Results of Georgia's 2021 Silvicultural Best Management Practices Implementation and Compliance Survey

Prepared by the

Georgia Forestry Commission

in cooperation with the
Environmental Protection Division
of the
Department of Natural Resources,
State of Georgia

December 10, 2021

WATER QUALITY
PROGRAM

GEORGIA FORESTRY
COMMISSION

The preparation of this report was financed in part through a grant from the United States Environmental Protection Agency under the provisions of Section 319(h) of the Federal Water Pollution Control Act, as amended.

EXECUTIVE SUMMARY

The Georgia Forestry Commission (GFC) is the lead agency, as designated by the Georgia Environmental Protection Division (EPD) of the Georgia Department of Natural Resources (DNR), for statewide development, education, implementation, and monitoring for "Georgia's Best Management Practices for Forestry" (BMPs). Beginning in July of 2020, the GFC began the thirteenth Statewide Forestry BMP Implementation and Compliance Survey. Such surveys have been done periodically since 1991.

The objectives of the 2021 Statewide Forestry BMP Survey were to determine the following: rates of BMP implementation, miles of streams in compliance, miles of roads in compliance, total number of *water quality risks* identified, effectiveness of BMPs for any needed modifications, and ownership classes and regions to target for future training.

The protocol and scoring methodology for this thirteenth survey was consistent with the revised recommendations developed and adopted by the Southern Group of State Foresters' (SGSF) BMP Monitoring Task Force in June 2002, titled *Silvicultural Best Management Practices Implementation Monitoring, a Framework for State Forestry Agencies* at:
http://www.southernforests.org/resources/publications/SGSF%20Regional%20BMP%20Framework%20Protocol%20publication_2007.pdf/view.

The SGSF Task Force is composed of hydrologists and water specialists from state forestry agencies, the US Forest Service, forest industry, and the National Council for Air and Stream Improvement (NCASI), in consultation with EPA Region IV nonpoint source specialists.

The 2021 Statewide Forestry BMP Survey evaluated 260 sites that were selected in a stratified random sample. These sites had to have been silviculturally treated within the past two years, preferably within the previous six months. By ownership, 156 sites occurred on non-industrial private forest land (NIPF), 79 sites on forest industry / corporate land, and 25 sites on public land. By physiographic region, 8 sites were in the Mountains, 14 sites were in the Ridge & Valley, 70 sites were in the Piedmont, 49 sites were in the Upper Coastal Plain and 119 sites were in the Lower Coastal Plain.

BMP implementation was determined by dividing the total number of individual BMPs that were applicable and fully implemented on the sites by the total number of applicable BMPs. Results were summarized for each practice or category, overall site, region, and statewide. **Of the 9475 individual BMPs evaluated, the statewide percentage of correct implementation was 92.58 percent. This is a 1.82 percentage point change in BMP implementation from the 2019 survey**. By ownership, the percentage of BMP implementation statewide was 95.07 percent on corporate lands, 97.11 percent on public lands, and 90.44 percent on NIPF lands. Corporate lands remained at a high level changing by just 1.23 percentage points from 2019, while NIPF lands and public lands both changed just by 2.38 and 0.87 percentage points respectively from the good levels seen in 2019.

Of particular interest is that the number of Water Quality Risks observed increased from 34 to 58. The average ratio of Water Quality Risks per site for the 2021 survey is calculated at 0.22. A more detailed discussion of Water Quality Risks can be found later in this report.

Best Management Practices compliance for stream and road length on all sites was evaluated on a mileage basis for this survey. It should be noted that this per unit BMP compliance scoring methodology goes beyond the SGSF recommendations for BMP monitoring and is specific to Georgia. BMP compliance was determined by dividing miles of streams or roads that were in compliance with BMPs, by the total number of miles of streams or roads. On the 260 sites, 50420.69 acres of separate forestry operations were evaluated. Of the 109.91 miles of streams

evaluated, 103.21 miles (or 93.90 percent) were observed to have no impacts or impairment from forestry practices. This remains a good score, but the score did drop slightly from 2019 by 3.02 percentage points. Of the 254.07 miles of roads evaluated, 245.07 miles, or 96.46 percent, were observed to have no impacts or impairment from forestry practices. This score is slightly better than the 2019 survey, representing a 0.62 percentage point change from the 2019 survey. By practice or category, statewide percentages of BMP implementation and compliance were as follows:

Practice or Category	2021		2019
	Implementation (% BMPs Implemented)	% Point Change from 2019 Survey	Implementation (% BMPs Implemented)
Stream Crossings	85.53	- 5.96	91.49
Forest Roads	93.49	+ 0.28	93.21
Timber Harvesting	97.08	- 1.14	98.22
Mechanical Site Preparation	90.20	+ 3.02	87.18
Chemical Site Preparation	97.19	+ 0.85	96.34
Firebreaks/Burning	81.47	- 5.15	86.62
Artificial Regeneration (Tree Planting)	93.89	- 4.36	98.25
Equipment Servicing	97.41	- 0.98	98.39
Special Management Areas	91.53	- 2.41	93.94
Forest Fertilization	100	0	100
Streamside Management Zones (SMZs)	90.98	- 1.98	92.96
Weighted Overall Average	**92.58**	- 1.82	94.40

Practice or Category	2021		2019
	Compliance (% Miles meeting BMPs)	% Point Change from 2019 Survey	Compliance (% Miles meeting BMPs)
Stream Mileage	93.90	- 3.02	96.92
Forest Roads Mileage	96.46	+ 0.62	95.84

Forest operators continue to do a good job of protecting sensitive areas. The score for SMZs remains good at 90.98 percent, but that was a 1.98 percentage point drop in BMP Implementation in the category of streamside management zones (SMZs). Stream crossings declined by 5.96 percentage points to a score of 85.53 percent, while special management areas maintained a good score of 91.53 percent. Generally, forest operators as a whole continue to do a good job of implementing forestry BMPs with an overall implementation rating of 92.58 percent. This 92.58 percent represents a slight drop of 1.82 percentage points from 2019.

BMP implementation for forest roads improved by 0.28 percentage points to a score of 93.49 percent. There continues to be some room for improvement in the areas of stream crossings, and to a lesser extent, streamside management zones. Stream crossings on non-industrial private lands in the Mountains and Lower Coastal Plain need some improvement. Forest roads on Corporate lands in the Mountain region need improvement as well. Streamside management zones (SMZs) scored well at 90.98 percent implementation overall. However, on private lands in the Mountains and Lower Coastal Plain, some extra attention to SMZs is warranted. Firebreak/burning

scores decreased to 81.47 percent implementation, representing a 5.15 percentage point reduction. Continued education about firebreak/burning BMPs is needed for landowners and private contractors. We will continue to address this issue during Prescribed Burning Certification Classes held regularly throughout the state, and with any interactions with landowners and contractors.

There were 161 stream crossings evaluated on 81 sites with an overall implementation rate of 85.53 percent, which represents a drop of 5.96 percentage points from the 2019 survey. The most noted stream crossing problems were associated with approach design, culvert sizing, culvert installation, and the use of improper debris crossings and fill. BMPs related to stream crossings accounted for 33 of the total 58 water quality risks on all the survey sites. That represents 57 percent of the Water Quality Risks found during the entire 2021 Survey. A more detailed discussion of the reasons seen as the causes of the BMP implementation changes in some categories is located in the *Educational Opportunities* and *Conclusion* section of this report on pp.17-19.

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INTRODUCTION

Georgia has an abundant amount of forest and water resources that provide a variety of benefits for the people of the state and region. The 24 million acres (2016 forest inventory and analysis data) of commercial forestland (two-thirds of the state) provide for forest products, clean water, clean air, soil conservation, wildlife habitat, recreation, aesthetics, education, and research. Many of the state's 44,056 miles of perennial streams, 23,906 miles of intermittent streams, and 603 miles of ditches and canals begin or flow through forestlands. Therefore, it is important for forest landowners to practice responsible forestry in order to protect these water resources

The 1972 Federal Clean Water Act resulted in the Georgia Environmental Protection Division (EPD) being responsible for managing and protecting the state's waters from point and nonpoint sources of pollution. Since 1977, the EPD has designated the Georgia Forestry Commission (GFC) as the lead agency to develop, educate, implement and monitor the use of Best Management Practices (BMPs) for forestry operations to minimize or prevent the practice's nonpoint source pollution contributions (primarily erosion and sedimentation). Upon passage of the Clean Water Act (CWA) Amendments of 1987, the EPA issued guidance on the relationship of *Nonpoint Source Controls and Water Quality Standards* as part of the *Water Quality Standards Handbook*. To paraphrase the guidance: ***It is recognized that Best Management Practices, designed in accordance with a state approved process, are the primary mechanisms to enable the achievement of water quality standards.*** It goes on to explain that ***it is intended that proper installation of state approved BMPs will achieve water quality standards and will normally constitute compliance with the CWA.***

BMPs for forestry were first developed and published in Georgia in 1981. A wetlands BMP manual was developed in 1990 and revised in 1993. In January 1999, these manuals were combined into one document, with input from environmental groups, soil and water experts, fish and wildlife biologists, attorneys, private forest landowners, independent timber buyers and loggers, academia, and state and federal water quality personnel. Since then, guidance for the treatment of canals and ditches was adopted in March 2000 and for floodplain features in riverine systems in July 2003. Guidance for headwater areas, i.e. ephemeral areas and gullies, was adopted in October 2005. These guidelines were merged into an updated BMP manual released in summer 2009. In 2019, the manual was updated slightly to include some additional clarification on firebreak BMPs. We also incorporated the new intermittent trout stream SMZs and some additional reference materials in the appendix. Since 1981, more than 95,500 BMP manuals and brochures have been distributed.

The main role of the GFC is to educate and inform the forestry community about these common sense recommendations, known as BMPs, through workshops and field visits and demonstrations. Since publication of the first BMP manual, the GFC has given 3,418 BMP talks to more than 109,623 people and participated in 644 field demonstrations of BMPs (through December 2021). The education process is ongoing, with workshops routinely provided for foresters, timber buyers and loggers through the Sustainable Forestry Initiative® (SFI®) Program in Georgia. Georgia Forestry Commission foresters have also provided BMP advice in more than 79,348 cases covering over 5.53 million acres.

Implementation of BMPs is determined through monitoring surveys. The GFC also tracks BMP implementation through BMP Assurance Exams in the regular course of carrying out complaint resolution. Of statistical importance are the monitoring surveys. The GFC has conducted BMP Implementation Surveys in 1991, 1992, 1998, 2002, 2004, 2007, 2009, 2011, 2013, 2015, 2017, and 2019. This current 2021 statewide survey continues nearly 30 years of Forestry BMP monitoring in Georgia. The statewide average BMP implementation over this period has ranged from 65 percent in 1991, to a high of 95 percent in 2011, to the current rate of 92.58 percent for 2021. The purpose of this report is to present the results of the 2021 BMP Implementation and Compliance Survey.

SURVEY PROCEDURE

Methodology for Sampling Intensity and Site Selection

The number of evaluation sites in each of Georgia's 159 counties was based on the amount of timber harvested in each county, as determined by the Georgia Forestry Commission's Forest Inventory Analysis report of wood removals by county. GFC's forest inventory analysis data collection is overseen by the US Forest Service. This methodology resulted in 260 sites being surveyed. The next step was to target the sample where the practices occurred, to reflect ownership. Ownership classes are categorized into non-industrial private forest (NIPF) land, corporate lands including forest industry and Timber Investment Management Organizations (TIMOs), and public lands, which include federal, state, county, or city ownership. The timber harvest drain for each county was used to target the number of sites to inspect per ownership class in each county. For the 2021 BMP survey, 156 sites (60.00 percent) were inspected on NIPF lands, 79 sites (30.38 percent) on corporate, and 25 sites (9.62 percent) on public lands were inspected.

Georgia Forestry Commission personnel used satellite data from Sentinel 2 to pull land disturbance locations within a specified timeframe for the potential survey sites. The timeframe includes sites disturbed within the last two years. The sites were checked initially to confirm which sites were actually forestry sites. The forestry sites were separated by ownership category and the appropriate number of sites was drawn randomly. Table 1 (pages 21-23) shows the distribution of survey sites by county.

Site Evaluation

For this thirteenth survey, and as noted in the Executive Summary, the protocol and scoring methodology was consistent with the Southern Group of State Foresters' Protocol titled *Silvicultural Best Management Practices Implementation Monitoring, a Framework for State Forestry Agencies at:* http://www.southernforests.org/resources/publications/SGSF%20Regional%20BMP%20Framework%20Protocol%20publication_2007.pdf/view

After sites had been selected and verified in the field by county foresters or forest technicians, all landowners were contacted to obtain permission to conduct site evaluations. All evaluations were conducted by trained forest water quality specialists or region water quality foresters to provide accuracy, consistency, and quality control using the BMP Compliance Survey Form. For a blank copy of the 14-section 136 question form, please contact Scott Thackston (*sthackston@gfc.state.ga.us*).

Once a site was selected, the forest water quality specialist or region water quality forester inspected the site and completed the survey form. Each site was identified by county, GFC region, physiographic region, ownership, river basin and sub-basin, silvicultural treatment type, terrain class, soil erodibility class, hydric soil limitation class, types of water bodies within the practice area, and miles of streams and roads evaluated within the practice area. Soils and stream data were determined using NRCS county soil survey maps, Web Soil Survey, or USGS topographical maps. Data could be extracted through each of these fields of information.

BMP Implementation

Each site was evaluated for BMP implementation by observing as much of the treated area as possible and answering the 136 specific, YES/NO questions directly related to BMP implementation. Scoring was determined at three levels on each site: (1) individual BMP; (2) category of practice; and (3) overall site implementation.

Level 1 - individual BMP implementation was recorded as either a *NOT APPLICABLE, YES,* or *NO*. For all applicable BMP's, each question was worded so that a *YES* represents a BMP that was implemented properly while a *NO* represents a BMP implemented improperly or not at all. If an individual BMP that was applicable and needed was not fully implemented over the entire area, it received a *NO*. There is no partial credit, as recommended by the SGSF framework.

Level 2 - categories of practice and Level 3 - overall site implementation, scores were expressed as a percent of all applicable BMPs implemented against all applicable BMPs in the category of practice and overall site. Therefore, each category of practice and overall site could score between 0 and 100 percent. The categories of practices evaluated were as follows:

Streamside Management Zones (SMZs)
Stream Crossings
Forest Roads
Timber Harvesting
Mechanical Site Preparation
Chemical Site Preparation
Firebreaks/Burning
Artificial Regeneration (Tree Planting)
Equipment Servicing
Special Management Areas
Forest Fertilization

Significant Water Quality Risk

Each BMP was further evaluated in terms of significant *water quality risk* (WQR). A risk is defined by the SGSF framework for monitoring as "*existing on-the-ground condition resulting from failure to correctly implement BMPs, that if left unmitigated will likely result in an adverse change in the chemical, physical or biological condition of a waterbody. Such change may or may not violate water quality standards*." Documenting the occurrence of risks serves a number of useful and practical purposes. First, risk assessment lends much credibility and integrity to the BMP monitoring process by evaluating the effectiveness of an individual or group of BMPs and allows opportunities to analyze ineffective BMPs for possible revisions. Second, it recognizes that high-risk conditions can occur and that prevention and/or restoration is a high priority for state forestry agencies. Third, routine documentation of risks will determine whether such instances are the exception rather than the rule. Finally, providing forest landowners with an objective risk assessment is a valuable public service that not only protects the environment, but can also protect the landowner and/or operator from what might otherwise result in enforcement proceedings or other personal liability.

BMP Compliance

BMP Compliance was also determined for the categories of forest roads and stream length. This scoring methodology goes beyond the SGSF BMP monitoring protocol and is specific to Georgia. However, this scoring methodology allowed for comparison with previous surveys in determining trends. Forest road and stream length were measured in *miles*. Scores were expressed as a percent of units of measure in full BMP compliance against the total units of measure evaluated. Documenting compliance with the units of measure is important in that it allows forest managers, landowners, and regulators to see the holistic picture of forestry operations and our effect on these critical categories. As with the implementation evaluation, the lack of BMP implementation may not necessarily equate to large-scale areas being out of compliance. For those two categories, it provides a better picture of locations to be prioritized for improvements.

RESULTS AND DISCUSSION

The 2021 Statewide Forestry BMP Survey evaluated 260 sites comprising 50,420.69 acres. There were 161 stream crossings, 254.07 miles of forestry roads, and 109.91 stream miles evaluated. Table 1 (pages 21-23) shows the distribution of survey sites by county. Figure 1 (page 48) shows the spatial location of the 260 survey sites. Figure 2 (page 49) is a map of the state showing the different physiographic regions for reference. The tables, charts, and maps included with this report provide summaries of the distribution of the sites evaluated by region and ownership, as well as BMP implementation and compliance results.

Statistical Analysis

The 260 sites evaluated during this survey represent only a sample of all operations that met the criteria for selection. Data compiled from county tax assessors' offices indicates that the number of timber harvesting operations conducted annually ranges from 7,000 to 10,000. Therefore, one could assume the sample reflects a range of 3.6 percent to 2.5 percent sample at best. In order to achieve a statistically valid monitoring report, Georgia has adopted the *Statistical Guide for BMP Implementation Monitoring.* This guidance was developed by the Water Resources Committee of the Southern Group of State Foresters, to be used as a model for achieving statistically valid BMP monitoring.

The guide has been used to determine the number of sites needed to conduct a statistically reliable survey, to calculate the margin of error for each BMP category or individual BMP, and analyze statistical trends in implementation.

Formula for Determining the Sample Size, or Number of Sites to Evaluate

$$n = \frac{4p(100 - p)}{m^2}$$

Where n = the number of sites to evaluate
p = the estimated overall percent implementation in the state
m = the margin of error (5%)

- p must be estimated because it is unknown (% implementation from the most recent survey may be used).
- The closer the estimated value of p is to 100, the lower the value of n will be.
- n is highest when p is estimated to be 50 percent.
- m is the margin of error associated with the estimate of P. That is, there is 0.95 probability that the sample taken will produce an estimate that differs from p by a value of m. The SGSF framework recommended a margin of error at five percent.

