

# Road and Trails

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***Best Management Practices***  
*for water quality while*  
*harvesting forest products*

# Road and Trails

**PROPER CONSTRUCTION OF ROADS IS A VITAL STEP IN PREVENTING EROSION. THE POTENTIAL FOR SOIL LOSS DUE TO WATER EROSION IS GREATEST DURING ACTIVE HARVEST OPERATIONS. CONTINUAL SOIL DISTURBANCE BY HARVESTING EQUIPMENT CREATES A CONDITION WHERE EVEN LIGHT RAIN CAN CAUSE EROSION.**

In the course of harvest operations, the operator must deal effectively with both surface water and stream crossings to minimize erosion and sedimentation. Control measures should minimize the amount



of disturbance and related erosion, and prevent detached soil from entering watercourses as sediment. Decisions made during the planning stage will affect road construction costs, maintenance needs, service life and the potential occurrences of erosion and sedimentation.

### Truck Roads

Truck roads are used to take logs from a landing to a public road. Whether truck roads are constructed for temporary or permanent access to a parcel of land, the following recommendations should be considered when planning the location of truck roads:

**Note that many of the practices recommended for skid roads and trails are applicable to truck roads, including but not limited to, planning and construction practices.**

- Locate roads to minimize the amount of cut and fill.
- Provide adequate filter strips by locating roads away from streams, ponds, lakes, vernal pools, and wetlands.
- Locate roads and trails where water may be easily diverted, not in swales or other low points.
- Avoid locating roads on **slopes** with unstable soils. Soil Surveys Maps will aid in identifying these soils.

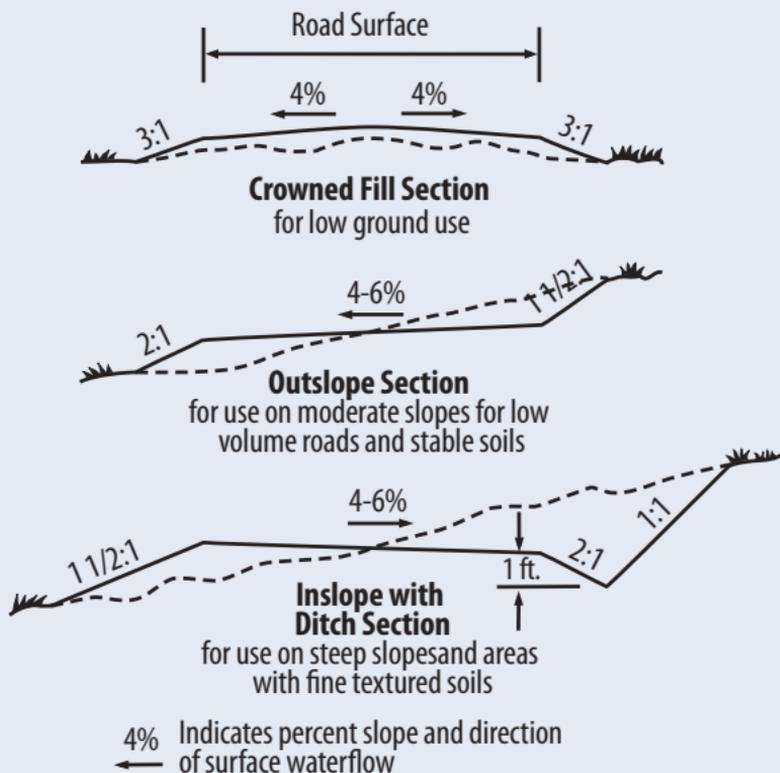
- Avoid planning roads with **grades** in excess of 10%. Short sections may approach 20% grade to avoid obstacles.

### *Surface Water Drainage*

Water flowing along or onto the roads should be diverted before it gains sufficient volume or velocity to cause significant erosion. Water accumulation on roads can be minimized by implementing a combination of out-sloped, in-sloped and crowned road cross-sections, as well as water diversion structures within the roadbed itself. The choice of the shape of the road or its cross section depends on drainage needs, soil stability, slope, and expected traffic volume.

Out-sloped roads drain water toward the downhill side of the road. They are for use on moderate slopes for low volume roads with stable soils. Outsloping is not recommended on roads requiring winter hauling or on slopes of 20 percent or more. Insloped roads are for use on steep slopes and areas with fine textured soils. Crowned roads are for use on flat ground where water standing on the surface is a problem and for high volumes roads on steep slopes. In-sloped and Crowned roads require frequent culverts to carry water underneath the road to the downhill side.

