NORTH CAROLINA
DEPARTMENT OF AGRICULTURE & CONSUMER SERVICES

IMPLEMENTATION OF BEST MANAGEMENT PRACTICES FOR FORESTRY, 2012-2016

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The BMP Life Cycle

Develop BMPs
BMP Manual & Field Pocket Guide

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

Monitor Use
BMP Implementation Surveys & Reports

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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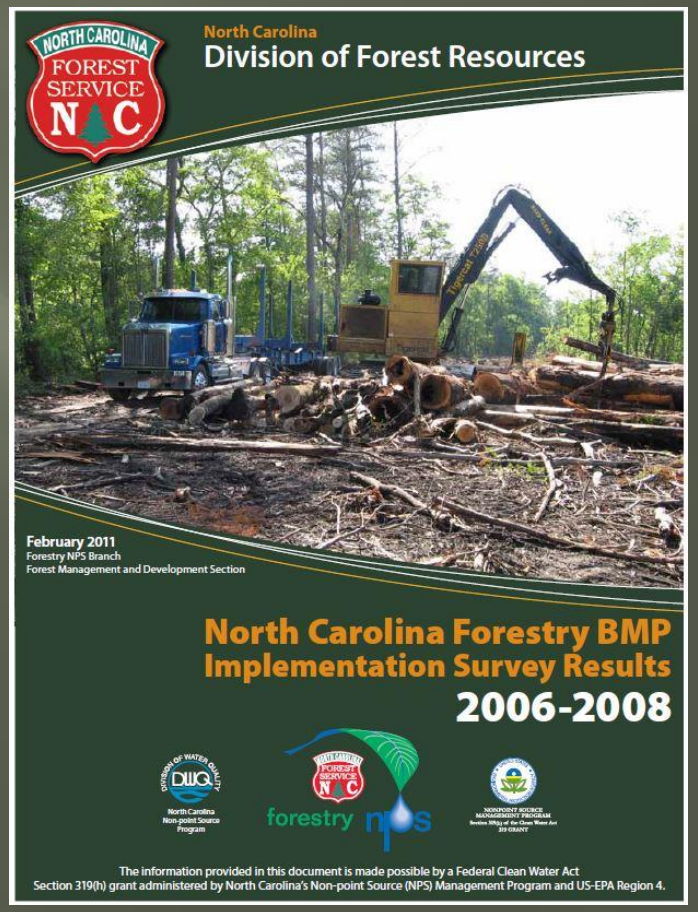


Following Up (2012-2017)

- 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**

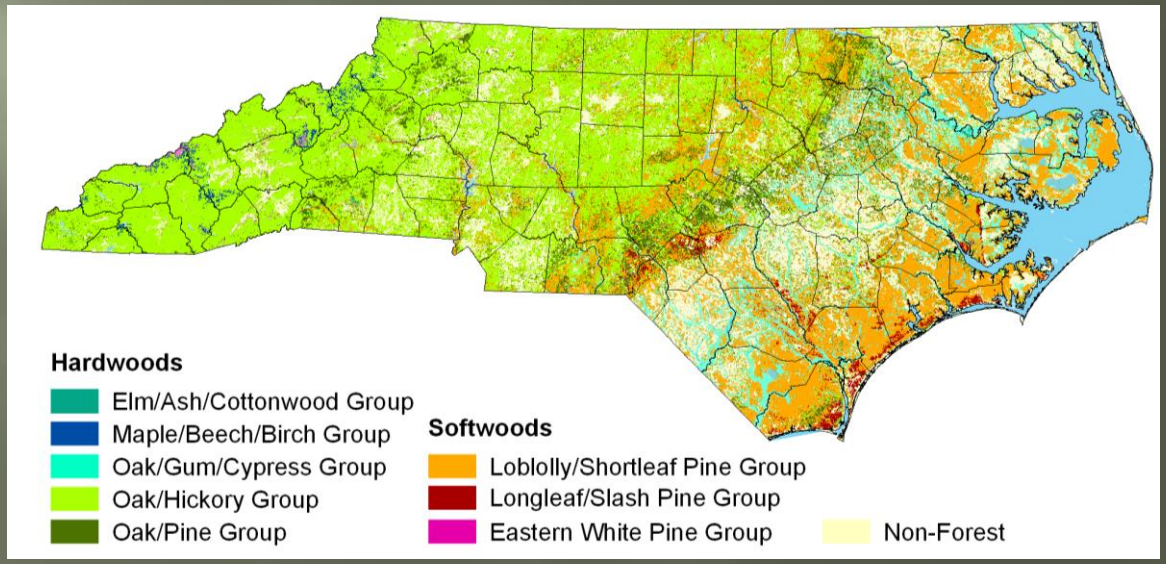
Cannot be directly compared to previous survey results

