South Carolina Forestry Commission
Best Management Practices

Forest Road Construction

BMPs: Planning , Construction , Stabilization , Maintenance
Avoid
Forested Wetland Road Construction

An effort has been made to italicize technical words or phrases and clearly define them in the glossary.

Forest roads are needed to provide access for forest management and recreational activities. *Permanent main access* (MA) *roads* and *temporary limited use* (LU) *roads* should be planned in advance of road construction in order to protect water quality.
Historically, roads have been one of the major sources of *sediment* from forestry related activities. Planning can reduce *skidding* distances and eliminate unnecessary roads. Use of *broad-based dips*, *water bars*, *filter strips*, and other sediment control techniques can significantly lower the amount of *erosion* which might otherwise occur.
To protect water quality, roads should be designed to minimize the amount of sediment entering stream channels.

Figure 4. Culverts provide cross drainage for roads with inside ditches.

BMPs

Planning

- Identify and avoid *sensitive sites* where possible.
- Design the road system to meet long-range objectives rather than simply to access individual sites. Numerous separate road projects tend to have more environmental impact than one well-designed road system.
- Locate roads on the sides of ridges to ensure proper drainage.
- Follow the *contour* as much as possible, with *grades* between 0% and 10%, except where terrain requires short, steep grades. Breaking or changing grade frequently will cause fewer erosion problems than long, straight, continuous gradients.
- Use *outsloped roadbeds*, on hilly or mountainous terrain, to remove surface runoff from the road as quickly as possible, except where safety and environmental concerns dictate otherwise.
- Construct roads only wide enough to handle equipment that will use the road (usually 12 to 14 feet travel width for LU roads and 16 to 20 feet travel width for MA roads). Narrow roads may need to be widened on curves, with periodic pull-outs for passing.
- Construct a road right-of-way wide enough to minimize shade from roadside trees where surface drainage is a problem. This will allow roadbeds to dry out following rainfall.
- In lowland areas, keep road surfaces as close to ground surface level as possible (normally less than two feet above the forest floor).

Top of Page

BMPs

Construction

- On steep grades, where inside ditches are required, install *culverts* at specified intervals (Table 3) to remove surface runoff with minimal erosion.
- Install culverts or construct broad-based dips (or other suitable drainage structures) so that they are large enough and frequent enough to accommodate expected volumes of water **(Table 3)**.
- Cover culverts with enough compacted fill to prevent damage by traffic.
- Ensure that culverts, *water turnouts*, and broad-based dips empty road runoff onto the undisturbed forest floor.

Top of Page

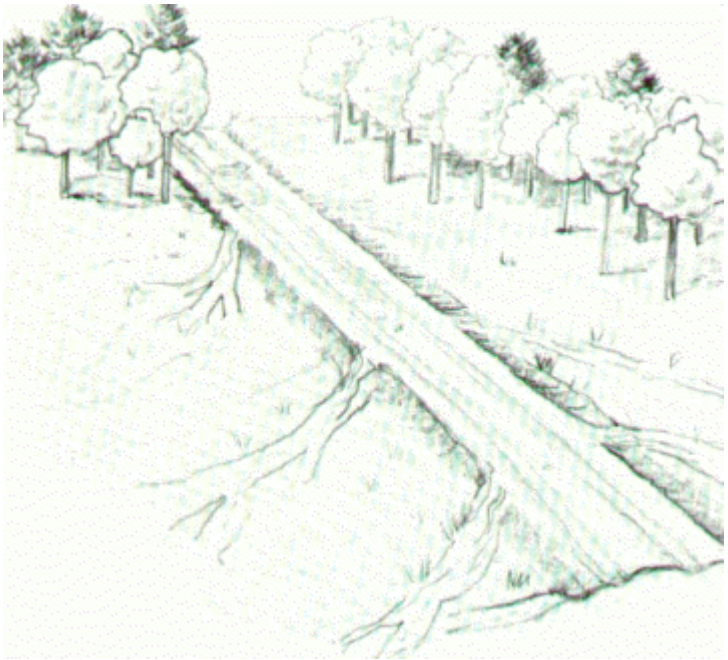

Figure 5. Water turnouts empty road runoff onto the undisturbed forest floor.

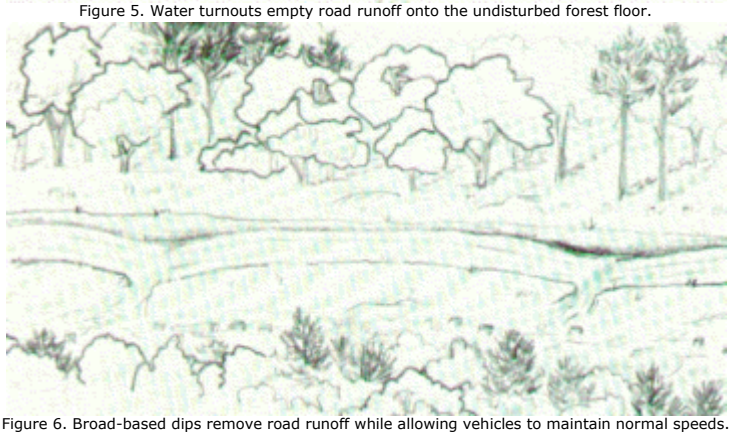

Figure 6. Broad-based dips remove road runoff while allowing vehicles to maintain normal speeds.

