

APPENDIX A

BEST MANAGEMENT PRACTICES

A. Roads

1. Location

- a. Minimize the number of roads constructed in a watershed through comprehensive road planning, recognizing intermingled ownership and foreseeable future uses. Use existing roads where practical.
- b. Fit the road to the topography. Locate roads on natural benches and stable soil types to minimize the area of road disturbance.
- c. Locate roads on well drained soils and rock formations that tend to dip into the slope. Avoid slide-prone areas characterized by seeps, steep slopes, highly weathered bedrock, clay beds, concave slopes, hummocky topography, and rock layers that dip parallel to the slope.
- d. Avoid high erosion hazard sites, such as steep narrow canyons, slide areas, slumps, swamps, wet meadows, or natural drainage channels. Where there is potential for material to enter a stream, obtain approval of the Conservation District and/or the Water Quality Bureau under applicable laws (i.e., 124 permit by the BLM or a 310 permit by a private contractor).
- e. Locate roads a safe distance from streams when roads are running parallel to stream channels. Provide an adequate streamside management zone in order to catch sediment and prevent its entry in to the stream.
- f. Minimize the number of stream crossings.
- g. Cross streams at right angles to the main channel if practical.
- h. Choose a stable stream crossing site and adjust the road grade to reach the site if possible.
- i. Avoid unimproved stream crossings. Where a culvert or bridge is not feasible, locate drive-throughs on a stable, rocky portion of the stream channel.

j. A 124 permit by the BLM or a 310 permit by a private contractor (Natural Streambed and Land Preservation Act of 1975) is required before disturbance is allowed within the area between the normal high water mark of perennial streams.

k. Avoid long, sustained, steep road grades. Where unavoidable, establish effective water bars and sediment diversions.

l. Vary road grades to reduce concentrated flow in road drainage ditches and culverts to reduce erosion on cut and fill slopes and road surface.

m. When locating roads, provide access to suitable log landing areas (flatter, well drained) in order to reduce soil disturbance.

2. Design

a. Incorporate preventive action into transportation plans. Minimize disturbance. Use available information to help identify erodible soils, unstable areas, and road surface materials.

b. Plan roads to the minimum standard necessary to accommodate anticipated use and equipment. When using existing roads, avoid reconstruction unless absolutely necessary. The need for higher standard roads can be alleviated through better road use management.

c. Construct cut and fill slopes at stable angles.

d. Use plans that balance cuts and fills or use full bench construction (no fill slope) where stable fill construction is not possible. Haul excess material to a safe disposal site and include these waste areas in soil stabilization planning for the road.

e. Contour and roll road grades for minimal disruption of drainage patterns.

3. Drainage

a. Design water crossing structures at points where it is necessary to cross stream courses. Provide for adequate fish passage, minimum impact on water quality, and at a minimum the 25 year frequency

- runoff. A 124 permit by the BLM or a 310 permit by a private contractor is required for perennial stream crossings.
- b. Install culverts to conform to the natural stream bed and slope. Place culverts slightly below normal stream grade to avoid culvert outfall barriers.
 - c. Design culvert installations to prevent erosion of fill. Compact the fill material to prevent seepage and failure. Armor the inlet and/or outlet with rock or other suitable material where needed.
 - d. Provide adequate drainage for the road surface. Use outsloped roads, insloped roads with ditches and cross drains or drain dips. Dips should be constructed deep enough into the subgrade that traffic will not obliterate them.
 - e. Plan ditch gradients steep enough, generally greater than 2%, but less than 8%, to prevent sediment deposition and ditch erosion. Gradient depends on parent material.
 - f. Design the spacing of road drainage facilities based on geologic type, soil erosion class, and road grade.
 - g. Where possible, install ditch relief culverts at the gradient of the original ground slope, otherwise anchor downspouts to carry water safely across the fill slope.
 - h. Skew relief culverts 20 to 30 degrees toward the inflow from the ditch to provide better inlet efficiency.
 - i. Provide energy dissipators where necessary at the downstream end of ditch relief culverts to reduce the erosion energy of the emerging water.
 - j. Protect the upstream end of cross drain culverts from plugging with sediment and debris. Prevent downslope movement of sediment by using sediment catch basins, drop inlets, changes in road grade, headwalls, and recessed cut slopes.
 - k. Install culverts to assure protection from crushing due to traffic. Use 1 foot minimum cover for corrugated metal pipes 15 to 36 inches in diameter, and a cover of one-third diameter for larger corrugated metal pipes.
 - l. Use corrugated metal pipes with a minimum diameter of 15 inches to avoid plugging.
 - m. Install road drainage facilities above stream crossings so water may be routed through a streamside management zone before entering a stream.
- #### 4. Construction
- a. Place debris, overburden, and other waste materials associated with construction activities in a location to avoid entry into streams.
 - b. Minimize stream channel disturbances and related sediment problems during construction of roads and installation of stream crossing structures. Do not place easily eroded material into live streams. Remove material stockpiled on a floodplain before rising water reaches the stockpile. Locate bypass roads to have minimal disturbance on the stream course. Limit construction activity to specific times to protect beneficial water uses.
 - c. Minimize earth moving activities when soils appear excessively wet. Do not disturb roadside vegetation more than necessary to maintain slope stability and to serve traffic needs.
 - d. Clear all vegetative material before constructing the fill portion of the road prism.
 - e. On potentially erodible fill slopes, windrow slash at the toe of the fill slopes to trap sediment, particularly near stream crossings and on erodible fill slopes. Leave breaks for wildlife passage.
 - f. Stabilize erodible, exposed soils by seeding, compacting, riprapping, benching, mulching, or other suitable means prior to fall or spring runoff.
 - g. Keep slope stabilization, erosion and sediment control work as current as possible with road construction.
 - h. Install drainage structures concurrent with construction of new roads and always prior to fall or spring runoff.
 - i. Complete or stabilize road sections within the same operating season as construction is started, rather than leave major road sections in a pioneer condition over a winter season.
 - k. Minimize sediment production from borrow pits and gravel sources through proper location, development, and reclamation.

5. Maintenance

- a. Grade road surfaces as often as necessary to maintain a stable running surface and to retain the original surface drainage.
- b. Avoid cutting the toe of stable cut slopes when grading roads or pulling ditches.
- c. When plowing snow for winter timber harvest, provide breaks in snow berm to allow road drainage.
- d. Keep erosion control measures functional through periodic inspection and maintenance.
- e. Haul all excess material removed by maintenance operations to safe disposal sites. Apply stabilization measures to these sites to prevent erosion. Avoid side casing material where it will enter a stream or be available to erode directly into a stream.
- f. Leave closed roads in a condition that provides adequate drainage without further maintenance.
- g. Restrict the use of roads during wet periods and spring breakup period if damage to road drainage features resulting in increased sedimentation is likely to occur.

B. Fire Suppression

1. Minimize watershed damage from fire suppression by avoiding heavy equipment operation on fragile soils and steep slopes.
2. Stabilize suppression damage where erosion potential has increased. Treatments include installing water bars, seeding, planting, fertilizing, spreading slash or mulch on bare soil, repairing road drainage facilities, and clearing stream channels of debris.
3. Conduct burn area surveys where necessary to assess the need for rehabilitation of watershed damage. Rehabilitation measures may include: seeding, fertilizing, fencing, clearing debris from stream channels, constructing trash racks, channel stabilization structures and debris retention structures.
4. Consider the impacts of sewage disposal when establishing locations for fire camps, logging camps, or other similar facilities.