather, slope, aspect, soil moisture, and fuel moisture. These elements influence the fire intensity and thus have a direct effect on whether or not a desired ground cover remains after burning, and whether or not a water repellent layer is formed. The amount of remaining ground cover and extensiveness of water repellent soil can significantly affect erosion rates on certain sensitive sites.

Field investigations are conducted as required to identify site-specific conditions that may affect the prescription. Water quality objectives are established prior to preparation of the burn plan. The interdisciplinary team assesses the prescription elements and the fire management officer prepares the fire prescription.

Develop burn plans so that the mineral soil surface is not oxidized to a reddish color and so that some of the forest floor litter and duff layer is retained over most of the burn area. Avoid prescriptions that result in duff removal of large areas (greater than 100 square feet). The need to provide soil cover applies to all units.

Ability to Implement: High
Effectiveness: High
Monitoring: The fire prescription should be reviewed by the interdisciplinary team, and shall be approved by the appropriate line officer.

PF-3. Protection Of Water Quality During Prescribed Fire Operations: Some of the techniques used to prevent water quality degradation are:

a. Constructing water bars in fire lines.
b. Maintaining the integrity of the streamside management unit or streamcourse.
c. Planning prescribed fires with intensities that will not result in soils becoming hydrophobic.
d. Retaining or re-establishing ground cover to prevent erosion of the burned site.

Ability to Implement: High
Effectiveness: High
Monitoring: Forest Service fire organization personnel and watershed specialists monitor implementation and effectiveness of this BMP. Also see Forest Plan monitoring plan.

PF-4. Minimizing Watershed Damage From Fire Suppression Efforts: Heavy equipment operation on fragile soils and steep slopes will be avoided when possible. Project fires will use a Resource Advisor and watershed specialists to advise the Incident Commander on resource values during the suppression effort. National fire management policies were changed in 1978, to provide in part for an Escaped Fire Situation Analysis if containment of the fire is not expected prior to the second burning period. The analysis will be prepared by a line officer with Incident Management Team input. Watershed considerations will be part of the analysis.

Ability to Implement: High
Effectiveness: High
Monitoring: The fire organization, Resource Advisors, and watershed specialists do Implementation monitoring on an on-going basis throughout the fire suppression effort. The same individuals do effectiveness monitoring following the fire.

PF-5. Repair or Stabilization of Fire Suppression Related Watershed Damage: Treatments for fire-suppression damages include, but are not limited to, installing water bars and other drainage diversions in fire roads, firelines, and other cleared areas; seeding, planting and fertilizing to provide vegetative cover, spreading slash or mulch to protect bare soil; repairing damaged road drainage facilities; and clearing stream channels of structures or debris that is deposited by suppression activities.

Ability to Implement: Moderate
Effectiveness: Moderate
Monitoring: The fire organization, Resource Advisors, and watershed specialists monitor implementation. Effectiveness and rehabilitation of fire lines will be evaluated annually until the watershed is stabilized. Also see Forest Plan monitoring plan.

PF-6. Emergency Rehabilitation Of Watersheds Following Wildfires: Emergency burned area rehabilitation is a corrective measure that involves a variety of treatments. Examples of treatments include: (1) Sowing grass or other vegetation as needed to provide a protective cover as soon as possible; (2) fertilization; (3) log erosion barriers (contour-felled and anchored trees); (4) channel stabilization structures; (5) mulching with straw or other suitable material; (6) trash racks above road drainage structures; and (7) debris retention structures.

Treatments are selected on the basis of on-site values, downstream values, probability of successful implementation, social and environmental considerations, and cost as compared to benefits.

Ability to Implement: High

Effectiveness: High
Monitoring: Rehabilitation projects are evaluated following major storms and runoff events and at least annually until the watershed is stabilized. The evaluation determines the effectiveness of the rehabilitation measures and indicates if follow-up actions are needed. Also see Forest Plan monitoring plan.

PW-1. Watershed Restoration Watershed restoration is a corrective measure to:

a. Improve ground cover.
b. Improve infiltration.
c. Prevent overland flow and conserve the soil resource.
d. Stabilize stream banks and stream channels.
e. Improve soil productivity.
f. Reduce flood occurrence and flood damage.
g. Enhance economic, social, and/or aesthetic values of the watershed.

The following factors shall be considered during development of restoration projects: Predicted changes in water quality, downstream values, site productivity, threats to life and property, any direct or indirect economic returns and social or scenic benefits.

Watershed restoration measures should reflect the state of the art and must be chosen to reflect the unique hydrologic and climatic characteristics of each watershed. Examples of watershed restoration measures are streambank stabilization, landing pullback, and ripping and planting unused temporary roads and landings.

Ability to Implement: High
Effectiveness: High
Monitoring: Watershed specialists and Ranger District resource personnel will evaluate the performance and effectiveness of the watershed restoration measures.

PW-3. Protection of Wetlands: 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 proposal's effect on the survival and quality of the wetlands. Factors to be evaluated 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
Monitoring: Watershed, wildlife, and resource specialists verify that all wetlands requiring projection have been identified either at the Forest Planning or project level. The land management planning data inventory is updated when non-mapped wetlands are identified at the project level.

PW-4. Oil and Hazardous Substance Spill Contingency Plan and Spill Prevention Control & Countermeasure (SPCC) Plan: 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 which requires appropriate measures (40 CFR 112) to prevent oil products from entering the navigable waters of the United States. An SPCC Plan will be 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: High
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.

PW-5. Cumulative Watershed Effects: To evaluate the extent of additional management activity that can be recommended in a given watershed the following process will be employed:

a. The existing watershed condition will be determined.
b. The additional effects that proposed management activities would be expected to create will be estimated and added to the existing conditions.
c. The cumulative effects and condition will be compared a threshold of concern, which considers Basin objectives for the watershed.