## ROAD CROSS-SECTION



The use of pipe culverts for stream crossings takes special considerations. See **Stream Crossings** section.

*Pipe Culverts for Surface Water Drainage*

- Pipe culverts are often used to drain surface water from permanent roads because of their long life and effectiveness.
- Pipe culverts should only be used where adequate fill can be placed over the culvert.
- Place the culverts required on the in-sloped and crowned roads across the road on a 60-degree angle to the road edge and at a grade of 2% to 4%.
- The type of culvert used depends on the conditions and planned use of the road.

**Recommended Distances Between  
Pipe Culverts on Truck Roads**

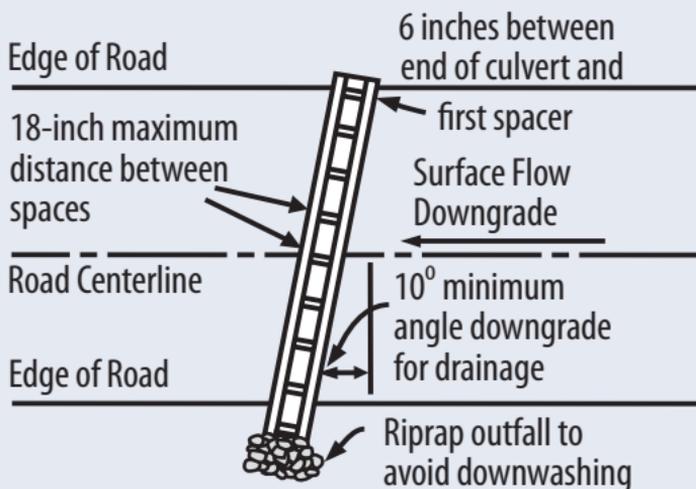
Road Grade %	Pipe Culverts (Spacing in Feet)
1	450
2	300
5	200
10	140
15	130
20	130
25	65
30	30
40	50

- Culverts for surface water drainage should be a minimum of 12" in diameter. Note: minimum sizes for culverts used in stream crossings are larger. See the section on stream crossings.

### *Open Top Culverts for Surface Water Drainage*

Open top culverts are an effective way to control surface water drainage. They are inexpensive and easy to construct but require constant maintenance to remain effective. Broad based dips may be an effective alternative where providing constant long-term maintenance is a problem.

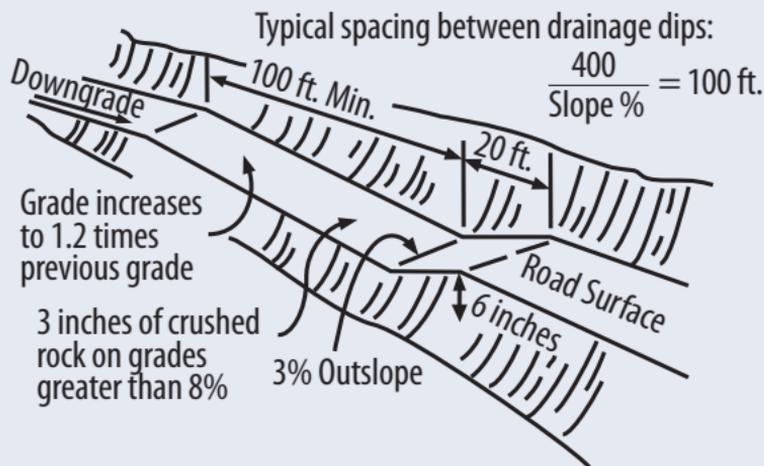
## OPEN-TOP CULVERT



### Broad Based Dips

- Broad based dips may also be used to divert water off the road surface, but are only effective when the road slope is 10% or less and where no streams are present. Dips are less costly to maintain than culverts.
- Broad based dips should be at least 20' long from trough to crest, with adequate drainage at the outflow of the dip.
- There should be adequate filter strip width to allow for the settling of discharge. Discharge areas may be protected with stone, logs, or tree tops that will reduce the speed of the water.

## BROAD BASED DIP



### *Excavation*

Recently excavated and exposed soil is a critical factor contributing to the siltation of waters. Recommended methods for placement of excavated materials associated with road construction include the following:

- Place excavated material in a manner that will not impede water flow or potentially increase the sedimentation of wetlands and watercourses.
- Deposit excavated material in stable locations away from filter strips surrounding streams, ponds, lakes and wetlands.