This formula provides the minimum sample size of 85 sites in order to achieve a five percent margin of error. We have evaluated 3.05 times the needed number of sites, so, using the formula, this level of survey should yield a margin of error of 2.85 percent for this survey. The reason the additional sites were assessed is so subsets of data in the survey, i.e., landowner groups, physiographic regions, river basins, etc., would be more statistically valid when used separately from statewide data.

OVERALL BMP IMPLEMENTATION AND COMPLIANCE RESULTS BY CATEGORY OF PRACTICE

Streamside Management Zones (SMZs)

Streamside Management Zones (SMZs) are designated areas of varying widths adjacent to the banks of perennial (continuous flowing) or intermittent (normally flows only during winter months) streams and other bodies of water. USGS topographical maps and Natural Resource Conservation Service county soil survey maps along with field observations were used to identify these types of streams. In these SMZs, forest management practices are modified in order to minimize potential impacts to protect water quality, fish, or other aquatic resources. According to the 2019 BMP manual, SMZs along intermittent streams vary in width from 20 to 50 feet on most streams, depending on slope. A formal amendment was made to the trout stream SMZs in 2015 and incorporated into the actual manual in 2019. SMZs along intermittent trout streams are now 35 to 50 feet. SMZs along perennial streams vary from 40 to 100 feet, depending on slope, and SMZs should be 100 feet on perennial trout streams. Clearcutting is not recommended in the SMZs, except during the control of documented serious health/pest issues such as southern pine beetles or salvage operations from natural disasters. Special care should still be given to avoid adverse soil disturbance. Of note SMZs are also recommended for ponds, lakes, and sinkholes, per Georgia's Best Management Practices Guidelines for Forestry.

It is worth noting that during the course of this survey many sites had areas left where no harvesting occurred adjacent to streams. These unharvested areas are significantly wider than what is recommended by definition as an SMZ. Such areas provide all the water protection of an SMZ plus other multiple use benefits such as wildlife corridors, diversity, and aesthetics. However, areas were not judged as SMZs where they were significantly wider than normal SMZs, and therefore the forestry activities that did occur on the parcels do not have any effect on water quality. In addition, these areas were not marked to show that they were intentionally left as an SMZ. If such areas had been included as SMZs, then scores would likely have been even higher than recorded.

Table 2 (page 24) provides summaries of the results by ownership, region, and state totals. Chart 6 (page 42) provides total BMP Implementation over time. Notable findings include:

- Statewide implementation for SMZs is 90.98 percent.
- Statewide BMP compliance for stream length is 93.90 percent.
- 18 WQRs were identified for SMZs (nearly all NIPF ownerships), up from 13 in 2019.
- Implementation for overall SMZs have dropped slightly, by 1.98 percentage points to a still good overall score of 90.98 percent. Of note, the Mountain area went down by 8.61 percentage points to a score of 90.00 percent. Additionally, the scores went down in the Piedmont, as well as the Ridge & Valley area, both dropping about 4 percentage points, from 2019 to 93.00 percent and 90.00 percent respectively.
- Insufficient SMZ widths, insufficient residual basal area, logging debris left in stream channels, and streambank tree harvesting seem to be the most common BMP deficiencies found in the SMZ category. Additionally, the proper tie-in of firebreaks within SMZs needs additional attention.

Stream Crossings

Stream crossings are often necessary for access to forestlands. From a water quality standpoint, stream crossings are the most critical aspect of the road system. Failure of a stream crossing due to improper planning or construction can result in erosion and introduction of sediment into a stream, affecting water quality. Types of acceptable crossings include main haul road fords, culvert crossings, and bridges. Dirt/Debris-type crossings and skidder fords are not acceptable crossing types. Permanent crossings are considered those still in place at the time

of inspection. Temporary crossings were noted where crossing approaches were still evident, but the actual crossing facility (i.e. temporary bridge, culvert and fill, etc.) had been removed.

Table 3 (page 25) provides a summary of the results by ownership, region, and state totals. Chart 7 (page 42) provides total BMP Implementation over time. A total of 161 crossings were evaluated on 81 sites statewide. Significant findings include:

- Statewide implementation for stream crossings is 85.53 percent. This is a 5.96 percentage point drop from 2019.
- Stream crossings scores dropped in all regions by at least 5.30 percentage points.
- 33 WQRs were associated with stream crossings. This is a little over twice as many Water Quality Risks for stream crossings compared to 2019. Of note, 6 of the 33 WQRs associated with stream crossings were found on one single site in the Lower Coastal Plain.
- The WQRs associated with stream crossings were distributed as follows: 30 for Non-Industrial Private ownerships, 3 for Corporate ownerships, and 0 for Public ownerships.
- Areas for improvement in stream crossing design continue to be stream crossing approach design, culvert installation and culvert sizing with respect to storm flow, culvert placement with respect to migration of aquatic species, and proper removal/restoration of temporary crossings.

Forest Roads Outside SMZs

Access roads are an essential part of any forest management operation and provide access for other activities, permanent or temporary. With proper planning, location, construction and maintenance, access roads allow for productive operations and minimally impact soil and water quality. However, poorly located, poorly constructed, and/or poorly maintained roads can result in sediment reaching streams. These factors may lead to changing stream flow patterns, degrading fish and aquatic organism habitat, and adversely affected aesthetics.

Table 4 (page 26) provides a summary of the results by region, ownership, and state totals. Chart 8 (page 43) provides total BMP Implementation over time. Approximately 254.07 miles of road were evaluated on 258 sites. Forest road BMP implementation showed a very slight increase of 0.28 percentage points from the 2019 survey. Significant findings include:

- Forest roads BMP implementation across all ownerships is 93.49 percent.
- Forest roads compliance is 96.46 percent, a very slight improvement of 0.62 percentage points.
- There were zero WQRs associated with forest roads.
- Challenges for forest roads BMP implementation continue to be properly installing water diversions and stabilizing and reshaping of forest roads after activities are complete.

Special Management Areas

This category applies to canals and ditches, riverine floodplain features, headwater/ephemeral areas, and wetlands that could possibly transport sediments and other pollutants into other water bodies. These areas need some measure of protection, but normally do not need to be treated as streams.

Table 5 (page 27) provides a summary of the results by region, ownership, and state totals. Chart 9 (page 43) provides total BMP Implementation over time. Statewide, there were 242 sites with canals, ditches, ephemeral areas, gullies, floodplain features, and wetland features. Other significant findings include:

- Special management area BMP implementation across all ownerships was 91.53 percent. While this is still a good score, it does represent a small 2.41 percentage point decline.
- There were 6 WQRs associated with special management areas, this was 3 more than the number found in 2019. Of note, all 6 of the WQRs found were in the Lower Coastal Plain, 5 on Non-Industrial Private ownerships, and 1 on a Corporate ownership.

Timber Harvesting Outside SMZs

Timber harvesting outside of SMZs poses little threat to water quality in Georgia. Potential impacts can be avoided or minimized if careful consideration is given to seasonal weather conditions, soil type, soil moisture, topography, and equipment type matched to the particular harvesting site. The location, construction, and maintenance of log decks and skid trails are the primary concerns.

Table 6 (page 28) provides a summary of the results by ownership, region, and state total. Chart 10 (page 44) provides total BMP Implementation over time. Approximately 26,107.26 acres were evaluated on 244 sites. A total of 977 log decks were evaluated and 1,629 main skid trails were evaluated. Other significant findings include:

- Timber harvesting outside SMZs BMP implementation, across all ownerships, is 97.08 percent.
- All BMPs for Timber Harvesting scored 91 percent or better, except for minimizing rutting on wetland soils and skid trail retirement/stabilization, which scored 85 percent and 87 percent respectively.
- There was just one WQR associated with Timber Harvesting (on a NIPF ownership in the Lower Coastal Plain).

Mechanical Site Preparation Outside SMZs

Site preparation methods groom harvested and non-forested areas for the natural and artificial regeneration of desired tree species and stocking. Methods include shearing, raking, chopping, windrowing, piling, bedding, and other physical methods to cut, break apart or move logging debris, or to improve soil conditions prior to planting. The purpose is to reduce logging impacts and debris, control competing vegetation, and enhance seedling survival. The technique or method(s) used depends on soil type, topography, erodibility, condition of the site, and any wetland limitations.

Table 7 (page 29) provides a summary of the results by region, ownership, and state totals. Chart 11 (page 44) provides total BMP Implementation over time. Statewide, approximately 4,997.92 acres were evaluated on 46 sites. Significant findings include:

- Mechanical Site Prep BMP implementation is 3.02 percentage points higher than the 2019 survey. It now sits at 90.20 percent.
- There were no WQRs found associated with Mechanical Site Prep.
- Mechanical Site Prep for pine regeneration in wetlands identified in EPA/USACE memo did not occur on any applicable sites surveyed.
- The main challenge observed for Mechanical Site Prep is avoiding bedding that directs water into roadways and ditches.

Chemical Site Preparation Outside SMZs

Herbicides are valuable tools used in forest management to control competing vegetation, invasive species, and enhance tree survival and growth. On many highly erodible sites, the use of herbicides is actually more effective

than exposing too much surface area by mechanical site preparation methods. By following EPA approved labels that govern storage, transportation, handling, and application, herbicide application should not pose any threat to water quality.

Table 8 (page 30) provides a summary of the results by region, ownership, and state totals. Chart 12 (page 45) provides total BMP Implementation over time. Statewide, approximately 9,170.49 acres were evaluated on 89 sites. Significant findings include:

- BMP implementation and compliance for Chemical Site Prep is 97.19 percent, a 0.85 percentage point increase from 2019.
- The one issue for Chemical Site Prep included just 4 relatively minor instances of drift into sensitive areas.

Firebreaks/Burning Outside SMZs

Controlled burning is often used alone or in conjunction with chemical or mechanical site preparation to prepare sites for regeneration. It may also be used during timber stand management to control or reduce hazardous accumulations of forest fuels, manage competing vegetation, improve wildlife habitat, and perpetuate certain endangered plant and animal ecosystems.

Approximately 2491.59 acres were evaluated for burning including 77.41 miles of firebreaks. There was a total of 48 sites evaluated for firebreaks/burning. BMP implementation was 81.47 percent. The score dropped by 5.15 percentage points from 2019, but the overall score remained acceptable. The main challenges involved firebreaks including proper construction and spacing of water diversions, avoiding intersections with forest roads, and tying improperly into streamside management zones or special management areas. One very important thing to note is that while the implementation did decline, there were zero WQRs found on any of the evaluated firebreaks. Firebreaks are created by various methods to contain prescribed burns and wildfires. If properly installed according to BMP guidelines, firebreak impacts on water quality can be minimized.

Of the 48 sites, 25 sites included GFC installed firebreaks. GFC installed firebreaks scored 87.50 percent BMP implementation. There were 23 sites that included landowner (private and public) or contractor installed firebreaks. For the 2021 survey landowner/contractor installed firebreaks scored 75.35 percent BMP implementation. However, it is again worth noting that no water quality risks were found on the firebreaks inspected here. Historically relatively little firebreak BMP training has occurred for landowner or contractors. GFC personnel receive regular training on firebreak BMPs. GFC will continue providing some firebreak BMP training to landowners and contractors during regularly held Prescribed Burn Certification classes.

Table 9 (page 31) provides a summary of the results by region, ownership, and state totals. Chart 13 (page 45) provides total BMP Implementation over time.

Artificial Regeneration (Tree Planting) Outside SMZs

Reforestation can be accomplished artificially or naturally. Natural regeneration and hand planting generally pose less of a threat to water quality than mechanical methods. Table 10 (page 32) provides a summary of the results by region, ownership, and state totals. Chart 14 (page 46) provides total BMP Implementation over time. Approximately 6,720.95 acres were evaluated on 67 sites. Overall BMP implementation for artificial regeneration was 93.89 percent. That maintains a high level of BMP Implementation. No water quality risks were identified. Significant findings include:

- There were a few sites where machine planting did not fully follow the contour or where establishment of pines was not fully avoided in restricted wetlands identified in the 1995 EPA/USACE memo.
- BMPs were fully implemented on the vast majority of these sites.
- No water quality risks were found associated with artificial regeneration.

Forest Fertilization

Forest fertilization was known to have occurred on only one single survey site. It was a NIPF site in the Lower Coastal Plain. A total of 107.86 acres were treated with two BMPs assessed on the one site with a 100 percent BMP implementation score. Indicators of this particular practice include evidence of mixing areas and containers on the site. Since the BMPs call for the removal and proper disposal of containers, additional fertilization that was not obvious may have occurred.

Equipment Washing and Servicing

Improper equipment washing and servicing can introduce hazardous or toxic materials to the site, which can affect water quality. Oils, lubricants, their containers, and other trash and waste should be disposed of properly.

Table 11 (page 33) provides a summary of the results by region, ownership, and state totals. Chart 15 (page 46) provides total BMP Implementation over time. A total of 1028 landings were evaluated on 258 sites. Significant findings include:

- BMP implementation for Equipment Servicing was 97.41 percent, down by just 0.98 percentage points from 2019. There were no WQRs found for this category.
- The most common issue was improper disposal of oil/lubricants, containers, and other trash.
- All BMPs assessed for Equipment Servicing were implemented at or above 94 percent.

Stream Assessments

Perhaps the most important observation in evaluating the effectiveness of BMPs was the visual assessment of the water bodies on each site. A total of 109.91 miles of streams on 166 sites were evaluated for visual signs of impairment. Those signs could include obvious soil erosion entering the stream, logging debris left in the channel, improper stream crossings resulting in blocked flow, excessive removal of canopy trees within the SMZs exposing the stream to elevated temperatures, and impaired stream bank or channel integrity due to forestry practices.
Table 12 (page 34) provides a summary of the results by region, ownership, and state totals by stream type. A total of 55.30 miles of perennial streams were assessed on these sites. Of these, 94.90 percent were in compliance. A total of 54.61 miles of intermittent streams were assessed on these sites. Of these, 92.90 percent were in compliance. Total combined stream compliance was 93.90 percent. Significant findings include:

- 58 water quality risks (WQRs), total, were identified statewide
- There were 33 WQRs (56.90 percent of the total) involving stream crossings
  - ✓ 11 of these were associated with steam crossing approaches
  - ✓ 6 were associated with temporary fills not removed in their entirety
  - ✓ 5 involved the disruption of the migration of aquatic species
  - ✓ 3 involved the stabilization of exposed soils on a wetland fill road
  - ✓ 3 were instances where skidder fords were not avoided
  - ✓ 3 involved culvert sizing and proper installation
  - ✓ 1 involved not minimizing the number of crossings
  - ✓ 1 involved not minimizing vegetative disturbance

- ✓ Of note is the fact that 6 of the 33 WQRs associated with stream crossings were on one single site in the Lower Coastal Plain.

- Within SMZs, there were 18 WQRs (31.03 percent of the state total of WQRs).
  - ✓ 5 were associated with logging debris in stream channels
  - ✓ 4 involved firebreaks lacking proper water diversions where tied in at the SMZ margins
  - ✓ 3 involved a lack of stabilization for skid trails or log decks within an SMZ
  - ✓ 2 involved water diversion for roads not directing surface flows into adequate filter zones
  - ✓ 2 involved inadequate SMZ width or residual basal area
  - ✓ 1 involved mechanical site prep not being kept fully out of the SMZ
  - ✓ 1 involved not minimizing soil disturbance
  - ✓ Of note is the fact that 6 of the 18 WQRs associated with SMZs were on one single site in the Lower Coastal Plain.
- 6 WQRs were associated with Special Management Areas
  - ✓ 4 involved not properly stabilizing culvert crossings on canal/ditches
  - ✓ 2 involved turnouts/outfalls of roads or firebreaks tying into ephemeral areas
- 1 WQR was associated with Timber Harvesting outside of SMZs involving rutting in saturated soils

Overall, the 93.90 percent stream compliance figure in Georgia further supports that BMPs are protecting water resources.

Overall Statewide Results

Table 13 (page 35) provides the statewide implementation results of the total number of sites, the acres evaluated, the number of BMPs evaluated, and the number of water quality risks determined by region and ownership. Chart 16 (page 47) provides total BMP Implementation over time. Statewide, the overall BMP implementation for all practices, all landownership classes, and all regions, was found to be 92.58 percent. This is a small 1.82 percentage point drop from the 2019 survey but remains a good overall score. Using the SGSF BMP Monitoring Framework Guidance, a sample size of 260 sites for this survey results in a margin of error of 2.85 percent.

Water Quality Risk Assessment

Water Quality Risk assessments were made at each site as a component of the Southern Group of State Foresters' BMP monitoring protocol. Water Quality Risks (WQRs) were observed at 58 specific locations on just 29 sites, out of the 260 total survey sites. This indicates that only a small portion of sites contain any WQRs. The total of 58 WQRs is higher than the previous BMP survey in 2019, representing a 70.58 percent negative change from the 2019 survey. Looking into these numbers a little deeper, it can be seen that 88.85 percent or 231 of the 260 sites surveyed for 2021 had no WQRs. Overall, it is clear that a small percentage of the sites surveyed account for all the observable Water Quality Risks seen. ***Additionally, of note is the fact that for the 2021 Survey, 13 (or 22.41 percent) of the total 58 WQRs, were found on one single poorly executed site in the Lower Coastal Plain.*** Below is a table showing the distribution of Water Quality Risk occurrence over the past nine survey cycles.

Survey Year	Survey Done	0 WQ Risks		1-3 WQ Risks		4-6 WQ Risks		7-9 WQ Risks		10 or more WQ Risks	
2004	412	352	85.44%	36	8.74%	13	3.16%	5	1.21%	6	1.46%
2007	370	328	88.65%	21	5.68%	15	4.05%	4	1.08%	2	0.54%
2009	221	212	95.93%	8	3.62%	1	0.45%	0	0.00%	0	0.00%
2011	187	178	95.19%	7	3.74%	1	0.53%	1	0.53%	0	0.00%
2013	209	185	88.52%	13	6.22%	6	2.87%	3	1.44%	2	0.96%
2015	213	199	93.43%	7	3.29%	3	1.41%	3	1.41%	1	0.47%
2017	232	214	92.24%	13	5.60%	4	1.72%	1	0.43%	0	0.00%
2019	254	230	90.55%	23	9.06%	1	0.39%	0	0.00%	0	0.00%
2021	260	231	88.85%	25	9.62%	3	1.15%	0	0.00%	1	0.38%

BMP Implementation data available by River Basin and Ecoregion

Regional Water Councils can extract similar statistics for each of the 14 major river basins (Figure 4, page 51), 52 sub-basins, and 12-digit HUCs for use in accordance to the Georgia Comprehensive State-wide Water Management Plan. Each of Georgia's 29 Ecoregions (Figure 5, page 52) could also be used to extract the survey statistics.