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

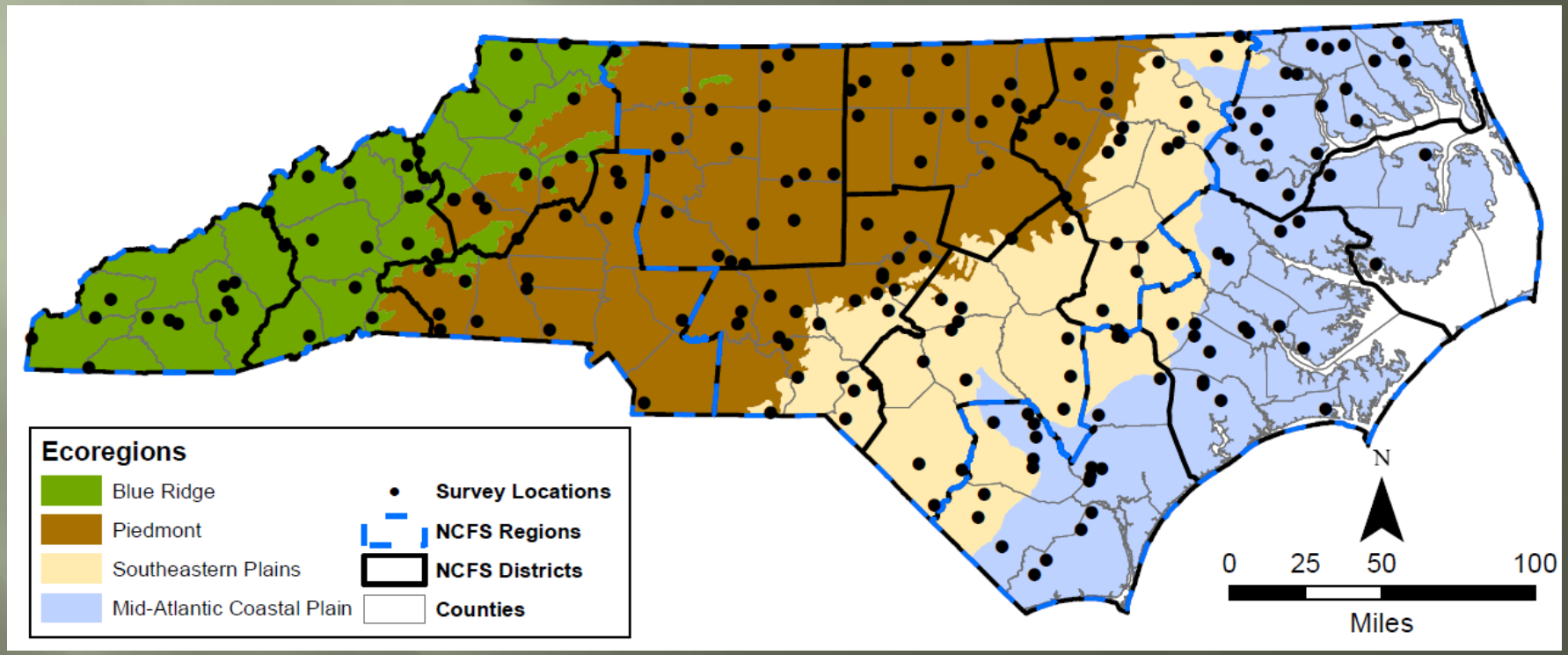
- Differences in:
  - Physiography
  - Climate
  - Dominant species
  - Practices?



