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Steve Troxler, Commissioner

BMP Newsletter

Best Management Practices for Water Quality & Soil Conservation

This issue's cover photo was taken in Randolph County. It depicts a typical low-volume, low-standard forest haul road that was recently used for a logging operation. This road is likely a 'legacy road', which is a road that has existed for a long time and has been inherited by the current owner. Reopening a legacy road is often more desirable than constructing a new road in another location on the property. However, legacy roads may require significant improvements to road gradient, road surfacing such as gravel, and placement of water control structures to create appropriate road drainage and protect water quality. Road costs can be a barrier to forest management, which is partly why minimum standard roads are commonly used. Thoughtful assessment and targeted upgrades before a forest operation can be key to meeting environmental standards on legacy roads.

In this newsletter edition, we focus on the topic of road drainage and common water control structures used for forest roads and skid trails as a quick refresher.

Inside this issue:

Road Drainage

The secret of good forest roads is **DRAINAGE**, regardless of which region of North Carolina you work in. But, don't confuse road drainage with site drainage! Forestry tracts should not alter the natural hydrology of a site (review pages 94 and 95 in the BMP manual).

Removing water from the road surface is necessary to keep the road trafficable. Regardless of how well a road is located or constructed, if it does not have adequate drainage, it will not remain a serviceable road for long.

A common road drainage issue to be on the lookout for is the road surface elevation below that of the surrounding area. In the left image above, water cannot exit the roadway, resulting in concentrated flow and excessive rill-like erosion. In the right image above, the road surface elevation is above that of the surrounding area. Road grading, adding surface coverage and/or installation of water control structures can help remedy this erosion issue.

We know that more runoff volume on roads and/or steeper road grades increase the probability of accelerated erosion. Therefore, the number of water control structures or water diversions partly depend on slope steepness, slope length, traffic frequency and other road standards (see 2017 BMP Newsletter issue 3 for more information on road standards).

Water Control Structure: Water Bars

A water bar can be thought of as an angled 'speed bump' with a shallow trench along the uphill edge that diverts runoff. Water bars are typically used when closing off or 'retiring' skid trails and roads. They are not just soil piled in the road surface.

Slope Grade (*percent*)	***Water bars** (*feet*)
20 +	40 to 30
16 to 20	60 to 40
11 to 15	80 to 60
6 to 10	100 to 80
0 to 5	120+ to 100
***Spacing ranges are only general guidelines.**	

Pictured at left are two perspectives of the same water bar constructed across a skid trail. Note the shallow trench along the uphill face and how the water bar extends well beyond the skid trail edge.

Do not drive over water bars once installed.

There are two key points to functional waterbars:

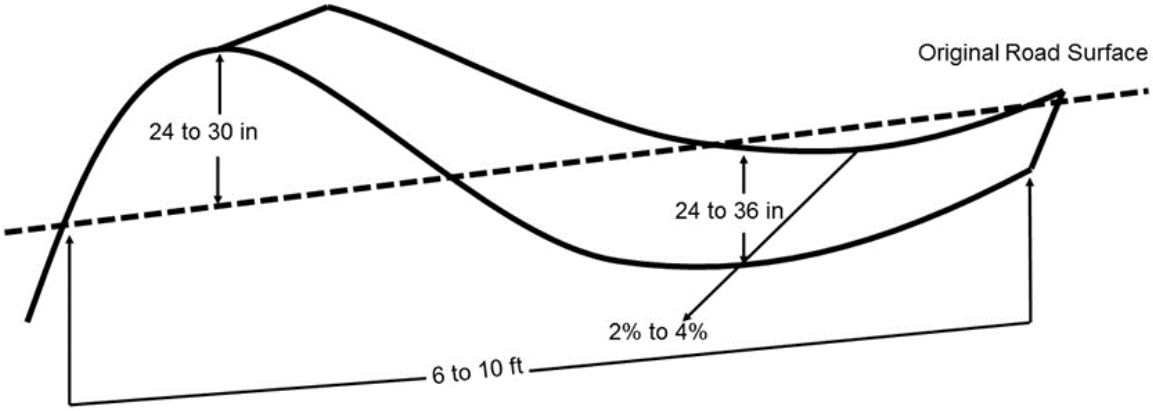
1. **A water bar must be constructed to extend completely across the trail or road surface.**
   - This prevents runoff from moving around the ends of the water bar and flowing past it.
   - This may require 'tying-in' the water bar with adjacent side / cut slopes.
   - This may require extending the water bar beyond the width of the road or trail travel surface.

2. **The water bar should be angled and have a suitable outlet for diverting runoff into an area where sediment can settle and/or filter out. It is not intended as a trap to block or pool stormwater runoff.**
   - Proper angling is needed to allow the runoff to drain and not backup.
   - Excavation of a shallow trench along the uphill edge of the water bar hump helps collect and drain off the diverted water.