EDUCATIONAL OPPORTUNITIES

BMPs for mechanical site prep had a 3.02 percentage point improvement from our 2019 survey. BMPs for roads experienced a slight improvement from our 2019 survey of about 0.28 percent. BMPs for chemical site prep had a small improvement of 0.85 percentage points. Our educational opportunities will continue to address these categories. However, there were some declines in a few categories, and we will concentrate our educational efforts wherever needed. In particular, educational opportunities include:

- Stream Crossings
  - ✓ Stream crossing approach design and stabilization
  - ✓ Proper removal and rehab of temporary crossings
  - ✓ Culvert crossing design, installation, and planning
  - ✓ Basic stream crossing design needs, including storm flow and aquatic migration requirements
  - ✓ Temporary portable bridge use
- Streamside Management Zones (SMZs)
  - ✓ Keeping logging debris out of stream channels
  - ✓ Proper water diversions for firebreaks when tied in at the SMZ margins
  - ✓ Water diversion for roads not directing surface flows into adequate filter zones
  - ✓ Lack of stabilization for skid trails or log decks within an SMZ
  - ✓ SMZ width or residual basal area
  - ✓ Keeping mechanical site prep fully out of SMZs
  - ✓ Minimizing soil disturbance in SMZs
- Firebreaks/Burning
  - ✓ Proper firebreak planning and water diversion installation
  - ✓ Proper tie-in with roads and other sensitive areas such as SMZs and ephemeral areas
- Forest Roads Outside of SMZs
  - ✓ Proper water diversion design and placement
  - ✓ Proper closeout needs following harvest activities

- Timber Harvesting Outside of SMZs
  - ✓ Skid trail stabilization requirements
  - ✓ Minimizing rutting on saturated soils
  - ✓ Minimizing harvests on wetland sites during wet weather
- Mechanical Site Preparation Outside of SMZs
  - ✓ Avoidance of bedding directing surface runoff to roads and road-ditches
  - ✓ Following the contour for intensive methods
- Special Management Areas
  - ✓ Stabilizing canal/ditch crossings
  - ✓ Avoidance of mechanical site prep in close proximity with floodplain features
- Artificial Regeneration Outside of SMZs
  - ✓ Machine planting on the contour
  - ✓ Avoidance of pine establishments on restricted wetlands
- Equipment Washing and Servicing
  - ✓ Proper disposal of oils, lubricants, and containers

Charts 1 through 4 (pages 36-40) are perhaps the most important tools in this document for determining BMP implementation trends. These charts provide an overall summary and comparison of BMP implementation by practice and ownership over recent survey cycles. They also provide impetus for continued training and improvement. The table below illustrates BMP Implementation according to three tract size groupings.

Tract Size	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Under 100 Acres	154	15,627.36	5369	92.42%	32
101-200 Acres	70	16,459.59	2659	92.85%	19
201 Acres or more	36	18,333.74	1447	92.67%	7
All	260	50,420.69	9475	92.58%	58

As shown in the above table, differences in the BMP implementation scores for different tract sizes appear to be minimal, but smaller tracts had more WQRs per acre on average than larger tracts. While the overall number of WQRs and the overall rate of WQRs/acre for the 2021 survey were found to be low and concentrated on a relatively small number of sites, a trend was seen related to tract size. The 2021 survey shows the number of WQRs/acre for three tract size categories, including small tracts (<100 acres), medium tracts (101 to 200 acres), and large tracts (+200 acres). Small tracts had an average of about 0.002 WQRs/acre. While medium tracts averaged about 0.001 WQR/acre, and large tracts averaged 0.0004 WQR/acre. Basically, tracts less than about 100 acres (small tracts) had about twice the rate of WQR/acre of tracts 101 to 200 acres (medium tracts). While small tracts had about five times the rate of WQR/acre of tracts 201 acres and above (large tracts). There are several reasons smaller tracts, on average, experience higher Water Quality Risks. As has been noted in previous surveys the reasons include: potential poor road location due to tract boundary constraints, potentially more stream crossings due to the access issues and boundary locations of smaller tracts, and having more roads and stream crossings simply because there are more landowners needing access across their parcels. Therefore, parcelization of land into more and smaller parcels seems to be part of the issue. Also, since smaller landowners often have fewer resources and/or knowledge of forestry, problems are often left unnoticed or given little attention, likely resulting in more water quality risks on such ownerships. When land is allocated into larger tracts, there are fewer owners, and therefore, less need for stream crossings and access points from public roads. Larger landowners also tend to have more resources and/or knowledge of forestry to recognize and address potential issues.

All of these results suggest a need for continued outreach to landowners of all sizes of tracts, but especially smaller acreage landowners of fewer than 100 acres. The GFC has already undertaken efforts to make BMP educational information available online. Currently, GFC has 3 BMP learning modules available for anyone to access at any time to learn about forestry BMPs. Those module titles include *Forest Roads* and *Pre-Harvest Planning*, along with a slide-show depicting detailed installation steps for geotextile rocked ford stream crossing installation. These modules are located on GFC's public website at: https://gatrees.org/forest-management-conservation/water-quality-protection/. Additionally, we hope to update modules on *Temporary Stream Crossings* and *Stream Classification* and make them available again as well. Additional modules might be created in the future to continue to address these needs. In addition, an ongoing effort further promotes the use of temporary portable bridges for timber harvesting. Although we continue to see efforts made to avoid the need for stream crossings during timber harvesting activities, issues persist with skidders using inadequate crossings. An increased use of proper temporary and/or portable logging bridge stream crossings would help avoid many of these problems. Also, for mechanical site prep, there is a need to re-emphasize the avoidance of bedding directing surface runoff into roads and road-ditches. Finally, we plan to continue to emphasize the BMPs for firebreak installation through our Prescribed Burn Certification training for landowners and contractors that started just in 2018.

Chart 5 (page 41) shows the current number of Water Quality Risks (WQRs) observed in BMP implementation surveys between the 1998 survey and the present. There had been a dramatic decline in these observed WQRs until the 2013 survey, which exposed some issues with basic BMP implementation and planning, leading to an uptick in WQRs for that 2013 survey. However, in the 2015, 2017, and 2019, the WQRs went back down. The 2021 survey showed another uptick on WQRs. However, this uptick is less significant, and as has been the case in past surveys, the vast majority of those WQRs were concentrated on just a small number of poorly executed sites.

CONCLUSION

Since the survey first started in 1991 the BMP Implementation score has improved greatly from 64.9 percent in 1991, to as high as 95.30 percent in 2011. The BMP Implementation score has been high and remained high (about 90% or above) since 2004 (about 17 years). The current 2021 survey shows that the BMP Implementation score remains strong with a score of 92.58 percent overall. The percentage of stream miles in compliance remains high at 93.90 percent. Since the 1998 survey, the number of water quality risks has markedly decreased, but did experience a significant upswing in the 2013 survey. However, the number of WQRs decreased back down to good levels between 2013 and 2019. The 2021 survey showed another uptick on WQRs. However, this uptick is less significant, and as has been the case in past surveys, the vast majority of those WQRs were concentrated on just a small number of poorly executed sites. Chart 5 (page 41) tracks the level of observed Water Quality Risks since the 1998 survey.

The 2021 BMP implementation survey shows the need for continued BMP education efforts in order to help stabilize BMP implementation at satisfactory levels. Although the survey shows relatively high overall rates of BMP implementation, it also reveals areas for improvement within certain BMP categories and across certain landowner groups in the state. The information from this survey will be used to target BMP training at Master Timber Harvester workshops, SWPA workshops, and forester and landowner workshops and trainings. In addition, emphasis for the increased use of portable logging bridges could be useful in helping to maintain/increase stream crossing BMP implementation.

GFC will continue to use available means to resolve forestry BMP complaints. The Georgia Forestry Commission, the Georgia Forestry Association, the University of Georgia Warnell School of Forestry and Natural Resources, participating companies who subscribe to the Sustainable Forestry Initiative, and the Southeastern Wood

Producers Association support this concept. The Georgia SFI® committee will continue to monitor and address "violators," as reported to their Inconsistent Practices sub-committee. Non-compliance cases will be referred to state or federal regulatory agencies as needed.

APPENDIX

Table 1: Site Distribution by County and Ownership

County	Public	Corporate	NIPF	Totals
Appling	1		1	**2**
Atkinson		1	1	**2**
Bacon			3	**3**
Baldwin			1	**1**
Banks	1			**1**
Bartow		2		**2**
Ben Hill			1	**1**
Berrien		1	2	**3**
Bleckley			1	**1**
Brantley		2	1	**3**
Brooks			2	**2**
Bryan North	1	2		**3**
Bulloch			4	**4**
Burke	1		5	**6**
Butts	1		1	**2**
Calhoun	1			**1**
Camden		3	1	**4**
Candler		1		**1**
Carroll			2	**2**
Charlton	1	2		**3**
Chattahoochee	1			**1**
Cherokee		1	1	**2**
Clay			1	**1**
Clayton	1			**1**
Clinch		5	1	**6**
Coffee			2	**2**
Colquitt			1	**1**
Columbia	1			**1**
Cook			1	**1**
Coweta	1			**1**
Crawford			1	**1**
Dade			1	**1**
Dawson		1		**1**
Decatur			2	**2**
Dodge			4	**4**
Dooly			2	**2**
Early			2	**2**
Echols		3		**3**
Effingham			3	**3**
Elbert		2		**2**
Emanuel		1	2	**3**
Evans			1	**1**
Fannin	1			**1**

County	Public	Corporate	NIPF	Totals
Floyd			1	**1**
Franklin		1		**1**
Gilmer			1	**1**
Glynn		1		**1**
Gordon			1	**1**
Grady			2	**2**
Greene		2		**2**
Habersham	2		1	**3**
Hall		1	1	**2**
Hancock		1	2	**3**
Haralson			2	**2**
Harris			1	**1**
Hart			2	**2**
Heard			1	**1**
Houston			1	**1**
Irwin			2	**2**
Jackson			1	**1**
Jasper	1		1	**2**
Jeff Davis		1	1	**2**
Jefferson		1	2	**3**
Jenkins			1	**1**
Johnson		1	1	**2**
Jones	1			**1**
Lamar			1	**1**
Lanier		1		**1**
Laurens		1	3	**4**
Lee			1	**1**
Liberty	1	2	1	**4**
Long		1	1	**2**
Lowndes		1		**1**
Lumpkin	1		1	**2**
Macon			1	**1**
Madison			1	**1**
Marion		1	1	**2**
McDuffie		1	1	**2**
McIntosh	1	1		**2**
Meriwether	1	1		**2**
Miller			1	**1**
Mitchell			1	**1**
Monroe			2	**2**
Montgomery			1	**1**
Morgan			1	**1**
Murray			2	**2**
Oconee			1	**1**
Oglethorpe			3	**3**
Paulding	1			**1**

County	Public	Corporate	NIPF	Totals
Pickens		1	1	**2**
Pierce		1	1	**2**
Polk			2	**2**
Pulaski		1		**1**
Putnam			1	**1**
Quitman		2		**2**
Randolph		2		**2**
Richmond	1			**1**
Rockdale			1	**1**
Schley			2	**2**
Screven		2	2	**4**
Seminole			1	**1**
Spalding			2	**2**
Stephens			1	**1**
Stewart		2		**2**
Sumter	1		1	**2**
Talbot		2	1	**3**
Taliaferro		1	1	**2**
Tattnall			2	**2**
Taylor			2	**2**
Telfair		3		**3**
Terrell			1	**1**
Thomas			1	**1**
Tift			2	**2**
Toombs		1	1	**2**
Treutlen			1	**1**
Troup			2	**2**
Turner		1		**1**
Twiggs			2	**2**
Union		1	1	**2**
Upson			1	**1**
Walker	1		3	**4**
Walton		1		**1**
Ware		1	4	**5**
Warren		3		**3**
Washington	1		3	**4**
Wayne		2	2	**4**
Wheeler			2	**2**
White			1	**1**
Total	**25**	**79**	**156**	**260**

Tables 2 a – d: Distribution of Sites with Streamside Management Zones Evaluated By Region Ownership, Acres Evaluated, BMP Assessed, and % BMPs Implemented, and # Water Quality Risks.

2a. Streamside Management Zones - NIPF					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	23.89	21	76.19%	0
Piedmont	37	161	325	90.77%	2
Upper Coastal Plain	14	52.97	125	96.80%	1
Lower Coastal Plain	33	71.63	348	82.47%	11
Ridge and Valley	9	28.65	92	86.96%	3
Total	95	338.14	911	87.71%	17
2b. Streamside Management Zones - Public					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	26.67	18	100.00%	0
Piedmont	9	54.89	77	100.00%	0
Upper Coastal Plain	1	1.64	9	100.00%	0
Lower Coastal Plain	3	7.64	32	93.75%	0
Ridge and Valley	1	29.3	9	100.00%	0
Total	16	120.14	145	98.62%	0
2c. Streamside Management Zones - Corporate					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	79.32	21	95.24%	0
Piedmont	17	86.29	155	94.19%	0
Upper Coastal Plain	8	40.45	71	98.59%	0
Lower Coastal Plain	25	147.39	253	93.28%	1
Ridge and Valley	2	12.89	19	100.00%	0
Total	54	366.34	519	94.61%	1
2d. Streamside Management Zones - All Ownership					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	6	129.88	60	90.00%	0
Piedmont	63	302.18	557	93.00%	2
Upper Coastal Plain	23	95.06	205	97.56%	1
Lower Coastal Plain	61	226.66	633	87.36%	12
Ridge and Valley	12	70.84	120	90.00%	3
Total	165	824.62	1575	90.98%	18

Tables 3 a – d: Distribution of Sites with Stream Crossings Evaluated by Region, Ownership, and # Crossings Assessed, # BMPs Assessed, % BMPs Implemented and Water Quality Risks.

3a. Stream and Wetland Crossings - NIPF					
Region	**No. Sites**	**Crossings**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	1	1	15	60.00%	2
Piedmont	17	43	209	80.86%	10
Upper Coastal Plain	8	11	105	87.62%	1
Lower Coastal Plain	16	31	162	74.69%	14
Ridge and Valley	6	14	81	80.25%	3
Total	48	100	572	79.72%	30
3b. Stream and Wetland Crossings - Public					
Region	**No. Sites**	**Crossings**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	0	0	0	NA	0
Piedmont	5	6	61	93.44%	0
Upper Coastal Plain	1	1	8	100.00%	0
Lower Coastal Plain	1	3	19	94.74%	0
Ridge and Valley	1	3	15	86.67%	0
Total	8	13	103	93.20%	0
3c. Stream and Wetland Crossings - Corporate					
Region	**No. Sites**	**Crossings**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	6	27	96.30%	0
Piedmont	7	10	100	94.00%	0
Upper Coastal Plain	3	13	33	93.94%	1
Lower Coastal Plain	12	17	166	91.57%	2
Ridge and Valley	1	2	8	100.00%	0
Total	25	48	334	93.11%	3
3d. Stream and Wetland Crossings - All Ownership					
Region	**No. Sites**	**Crossings**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	3	7	42	83.33%	2
Piedmont	29	59	370	86.49%	10
Upper Coastal Plain	12	25	146	89.73%	2
Lower Coastal Plain	29	51	347	83.86%	16
Ridge and Valley	8	19	104	82.69%	3
Total	81	161	1009	85.53%	33

Tables 4 a – d: Distribution of Forest Road Sites Evaluated By Region, Ownership, Miles Assessed, % Compliance, # BMP Assessed, % BMPs Implemented, and Water Quality Risks.

4a. Forest Road Sites - NIPF						
Region	**No. Sites**	**Miles**	**% Miles Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	3	1.32	92.42%	32	87.50%	0
Piedmont	41	20.36	92.44%	400	93.00%	0
Upper Coastal Plain	28	27.29	93.44%	207	85.99%	0
Lower Coastal Plain	71	57.55	98.12%	468	93.80%	0
Ridge and Valley	11	4.78	87.03%	127	92.91%	0
Total	154	111.3	95.39%	1234	91.98%	0
4b. Forest Road Sites - Public						
Region	**No. Sites**	**Miles**	**% Miles Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	3	0.51	100.00%	33	100.00%	0
Piedmont	10	17.32	97.98%	105	95.24%	0
Upper Coastal Plain	6	13.79	99.93%	48	97.92%	0
Lower Coastal Plain	5	4.61	51.84%	36	100.00%	0
Ridge and Valley	1	1.34	97.76%	10	90.00%	0
Total	25	37.57	93.05%	232	96.98%	0
4c. Forest Road Sites - Corporate						
Region	**No. Sites**	**Miles**	**% Miles Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	4.05	96.30%	26	76.92%	0
Piedmont	19	10.64	98.97%	204	98.04%	0
Upper Coastal Plain	13	17.76	97.64%	99	93.94%	0
Lower Coastal Plain	43	72.15	99.20%	333	94.59%	0
Ridge and Valley	2	0.6	100.00%	21	100.00%	0
Total	79	105.2	98.80%	683	95.02%	0
4d. Forest Road Sites - All Ownership						
Region	**No. Sites**	**Miles**	**% Miles Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	8	5.88	95.75%	91	89.01%	0
Piedmont	70	48.32	95.86%	709	94.78%	0
Upper Coastal Plain	47	58.84	96.23%	354	89.83%	0
Lower Coastal Plain	119	134.31	97.11%	837	94.38%	0
Ridge and Valley	14	6.72	90.33%	158	93.67%	0
Total	258	254.07	96.46%	2149	93.49%	0

Table 5 a – d: Overall Distribution of Special Management Areas Evaluated By Region, Ownership, BMPs Assessed, % BMPs Implemented, and Water Quality Risks.