Stratified sample by ecoregion area:

Blue Ridge	Piedmont	Southeastern Plains	Mid-Atlantic Coastal Plain
35	*75*	*41*	*53*

Surveys



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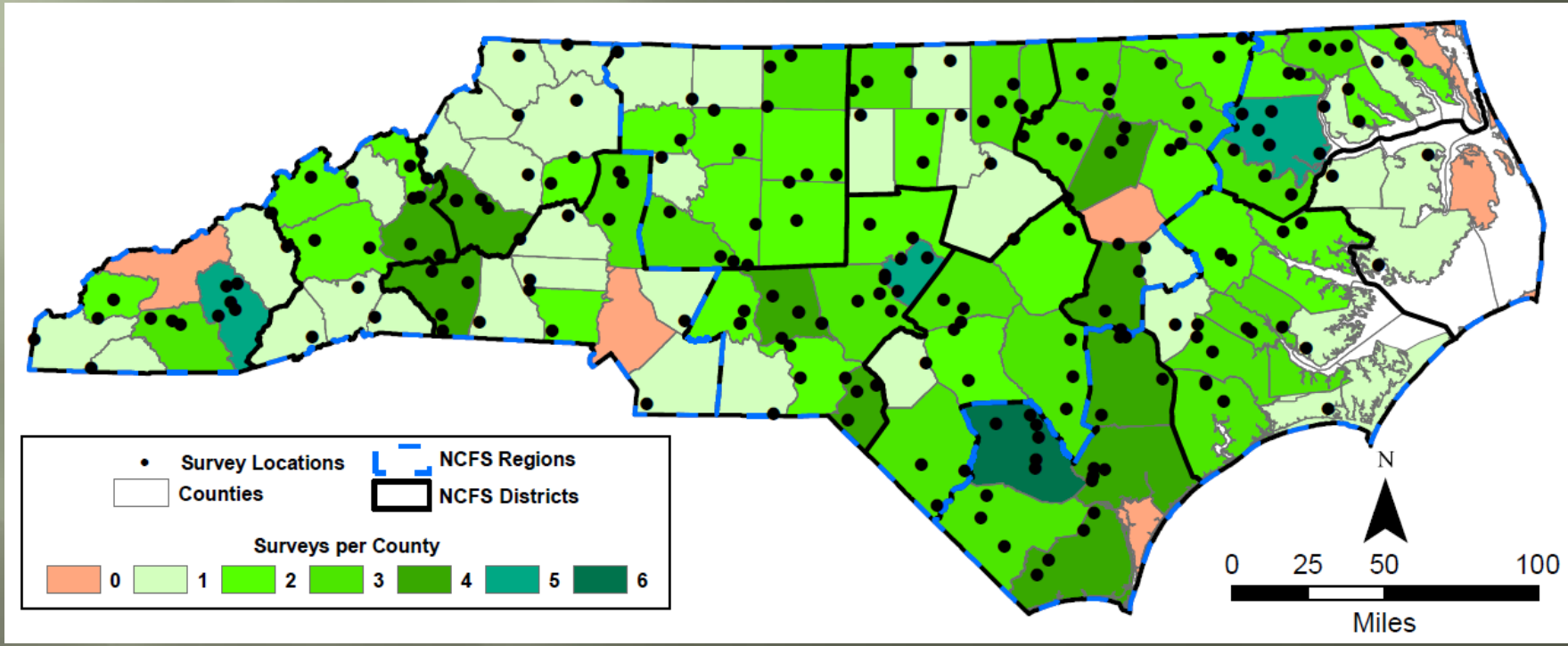