Water Control Structure: Rolling Dips

A rolling dip is a cross between a water bar and a broad-based dip. Like broad-based dips, they have a reverse grade, formed immediately on the downhill edge of the dip. However, this reverse grade is generally shorter and the outlet is narrower. Like water bars, they have a mound of dirt at the downhill end that is angled to divert runoff. Rolling dips can be used on roads with steeper grades that are unsuitable for a broad-based dip.

Pictured above is a rolling dip on a forest haul road. Illustrated below is an idealized schematic of a rolling dip.



BMPs for Rolling Dips

- Rolling dips should be excavated and constructed using equipment and/or techniques that assure proper angles and a firm hump like a water bar.
- A 10 to 15-foot long, 3-8% reverse grade should be constructed into the roadbed by cutting upgrade to the dip location and then using the cut material to build the mound for the reverse grade.

Slope Grade (*percent*)	***Rolling Dips** (*feet*)
16 +	120
11 to 15	135
6 to 10	150
0 to 5	180
***Spacing ranges are only general guidelines.**	

Water Control Structure: Turnouts

A turnout is a type of shallow trench or pathway that diverts runoff from the surface of a road, skid trail or fire line. There are two angles on a turnout. First, the outlet gradient angle, which is the slope needed to drain runoff from the road surface. Second, the turnout angle, which is how wide apart the turnout veers away from the roadside or trail. A wing-ditch or lead-off ditch is a specific type of turnout used for controlling runoff within roadside ditches. In any case, the turnout should be constructed as a continuous offshoot of the road, skid trail, fire line or roadside ditch. This helps maintain an uninterrupted connection for runoff to flow.

Pictured above is a turnout used together with a water bar on a skid trail.

BMPs for Turnouts

- Begin the inflow of the turnout at the same grade level as the road, skid trail, fire line or ditch so runoff can flow easily without being interrupted.
- Excavate the turnout with enough outlet gradient angle so runoff can drain in a controlled manner, generally from 1-3% is adequate.
- Construct using a turnout angle between 15 to 30 degrees downslope.
- Situate the end of the turnout outlet in a manner that prevents runoff from flowing directly into streams or waterbodies. Take measures to capture the sediment from the outlet as needed.
- Avoid siting the outlet onto soft soil or fill material, unless measures are implemented to prevent accelerated erosion from the outlet.
- For use in roadside ditches, take action to minimize erosion within that ditch so the inflow of the turnout does not create a gully.

Slope Grade (*percent*)	***Turnouts** (*feet*)
20+	60 to 40
16 to 20	100 to 60
11 to 15	140 to 100
6 to 10	180 to 140
0 to 5	250+ to 180
***Spacing ranges are only general guidelines.**	

Additional Resources for Roads

There are several more water control structures and other methods for achieving road standard objectives. Learn about other such water control devices in the BMP manual and resources listed below.

- https://www.ncforestservice.gov/water_quality/roads.htm
- A Guide for Forest Access Road Construction and Maintenance in the Southern Appalachian Mountains
- Environmentally Sensitive Road Maintenance Practices for Dirt and Gravel Roads
- Guidance for the Construction and Maintenance of Forestry Roads in Wetlands of North Carolina

Recent Water and Forestry Podcast

Check out How the River Flows podcast by Keeping Forests. They have released two new episodes since the release of the last BMP newsletter. This podcast focuses on forest conservation and water quality.

N.C. Forest Service - Water Quality
www.ncforestservice.gov/water_quality/water_quality.htm

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North Carolina Forest Service

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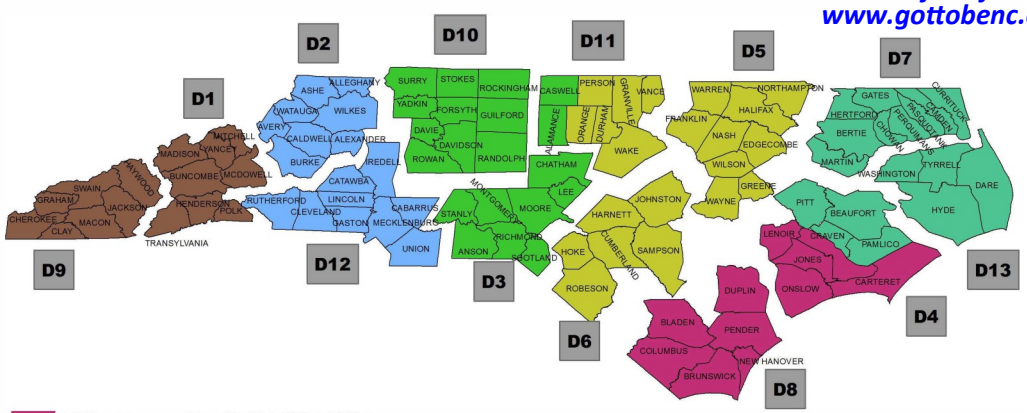

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