5a. Special Management Areas - NIPF				
Region	**No. Sites**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	3	17	100.00%	0
Piedmont	41	263	96.20%	0
Upper Coastal Plain	23	133	97.74%	0
Lower Coastal Plain	64	328	78.96%	5
Ridge and Valley	10	46	97.83%	0
Total	141	787	89.45%	5
5b. Special Management Areas - Public				
Region	**No. Sites**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	3	13	100.00%	0
Piedmont	10	53	98.11%	0
Upper Coastal Plain	4	11	100.00%	0
Lower Coastal Plain	5	45	91.11%	0
Ridge and Valley	1	2	100.00%	0
Total	23	124	95.97%	0
5c. Special Management Areas - Corporate				
Region	**No. Sites**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	11	100.00%	0
Piedmont	19	129	96.90%	0
Upper Coastal Plain	12	52	100.00%	0
Lower Coastal Plain	43	326	90.80%	1
Ridge and Valley	2	11	100.00%	0
Total	78	529	93.57%	1
5d. Special Management Areas - All Ownership				
Region	**No. Sites**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	8	41	100.00%	0
Piedmont	70	445	96.63%	0
Upper Coastal Plain	39	196	98.47%	0
Lower Coastal Plain	112	699	85.26%	6
Ridge and Valley	13	59	98.31%	0
Total	242	1440	91.53%	6

Table 6 a – d: Distribution of Harvesting Operations Evaluated By Region, Ownership, Acres Assessed, # BMP Assessed, % Implemented, and Water Quality Risks.

6a. Timber Harvesting Outside SMZs - NIPF					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	138.33	16	87.50%	0
Piedmont	41	3292.26	309	95.47%	0
Upper Coastal Plain	29	3366.72	197	98.98%	0
Lower Coastal Plain	67	6160.65	482	96.06%	1
Ridge and Valley	11	659.82	86	97.67%	0
Total	150	13617.78	1090	96.42%	1
6b. Timber Harvesting Outside SMZs - Public					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	3	114.51	24	100.00%	0
Piedmont	10	1507.29	73	98.63%	0
Upper Coastal Plain	5	1103.74	35	100.00%	0
Lower Coastal Plain	4	629.2	30	100.00%	0
Ridge and Valley	1	176.7	8	100.00%	0
Total	23	3531.44	170	99.41%	0
6c. Timber Harvesting Outside SMZs - Corporate					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	221.19	16	93.75%	0
Piedmont	18	1529.37	142	97.89%	0
Upper Coastal Plain	13	1918.54	85	100.00%	0
Lower Coastal Plain	36	5122.73	263	96.96%	0
Ridge and Valley	2	166.21	15	100.00%	0
Total	71	8958.04	521	97.70%	0
6d. Timber Harvesting Outside SMZs - All Ownership					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	7	474.03	56	94.64%	0
Piedmont	69	6328.92	524	96.56%	0
Upper Coastal Plain	47	6389	317	99.37%	0
Lower Coastal Plain	107	11912.58	775	96.52%	1
Ridge and Valley	14	1002.73	109	98.17%	0
Total	244	26107.26	1781	97.08%	1

Table 7 a – d: Distribution of Mechanical Site Preparation Operations Evaluated By Region, Ownership, and Acres Assessed, # BMPs Assessed, % BMP Implementation, and Water Quality Risks.

7a. Mechanical Site Preparation Outside SMZs - NIPF					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	0	0	0	NA	0
Piedmont	0	0	0	NA	0
Upper Coastal Plain	3	28.25	3	100.00%	0
Lower Coastal Plain	14	1381.42	53	83.02%	0
Ridge and Valley	0	0	0	NA	0
Total	17	1409.67	56	83.93%	0
7b. Mechanical Site Preparation Outside SMZs - Public					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	0	0	0	NA	0
Piedmont	1	2	2	100.00%	0
Upper Coastal Plain	1	27.78	1	100.00%	0
Lower Coastal Plain	2	148.08	7	100.00%	0
Ridge and Valley	0	0	0	NA	0
Total	4	177.86	10	100.00%	0
7c. Mechanical Site Preparation Outside SMZs - Corporate					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	0	0	0	NA	0
Piedmont	1	10	2	100.00%	0
Upper Coastal Plain	1	72.38	3	100.00%	0
Lower Coastal Plain	23	3328.01	82	92.68%	0
Ridge and Valley	0	0	0	NA	0
Total	25	3410.39	87	93.10%	0
7d. Mechanical Site Preparation Outside SMZs - All Ownership					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	0	0	0	NA	0
Piedmont	2	12	4	100.00%	0
Upper Coastal Plain	5	128.41	7	100.00%	0
Lower Coastal Plain	39	4857.51	142	89.44%	0
Ridge and Valley	0	0	0	NA	0
Total	46	4997.92	153	90.20%	0

Table 8 a – d: Distribution of Chemical Site Preparation Operations Evaluated By
Region, Ownership, and Acres Assessed, BMPs Assessed, % BMP Implementation, and Water Quality Risks.

8a. Chemical Site Preparation Outside SMZs - NIPF					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	0	0	0	NA	0
Piedmont	8	540.53	16	93.75%	0
Upper Coastal Plain	10	891.04	20	100.00%	0
Lower Coastal Plain	22	2362.86	44	93.18%	0
Ridge and Valley	3	112.06	6	100.00%	0
Total	43	3906.49	86	95.35%	0
8b. Chemical Site Preparation Outside SMZs - Public					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	0	0	0	NA	0
Piedmont	3	247.15	6	100.00%	0
Upper Coastal Plain	1	27.78	2	100.00%	0
Lower Coastal Plain	3	376.89	6	100.00%	0
Ridge and Valley	0	0	0	NA	0
Total	7	651.82	14	100.00%	0
8c. Chemical Site Preparation Outside SMZs - Corporate					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	1	70.1	2	100.00%	0
Piedmont	8	749.54	16	100.00%	0
Upper Coastal Plain	3	241.13	6	100.00%	0
Lower Coastal Plain	27	3551.41	54	98.15%	0
Ridge and Valley	0	0	0	NA	0
Total	39	4612.18	78	98.72%	0
8d. Chemical Site Preparation Outside SMZs - All Ownership					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	1	70.1	2	100.00%	0
Piedmont	19	1537.22	38	97.37%	0
Upper Coastal Plain	14	1159.95	28	100.00%	0
Lower Coastal Plain	52	6291.16	104	96.15%	0
Ridge and Valley	3	112.06	6	100.00%	0
Total	89	9170.49	178	97.19%	0

Table 9 a – d: Distribution of Firebreak installation and Burning Operations Evaluated by Region, Ownership, % BMP Implementation, and Water Quality Risks.

9a. Fire Breaks & Prescribed Burning- NIPF					
Region	**No. Sites**	**Miles**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	1.29	13	69.23%	0
Piedmont	5	7.09	38	76.32%	0
Upper Coastal Plain	4	6.38	23	65.22%	0
Lower Coastal Plain	22	42.58	123	80.49%	0
Ridge and Valley	4	2.68	28	92.86%	0
Total	37	60.02	225	79.11%	0
9b. Fire Breaks & Prescribed Burning- Public					
Region	**No. Sites**	**Miles**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	0	0	0	NA	0
Piedmont	1	0.67	7	71.43%	0
Upper Coastal Plain	1	4.31	3	100.00%	0
Lower Coastal Plain	2	2.18	10	90.00%	0
Ridge and Valley	0	0	0	NA	0
Total	4	7.16	20	85.00%	0
9c. Fire Breaks & Prescribed Burning- Corporate					
Region	**No. Sites**	**Miles**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	0	0	0	NA	0
Piedmont	4	6.22	27	88.89%	0
Upper Coastal Plain	1	0.88	5	100.00%	0
Lower Coastal Plain	2	3.13	9	100.00%	0
Ridge and Valley	0	0	0	NA	0
Total	7	10.23	41	92.68%	0
9d. Fire Breaks & Prescribed Burning- All Ownership					
Region	**No. Sites**	**Miles**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	1.29	13	69.23%	0
Piedmont	10	13.98	72	80.56%	0
Upper Coastal Plain	6	11.57	31	74.19%	0
Lower Coastal Plain	26	47.89	142	82.39%	0
Ridge and Valley	4	2.68	28	92.86%	0
Total	48	77.41	286	81.47%	0

Table 10 a – d: Distribution of Artificial Regeneration Operations Evaluated By Region, Ownership, Acres Assessed, BMPs Assessed, % BMP Implementation, and Water Quality Risks.

10a. Artificial Regeneration Outside SMZs - NIPF					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	0	0	0	NA	0
Piedmont	5	409.03	9	100.00%	0
Upper Coastal Plain	10	878.2	17	94.12%	0
Lower Coastal Plain	19	1776.62	38	89.47%	0
Ridge and Valley	2	55.06	5	100.00%	0
Total	36	3118.91	69	92.75%	0
10b. Artificial Regeneration Outside SMZs - Public					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	0	0	0	NA	0
Piedmont	1	91.95	2	100.00%	0
Upper Coastal Plain	0	0	0	NA	0
Lower Coastal Plain	3	378.89	6	100.00%	0
Ridge and Valley	0	0	0	NA	0
Total	4	470.84	8	100.00%	0
10c. Artificial Regeneration Outside SMZs - Corporate					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	1	70.1	3	100.00%	0
Piedmont	5	509.94	10	90.00%	0
Upper Coastal Plain	3	281.59	3	100.00%	0
Lower Coastal Plain	18	2269.57	38	94.74%	0
Ridge and Valley	0	0	0	NA	0
Total	27	3131.2	54	94.44%	0
10d. Artificial Regeneration Outside SMZs - All Ownership					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	1	70.1	3	100.00%	0
Piedmont	11	1010.92	21	95.24%	0
Upper Coastal Plain	13	1159.79	20	95.00%	0
Lower Coastal Plain	40	4425.08	82	92.68%	0
Ridge and Valley	2	55.06	5	100.00%	0
Total	67	6720.95	131	93.89%	0

Forest Fertilization: Forest fertilization occurred on only 1 NIPF site in the Lower Coastal Plain. A total of 107.86 acres were treated with 2 BMPs assessed with 100% BMP implementation.

Table 11 a – d: Distribution of Equipment Servicing Operations Evaluated By Region, Ownership, No. of Landings Assessed, BMPs Assessed, % BMP Implementation, and Water Quality Risks.

11a. Equipment Servicing and Trash Clean-up - NIPF					
Region	**No. Sites**	**Landings**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	8	5	100.00%	0
Piedmont	41	106	123	100.00%	0
Upper Coastal Plain	30	93	89	100.00%	0
Lower Coastal Plain	70	251	210	94.76%	0
Ridge and Valley	11	24	33	100.00%	0
Total	154	482	460	97.61%	0
11b. Equipment Servicing and Trash Clean-up - Public					
Region	**No. Sites**	**Landings**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	3	4	9	100.00%	0
Piedmont	10	44	29	96.55%	0
Upper Coastal Plain	6	32	18	100.00%	0
Lower Coastal Plain	5	30	15	100.00%	0
Ridge and Valley	1	3	3	100.00%	0
Total	25	113	74	98.65%	0
11c. Equipment Servicing and Trash Clean-up - Corporate					
Region	**No. Sites**	**Landings**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	15	6	100.00%	0
Piedmont	19	50	57	100.00%	0
Upper Coastal Plain	13	56	39	94.87%	0
Lower Coastal Plain	43	306	129	95.35%	0
Ridge and Valley	2	6	6	100.00%	0
Total	79	433	237	96.62%	0
11d. Equipment Servicing and Trash Clean-up - All Ownership					
Region	**No. Sites**	**Landings**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	7	27	20	100.00%	0
Piedmont	70	200	209	99.52%	0
Upper Coastal Plain	49	181	146	98.63%	0
Lower Coastal Plain	118	587	354	95.20%	0
Ridge and Valley	14	33	42	100.00%	0
Total	258	1028	771	97.41%	0

Table 12 a – d: Distribution of Stream Types, Miles Assessed, and % Compliance by Region, and Ownership.

12a. Stream Assessment - NIPF						
Region	**No. Sites**	**Intermittent Miles Assessed**	**% Miles Compliance**	**Perennial Miles Assessed**	**% Miles Compliance**	**Total % Miles Compliance**
Mountains	2	0.43	97.67%	0.93	100.00%	99.26%
Piedmont	38	9.15	88.20%	13.53	93.13%	91.14%
Upper Coastal Plain	14	6.8	93.09%	3.8	78.42%	87.83%
Lower Coastal Plain	33	11.31	89.39%	4.43	83.52%	87.74%
Ridge and Valley	9	3.04	82.24%	1.8	91.11%	85.54%
Total	96	30.73	89.26%	24.49	89.22%	89.24%
12b. Stream Assessment - Public						
Region	**No. Sites**	**Intermittent Miles Assessed**	**% Miles Compliance**	**Perennial Miles Assessed**	**% Miles Compliance**	**Total % Miles Compliance**
Mountains	2	0.22	100.00%	1.98	100.00%	100.00%
Piedmont	9	3.99	100.00%	5.49	100.00%	100.00%
Upper Coastal Plain	1	0.14	100.00%	0.27	100.00%	100.00%
Lower Coastal Plain	3	0.98	100.00%	0.59	96.61%	98.73%
Ridge and Valley	1	0	NA	1.69	100.00%	100.00%
Total	16	5.33	100.00%	10.02	99.80%	99.87%
12c. Stream Assessment - Corporate						
Region	**No. Sites**	**Intermittent Miles Assessed**	**% Miles Compliance**	**Perennial Miles Assessed**	**% Miles Compliance**	**Total % Miles Compliance**
Mountains	2	2.21	95.02%	3.16	100.00%	97.95%
Piedmont	17	4.16	94.71%	8.16	100.00%	98.21%
Upper Coastal Plain	8	3.07	100.00%	3.75	100.00%	100.00%
Lower Coastal Plain	25	8.69	97.12%	5.04	96.83%	97.01%
Ridge and Valley	2	0.42	100.00%	0.68	100.00%	100.00%
Total	54	18.55	96.87%	20.79	99.23%	98.12%
12d. Stream Assessment - All Ownership						
Region	**No. Sites**	**Intermittent Miles Assessed**	**% Miles Compliance**	**Perennial Miles Assessed**	**% Miles Compliance**	**Total % Miles Compliance**
Mountains	6	2.86	95.80%	6.07	100.00%	98.66%
Piedmont	64	17.3	92.49%	27.18	96.58%	94.99%
Upper Coastal Plain	23	10.01	95.30%	7.82	89.51%	92.77%
Lower Coastal Plain	61	20.98	93.09%	10.06	90.95%	92.40%
Ridge and Valley	12	3.46	84.39%	4.17	96.16%	90.83%
Total	166	54.61	92.90%	55.3	94.90%	93.90%

Table 13 a – d: Overall Distribution of Sites Evaluated by Region, Ownership, Acres Evaluated, BMPs Assessed, % BMPs Implemented, and Water Quality Risks.

Overall Distribution - NIPF					
13a. Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	3	174.92	119	82.35%	2
Piedmont	41	4687.74	1692	92.20%	12
Upper Coastal Plain	30	5367.35	919	93.47%	2
Lower Coastal Plain	71	13225.3	2258	88.04%	31
Ridge and Valley	11	943	504	91.67%	6
Total	156	24398.31	5492	90.44%	53
13b. Overall Distribution - Public					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	3	141.18	97	100.00%	0
Piedmont	10	1910.78	415	96.63%	0
Upper Coastal Plain	6	1160.94	135	99.26%	0
Lower Coastal Plain	5	1771.51	206	96.12%	0
Ridge and Valley	1	206	47	93.62%	0
Total	25	5190.41	900	97.11%	0
13c. Overall Distribution - Corporate					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	2	440.71	112	91.96%	0
Piedmont	19	3137.3	842	96.44%	0
Upper Coastal Plain	13	2556.09	396	97.22%	1
Lower Coastal Plain	43	14518.77	1653	93.83%	4
Ridge and Valley	2	179.1	80	100.00%	0
Total	79	20831.97	3083	95.07%	5
13d. Overall Distribution - All Ownership					
Region	**No. Sites**	**Acres**	**BMPs Assessed**	**% BMPs Implemented**	**WQ Risks**
Mountains	8	756.81	328	90.85%	2
Piedmont	70	9735.82	2949	94.03%	12
Upper Coastal Plain	49	9084.38	1450	95.03%	3
Lower Coastal Plain	119	29515.58	4117	90.77%	35
Ridge and Valley	14	1328.1	631	92.87%	6
Total	260	50420.69	9475	92.58%	58

