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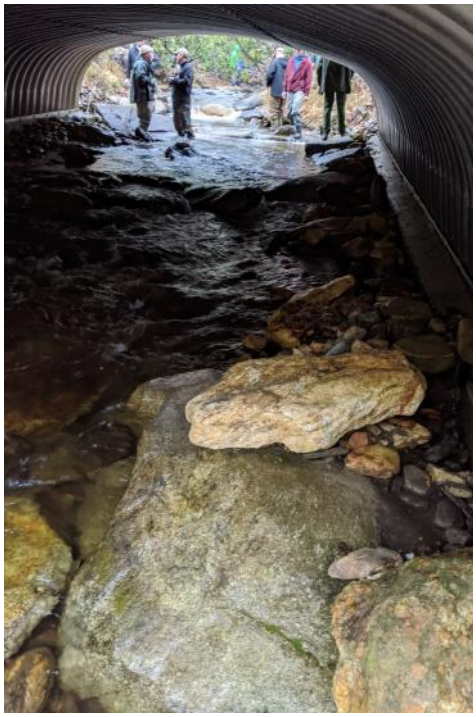
North Carolina Forest Service

A Division of the N.C. Department of Agriculture and Consumer Services
Steve Troxler, Commissioner

BMP Newsletter

Best Management Practices for Water Quality & Soil Conservation



This issue's cover photo is a stream view of a road stream crossing on the Pisgah National Forest. This stream crossing was designed with aquatic organism passage in mind. A section of stream nearby the crossing was replicated at the crossing, then a lid was placed over it. The pipe arch design is strong enough to support the road traffic above and wide enough to allow for channel banks to be constructed beneath. Having banks along the concrete footers provides some protection from bedload abrasion during storm events. Aquatic organisms should have no greater difficulty navigating this stream section than if there were no crossing at all. The USDA Forest Service and its collaborators should be commended for their efforts on this project. Well done!

Lean more about Aquatic Organism Passage here:
https://www.fs.fed.us/biology/fish/1000-culverts/

Inside this issue:

Aquatic Organism Passage

Stream crossings that significantly alter natural flow patterns can negatively influence aquatic organism interactions within and among species. These interactions influence their distribution and abundance.

Can the aquatics move freely within your managed forests?

Just because you have a big culvert doesn't mean you are allowing aquatic organisms to pass freely up and down stream.

Pictures shown here are culvert stream crossings that may be limiting to aquatics. Note that both culverts are perched, i.e., above the streambed.

Read/review Stream Crossing BMPs in Chapter 5 Part 3 of the N.C. Forest Service BMP Manual

Since stream crossings are the most likely stream area to limit aquatic movement, stewards of forestland should consider all crossing options and associated BMPs, then implement them accordingly. Keep in mind that the optimal stream crossing for aquatic organisms would mimic the stream characteristics in the adjacent natural channel. This would allow aquatic organisms to move through the culvert or ford or under the bridge crossing structure with no greater difficulty than if there were no crossing at all.

Identifying Culvert Impacts

Culverts are a static structure in a dynamic stream system. Even if they are properly designed and installed, they can become less effective over time. As the channel changes, culverts can become undersized and/or a barrier to aquatic organisms. What are some signs that indicate when a culvert should be replaced, upgraded, or removed?

Stream flow is no longer moving through the culvert.

Culvert is perched well above the streambed.

A wide channel width at the inlet (pictured left) and outlet (pictured right) relative to the upstream and downstream channels have created a well-defined hourglass shape. Also, note the accumulating debris.

A sediment wedge has formed at the inlet.

Plunge pool at outlet is exceedingly deep.

