

# APPENDIX A

## BEST MANAGEMENT PRACTICES

The following Best Management Practices (BMPs) are adapted from the Montana Statewide 208 study (Montana 1979). In general, these BMPs are designed to avoid or reduce nonpoint sources of water pollution resulting from forest management practices and similar activities.

### ROAD SYSTEM

Road locations, particularly in sensitive areas, should be evaluated by an engineer, soil scientist, wildlife biologist, and others as needed. Fit location to the topography to minimize cut and fill situations. In areas of important big game habitat, consultation with the wildlife biologist will be necessary to reduce location impact on ridgelines, saddles, and upper drainage heads.

Where alternative road locations are not possible, incorporate mitigative measures into plans.

Maintain streambank vegetation when crossing streams. Avoid stream crossings if possible; otherwise, minimize approach cuts and fills and channel disturbance.

Do not locate stream crossings strictly on where road grade indicates. Choose a stable site and adjust grade to it, when possible.

Keep stream disturbance to an absolute minimum.

If necessary, include short road segments with steeper grades, consistent with traffic needs and safety, to avoid problem areas or to take advantage of terrain features.

For timber harvest roads, take advantage of natural landing areas (flatter, better drained, open areas) to reduce soil disturbance associated with log landings and temporary work roads.

Vary road grades where possible to reduce concentrated flow in road drainage ditches and to reduce erosion on road surfaces.

Design drainage ditches, water bars, culvert placement, etc. in such a way as to disperse runoff and minimize cut and fill erosion.

Install culverts frequently enough to avoid accumulations of water that will cause erosion of road ditches and the area below the culvert outlet.

Seed (e.g., revegetate) cuts and fills the first fall season following disturbance.

Deposit excess material in stable locations well above the high water level and never into stream channel. Do not allow any material, including sidecast soil, stumps, logs, or other material to be deposited into a stream.

Plan ditch gradients steep enough (generally greater than 2 percent) to prevent sediment deposition.

When installing culverts, avoid changes in channel orientation and place culverts to conform to the natural channel gradient. Design culverts for maximum stream flow (e.g., 25 year discharge, etc.).

Skew culverts 30 degrees toward the inflow to provide better inlet efficiency.

Provide rock or other splash basins at the outlet end of culverts.

In some areas, alternating inslope and outslope sections can be built into the road especially if road grades are rolled to dispose of road surface flow.

Obtain all necessary permits for stream crossings before beginning activities.

Maintain roads immediately after logging and whenever necessary by cleaning ditch lines, blading debris from empty landings, trimming damaged culvert ends and cleaning out culvert openings. Culverts, cross drains, and dips should be cleaned regularly to assure proper functioning, especially before winter or expected rainy seasons. Debris should be removed from live drainages upstream from the inlet.

Grade the road surface as often as necessary to retain the original surface drainage (either insloped or outsloped). Take care to avoid sidecasting graded material over the fill slope. Carefully monitor surface drainage during wet periods and close the road if necessary to avoid undue damage. Restore surfacing on the road tread and in the road ditch if necessary following damage caused by operation in wet periods.

Haul all excess material removed by maintenance operations to safe disposal areas. Apply stabilization measures on disposal sites if necessary to assure that erosion and sedimentation do not occur.

Use the steepest slopes possible on cut and fill slopes commensurate with the strength of the soil and bedrock material as established by an engineering geologist or other specialist in soil mechanics. Benching cut slopes in areas of weak or erodible bedrock (e.g., weathered granites) into a series of properly drained terraces provides opportunity for vegetative establishment and may even require less excavation.

Control roadside brush only to the extent required for good road maintenance.

### LOGGING PRACTICES

Avoid logging across any stream supporting resident fish or on any stream where a downstream water system might be affected.

Time logging activities for the season in which soil damage can be kept to acceptable limits.

Design and locate skid trail and skidding operations to avoid across ridge and across drainage operation.

Avoid yarding in stream channels.

Install water bars on skid trails when logging is finished (soil scientist and/or engineer will provide assistance as requested and/or needed).

Avoid trapping and turning small streams out of their natural beds in tractor trails and landings.

Deposit excess materials from landings and skid trails in such locations that it will not get cut or be washed into streams.

If debris should enter any stream, such debris shall be removed concurrently with the yarding operation and before removal of equipment from the project site. Removal of debris shall be accomplished in such a way that natural streambed conditions and streambank vegetation are not disturbed.

Provide appropriate width buffer strips adjacent to perennial and intermittent streams, springs, and wet meadows.

## CHEMICALS HANDLING

Chemicals applied to forest lands should not include direct applications to water bodies. Suitable buffer strips should be provided. Weather and runoff conditions should be considered.

During mixing and disposal of chemicals, entry of chemicals into drainages should be prevented.

Selective, nonpersistent pesticides should be favored whenever possible.

Prevent deposition of fertilizers in water bodies or drainage ways, particularly during aerial application.

Existing Montana regulations regarding use of chemicals should be strictly adhered to regarding mixing, application, and disposal.