Chart 1a: Statewide Trends in BMP Implementation

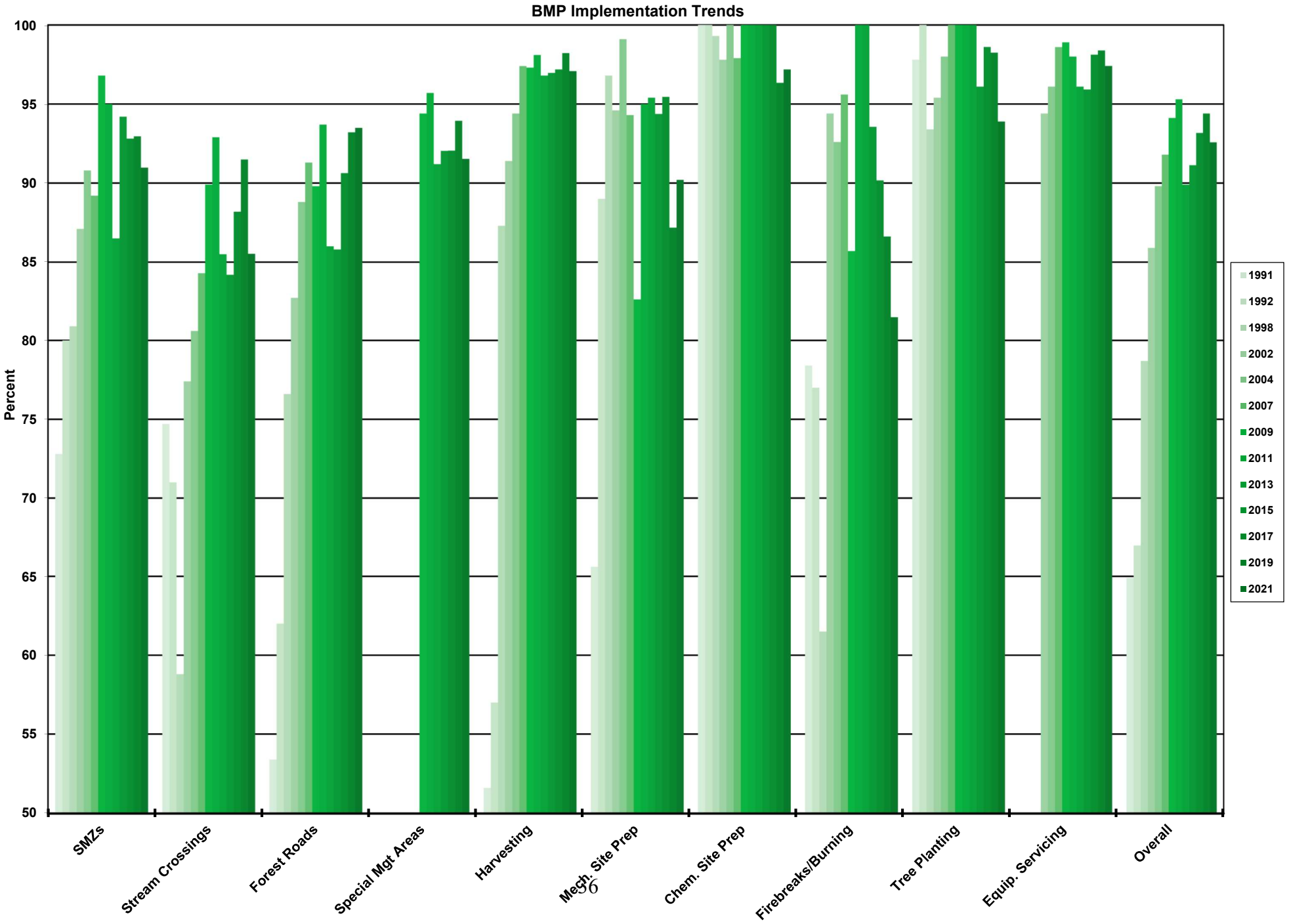


Chart 1b: Statewide Trends in BMP Implementation

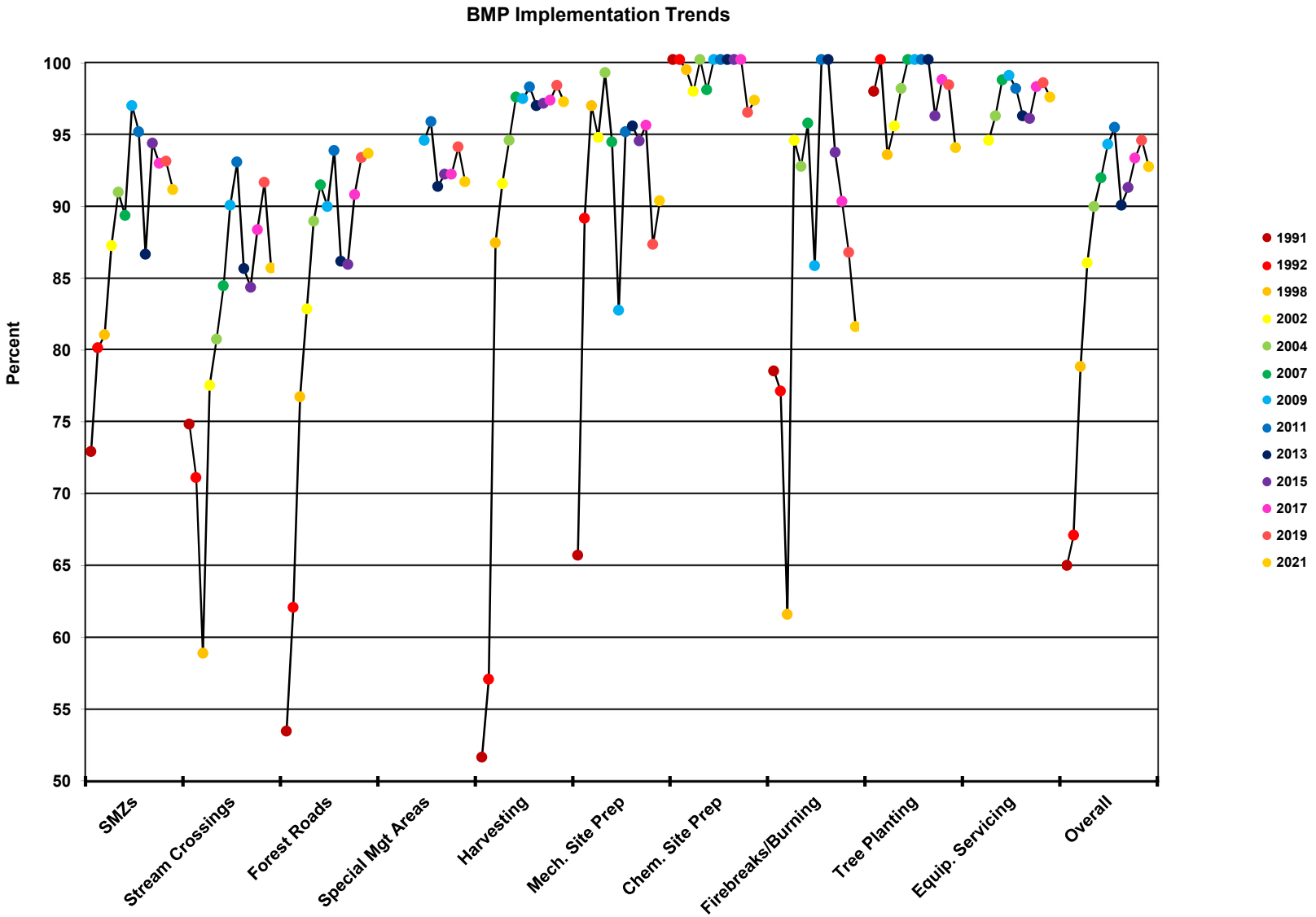


Chart 2: Statewide Trends in BMP Implementation on NIPF

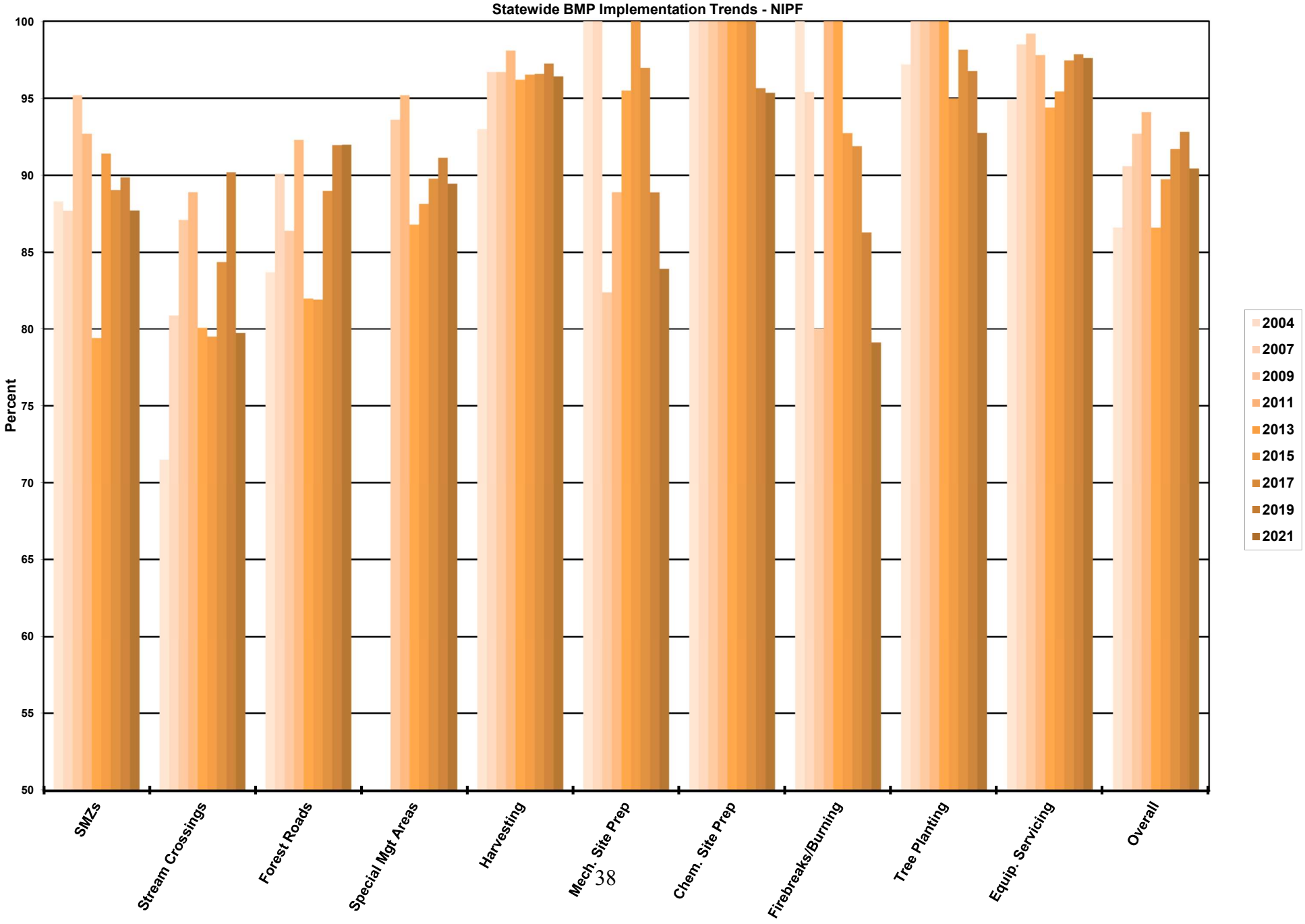


Chart 3: Statewide Trends in BMP Implementation on Corporate Sites

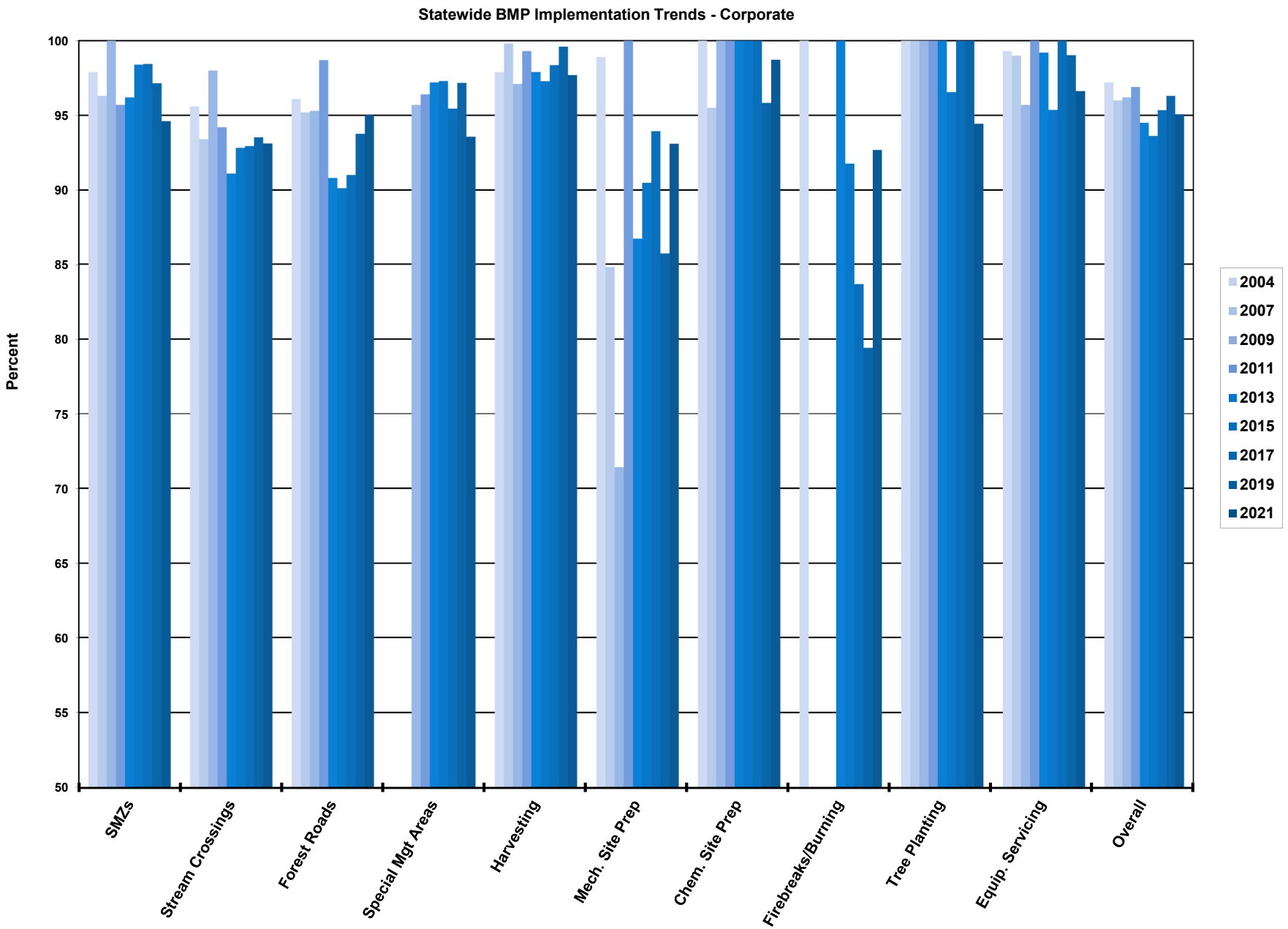


Chart 4: Statewide Trends in BMP Implementation on Public Sites

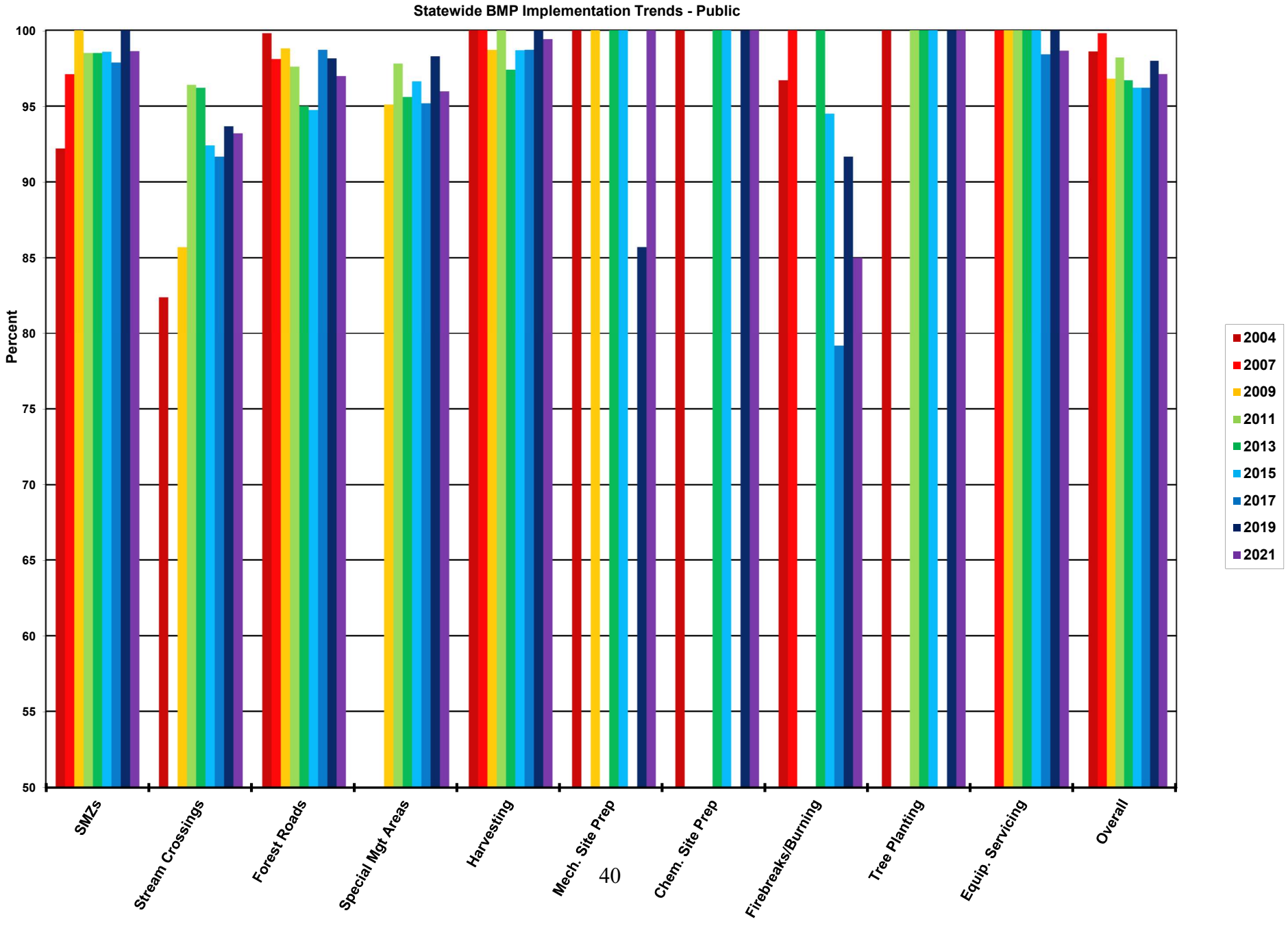
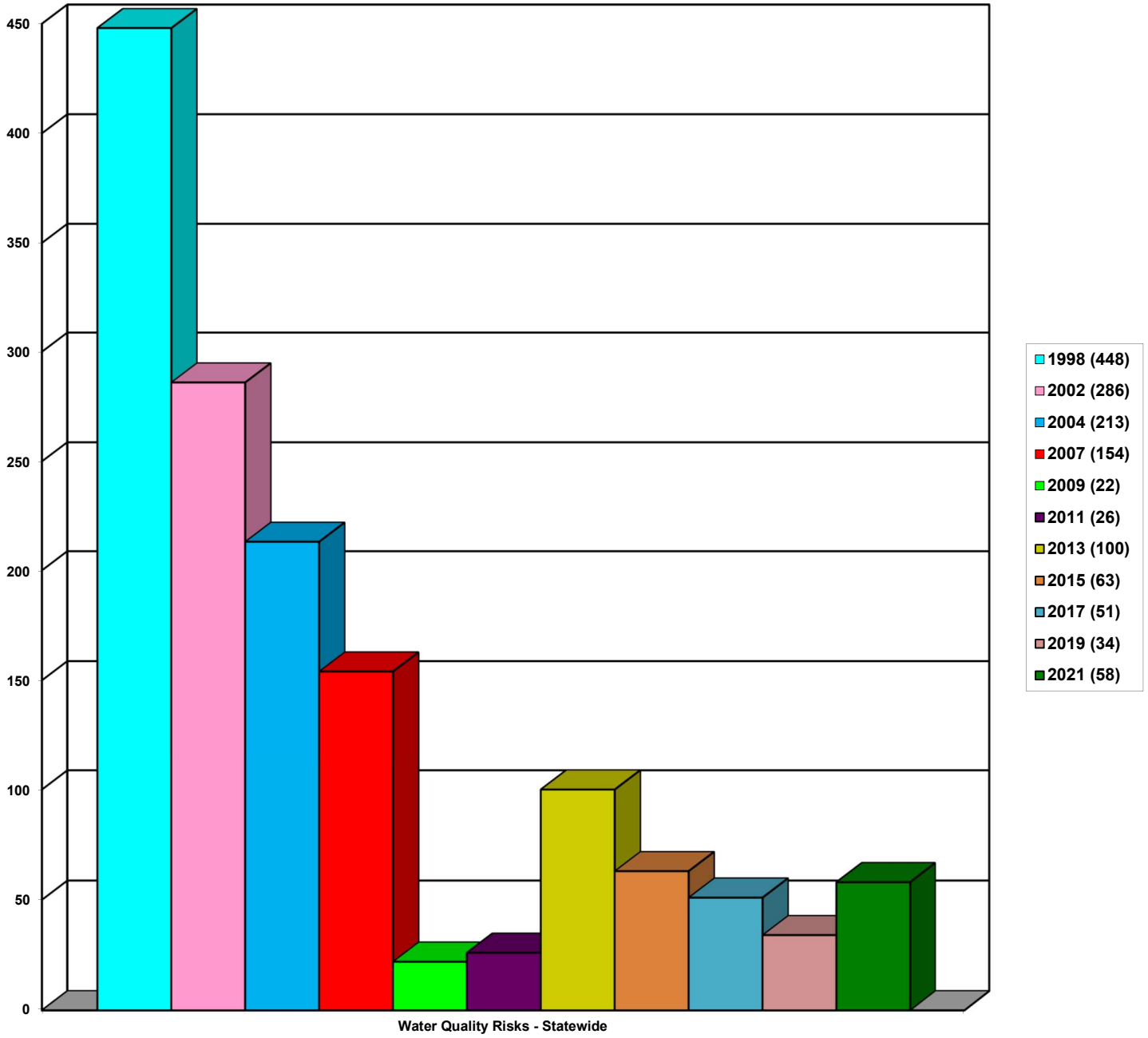