BMPs

Stabilization

- Protect the culvert inlet with a headwall of stable material where necessary. If the culvert outlet is above the *toe of the fill*, stabilize fill with rip-rap or other suitable material.
- Where erosion may occur, stabilize exposed *mineral soil* when road construction is completed. Soil stabilization may include *mulching*, rocking, seeding with grasses, or using erosion-resistant fabrics.
- Use water bars when retiring LU roads and *skid trails* or where broad-based dips cannot be constructed.

Top of Page

BMPs

Maintenance

- Maintain culverts to prevent blockage and resultant flooding.
- Minimize road grading and reshaping on hilly or mountainous terrain unless required to repair damaged road sections.

Top of Page

Avoid

- Road construction inside SMZ except where necessary to cross streams.
- Locating roads on broad, flat ridges where water tends to collect, resulting in poor drainage.
- Traffic on soft roads during wet ground conditions.
- Constructing forest access roads that are wider or longer than necessary for normal forestry activities.
- Emptying road runoff directly into drains.

Top of Page

Table 3: Recommended Maximum Spacing for Drainage Structures

Slope (Percent)	Broad-Based Dips and Culverts (feet)	Water Bars and Turnouts (feet)
2	300	245
5	180	125
10	140	80
15	125	60
20	120	50
25	115	40

Top of Page

Figure 7. Water bars are used to remove surface runoff when retiring limited use roads.

FORESTED WETLAND ROAD CONSTRUCTION

Road construction for *silvicultural* purposes in *jurisdictional wetlands* does not require a permit because of the silvicultural exemption under Section 404 of the Clean Water Act. However, to qualify for the silvicultural exemption, the road construction must comply with the following BMPs, (from Clean Water Section 404 Program Definition and Permit Exemption, Part 232.3).

Federally Mandated BMPs

1. Permanent roads, temporary access roads, and *skid trail*s in waters of the United States shall be held to the minimum feasible number, width, and total length consistent with the purpose of silvicultural operations and local topographic and climatic conditions.
2. All roads, temporary or permanent, shall be located sufficiently far from streams or other water bodies (except for portions of such roads which must cross water bodies) to minimize discharges of dredged or fill material into waters of the United States.
3. The road fill shall be bridged, culverted, or otherwise designed to prevent the restriction of expected flood flows.
4. The fill shall be properly stabilized and maintained to prevent erosion during and following construction.
5. Discharges of dredged or fill material into waters of the United States to construct a road fill shall be made in a manner that minimizes the encroachment of trucks, tractors, or other heavy equipment within the waters of the United States (including adjacent wetlands) that lie outside the lateral boundaries of the fill itself.
6. In designing, constructing, and maintaining roads, vegetative disturbance in the waters of the United States shall be kept to a minimum.
7. The design, construction, and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body.
8. Borrow material shall be taken from upland sources whenever feasible.
9. The discharge shall not take, or jeopardize, the continued existence of a threatened or endangered species as defined under the Endangered Species Act, or adversely modify or destroy the critical habitat of such species.
10. Discharges into breeding and nesting areas for migratory waterfowl, spawning areas, and wetlands shall be avoided if practical alternatives exist.
11. The discharge shall not be located in the proximity of a public water supply intake.
12. The discharge shall not occur in areas of concentrated shellfish production.
13. The discharge shall not occur in a component of the National Wild and Scenic River System.
14. The discharge of material shall consist of suitable material free from toxic pollutants in toxic amounts.
15. All temporary fills shall be removed in their entirety and the area restored to its original elevation.

Additional BMPs are listed below as interpretation of the 15 federally mandated BMPs.

BMPs

- The height of both MA and LU roads on high ground should normally be less than two feet above the forest floor.
- Where a MA or LU road crosses a stream or slough, or enters a *peat* or *muck swamp*, the fill should not be higher than the road at either end, except as required by DHEC for crossing navigable streams. Normally the road height should be two to three feet above the forest floor, but it may be higher in low areas.
- MA roads at streams should be bridged or culverted with permanent structures of a size and frequency to allow expected flow of water. Where *fords* are used in lieu of bridges or culverts, they must have adequate rock bases to protect the stream bed.
- Stabilize soils around each structure where MA roads cross *intermittent* or *perennial streams* which have an average annual flow of five cubic feet per second or greater, and where rainwater runoff from the road will likely cause serious *erosion* and stream sedimentation.
- Where LU roads cross intermittent or perennial streams, temporary bridges or culverts of sufficient size and frequency should be used to minimize interference with the flow of water. When a silvicultural operation is completed, temporary bridges and culverts should be removed, and LU roads cross-ditched where needed to allow normal water flow.
- Obtain roadbed material from upland *borrow pits* whenever possible. For roads that cross sloughs or muck swamps, the base may be logs or sand and clay. Logs are preferable because they reduce the amount of fill material required. Roads with only a sand or clay base gradually settle into the peat or muck, and must be constructed higher initially to ensure adequate width.
- Roads in muck swamps, *headwater swamps*, and *black river bottoms* may be constructed from *dredge material* obtained from a ditch along the upper side of the road, then capped with fill from an upland area. Continuous side ditches are preferred. They reduce the impoundment of water on the upper side of the road, provided there are adequate culverts to move water from the upper to the lower side. Ditch bottoms should follow surface topography and culverts should be located in the lower areas. Such ditches should not be designed to carry water for more than one-fourth mile. They must be separated from navigable water by vegetated *filter strips*.