Survey Locations
Counties
NCFS Regions
NCFS Districts
Surveys per County
0
1
2
3
4
5
6
N
0
25
50
100
Miles

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	**Improperly Implemented or Missing**
No risks to WQ	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	**Improperly Implemented or Missing**
Risk to WQ in 1% of observations	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	**Improperly Implemented or Missing**
No risks to WQ	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	**Improperly Implemented or Missing**
No risks to WQ	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%**

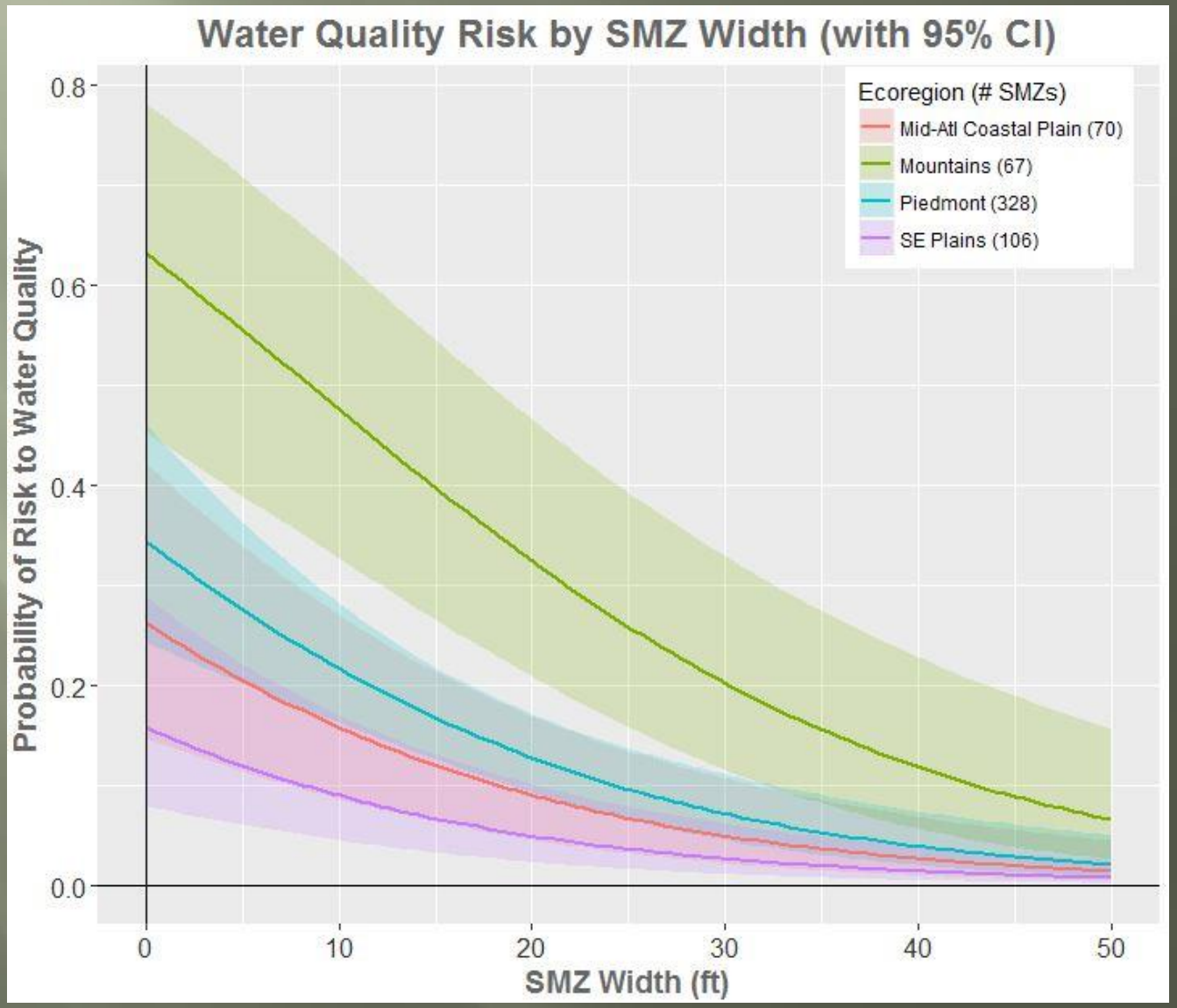
Mountains: **72%** | Piedmont: **91%** | SE Plains: **77%** | Coastal Plain: **87%**

