

Roads & Trails

Roads and trails provide access to key locations. They may be established over time by increasing use patterns with or without regard for impacts to areas through which they lead. Planning and informed design of roads and trails, whether new or enhanced, gives an opportunity to maximize benefits while anticipating and addressing risks such as:

- ✱ water-quality impacts:
 - ~ sedimentation;
 - ~ introduction of toxins;
 - ~ increase in nutrient load;
 - ~ changes in pH, salinity, and oxygen balance;
 - ~ increases in suspended and dissolved solids and turbidity;
- ✱ impediment of movement of storm waters (including soil compaction);
- ✱ habitat impacts;
- ✱ aesthetic impacts; and
- ✱ illicit access off roadways (social trails).

This section presents general guidelines for the development of roads and trails. This information is grouped in the following categories:

- Routing
- Vegetation
- Hydrology
- Design/Construction
- Culverts
- Drainage Ditches
- Spills
- Maintenance

Objectives of maintenance:

- (1) ensure user safety,*
- (2) provide convenient access,*
- (3) protect adjacent ecosystems,*
and
- (4) preserve capital investment.*



ROUTING

GENERAL DESIGN CONSIDERATIONS:

- ✓ Locate cleared, paved, and compacted surfaces away from wetlands. Consider the impact of accidents (contaminant spills) over the lifetime of the roadway. Route accordingly.
- ✓ Design crossings to minimize impacts to streambanks, riparian vegetation, water quality, and downstream environments.
- ✓ Include structures to prohibit vehicles from leaving roadbed.

NOTE:

- ⦿ Direct access is not the most critical design criteria.

VEGETATION

GENERAL DESIGN CONSIDERATIONS:

- ✓ Revegetate any disturbed area; provide for soil stabilization while vegetation takes hold.
- ✓ While managing roadside vegetation, avoid attracting wildlife to roads.

HYDROLOGY:

GENERAL DESIGN CONSIDERATIONS:

- ✓ Design roads and trails so as not to impede the natural hydrology including the inflow and outflow of flood waters.
- ✓ Provide cross-drainage during both flooded and low-water periods. (See “Culverts,” page 84)
- ✓ Locate roads on well drained soils.
- ✓ Construct all fill of granular, free-draining material. Do NOT take road-building materials from wetland sites.
- ✓ Consider the use of geotextile fabric in construction to increase the bearing strength of the road; minimize fill requirements, disturbance, and maintenance costs.
- ✓ To ensure adequate drainage, minimize surface-water velocities, discourage rutting and erosion, use surface drainage techniques such as:
 - crowning,
 - insloping and outsloping,
 - 2% minimum grade, as well as
 - surface gravel and maintenance.
- ✓ Where the organic layer is greater than 48” thick:
 - place a layer of geotextile fabric;
 - place a layer of “corduroy” logs, lying parallel to each other across the roadbed; and
 - place 12” thick layer of porous fill (*e.g.*, large stone, chunkwood which is lighter in weight), anticipating that the roadbed will sink into the organic mat. The fill will allow passage of subsurface and surface waters.
- ✓ Where temporary roads are necessary:
 - consider the use of wooden mats, geotextiles, and metal platform devices;
 - consider loosening compacted surfaces after use is completed; and
 - use temporary stream crossings; design them to be removable/portable in case of flooding.

DESIGN/CONSTRUCTION:

GENERAL DESIGN CONSIDERATIONS:

- ✓ Conduct detailed soil, vegetation, and species inventories prior to any surface disturbance.
- ✓ Analyze flood potential for human safety and structural stability.
- ✓ Develop a road plan for watershed as a whole.
- ✓ Build only what is currently necessary.
- ✓ Construct road/trail when ground is frozen to preserve the integrity of the root mat as much as possible.
- ✓ Do NOT undertake construction during spring thaw and other wet periods.
- ✓ Use signage to indicate sensitive areas.

CULVERTS & DRAINAGE DITCHES

GENERAL DESIGN CONSIDERATIONS:

- ✓ Design to minimize culvert requirements.
- ✓ Where roads and trails must cross wetlands, provide cross-drainage during both flooded and low-water periods.
- ✓ Where culverts are used, allow for the passage of fish and in-stream debris.
- ✓ Where the organic layer is greater than 48" thick, place culverts at the lowest points of roadbed and on firm subsurfaces (*e.g.*, at margin of wetland, at points where organic mat is thin). In this case, construct ditches on both sides of the roadbed to collect surface and subsurface water, channel waters through culverts, and disperse waters again on the downslope side; orient ditches parallel to the roadbed; place them at a distance from the roadbed equal to three times the depth of the organic soil; dig them as deep as culverts lie.
- ✓ To collect surface and subsurface water, construct ditches on both sides of the roadbed. Channel waters through culverts, and disperse waters again on the downslope side.
- ✓ Orient ditches parallel to the roadbed.
- ✓ Place ditches at a distance from the roadbed equal to three times the depth of the organic soil.
- ✓ Dig ditches as deep as culverts lie.
- ✓ Divert outflow from drainage ditches before they enter wetlands.
- ✓ To provide adequate drainage where organic layers are in excess of 16" in thickness, culverts must be 24" in diameter and half buried in the soil surface to provide for both surface and subsurface flow.
- ✓ (See also "Temporary Stream Crossings," page 67)

SPILLS:

GENERAL DESIGN CONSIDERATIONS:

- ✓ Provide containers to collect fluids when breakdown occurs and repairs must be made on the site.
- ✓ Identify disposal sites for road-construction waste materials and garbage associated with road use.

MAINTENANCE:

GENERAL DESIGN CONSIDERATIONS:

- ☒ Cease road use if ruts exceed 6" deep for more than 300' (as these interfere with drainage); cease trail use if churning exceeds 50-100'.
- ☒ Close and rehabilitate all unused roads and trails.

SUGGESTED READING

- Colorado Department of Transportation. 1995. Erosion Control and Stormwater Quality Guide. Denver. 175 p. (303/757-9343)
- Hynson, J., P. Adamus, S. Tibbetts, and R. Darnell. 1982. Handbook for the protection of fish and wildlife from construction of farm and forest roads. U.S. Department of the Interior, Office of Biological Services, Fish and Wildlife Service.
- Levinski, C.L. 1982. Best management practices for road activities. Idaho Department of Health and Welfare, Division of Environmental Quality. Boise, ID. Volumes I and II, BMP Catalog.
- Mason, L. 1990. Portable Wetland Area Stream Crossings, Technology & Development Center, U.S. Forest Service, San Dimas, California.