If the condition is estimated less than the threshold value, the management activity in question would occur as planned. If the condition approaches or exceeds the threshold of concern, a caution flag is raised for the manager. Prior to implementing the planned activity, the scheduling of activities, type and effectiveness of mitigation measures, and potential for watershed improvement activities will be reviewed, to determine if changes can be made which would result in the project meeting watershed objectives.

On all units where a CTL (cut-to-length) system is used, minimize the compaction by buffering the soil with slash. Slash will be placed on ground ahead of the timber-felling machine to minimize compaction; and the same trail will be used by the forwarder. The slash needs to be at least 12 to 18 inches deep prior to compaction by the equipment to provide sufficient compaction buffering. Slash buffering applies to all units.

On harvest units listed below, minimize the compaction of CTL and tractor trails by buffering the soil with snow or operating under frozen soil conditions. Harvest activities may be timed to occur during snow periods to minimize compaction, or harvest over snow may be required in the contract. Depending on the firmness of the snow, a snowpack of about 18-24 inches[1] will generally protect soil from compaction. Snow over frozen soil is the most effective. The following units must be harvested over snow in order to prevent additional compaction—

- Alternative B
  - → Unit 45. This unit has been logged before. The proposed treatment is small pole thinning. Depending on the amount of material to be removed, and the equipment to be used, this unit may require logging over snow. Existing detrimental soil conditions are about 13%.
  - → Unit 31. Existing detrimental soil conditions are about 15%.
  - → Unit 38. Existing detrimental soil conditions are about 15%.
- Alternative C units 6, and 38.
  - → Unit 6. The smaller unit consists entirely of the area with the most detrimental soil conditions.
  - → Unit 38. Existing detrimental soil conditions are about 15%.

Based on unit reviews, the following units are not likely to produce sufficient slash to buffer CTL trails. This mitigation applies to the following units <u>if a CTL system is used</u> –

- Alternative B
  - → Unit 3.
  - → Unit 10
  - → Unit 15, the portion that is an old plantation.
  - → Unit 19 above FR 2086900.
  - → Unit 22, south side.
- Alternative C Units.
  - → Unit 10.
  - → Unit 15, the portion that is an old plantation.

Proposed activities will be evaluated in terms of their locations relative to sensitive land types. Proposed activities occurring within or adjacent to sensitive land types will be evaluated in terms of types of activities that have been judged to be appropriate for those grounds. As required, the nature and/or location of the activity will be modified to insure adequate protection of the sensitive land.

Avoid new user-created ORV trails. In areas that have recognized ORV (off-road-vehicle) use, design and implement the ground-based yarding system so that it is unattractive to ORV riders. Trails covered with slash are not attractive to ORV riders. The following units are adjacent to dispersed recreation sites which may include ORV use.

- Alternative B Units 2, 3, 8, 10, 14, 15, 19, 30, 32, 33, 37, 38, and 44.

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[1] The snow depth is to be measured in the openings. This is expected to equal about 12-14 inches of snow under the tree canopy.

- Alternative C Units 8, 10, 15, 19, 32, 33, 37, and 38.

Ability to Implement: High
Effectiveness: High
Monitoring: Specialists evaluate watershed and channel condition for both project and forest planning level analyses. The evaluations compare actual conditions with those estimated in either the Forest Plan or project environmental documents. Also see Forest Plan monitoring plan.

PREC-8. Protection of Water Quality Within Developed and Dispersed Recreation Areas: This practice prohibits placing in or near a stream, lake or other water body, substances which may degrade water quality. This includes, but is not limited to, human and animal waste, petroleum products, and other hazardous substances. Areas may be closed in order to restrict use in problem areas.

Ability to Implement: High
Effectiveness: High
Monitoring: Forest Officers in both developed and dispersed recreation areas evaluate the implementation and effectiveness of this BMP during visits to various sites.

PVM-1. Slope Limitations for Tractor Operation: This 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 are made during the environmental analysis.

Limit the slopes where tractors may operate. Tractor and skidder logging would be limited to slopes less than 35%. Short pitches may be steeper. Avoid long steep skid trails. Applies to all units.

Limit the slopes where CTL (cut-to-length) equipment may operate. Cut-to-length logging would be limited to slopes less than 40%. Short pitches may be steeper, such as the access from the road. Applies to all units.

Ability to Implement: High
Effectiveness: High
Monitoring The Contracting Officer's Representative, Sale Administrator, Forest Service Representative, and watershed specialists will do implementation monitoring. 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.

PVM-3. Revegetation of Surface Disturbed Areas: This is a corrective practice to stabilize the soil surface of disturbed areas. The vegetation selected will be a mix best suited to meet the management objective for the area. Fertilization, irrigation, tackifier, netting, jute or other material may be necessary to ensure plant growth.

Ability to Implement: High
Effectiveness: High
Monitoring: The Contracting Officer's Representative, Sale Administrator, Forest Service Representative, and watershed specialists will do implementation monitoring. Watershed specialists will evaluate the effectiveness of the treatment measures for selected projects. Also see Forest Plan monitoring plan.

PVM-4. Soil Moisture Limitations for Tractor Operation: This is a preventive measure that reduces surface disturbance during wet soil conditions that 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 that are identified by soil scientists, geologists, and hydrologists during the environmental analysis (NEPA) process. The Contracting Officer's Representative 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.

Ability to Implement: High
Effectiveness: High
Monitoring: The Contracting Officer's Representative or project supervisor, with assistance as needed from watershed specialists will do implementation monitoring. Also see Forest Plan monitoring plan.