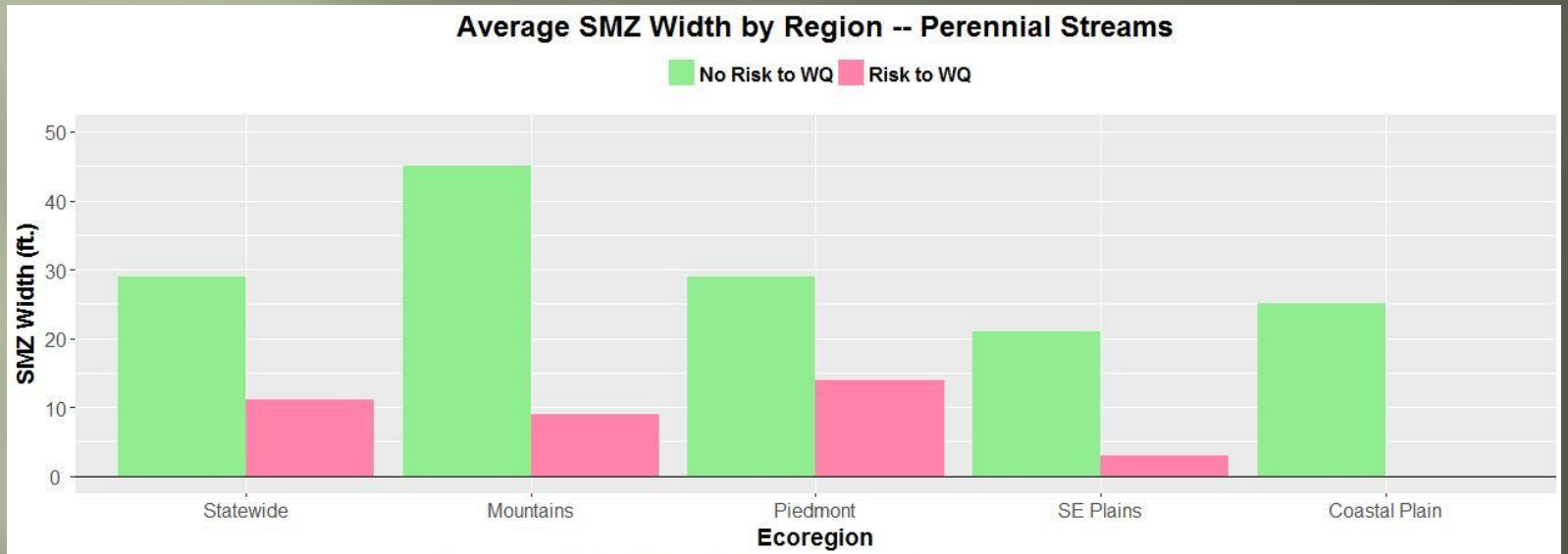
Properly Implemented	**Improperly Implemented or Missing**
No risks to WQ	Risk to WQ in 49% of observations

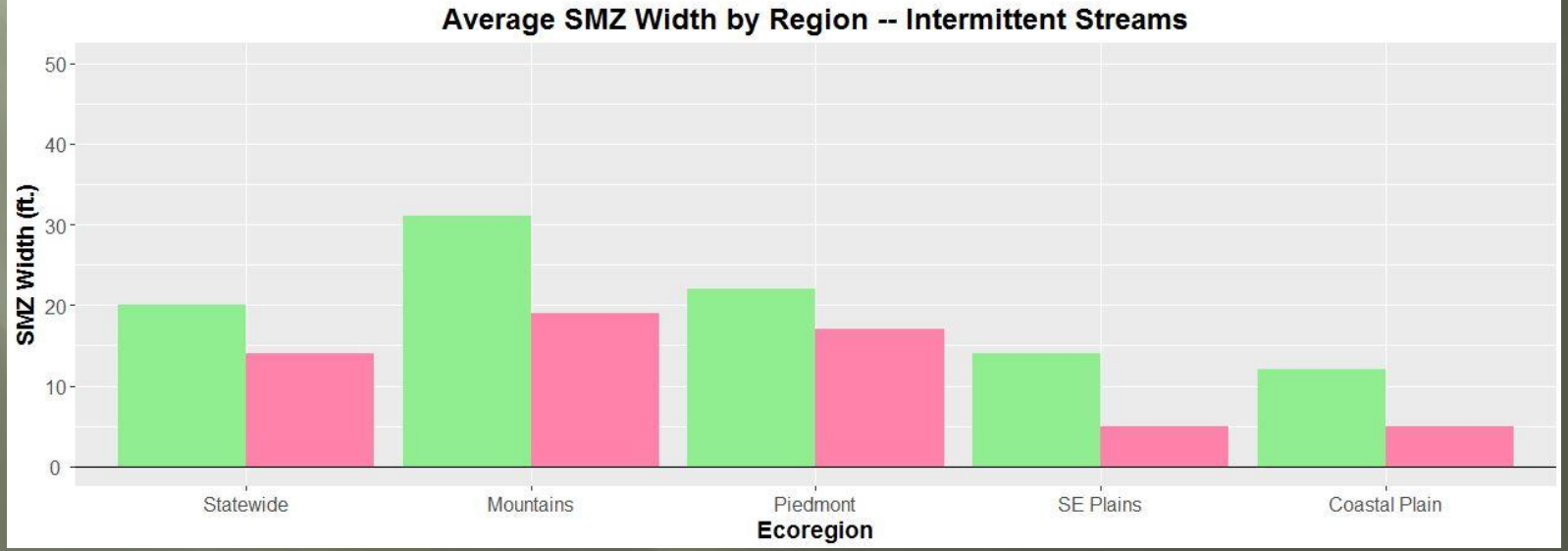
- Areas for Improvement:
  - Avoid gouging the soil in a manner that could funnel runoff and transport sediment to waterbodies.
  - Limiting heavy equipment use within 10 feet of the edges of streams and waterbodies.

Measuring SMZs

- One unit per side
  - New units when branching
- Length and width (ft)
- Stream type


Water Quality Risk by SMZ Width (with 95% CI)
Ecoregion (# SMZs)
Mid-Atl Coastal Plain (70)
Mountains (67)
Piedmont (328)
SE Plains (106)
Probability of Risk to Water Quality
0.0
0.2
0.4
0.6
0.8
0
10
20
30
40
50
SMZ Width (ft)


Average SMZ Width by Region -- Perennial Streams
No Risk to WQ
Risk to WQ
SMZ Width (ft.)
50
40
30
20
10
0
Statewide
Mountains
Piedmont
SE Plains
Coastal Plain
Ecoregion


Average SMZ Width by Region -- Intermittent Streams
SMZ Width (ft.)
50
40
30
20
10
0
Statewide
Mountains
Piedmont
SE Plains
Coastal Plain
Ecoregion

Statewide Implementation Rate of BMPs For Stream Crossings: **79%**

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

Properly Implemented	**Improperly Implemented or Missing**
No risks to WQ	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

Stream crossing type	Stream crossings evaluated	Risk to WQ	Frequency of Risk to WQ
Bridgemat	113	22	*19%*
Culvert	63	23	*37%*
Ford	19	15	*79%*
Pole	16	12	*75%*

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

ncforestservice.gov
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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