IMPLEMENTATION OF BEST MANAGEMENT PRACTICES FOR FORESTRY, 2012-2016

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The BMP Life Cycle

Develop BMPs
BMP Manual & Field Pocket Guide

Monitor Use
BMP Implementation Surveys & Reports

Educate & Train
BMP Videos, Forestry Leaflets, & Information Resources

Evaluate Effectiveness
BMP Effectiveness Monitoring Watershed Study & Stream Crossing Study
Introduction

• How are BMPs being implemented?

• When do we find potential water quality issues?

• Can we improve BMP technical assistance?

• What other factors might affect BMP implementation?
Previous Report

- Data collected 2006-2008
  - Published 2011
- Surveys conducted by WQFs and Service Foresters
- Stratified by NCFS regions
- Statewide BMP Implementation Rate: 85%

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Following Up (2012-2017)

- Forest Preharvest Planning Tool
- Bridgemat Loan Program
  - 267 sites, >12,000 acres of forestland
- Paired Watershed Study
- Outreach
  - ProLogger
  - WQ Refreshers
  - NCSU/Wayne CC
- Publications
  - Quarterly BMP Newsletter (contact ncfs.water@ncagr.gov)
  - Water Quality Leaflets
New Surveys

- Data collection: December 2012 - November 2016
- Data collected by Forest Water Quality Specialist
- Stratified by USEPA ecoregions
- Recommended statewide sample size: 204

Cannot be directly compared to previous survey results
Surveys

• 210 surveys on 204 sites

• 94 out of NC’s 100 counties

• 28,491 BMP implementation opportunities

• 79% of evaluated sites owned by NIPFs (61% statewide)
Ecoregions

- Differences in:
  - Physiography
  - Climate
  - Dominant species
  - Practices?

Stratified sample by ecoregion area:

<table>
<thead>
<tr>
<th>Blue Ridge</th>
<th>Piedmont</th>
<th>Southeastern Plains</th>
<th>Mid-Atlantic Coastal Plain</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>75</td>
<td>41</td>
<td>53</td>
</tr>
</tbody>
</table>
Methods

For every BMP opportunity:

1. Was the BMP properly implemented? (Yes or No)
2. Does a risk to water quality exist? (Yes or No)

- Visible sediment is reaching or could reach a waterbody
- Water flow inhibited or degraded by debris
- Vehicle fluids, pesticides, herbicides, fertilizers, or other chemicals/wastes are reaching or could reach a waterbody or groundwater
Methods
Statewide Implementation Rate of BMPs in all categories: 84%

Mountains: 82% | Piedmont: 87% | SE Plains: 79% | Coastal Plain: 84%

- 63% of all risks were found in the Stream Crossings and SMZs Categories
  - SMZs were 54% of all risks in the SE Plains
  - Stream Crossings were 41% of all risks in the Coastal Plain
BMP Implementation & Risks to Water Quality

- When BMPs were properly implemented, risks to water quality were very rare, only occurring **36 out of the 23,907 times (0.15%)** we observed properly implemented BMPs.

- When BMPs were improperly implemented or not implemented at all, evaluators found a risk to water quality at **1,370 out of 4,584 observations (30%)**. These situations made up less than 5 percent of all BMP implementation opportunities.

30% vs. 0.15%
Statewide Implementation Rate of BMPs For Controlling Erosion and Runoff: 87%

Mountains: 87% | Piedmont: 89% | SE Plains: 75% | Coastal Plain: 89%

- **Properly Implemented**
  - No risks to WQ

- **Improperly Implemented or Missing**
  - Risk to WQ in 13% of observations

Areas for Improvement:
- Situating outlets to capture sediment (broad-based dips, turnouts, waterbars)
- Ensuring firm, upright, intact waterbars
Statewide Implementation Rate of BMPs For Rehabilitation of the Project Site: 71%

Mountains: **53%**  |  Piedmont: **70%**  |  SE Plains: **60%**  |  Coastal Plain: **83%**

- **Properly Implemented**
  - Risk to WQ in 1% of observations

- **Improperly Implemented or Missing**
  - Risk to WQ in 54% of observations

• Areas for Improvement:
  • Removing debris from the stream channel.
  • Installing BMPs to control, divert, and/or capture runoff/sediment along stream crossing approachways.
Seed and straw ➔ Stable stream crossing ➔ Proper rehabilitation
Statewide Implementation Rate of BMPs
For Roads: 85%

Mountains: 89% | Piedmont: 86% | SE Plains: 85% | Coastal Plain: 76%

**Properly Implemented**
No risks to WQ

**Improperly Implemented or Missing**
Risk to WQ in 14% of observations

- Areas for Improvement:
  - Minimize soil disturbance and the amount of road at any stream crossing.
  - Stabilize bare soil areas using suitable techniques.
  - Avoid or minimize stream crossings.
Cross-drain collecting runoff from inside ditchline

Switchback with gravel
Statewide Implementation Rate of BMPs
For Skid Trails: 79%

Mountains: 70%  |  Piedmont: 82%  |  SE Plains: 78%  |  Coastal Plain: 86%

Properly Implemented
No risks to WQ

Improperly Implemented or Missing
Risk to WQ in 12% of observations

• Areas for Improvement:
  • Establishing skid trails along land contours and keeping slopes at less than a 25% grade.
  • Concentrating skidding on as few skid trails as needed.
  • Installing waterbars, brush barriers, turnouts, or other methods as needed.
Skid trails follow contours, could use logging debris for stability
Ample logging slash to protect bare soil
Statewide Implementation Rate of BMPs
For Streamside Management Zones (SMZs): 86%

Mountains: 72%  |  Piedmont: 91%  |  SE Plains: 77%  |  Coastal Plain: 87%

- **Properly Implemented**
  - No risks to WQ

- **Improperly Implemented or Missing**
  - Risk to WQ in 49% of observations

- **Areas for Improvement:**
  - Avoid gouging the soil in a manner that could funnel runoff and transport sediment to waterbodies.
  - Limiting heavy equipment use within 10 feet of the edges of streams and waterbodies.
Measuring SMZs

- One unit per side
  - New units when branching

- Length and width (ft)

- Stream type
Statewide Implementation Rate of BMPs
For Stream Crossings: 79%

Mountains: 75% | Piedmont: 78% | SE Plains: 72% | Coastal Plain: 83%

- **Properly Implemented**
  - No risks to WQ

- **Improperly Implemented or Missing**
  - Risk to WQ in 14% of observations

**Areas for Improvement:**
- Minimize alteration of stream depth, width, gradient, and capacity.
- Don’t use ford crossings as part of the skid trail network. Use ford crossings only for truck access.
- Protect the inlet/outlet of the culvert/fill material with suitable stabilization measures.
## Risks to water quality categorized by stream crossing type

<table>
<thead>
<tr>
<th>Stream crossing type</th>
<th>Stream crossings evaluated</th>
<th>Risk to WQ</th>
<th>Frequency of Risk to WQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridgemat</td>
<td>113</td>
<td>22</td>
<td>19%</td>
</tr>
<tr>
<td>Culvert</td>
<td>63</td>
<td>23</td>
<td>37%</td>
</tr>
<tr>
<td>Ford</td>
<td>19</td>
<td>15</td>
<td>79%</td>
</tr>
<tr>
<td>Pole</td>
<td>16</td>
<td>12</td>
<td>75%</td>
</tr>
</tbody>
</table>
Ford and pole crossings can be used, but must be constructed correctly
Well-stabilized headwall, sufficient culvert size, undisturbed banks
Statewide BMP Implementation in other categories:
Chemicals, Fluids and Solid Waste: 77%  |  Decks: 90%  |  Logging Systems: 86%

- Few BMPs observed for Wetlands, Firelines, and Site Preparation.

- Areas for Improvement:
  - Ceasing operations when inclement weather and/or wet site conditions persist.
  - Situating decks outside the SMZ.
  - Equipment, vehicles, and machinery free of leaking fluids. No stains on the ground that would indicate a leak.
Results: Other

- BMP implementation higher (87% vs. 83%) on “plantation” managed sites than on “naturally” managed sites.
- BMP implementation higher at the beginning and after the harvest (94% vs. 76% vs. 85%).
- BMP implementation highest (87%) and WQ risks lowest on sites >100 acres.
Results: Summary

• Statewide BMP Implementation: 84%

• Most risks related to stream crossings

• Site rehabilitation issues

• Generally: Wider SMZs were associated with fewer risks

• Bridgemats caused fewest risks to water quality
Takeaways

- BMPs are vital (0.15% vs. 30%)
- Rehabilitation
- SMZs
- Preharvest Planning
Other Products

- Full Report
- Story Map
- Appendix with tables

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Programs And Services > Water Quality > BMP Implementation Surveys
Future Work

• Next round of surveys
  • ArcCollector/Survey123
  • Comparison to these results
  • Validating erosion prediction models (USLE)

• SGSF Regional Report
Questions?

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