

An Assessment of Forestry Best Management Practices in North Carolina, 2012-2016

Executive Summary

Between December 2012 and November 2016, the North Carolina Forest Service (NCFS) conducted detailed site survey examinations to evaluate the implementation of voluntary forestry Best Management Practices (BMPs) on logging sites statewide. This survey is periodically carried out by the NCFS Water Resources Branch to help us understand which BMPs are used effectively to protect water quality and which BMPs may need to be revised or emphasized in different parts of the state. This report reviews our actions to address previous survey report recommendations, and provides new recommendations to enhance our efforts in the future. This is the first report following major amendments to the North Carolina Forestry BMP Manual that were made in September 2006.

We used standardized Southern Group of State Foresters (SGSF) methodology to determine a sample size of 204 sites statewide, stratified by the land area in each of the four ecoregions within North Carolina: Blue Ridge or Mountains, Piedmont, Southeastern Plains and Mid-Atlantic Coastal Plain. To identify many of the sites included in this survey, we used the Southern Forest Area Change Tools (SouthFACT), which analyzes periodic remote sensing data to locate areas of dramatic vegetation change. When SouthFACT was not practical, we identified potential sites by randomly selecting from recent NCFS records, or by assessing sites we came across while traveling through a county.

During the 4-year assessment, we completed 210 unique surveys on 204 sites in 94 of North Carolina's 100 counties. When we encountered a BMP implementation opportunity, we assessed whether the BMP had been properly implemented, and whether the situation presented a risk to water quality. We surveyed some BMPs on an individual basis, which differs from the approach used in the previous 2006-2008 BMP implementation survey project.

In total, evaluators assessed 28,491 BMP implementation opportunities statewide, including 9,671 in the Mountains, 11,206 in the Piedmont, 3,230 in the Southeastern Plains, and 4,384 in the Coastal Plain. Overall BMP implementation was 84 percent statewide, 82 percent in the Mountains, 87 percent in the Piedmont, 79 percent in the Southeastern Plains, and 84 percent in the Coastal Plain. When BMPs were properly implemented, risks to water quality were very rare, only occurring in 36 out of 23,907 observations. Evaluators associated a potential water quality risk to 30 percent of the improperly implemented BMPs, which constituted for less than five percent of all BMP implementation opportunities.

Statewide, when BMPs were not properly implemented, risks to water quality were more likely in the categories of Rehabilitation of the Project Site (54%), Streamside Management Zones (SMZs) (64%) and Stream Crossings (49%). This would infer that the BMPs in these categories are of greater importance for their value of protecting water quality. Specifically, BMPs related to stabilizing stream crossing approaches, removal of logging debris from streams, and overall site stabilization were noted as areas for improvement.

Bridgemats were found to be the stream crossing type that best protected water quality, as well as the most commonly used stream crossing type. Ford and pole type crossings were associated with a risk to water quality in more than 75 percent of cases.

Evaluators estimated the average width and total length of every SMZ encountered during a survey. Our results indicate that risks to water quality decreased as SMZ width increased. For a given probability of a risk to water quality, SMZ width must be greater in the Mountains than in the other ecoregions. In watersheds with a special riparian buffer rule, the BMPs for stream crossings and SMZs were implemented at higher rates on average, and risks to water quality were lower. Risks to water quality from improperly implemented SMZ BMPs decreased moving from west to east across ecoregions, as the terrain changed from steeper to flatter ground.

The highest rates of BMP implementation were found in the White Oak, Pasquotank, Tar-Pamlico, and Hiwassee river basins, and the lowest were in the Lumber, New and Cape Fear River basins.

Evaluators also collected information on the ownership and harvest characteristics at each survey unit. Implementation of BMPs was higher on publicly-owned and conservation land (96% each) and on land owned by timber investment/management groups (94%), as compared to other privately-owned land (79%). When BMPs were improperly implemented, risks to water quality were more frequent on “other public” land (48%) or state land (36%) as compared to federal lands (3%). Survey units with naturally regenerated stands had lower BMP implementation and more frequent risks to water quality than those managed as artificially regenerated timber plantations.

Harvesting areas that were active, ranging from 26 to 75 percent completed, had lower rates of BMP implementation and higher rates of risks to water quality. BMP implementation was higher and risks to water quality were lower on all sites larger than 100 acres, regardless of their operational phase of activity.

Our findings support the conclusions of many forest operation research studies that have found bridgemats to be the best type of temporary stream crossing for timber harvests when appropriate site conditions exist. Installed correctly, bridgemats require less soil disturbance near streams than other stream crossing types. If BMPs are implemented throughout the operation, the needed rehabilitation measures are minimal. The NCFS loans bridgemats to loggers for temporary use in many parts of the state. Considering our findings, and conclusions of other research, this program has likely reduced impacts to water quality at stream crossings around the state.

During water quality outreach and education programs, more emphasis may be needed for proper rehabilitation of project sites. Specifically, we found that forest operators did not consistently rehabilitate stream crossings by stabilizing banks and approaches, removing debris or old culverts when necessary. Particularly in the mountains, the risk of erosion from skid trails and other areas of bare soil likely could have been reduced if operators had applied leftover logging debris atop of skid trails, as is often recommended. This issue is supported by our findings on harvest progress, which showed that BMP implementation was lowest, and risks to water quality were highest, on sites that were 26 percent to 75 percent complete. Ideally, rehabilitation and site stabilization should occur throughout the operational phases of a harvest, and not simply be left until the harvest is concluded.

This survey supports other findings and research that demonstrate the function of SMZs in protecting water quality. Our data show a convincing inverse relationship between SMZ width and the probability of a risk to water quality, as illustrated in Figure 3. However, on average statewide, SMZs that were approximately 30 feet wide, or more, along perennial streams resulted in no risk to water quality. For intermittent streams, the width was 20 feet wide, or more. In all cases, when SMZs were 10 feet wide or narrower, there was a risk to water quality in 21 percent of our observations.

Many of the observed risks to water quality associated with stream crossings and SMZs could have been avoided if the operator had used proper preharvest planning to avoid or minimize stream crossings from the outset. Preharvest planning can make the operator or landowner aware of problematic soil conditions, special regulations, or threatened/endangered species in the area. The NCFS produced a freely available online Forest Preharvest Planning Tool that can assist in this strategy.

The information contained in this survey on BMP implementation helps inform our outreach programs, BMP technical assistance, forest management projects on state-owned land, and future revisions to the state’s forestry BMP manual. We will soon start preparing for the next BMP implementation survey, and hope to make improvements in survey quality, data collection technology, and applicability.