Chart 5: Statewide Trends in Reduction of WQRs from 1998 through 2021 Surveys



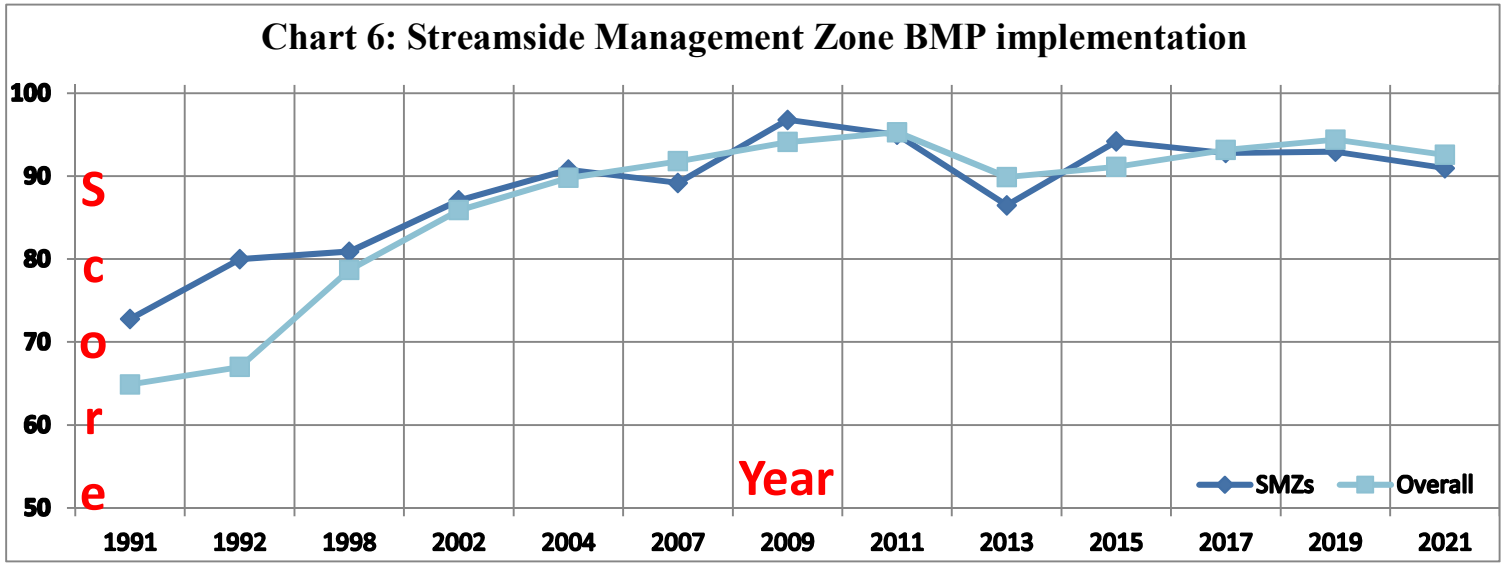


Chart 6: Streamside Management Zone BMP implementation
100
90
80
70
60
50
Score
Year
1991
1992
1998
2002
2004
2007
2009
2011
2013
2015
2017
2019
2021
SMZs
Overall

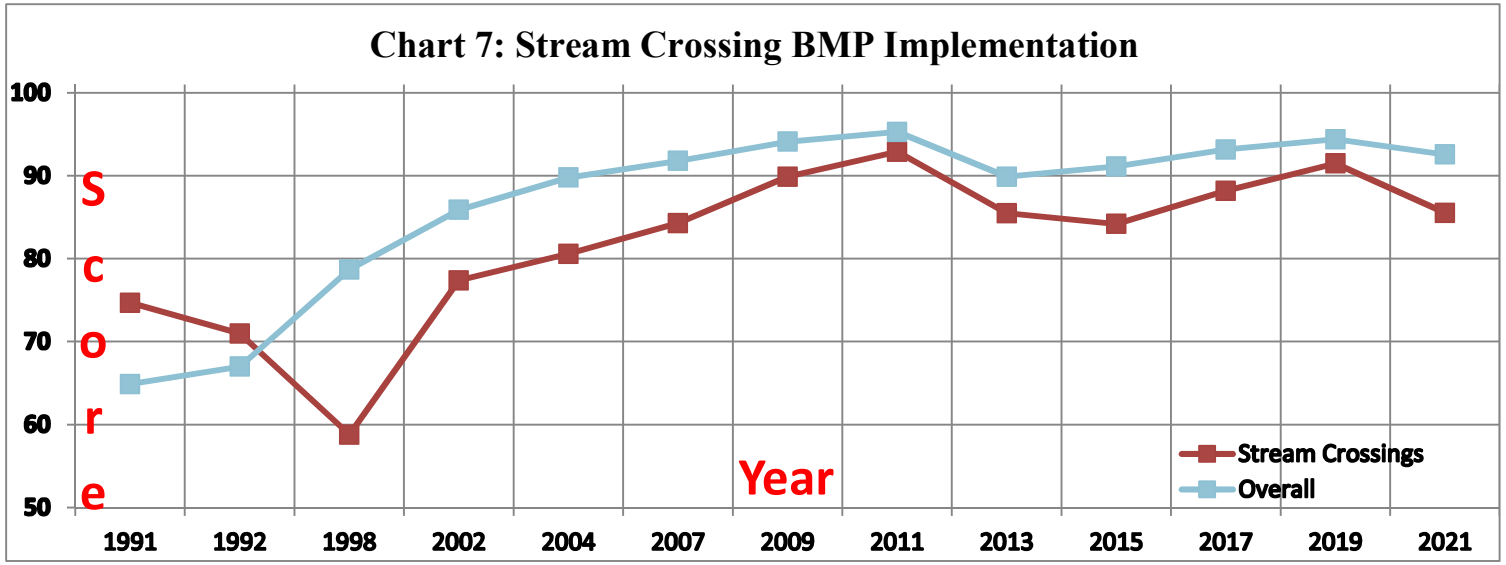


Chart 7: Stream Crossing BMP Implementation
100
90
80
70
60
50
Score
Year
1991
1992
1998
2002
2004
2007
2009
2011
2013
2015
2017
2019
2021
Stream Crossings
Overall

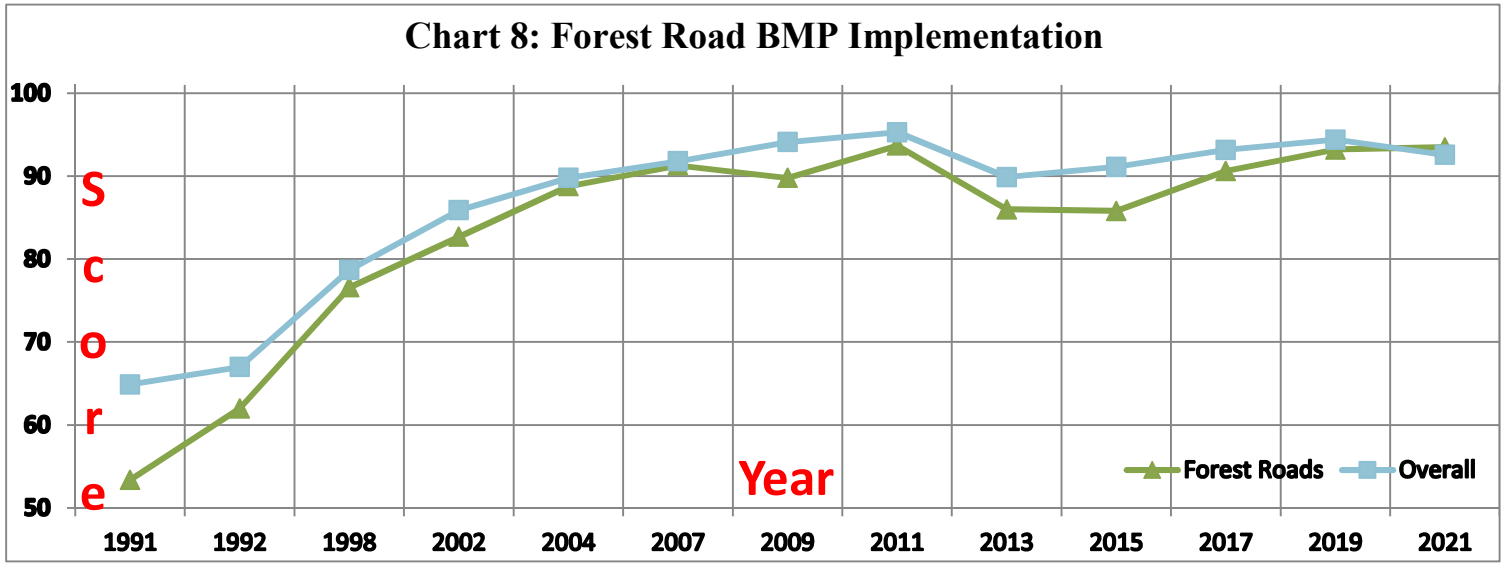


Chart 8: Forest Road BMP Implementation
100
90
80
70
60
50
Score
Year
1991
1992
1998
2002
2004
2007
2009
2011
2013
2015
2017
2019
2021
Forest Roads
Overall

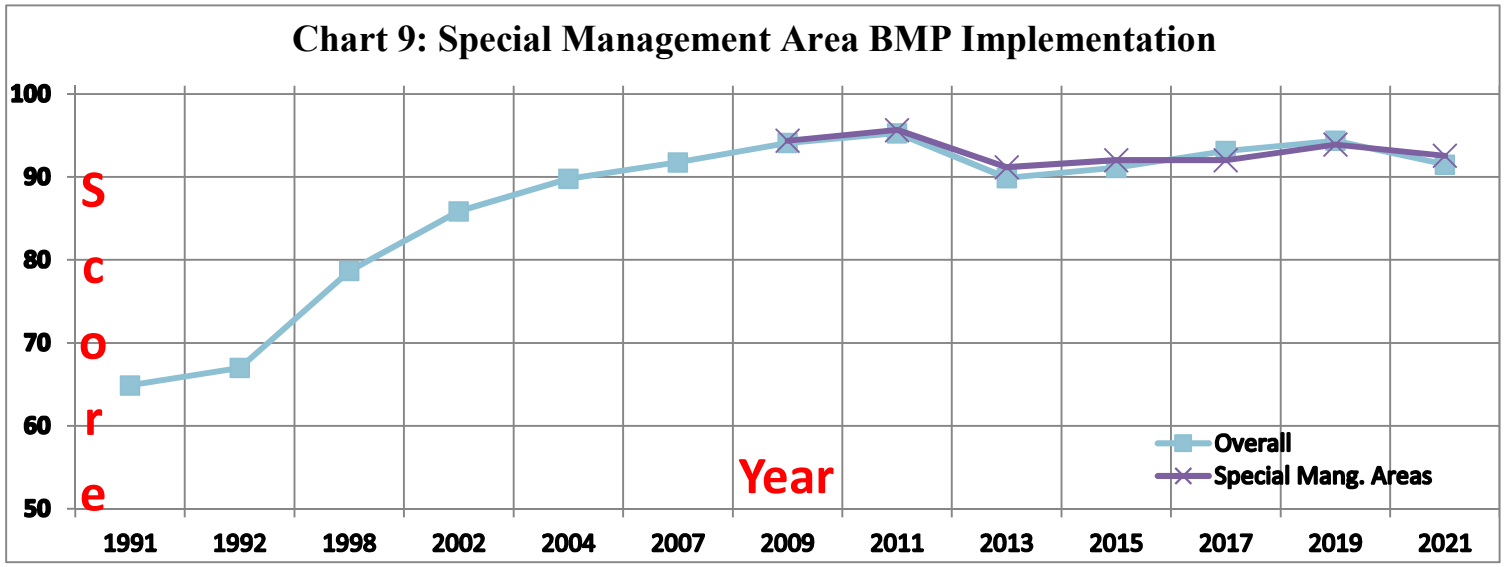


Chart 9: Special Management Area BMP Implementation
100
90
80
70
60
50
Score
Year
1991
1992
1998
2002
2004
2007
2009
2011
2013
2015
2017
2019
2021
Overall
Special Mang. Areas

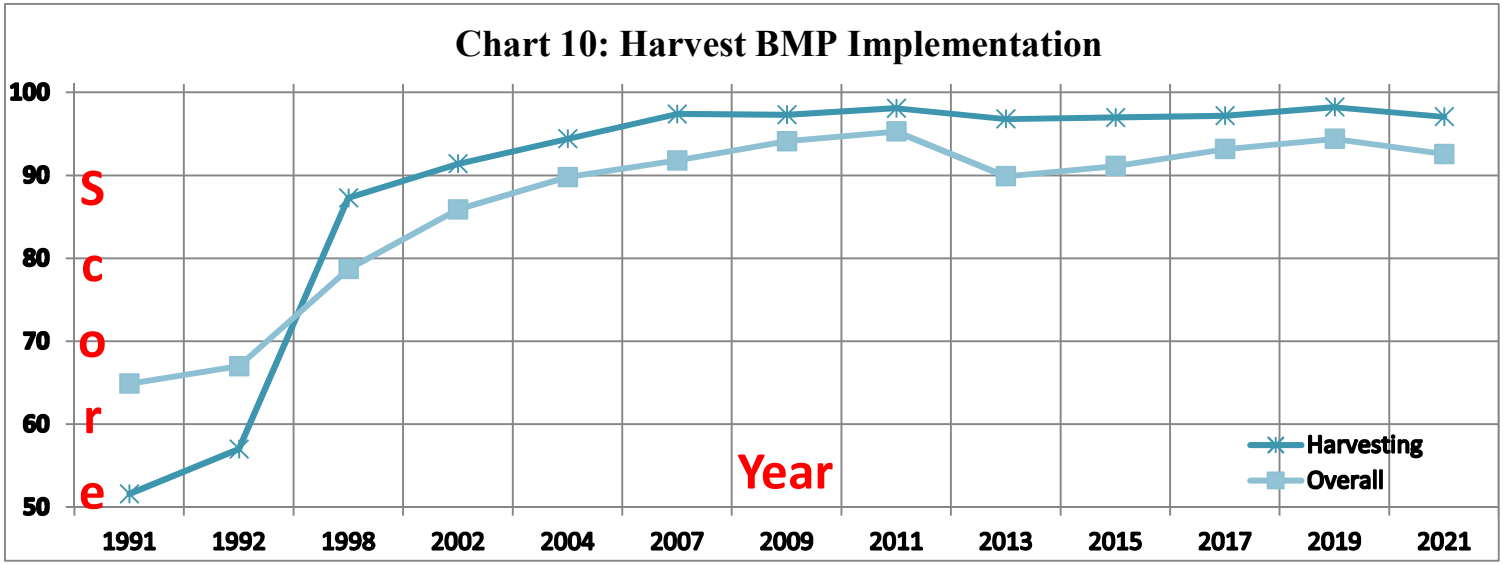


Chart 10: Harvest BMP Implementation
100
90
80
70
60
50
Score
Year
1991
1992
1998
2002
2004
2007
2009
2011
2013
2015
2017
2019
2021
Harvesting
Overall