BMP Focus: Culvert Sizing

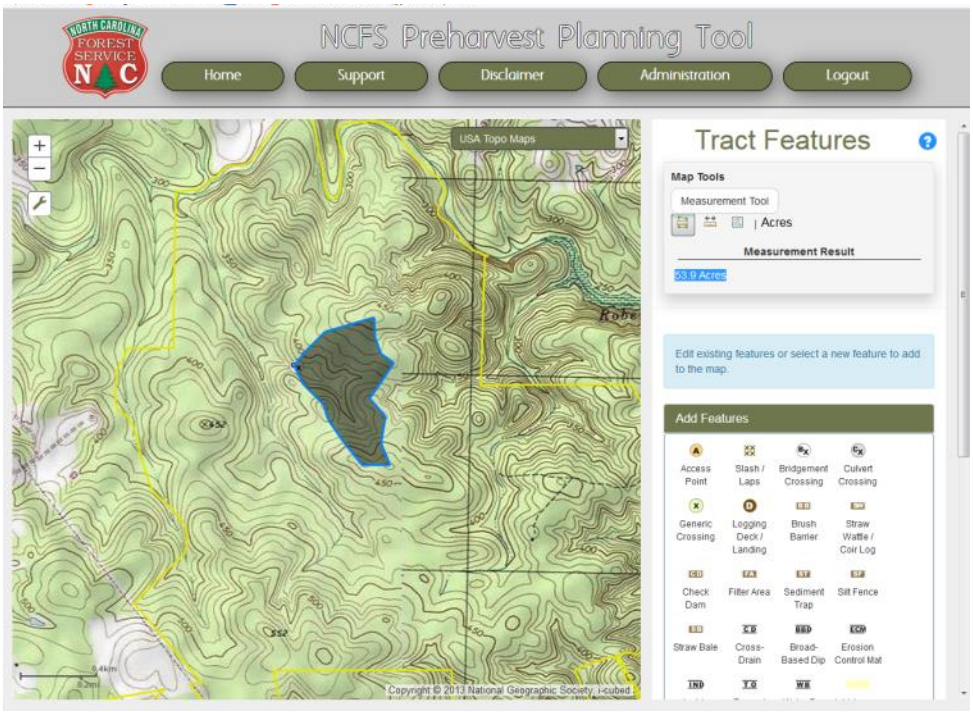
Culverts are a common method for stream crossings. Culvert size selection may vary slightly with differing landowner objectives, but the primary objective is to convey water beneath a road bed. All culverts, regardless of size, inherently have an associated risk of washout/failure. However, as the size of the culvert selected increases, the risk of perceived failure decreases. Landowners and forestland managers should make an informed decision with the data records available to them.

One of the most important factors when implementing a culvert stream crossing is to determine the proper size given the upstream watershed characteristics. Stream gauge data, historical records, or other hydrological data are useful to help understand flow dynamics, but are often not available in many forest management situations. Without hydrologic data, Talbot's Formula method has been a generally acceptable method for culvert sizing. It is one of the simplest and easiest to implement when few data records exist.

$$A = C * M^{0.75}$$

Where **A** = ***cross sectional area of a drainage needed.*** **C** = ***runoff coefficient constant.*** This is based on a combination of soil absorptive capacity, slope, and cover. **M** = ***acres of upstream watershed.*** Talbot's formula is used for a maximum of 4 inches of rainfall per hour, which is the rate used in the formula above. Note that the culvert sizing recommendations in the BMP manual are at a rate of 2.5 inches of rainfall per hour.

Looking for a math shortcut? Check out our newly added Talbot's Formula Excel Spreadsheet: https://www.ncforestservice.gov/water_quality/wq_CulvertSizing.htm



Don't know the size of your watershed? Use the N.C. Forest Service's Forestry Preharvest Planning Tool and estimate it with the measurement tool (pictured left).

Reach out to your local N.C. Forest Service office and request assistance: www.ncforestservice.gov/contacts

Upcoming Events:

Western Region Events

Piedmont Region Events

Eastern Region Events

All events are assumed to be canceled or rescheduled due to COVID-19 precautions.

Did you know…

A stream channel is either incising (lowering the streambed) or aggrading (elevating the streambed). Channel changes are natural, but can be further influenced by people. Changes that increase peak flow (land use change) or constrict flow (culverts, beaver dams, etc.) create stronger erosional forces within the stream. Stronger erosion forces can lead to incising. Headcuts can be seen on incising streams. A headcut can move upstream until it reaches a hard surface, such as a culvert.

North Carolina Forest Service

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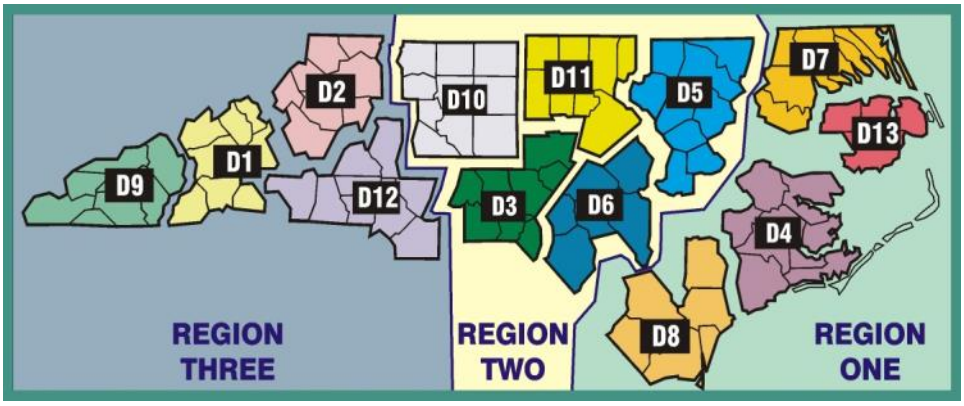

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