### *Construction*

Proper handling of water drainage during construction will minimize potential impacts on water quality. The key to construction is to anticipate problems and install preventative measures. Take action to mitigate unanticipated drainage problems the same day they are discovered. The following recommendations should be followed to reduce possible impacts:

- Provide adequate drainage for road grades during construction to minimize erosion of unconsolidated materials.

- During construction, provide temporary cross drainage structures such as water bars to drain water off road surfaces.
- Install permanent drainage structures as construction proceeds.
- During construction, install siltation barriers, such as silt fences and hay bales, in sites where wetlands and watercourses are in close proximity and downhill from roads.
- Material used for road fill should be compacted to reduce the infiltration of water, increase load carrying capacity and minimize settling.
- Use Geotextile fabrics and gravel to reinforce road surfaces as necessary.

## Skid Roads and Trails

Skid roads are temporary roads designed to move logs from the harvest area to a landing. A skid road may require some preparation, such as clearing or grading. A skid trail is used to bring logs to a skid road or on small harvests directly to a landing, and requires little, if any, preparation. Erosion is less likely to occur on a skid trail than on a skid road, because the roots and organic matter are left intact

and there is less compaction of the soil. The surface of an active skid road or trail is constantly being disturbed and subject to erosion. Skid roads and trails should be closed and permanent BMPs installed as soon as they are no longer needed instead of waiting until the timber harvest is completed.

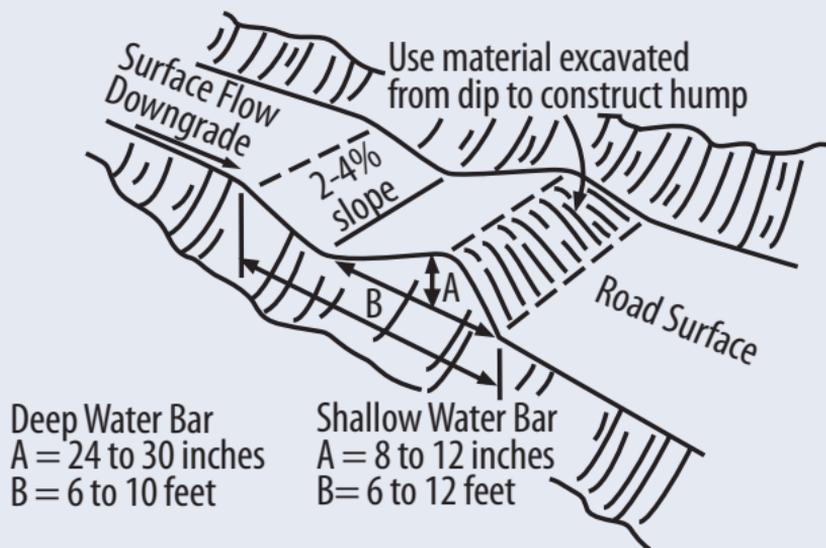
### *Skid Road and Trail Planning*

The following recommendations should be considered when planning the design of the skid roads and trails:

- Consider the topography and soil type in the location of roads and trails. Where possible avoid steep slopes and unstable soils.
- Minimize total road distance and ground disturbance.
- Locate roads and trails where water may easily be diverted, not in streambeds, swales or other low points.
- Minimize the number of water crossings.
- Keep roads and trails uphill from wet or steep areas.
- Identify appropriate stabilization, drainage and erosion control measures.
- Prior to a severe storm, plan to install additional temporary BMPs, since most erosion and sedimentation occurs during and immediately following such events.

- Implement a combination of out-sloping turn-ups, or reverse grades, as well as water diversion structures within the roadbed itself to minimize water accumulation on roads.
- Drain water off of the road and trail surfaces and into undisturbed area at the first opportunity and in the shortest distance possible.

## WATER BARS



### Recommended Distances Between Water Bars & Turn-ups on Roads and Skid Trails

Road Grade %	Water Bars (Spacing in Feet)	Turn-ups (Spacing in Feet)
1	400	450
2	250	300
5	135	200
10	80	140
15	60	130
20	45	120
25	40	
30	35	
40	30	

#### *Water Bars*

A water bar is a ditch and hump or a log lying across a trail or road for the purpose of directing water runoff into vegetation, litter layer, ditch, or dispersion area to reduce water volume and velocity. Deep water bars are usually used on roads that will be closed for extended periods. Water bars may be used temporarily on active operations or permanently in post harvest wrap up.

### *Turn-Ups*

An outsloping turn-up made by slightly changing the direction of a skid trail uphill is an effective way to divert water from the trails surface.



### *Natural Cross Drains*

Natural cross drains may be utilized, but must be kept open to prevent water from pooling.