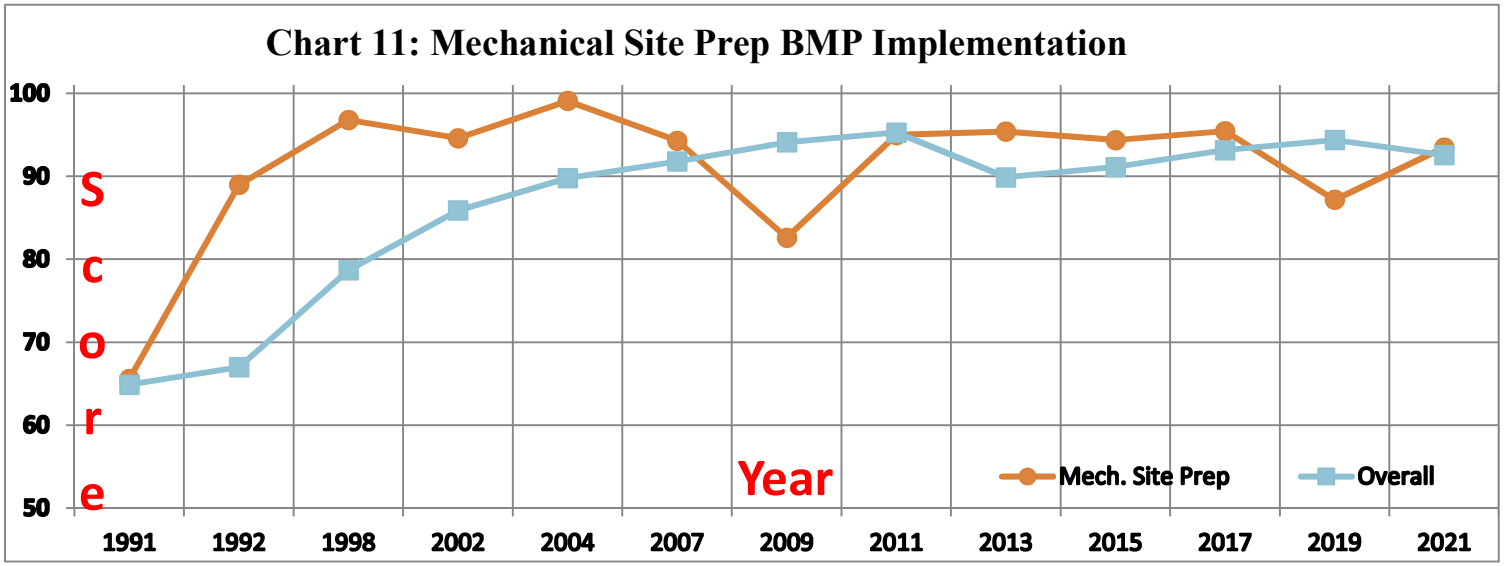


Chart 11: Mechanical Site Prep BMP Implementation
100
90
80
70
60
50
Score
Year
1991
1992
1998
2002
2004
2007
2009
2011
2013
2015
2017
2019
2021
Mech. Site Prep
Overall

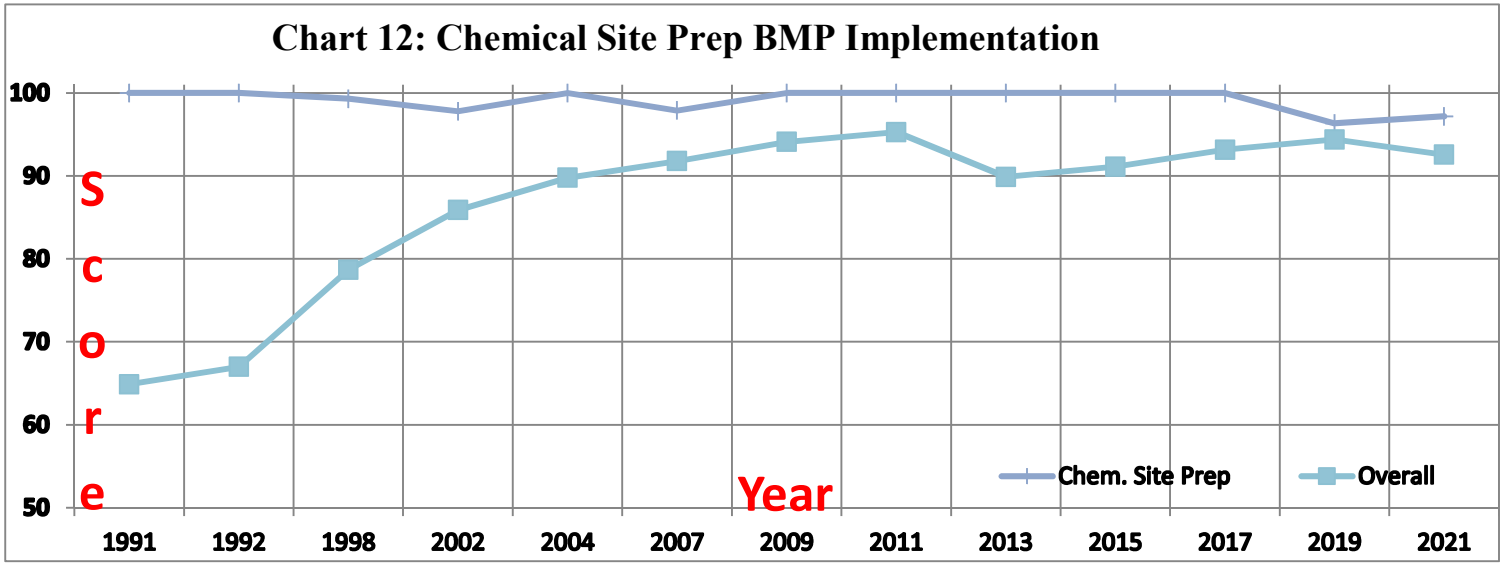


Chart 12: Chemical Site Prep BMP Implementation
100
90
80
70
60
50
Score
Year
1991
1992
1998
2002
2004
2007
2009
2011
2013
2015
2017
2019
2021
Chem. Site Prep
Overall

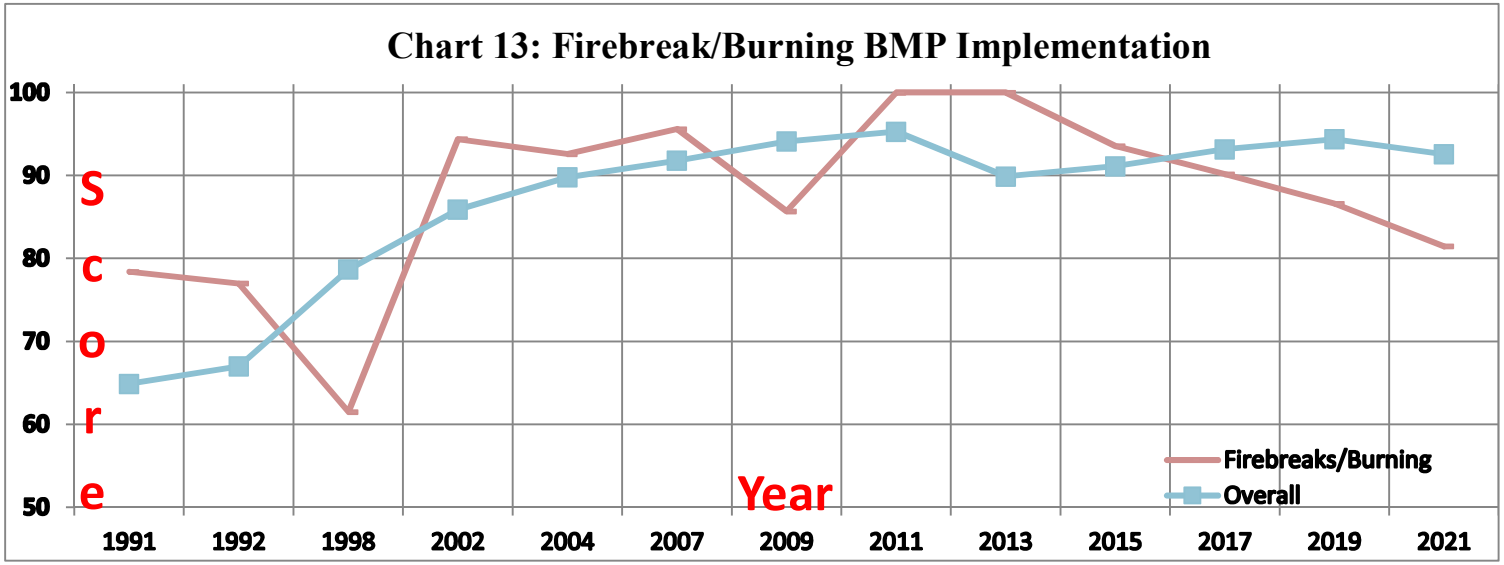


Chart 13: Firebreak/Burning BMP Implementation
100
90
80
70
60
50
Score
Year
1991
1992
1998
2002
2004
2007
2009
2011
2013
2015
2017
2019
2021
Firebreaks/Burning
Overall

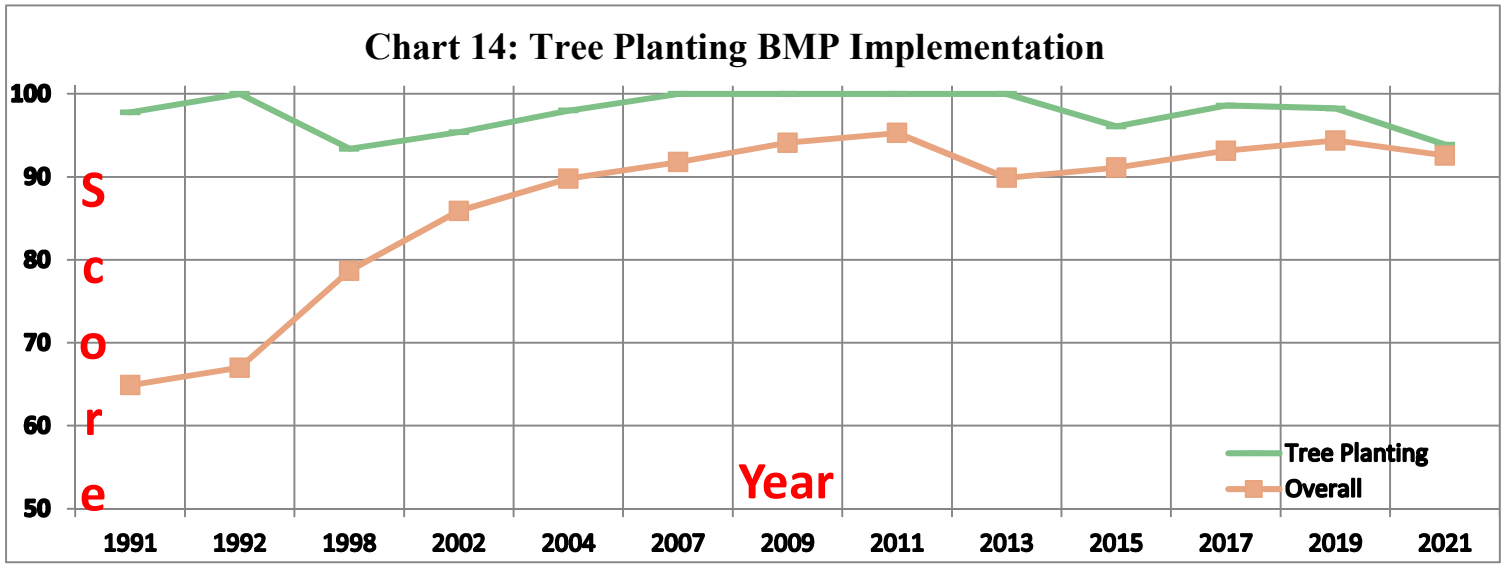


Chart 14: Tree Planting BMP Implementation
100
90
80
70
60
50
Score
Year
1991
1992
1998
2002
2004
2007
2009
2011
2013
2015
2017
2019
2021
Tree Planting
Overall

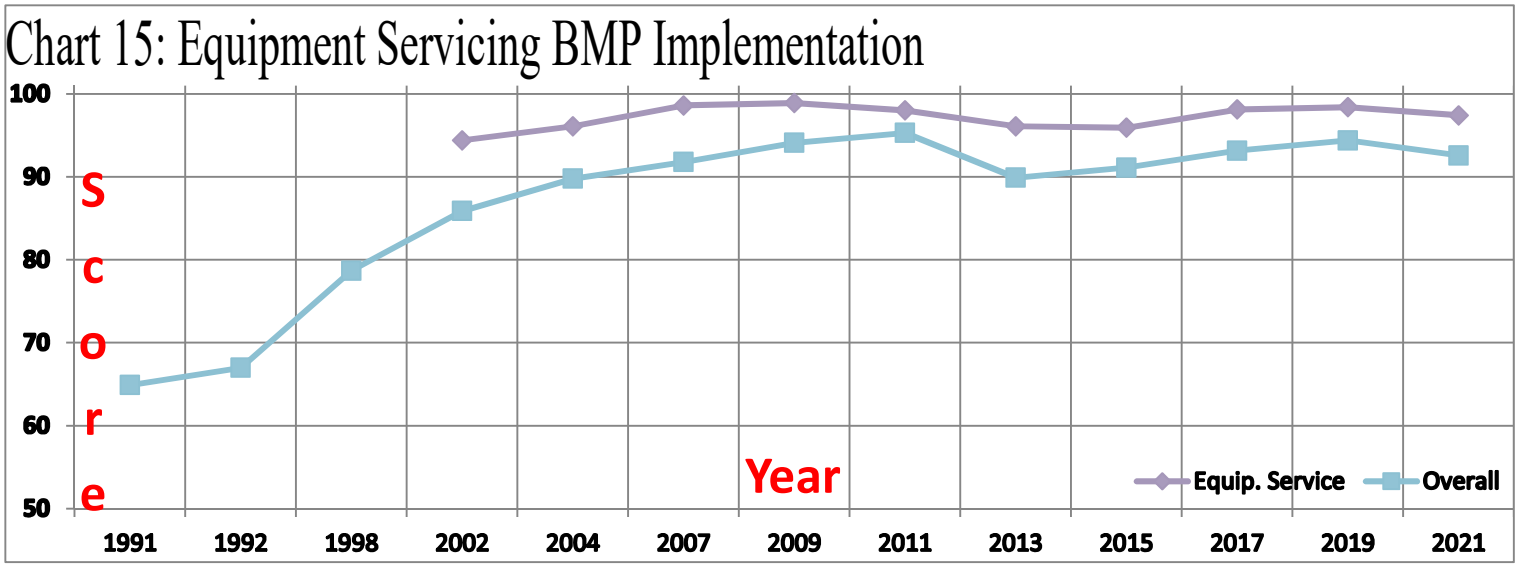


Chart 15: Equipment Servicing BMP Implementation
100
90
80
70
60
50
Score
Year
1991
1992
1998
2002
2004
2007
2009
2011
2013
2015
2017
2019
2021
Equip. Service
Overall

Forest Fertilization: Historically, forest fertilization has only been surveyed on a few sites each year. Due to the continually low sample size, a chart would likely not accurately represent trends.

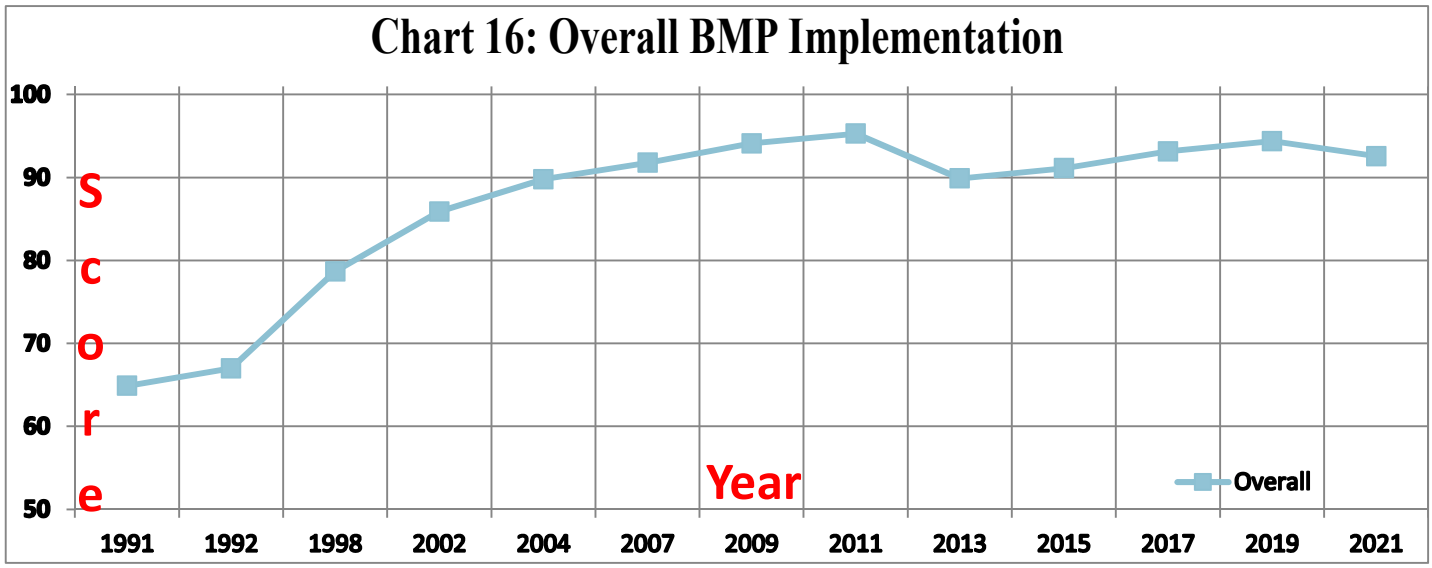


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Figure 1: 2021 BMP Survey Site Locations

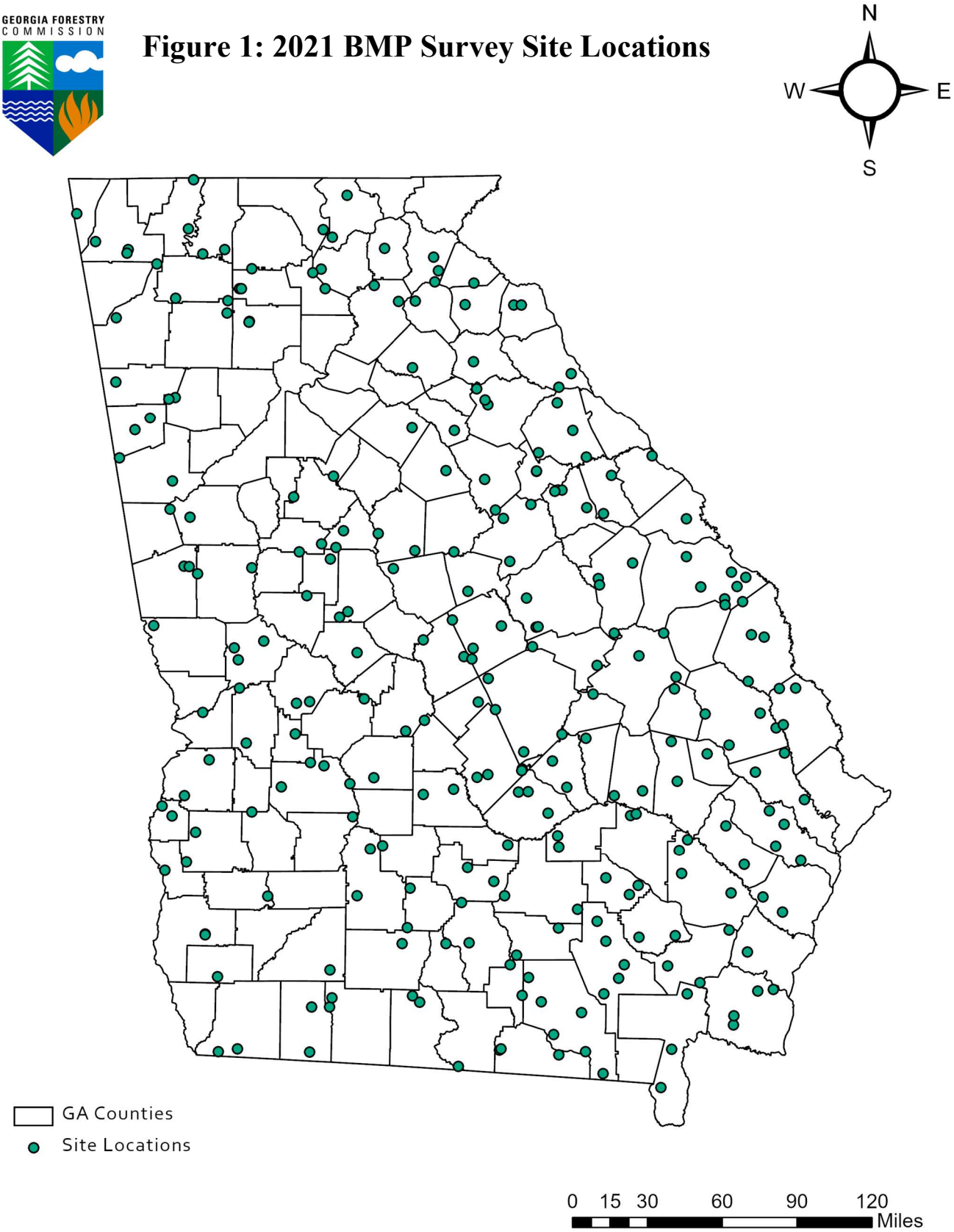

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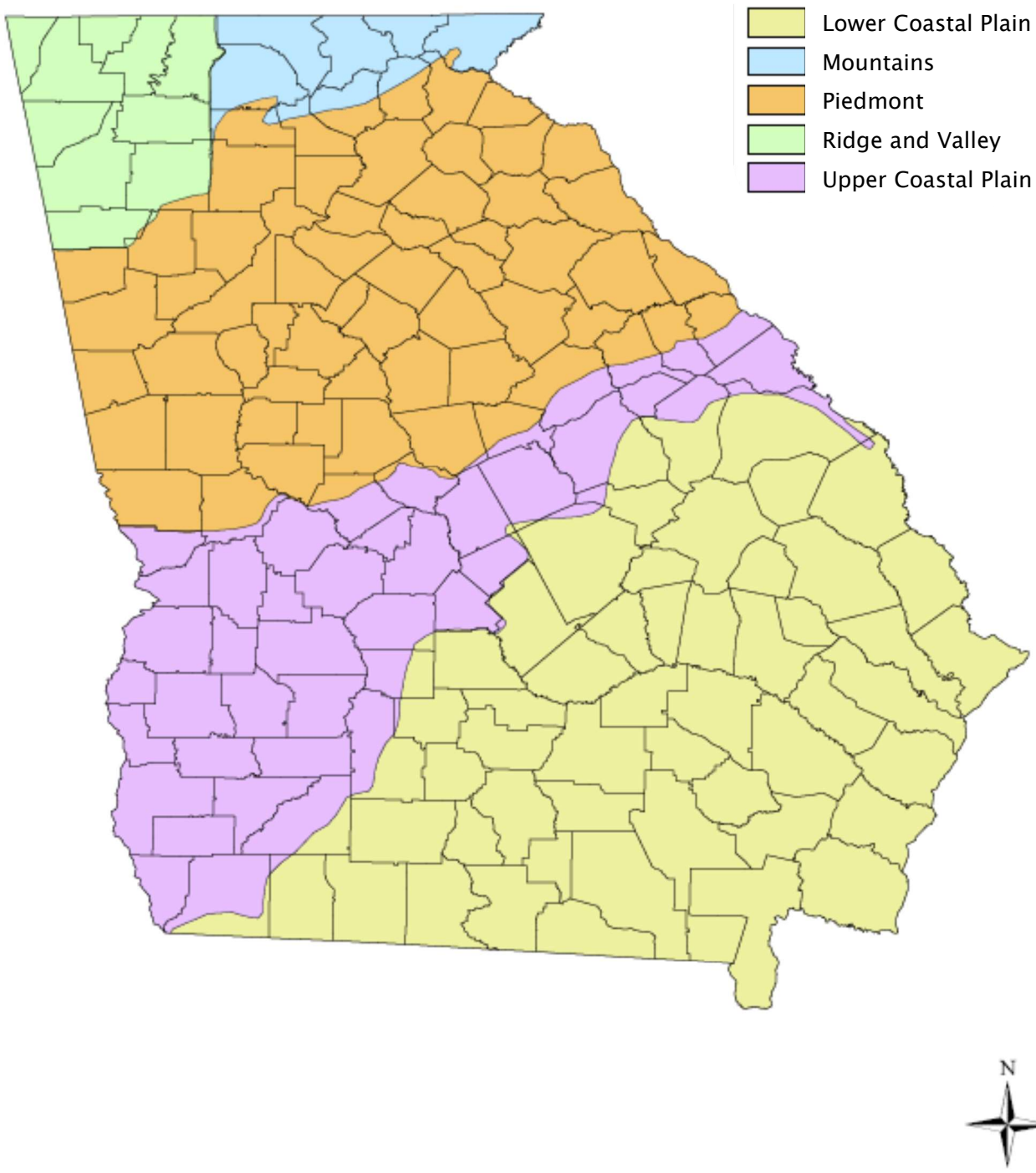
Figure 2: Physiographic Regions of Georgia



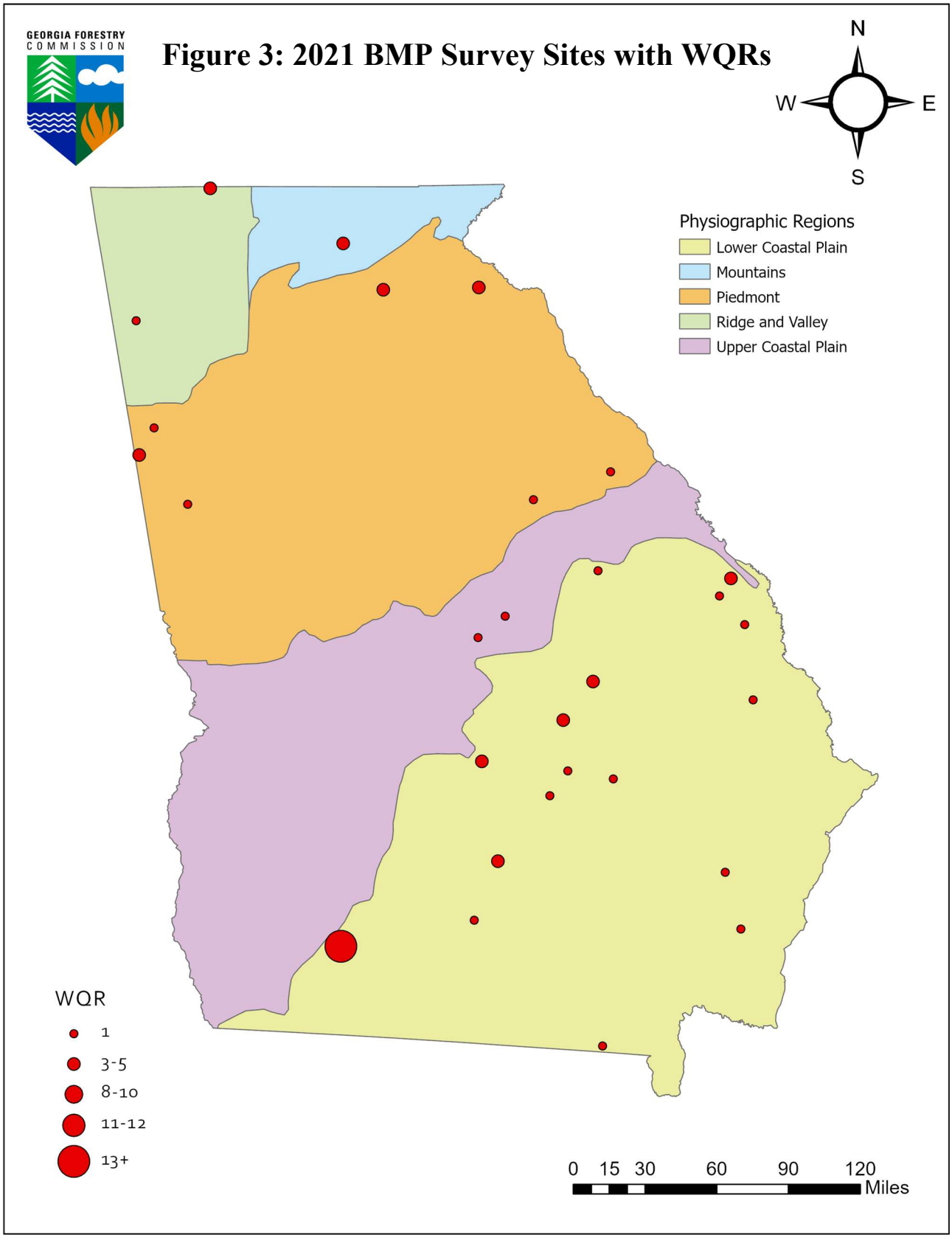
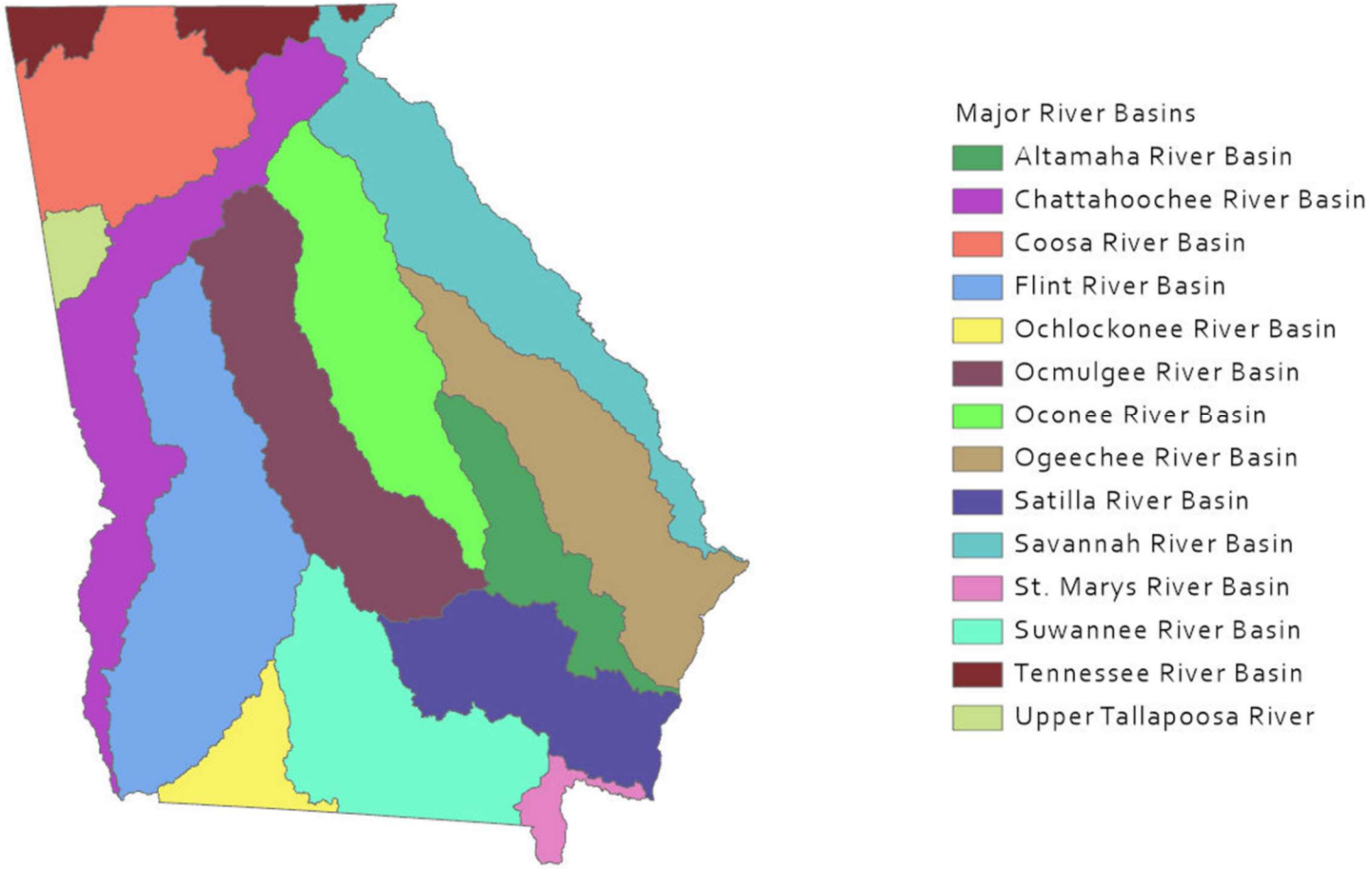
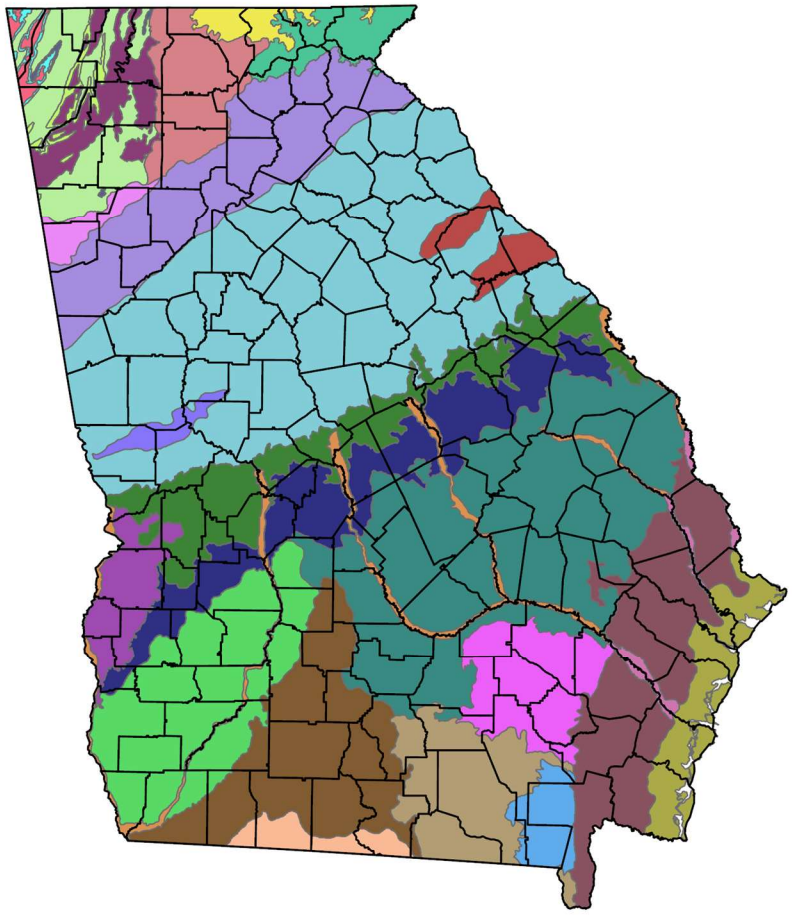

GEORGIA FORESTRY COMMISSION
Figure 3: 2021 BMP Survey Sites with WQRs
N
W
E
S
Physiographic Regions
Lower Coastal Plain
Mountains
Piedmont
Ridge and Valley
Upper Coastal Plain
WQR
1
3-5
8-10
11-12
13+
0 15 30 60 90 120
Miles

Figure 4: Georgia's 14 Major River Basins



Source: Atlanta Regional Commission

Figure 5: Georgia's Level IV Ecoregions



Georgia Ecoregions

- Atlantic Southern Loam Plains,65l
- Bacon Terraces,75h
- Broad Basins,66j
- Carolina Slate Belt,45c
- Coastal Plain Red Uplands,65k
- Dougherty Plain,65g
- Floodplains and Low Terraces,75i
- Okefenokee Plains,75e
- Okefenokee Swamp,75g
- Pine Mountain Ridges,45h
- Plateau Escarpment,68c
- Sand Hills,65c
- Sea Island Flatwoods,75f
- Sea Islands/Coastal Marsh,75j
- Southeastern Floodplains and Low Terraces,65p
- Southern Crystalline Ridges and Mountains,66d
- Southern Dissected Ridges and Knobs,67i
- Southern Hilly Gulf Coastal Plain,65d
- Southern Inner Piedmont,45a
- Southern Limestone/Dolomite Valleys and Low Rolling Hills,67f
- Southern Metasedimentary Mountains,66g
- Southern Outer Piedmont,45b
- Southern Sandstone Ridges,67h
- Southern Shale Valleys,67g
- Southern Table Plateaus,68d
- Talladega Upland,45d
- Tallahasee Hills/Valdosta Limesink,65o
- Tifton Upland,65h

Source: Atlanta Regional Commission

Notes: