

Results of Georgia's 2023 Silvicultural Best Management Practices Implementation and Compliance Survey

Prepared by the

Georgia Forestry Commission

in cooperation with the
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of the
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WATER QUALITY
P R O G R A M

GEORGIA FORESTRY
COMMISSION



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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 late-October of 2022, the GFC began the fourteenth Statewide Forestry BMP Implementation and Compliance Survey. Such surveys have been done periodically since 1991.

The objectives of the 2023 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 fourteenth 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://southernforests.org/wp-content/uploads/2023/11/SGSF_BMP_Implementation_Monitoring_Framework_2007_UpdatedLogo.pdf

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 2023 Statewide Forestry BMP Survey evaluated 266 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, 170 sites occurred on non-industrial private forest land (NIPF), 59 sites on forest industry / corporate land, and 37 sites on public land. By physiographic region, 13 sites were in the Mountains, 18 sites were in the Ridge & Valley, 68 sites were in the Piedmont, 53 sites were in the Upper Coastal Plain and 114 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 9093 individual BMPs evaluated, the statewide percentage of correct implementation was 96.81 percent. This is a 4.23 percentage point change in BMP implementation from the 2021 survey.** By ownership, the percentage of BMP implementation statewide was 98.33 percent on corporate lands, 98.39 percent on public lands, and 95.94 percent on NIPF lands. Corporate lands remained at a high level changing by 3.26 percentage points from 2021, while NIPF lands and public lands both changed by 5.5 and 1.28 percentage points respectively from the good levels from 2021.

A particularly positive note is that the number of Water Quality Risks observed decreased from 58 to 29. The average ratio of Water Quality Risks per site for the 2023 survey is calculated at 0.11. 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 266 sites, 56477.76 acres of separate forestry operations were evaluated. Of the 129.88 miles of streams evaluated, 128.55 (or 98.98 percent) were observed to have no impacts or impairment from forestry practices.

This continues a very good score and even represents a 5.08 percentage point improvement from 2021. Of the 268.61 miles of roads evaluated, 260.23 miles, or 96.88 percent, were observed to have no impacts or impairment from forestry practices. This score is slightly better than the 2021 survey, representing a 0.42 percentage point change. By practice or category, statewide percentages of BMP implementation and compliance were as follows:

Practice or Category	2021	% Point Change from 2021 Survey	2023
	Implementation (% BMPs Implemented)		Implementation (% BMPs Implemented)
Stream Crossings	85.53	+ 8.85	94.38
Forest Roads	93.49	+ 2.08	95.57
Timber Harvesting	97.08	+ 1.81	98.89
Mechanical Site Preparation	90.20	+ 5.85	96.05
Chemical Site Preparation	97.19	+ 2.81	100.00
Firebreaks/Burning	81.47	+ 8.36	89.83
Artificial Regeneration (Tree Planting)	93.89	+ 4.7	98.59
Equipment Servicing	97.41	+ 1.94	99.35
Special Management Areas	91.53	+ 5.48	97.01
Forest Fertilization	100	0	NA
Streamside Management Zones (SMZs)	90.98	+ 7.00	97.98
Weighted Overall Average	92.58	+ 4.23	96.81

Practice or Category	2021	% Point Change from 2021 Survey	2023
	Compliance (% Miles meeting BMPs)		Compliance (% Miles meeting BMPs)
Stream Mileage	93.90	+ 5.08	98.98
Forest Roads Mileage	96.46	+ 0.42	96.88

Forest operators continue to do a good job of protecting sensitive areas. The score for SMZs remains good at 97.98 percent, and this represents a 7.00 percentage point improvement in BMP Implementation in the category of streamside management zones (SMZs). Stream crossings improved by 8.85 percentage points to a score of 94.38 percent, while special management areas maintained a good score of 97.01 percent. Generally forest operators as a whole, continue to do a good job of implementing forestry BMPs with an overall implementation rating of 96.81 percent. This 96.81 percent represents an improvement of 4.23 percentage points from 2021.

BMP implementation for forest roads improved by 2.08 percentage points to a score of 95.57 percent. There continues to be some room for improvement in the areas of stream crossings, and to a lesser extent, streamside management zones. One corporate site in the Mountains did score relatively poorly. However, in general and overall, most of the scores for stream crossings were good. Scores for forest roads were generally good as well with no water quality risks found. Streamside management zones (SMZs) scored well at 97.98 percent implementation overall. However, some extra attention to SMZs is warranted in the Piedmont and the Ridge and Valley regions. Firebreak/burning scores improved to 89.83 percent implementation, representing an 8.36 percentage point improvement. 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 150 stream crossings evaluated on 80 sites with an overall implementation rate of 94.38 percent, which represents an improvement of 8.85 percentage points from the 2021 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 20 of the total 29 water quality risks on all the survey sites. That represents 69 percent of the Water Quality Risks found during the entire 2023 Survey. A more detailed discussion of the BMP implementation changes in each category 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 (2021 forest inventory and analysis) 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 96,540 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 3,566 BMP talks to more than 116,230 people and participated in 661 field demonstrations of BMPs (through December 2023). 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 79,660 cases covering over 5.55 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, 2019, and 2021. This current 2023 statewide survey continues over 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 96.81 percent in 2023. The purpose of this report is to present the results of the 2023 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 266 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 2023 BMP Survey, 170 sites (63.91 percent) were inspected on NIPF lands, 59 sites (22.18 percent) on corporate, and 37 sites (13.91 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 fourteenth 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://southernforests.org/wp-content/uploads/2023/11/SGSF_BMP_Implementation_Monitoring_Framework_2007_UpdatedLogo.pdf*

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

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 an “*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 2023 Statewide Forestry BMP Survey evaluated 266 sites comprising 56,477.76 acres. There were 150 stream crossings, 268.61 miles of forestry roads, and 129.88 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 266 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 266 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 3.8 percent to 2.7 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 110 sites in order to achieve a five percent margin of error. We have evaluated 2.42 times the needed number of sites, so, using the formula, this level of survey should yield a margin of error of 3.21 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/wetter 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 more 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 97.98 percent.
- Statewide BMP compliance for stream length is 98.98 percent.
- 4 WQRs were identified for SMZs (all in the Piedmont area). Overall, this was a good reduction of 14 WQRs from 2021.
- Implementation for overall SMZs have improved by 7.00 percentage points to a very good overall score of 97.98 percent.
- Insufficient SMZ widths and logging debris left in stream channels, seem to be the most common BMP deficiencies found in the SMZ category. Also, 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 150 crossings were evaluated on 80 sites statewide. Significant findings include:

- Statewide implementation for stream crossings is 94.38 percent. This is an 8.85 percentage point improvement from 2021.
- Stream crossings scores improved in all regions by at least 1.11 percentage points.
- 20 WQRs were associated with stream crossings in 2023, compared to 33 WQRs for 2021. This is a good 39.39% reduction in WQRs for stream crossings compared to 2021.
- Of note, 4 of the 20 total WQRs associated with stream crossings occurred on a single corporate site in the Mountain region. This one odd site made up 1/5th of the WQRs for stream crossings.
- The WQRs associated with stream crossings were distributed as follows: 15 for Non-Industrial Private ownerships, 5 for Corporate ownerships, and 0 for Public ownerships.
- Areas for improvement in stream crossings 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 268.61 miles of road were evaluated on 254 sites. Forest road BMP implementation showed an improvement of 2.08 percentage points from the 2021 survey. Significant findings include:

- Forest roads BMP implementation across all ownerships is 95.57 percent.
- Forest roads compliance is 96.88 percent, a very slight improvement of 0.42 percentage points.
- There were zero WQRs associated with forest roads.
- Challenges for forest roads BMP implementation continues 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 216 sites with canals, ditches, ephemeral areas, gullies, floodplain features, and/or wetland features. Other significant findings include:

- Special management area BMP implementation across all ownerships was 97.01 percent. This represents a 5.48 percentage point improvement from 2021.

- There were just 2 WQRs associated with special management areas, this was 4 less than the number found in 2021. One WQR involved reactivating a gully. The other WQR involved not fully protecting a floodplain feature.
- Additionally, problems were found with firebreaks crossing gullies and not using low impact methods.

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 27,923.99 acres were evaluated on 239 sites. A total of 880 log decks and 1,452 main skid trails were evaluated. Other significant findings include:

- Timber harvesting outside SMZs BMP implementation, across all ownerships, is 98.89 percent.
- All BMPs for Timber Harvesting scored 92 percent or better.
- There were just two WQRs associated with Timber Harvesting. Both were the result of failing to properly stabilize skid trails.

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 4,074.66 acres were evaluated on 35 sites. Significant findings include:

- Mechanical Site Prep BMP implementation is 5.85 percentage points higher than the 2021 survey. It now sits at 96.05 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 8,995.67 acres were evaluated on 93 sites. Significant findings include:

- BMP implementation and compliance for Chemical Site Prep is 100.00 percent, a 2.81 percentage point improvement from 2021.

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. Additionally, wildfires burn forestland acres as well.

Approximately 6010.84 acres were evaluated for burning including 120.01 miles of firebreaks. There was a total of 73 sites evaluated for firebreaks/burning. BMP implementation was 89.83 percent. The score improved by 8.36 percentage points from 2021. The main challenges involved firebreaks including proper construction and spacing of water diversions, avoiding intersections with forest roads, and improperly tying into streamside management zones or special management areas. 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 73 sites, 38 sites included GFC installed firebreaks. GFC installed firebreaks scored 92.02 percent BMP implementation. There were 36 sites that included landowner (private and public) or contractor installed firebreaks. For the 2023 survey landowner/contractor installed firebreaks scored 86.86 percent BMP implementation. 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 8,659.39 acres were evaluated on 87 sites. Overall BMP implementation for artificial regeneration was 98.59 percent. That maintains a high level of BMP Implementation. Significant findings include:

- BMPs were fully implemented on the vast majority of these sites.
- Just one water quality risk was identified on a corporate site in the Piedmont region where the planting did not properly follow the contour.

Forest Fertilization

For the 2023 BMP Survey, no known fertilization sites were selected during the random site selection process. 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, fertilization that was not obvious or reported may have occurred.

Equipment Servicing

Improper equipment washing and servicing can introduce hazardous or toxic materials to the site, which can affect water quality. Oils, lubricants, their containers, 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 913 landings were evaluated on 258 sites. Significant findings include:

- BMP implementation for Equipment Servicing was 99.35 percent, up by 1.94 percentage points from 2021. 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 98 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 129.88 miles of streams on 160 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 75.16 miles of perennial streams were assessed on these sites. Of these, 99.71 percent were in compliance. A total of 54.72 miles of intermittent streams were assessed on these sites. Of these, 97.97 percent were in compliance. Total combined stream compliance was 98.98 percent. Significant findings include:

- 29 water quality risks (WQRs), total, were identified statewide
- There were 20 WQRs (68.97 percent of the total) involving stream crossings
 - ✓ 7 of these were associated with stream crossing approaches
 - ✓ 6 were associated with temporary fills not removed in their entirety
 - ✓ 3 involved the disruption of the migration of aquatic species
 - ✓ 1 involved the stabilization of exposed soils on a wetland fill road
 - ✓ 1 were instances where skidder fords were not avoided
 - ✓ 1 involved culvert sizing and proper installation
 - ✓ 1 involved crossings not properly designed to prevent the restriction of expected flood flow
 - ✓ Of note, 4 of the 20 total WQRs associated with stream crossings occurred on a single corporate site in the Mountain region.
- Within SMZs, there were 4 WQRs (13.79 percent of the state total of WQRs).
 - ✓ 2 were associated with logging debris in stream channels
 - ✓ 1 involved a firebreak lacking proper water diversions where tied in at the SMZ margins
 - ✓ 1 involved mechanical site prep not being kept fully out of the SMZ

✓ Of note is the fact that all 4 WQRs for SMZs were found in the Piedmont region.

- 2 WQRs were associated with Special Management Areas.
 - ✓ 1 involved not avoiding reactivating a gully
 - ✓ 1 involved not fully protecting the bank of a floodplain feature
- 2 WQRs were associated with Timber Harvesting for skid trails on rolling/steep terrain not being properly stabilized.
- 1 WQR was associated with Tree Planting where machine planting was not done on the contour.

Overall, the 98.98 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 96.81 percent. This is a 4.23 percentage point improvement from the 2021 survey, a very good score. Using the SGSF BMP Monitoring Framework Guidance, a sample size of 266 sites for this survey results in a margin of error of 3.21 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 29 specific locations on just 15 sites, out of the 266 total survey sites. This indicates that only a small portion of sites contain any WQRs. The total of 29 WQRs is exactly half of the previous BMP survey in 2021, representing a 50 percent improvement from the 2021 survey. Looking into these numbers a little deeper, it can be seen that 94.36 percent or 251 of the 266 sites surveyed for 2023 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 2023 Survey, 5 (or 17.24 percent) of the total 29 WQRs, were found on one single poorly executed corporate site in the Mountain region.*** Below is a table showing the distribution of Water Quality Risk occurrence over the past 10 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%
2023	266	251	94.36%	14	5.26%	1	0.38%	0	0.00%	0	0.00%

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 28 Ecoregions (Figure 5, page 52) could also be used to extract the survey statistics.

EDUCATIONAL OPPORTUNITIES

For the 2023 Forestry Survey, BMP implementation improved for all categories including the following:

Stream Crossings	+ 8.85
Firebreaks/Burning	+8.36
Streamside Management Zones (SMZs)	+ 7.00
Mechanical Site Preparation	+ 5.85
Special Management Areas	+ 5.48
Artificial Regeneration (Tree Planting)	+ 4.70
Chemical Site Preparation	+ 2.81
Forest Roads	+ 2.08
Equipment Servicing	+ 1.94
Timber Harvesting	+ 1.81
Forest Fertilization	NA
Weighted Overall Average	+ 4.23

Our educational opportunities will continue to address these categories to maintain good scores. However, there is always some room for improvement, especially on critical area where we have seen issues in the past. 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)
 - ✓ Maintaining recommended minimum SMZ widths
 - ✓ Maintaining recommended minimum residual basal area within SMZs
 - ✓ Maintaining streambank trees
 - ✓ Keeping logging debris out of stream channels
 - ✓ Proper water diversions for firebreaks when tied in at the SMZ margins
 - ✓ Properly tying firebreaks into streams with low impact methods
 - ✓ Minimizing soil disturbance in SMZs

- Firebreaks/Burning Outside of SMZs
 - ✓ Proper firebreak planning and water diversion installation
 - ✓ Proper tie-in with roads and other sensitive areas such as 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
- Mechanical Site Preparation Outside of SMZs
 - ✓ Avoidance of bedding directing surface runoff to roads and road-ditches
- Special Management Areas
 - ✓ Keeping debris out of canals/ditches
 - ✓ Avoiding interference with natural flow in ephemeral areas
 - ✓ Avoidance of direct tie in from road and firebreak diversions into ephemerals and gullies
 - ✓ Using low impact methods for firebreaks
 - ✓ Identifying and preserving the Special Management Area features
- Artificial Regeneration Outside of SMZs
 - ✓ Machine planting on the contour
- Equipment Servicing
 - ✓ Proper disposal of oils, lubricants, containers, and/or trash

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	162	17870.82	5172	97.18%	9
101-200 Acres	63	17078.5	2292	96.68%	8
201 Acres or more	41	21528.44	1629	95.83%	12
All	266	56477.76	9093	96.81%	29

As shown in the above table, differences in the BMP implementation scores for different tract sizes appear to be small, and all the tract size categories showed good scores above 95 percent. In the past, we have seen trends that indicated poorer BMP implementation and/or more problems with water quality risks (WQRs) on smaller tracts versus larger tracts. For the 2023 BMP Survey we did not see a definitive trend related to tract size. However, the good scores and reduced number of water quality risks overall seem to indicate something positive. Tracts under 100 acres now seem to be doing much better than in the past and comparable to the larger tracts in general. It is noteworthy that out of the 12 WQRs found on larger tracts, 5 were found on a single large corporate tract in the Mountain region.

Although this survey did not see a trend with smaller tracts having more issues with BMP implementation or WQRs, we still need to be aware of certain potential problems associated with smaller tract parcelization.

As has been noted in previous surveys, problems could result from the following: 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, we know from experience that parcelization of land into more and smaller parcels has the real potential to lead to other problems. Also, since smaller landowners often have fewer resources and/or knowledge of forestry, problems are often left unnoticed or given little attention, potentially 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. The GFC has already undertaken efforts to make BMP educational information available in-person and online. GFC has worked with partners to provide BMP educational content for in-person and online Master Timber Harvester (MTH) training, as well as Continuing Logger Education (CLE). 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/>. Additional modules might be created in the future to continue to address 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.

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 2015, 2017, and 2019, the WQRs went back down. The 2021 survey showed another uptick in WQRs. However, this uptick was 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. For the 2023 survey, we saw a good decrease in the number of WQRs, down 50% from 2021.

CONCLUSION

Since the survey first started in 1991, the BMP Implementation score has improved greatly from 65 percent in 1991, to a new high of 96.81 percent for the 2023 survey. The BMP Implementation score has been high and remained high (about 90% or above) since 2004 (about 19 years). The current 2023 survey shows that the BMP Implementation score remains very strong with a score of 96.81 percent overall. The percentage of stream miles in compliance remains very high at 98.98 percent. Since the 1998 survey, the number of water quality risks has decreased significantly, 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 was 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. 2023 shows a good decrease in the number of WQRs. This continued the overall long-term downward trend for the number of WQRs. Chart 5 (page 41) tracks the level of observed Water Quality Risks since the 1998 survey.

The 2023 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, the increased availability and use of portable logging bridges would help 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 Type

County	Public	Corporate	NIPF	Totals
Appling	1		1	2
Atkinson			2	2
Bacon		2	1	3
Baldwin	1			1
Banks	1		2	3
Bartow			2	2
Ben Hill			1	1
Berrien	1	1		2
Bleckley			1	1
Brantley		2	1	3
Brooks		1	1	2
Bryan	1		1	2
Bulloch			4	4
Burke	1	1	4	6
Butts			1	1
Calhoun			1	1
Camden		1	3	4
Candler			1	1
Carroll			2	2
Charlton		3		3
Chattahoochee	1			1
Chattooga	1		2	3
Cherokee		2	1	3
Clay		1		1
Clinch		6		6
Coffee			2	2
Colquitt			1	1
Columbia			1	1
Cook			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		2	1	3
Elbert		2		2
Emanuel			3	3
Evans			1	1
Floyd			1	1
Franklin			3	3

County	Public	Corporate	NIPF	Totals
Gilmer			1	1
Glascok			1	1
Glynn		1		1
Gordon			2	2
Grady			2	2
Greene	2			2
Habersham	3		1	4
Hancock			1	1
Haralson			2	2
Harris			1	1
Hart			2	2
Heard			2	2
Henry	1			1
Irwin	1		1	2
Jackson			1	1
Jasper	1		2	3
Jeff Davis	1		1	2
Jefferson			2	2
Jenkins			1	1
Johnson			2	2
Jones	1		1	2
Lamar			1	1
Lanier		1		1
Laurens			4	4
Lee			1	1
Liberty	1	2	1	4
Long			2	2
Lumpkin	2		1	3
Macon			1	1
Madison			1	1
Marion		1	1	2
McDuffie		1		1
McIntosh	1	1		2
Meriwether	1			1
Miller	1			1
Mitchell			1	1
Monroe			2	2
Montgomery			1	1
Morgan		1	2	3
Murray	1		2	3
Oconee			1	1
Oglethorpe		2	1	3
Pickens		1	1	2
Pierce			2	2
Pike			1	1
Polk	1		3	4

County	Public	Corporate	NIPF	Totals
Pulaski	1		1	2
Putnam	1	1	1	3
Quitman		1	1	2
Randolph			2	2
Schley		1	1	2
Screven			4	4
Seminole			1	1
Spalding			2	2
Stewart		2		2
Sumter		1	1	2
Talbot		1	1	2
Taliaferro		2	1	3
Tattnall			2	2
Taylor			2	2
Telfair			3	3
Terrell			1	1
Thomas	1			1
Tift	1		1	2
Toombs			2	2
Treutlen			1	1
Troup			1	1
Turner			1	1
Twiggs			2	2
Union	1			1
Upson	1	1	1	3
Walker	3			3
Walton			1	1
Ware	1	2	2	5
Warren		3	2	5
Washington			3	3
Wayne			4	4
Wheeler			2	2
Whitfield		2	1	3
Wilcox			2	2
Wilkes		2	2	4
Wilkinson		1	3	4
Worth		1	1	2
Total	37	59	170	266

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

2a. Streamside Management Zones - NIPF					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	3	11.45	26	100.00%	0
Piedmont	36	157.59	327	96.33%	2
Upper Coastal Plain	19	56.3	192	97.92%	0
Lower Coastal Plain	32	88.87	312	98.72%	0
Ridge and Valley	10	68.06	100	95.00%	0
Total	100	382.27	957	97.39%	2
2b. Streamside Management Zones - Public					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	6	61.75	54	100.00%	0
Piedmont	9	97.24	77	98.70%	1
Upper Coastal Plain	3	10.89	30	100.00%	0
Lower Coastal Plain	5	14.91	42	100.00%	0
Ridge and Valley	4	75.68	32	96.88%	0
Total	27	260.47	235	99.15%	1
2c. Streamside Management Zones - Corporate					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	1	20.59	9	88.89%	0
Piedmont	16	83	149	98.66%	1
Upper Coastal Plain	8	35.4	61	100.00%	0
Lower Coastal Plain	7	28.81	64	100.00%	0
Ridge and Valley	1	2.67	9	100.00%	0
Total	33	170.47	292	98.97%	1
2d. Streamside Management Zones - All Ownership					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	10	93.79	89	98.88%	0
Piedmont	61	337.83	553	97.29%	4
Upper Coastal Plain	30	102.59	283	98.59%	0
Lower Coastal Plain	44	132.59	418	99.04%	0
Ridge and Valley	15	146.41	141	95.74%	0
Total	160	813.21	1484	97.98%	4

Tables 3 a – d: Distribution of Sites with Stream Crossings Evaluated by Region, Ownership, # 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	0	0	0	NA	0
Piedmont	16	31	199	90.45%	5
Upper Coastal Plain	12	15	155	94.19%	3
Lower Coastal Plain	15	18	208	96.63%	4
Ridge and Valley	8	12	95	89.47%	3
Total	51	76	657	93.15%	15
3b. Stream and Wetland Crossings - Public					
Region	No. Sites	Crossings	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	2	8	31	100.00%	0
Piedmont	2	4	21	100.00%	0
Upper Coastal Plain	0	0	0	NA	0
Lower Coastal Plain	4	6	58	100.00%	0
Ridge and Valley	4	15	51	94.12%	0
Total	12	33	161	98.14%	0
3c. Stream and Wetland Crossings - Corporate					
Region	No. Sites	Crossings	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	1	13	14	50.00%	4
Piedmont	6	12	85	96.47%	1
Upper Coastal Plain	4	5	40	100.00%	0
Lower Coastal Plain	5	9	66	100.00%	0
Ridge and Valley	1	2	9	100.00%	0
Total	17	41	214	95.33%	5
3d. Stream and Wetland Crossings - All Ownership					
Region	No. Sites	Crossings	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	3	21	45	84.44%	4
Piedmont	24	47	305	92.79%	6
Upper Coastal Plain	16	20	195	95.38%	3
Lower Coastal Plain	24	33	332	97.89%	4
Ridge and Valley	13	29	155	91.61%	3
Total	80	150	1032	94.38%	20

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	1.71	100.00%	31	100.00%	0
Piedmont	43	21.9	95.21%	463	94.60%	0
Upper Coastal Plain	37	36.99	92.27%	304	92.43%	0
Lower Coastal Plain	67	51.46	94.81%	508	93.90%	0
Ridge and Valley	12	7.31	99.59%	132	93.18%	0
Total	162	119.37	94.46%	1438	93.88%	0
4b. Forest Road Sites - Public						
Region	No. Sites	Miles	% Miles Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	9	17.16	100.00%	103	100.00%	0
Piedmont	8	11.37	99.91%	89	98.88%	0
Upper Coastal Plain	3	6.42	100.00%	22	100.00%	0
Lower Coastal Plain	9	30.57	98.36%	82	95.12%	0
Ridge and Valley	4	5.57	99.64%	43	97.67%	0
Total	33	71.09	99.25%	339	98.23%	0
4c. Forest Road Sites - Corporate						
Region	No. Sites	Miles	% Miles Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	1	2.23	100.00%	10	100.00%	0
Piedmont	16	12.68	95.90%	193	97.93%	0
Upper Coastal Plain	11	14.45	98.48%	93	97.85%	0
Lower Coastal Plain	29	48.59	98.97%	213	99.06%	0
Ridge and Valley	2	0.2	100.00%	19	100.00%	0
Total	59	78.15	98.41%	528	98.48%	0
4d. Forest Road Sites - All Ownership						
Region	No. Sites	Miles	% Miles Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	13	21.1	100.00%	144	100.00%	0
Piedmont	67	45.95	96.56%	745	95.97%	0
Upper Coastal Plain	51	57.86	94.68%	419	94.03%	0
Lower Coastal Plain	105	130.62	97.19%	803	95.39%	0
Ridge and Valley	18	13.08	99.62%	194	94.85%	0
Total	254	268.61	96.88%	2305	95.57%	0

Table 5 a – d: Distribution of Sites with 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	6	100.00%	0
Piedmont	43	233	96.57%	0
Upper Coastal Plain	29	129	95.35%	0
Lower Coastal Plain	42	139	94.24%	1
Ridge and Valley	12	46	100.00%	0
Total	129	553	96.02%	1
5b. Special Management Areas - Public				
Region	No. Sites	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	9	20	100.00%	0
Piedmont	9	62	96.77%	0
Upper Coastal Plain	4	22	100.00%	0
Lower Coastal Plain	9	34	94.12%	0
Ridge and Valley	4	14	100.00%	0
Total	35	152	97.37%	0
5c. Special Management Areas - Corporate				
Region	No. Sites	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	1	9	100.00%	0
Piedmont	16	95	98.95%	1
Upper Coastal Plain	10	46	97.83%	0
Lower Coastal Plain	23	112	99.11%	0
Ridge and Valley	2	4	100.00%	0
Total	52	266	98.87%	1
5d. Special Management Areas - All Ownership				
Region	No. Sites	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	13	35	100.00%	0
Piedmont	68	390	97.18%	1
Upper Coastal Plain	43	197	96.45%	0
Lower Coastal Plain	74	285	96.14%	1
Ridge and Valley	18	64	100.00%	0
Total	216	971	97.01%	2

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

6a. Timber Harvesting Outside SMZs - NIPF					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	3	232.15	24	100.00%	0
Piedmont	43	3915.47	323	97.21%	1
Upper Coastal Plain	37	5190.76	263	99.24%	0
Lower Coastal Plain	62	4480.1	422	99.53%	0
Ridge and Valley	12	1397.69	97	95.88%	0
Total	157	15216.17	1129	98.49%	1
6b. Timber Harvesting Outside SMZs - Public					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	9	468.49	73	100.00%	0
Piedmont	8	1875.95	61	100.00%	0
Upper Coastal Plain	3	893.13	20	100.00%	0
Lower Coastal Plain	10	2762.13	62	100.00%	0
Ridge and Valley	4	575.39	35	100.00%	0
Total	34	6575.09	251	100.00%	0
6c. Timber Harvesting Outside SMZs - Corporate					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	1	333.41	9	77.78%	1
Piedmont	16	1753.39	122	100.00%	0
Upper Coastal Plain	10	1036.33	70	100.00%	0
Lower Coastal Plain	19	2935.57	112	100.00%	0
Ridge and Valley	2	74.03	18	100.00%	0
Total	48	6132.73	331	99.40%	1
6d. Timber Harvesting Outside SMZs - All Ownership					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	13	1034.05	106	98.11%	1
Piedmont	67	7544.81	506	98.22%	1
Upper Coastal Plain	50	7120.22	353	99.43%	0
Lower Coastal Plain	91	10177.8	596	99.66%	0
Ridge and Valley	18	2047.11	150	97.33%	0
Total	239	27923.99	1711	98.89%	2

Table 7 a – d: Distribution of Sites with Mechanical Site Preparation Operations Evaluated By Region, Ownership, # Acres Assessed, # BMPs Assessed, % BMPs Implemented, 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	2	114.82	2	100.00%	0
Lower Coastal Plain	12	888.66	22	90.91%	0
Ridge and Valley	0	0	0	NA	0
Total	14	1003.48	24	91.67%	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	0	0	0	NA	0
Upper Coastal Plain	0	0	0	NA	0
Lower Coastal Plain	1	182.06	3	100.00%	0
Ridge and Valley	0	0	0	NA	0
Total	1	182.06	3	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	0	0	0	NA	0
Upper Coastal Plain	0	0	0	NA	0
Lower Coastal Plain	20	2889.12	49	97.96%	0
Ridge and Valley	0	0	0	NA	0
Total	20	2889.12	49	97.96%	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	0	0	0	NA	0
Upper Coastal Plain	2	114.82	2	100.00%	0
Lower Coastal Plain	33	3959.84	74	95.95%	0
Ridge and Valley	0	0	0	NA	0
Total	35	4074.66	76	96.05%	0

Table 8 a – d: Distribution of Sites with Chemical Site Preparation Operations Evaluated By Region, Ownership, # Acres Assessed, # BMPs Assessed, % BMPs Implemented, 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	9	523.92	18	100.00%	0
Upper Coastal Plain	20	3207.34	40	100.00%	0
Lower Coastal Plain	33	2502.5	66	100.00%	0
Ridge and Valley	2	48.99	4	100.00%	0
Total	64	6282.75	128	100.00%	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	1	211.46	2	100.00%	0
Upper Coastal Plain	2	234.97	4	100.00%	0
Lower Coastal Plain	2	61.63	4	100.00%	0
Ridge and Valley	0	0	0	NA	0
Total	5	508.06	10	100.00%	0
8c. Chemical Site Preparation Outside SMZs - Corporate					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0	0	0	NA	0
Piedmont	6	388.85	12	100.00%	0
Upper Coastal Plain	3	163.85	6	100.00%	0
Lower Coastal Plain	14	1612.16	28	100.00%	0
Ridge and Valley	1	40	2	100.00%	0
Total	24	2204.86	48	100.00%	0
8d. Chemical Site Preparation Outside SMZs - All Ownership					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0	0	0	NA	0
Piedmont	16	1124.23	32	100.00%	0
Upper Coastal Plain	25	3606.16	50	100.00%	0
Lower Coastal Plain	49	4176.29	98	100.00%	0
Ridge and Valley	3	88.99	6	100.00%	0
Total	93	8995.67	186	100.00%	0

Table 9 a – d: Distribution of Sites with Firebreaks and Burning Operations Evaluated by Region, Ownership, # Miles Assessed, # BMPs Assessed, % BMPs Implementation, and Water Quality Risks.

9a. Fire Breaks & Prescribed Burning- NIPF					
Region	No. Sites	Miles	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0	0	0	NA	0
Piedmont	12	15.54	84	84.52%	0
Upper Coastal Plain	14	33.54	84	90.48%	0
Lower Coastal Plain	29	42.89	139	94.96%	0
Ridge and Valley	3	3.29	19	78.95%	0
Total	58	95.26	326	90.18%	0
9b. Fire Breaks & Prescribed Burning- Public					
Region	No. Sites	Miles	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0	0	0	NA	0
Piedmont	2	5.02	19	73.68%	0
Upper Coastal Plain	3	6.96	14	100.00%	0
Lower Coastal Plain	4	6.35	17	94.12%	0
Ridge and Valley	0	0	0	NA	0
Total	9	18.33	50	88.00%	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	4.86	27	92.59%	0
Upper Coastal Plain	1	0.33	7	71.43%	0
Lower Coastal Plain	1	1.23	3	100.00%	0
Ridge and Valley	0	0	0	NA	0
Total	6	6.42	37	89.19%	0
9d. Fire Breaks & Prescribed Burning- All Ownership					
Region	No. Sites	Miles	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0	0	0	NA	0
Piedmont	18	25.42	130	84.62%	0
Upper Coastal Plain	18	40.83	105	90.48%	0
Lower Coastal Plain	34	50.47	159	94.97%	0
Ridge and Valley	3	3.29	19	78.95%	0
Total	73	120.01	413	89.83%	0

Table 10 a – d: Distribution of Sites with 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	9	520.32	16	100.00%	0
Upper Coastal Plain	15	2318	28	100.00%	0
Lower Coastal Plain	32	2445.59	47	100.00%	0
Ridge and Valley	2	48.69	4	100.00%	0
Total	58	5332.6	95	100.00%	0
10b. Artificial Regeneration Outside SMZs - Public					
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	2	234.97	3	100.00%	0
Lower Coastal Plain	2	61.63	3	100.00%	0
Ridge and Valley	0	0	0	NA	0
Total	4	296.6	6	100.00%	0
10c. Artificial Regeneration Outside SMZs - Corporate					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0	0	0	NA	0
Piedmont	6	388.85	14	85.71%	1
Upper Coastal Plain	3	163.85	4	100.00%	0
Lower Coastal Plain	15	2437.49	22	100.00%	0
Ridge and Valley	1	40	1	100.00%	0
Total	25	3030.19	41	95.12%	1
10d. Artificial Regeneration Outside SMZs - All Ownership					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0	0	0	NA	0
Piedmont	15	909.17	30	93.33%	1
Upper Coastal Plain	20	2716.82	35	100.00%	0
Lower Coastal Plain	49	4944.71	72	100.00%	0
Ridge and Valley	3	88.69	5	100.00%	0
Total	87	8659.39	142	98.59%	1

Forest Fertilization: There were no sites selected for this Survey on which forest fertilization was known to have occurred.

Table 11 a – d: Distribution of Sites with Equipment Servicing Operations Evaluated By Region, Ownership, # 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	3	10	9	100.00%	0
Piedmont	42	115	126	99.21%	0
Upper Coastal Plain	38	129	114	97.37%	0
Lower Coastal Plain	73	190	219	99.54%	0
Ridge and Valley	12	37	36	100.00%	0
Total	168	481	504	99.01%	0
11b. Equipment Servicing and Trash Clean-up - Public					
Region	No. Sites	Landings	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	8	21	24	100.00%	0
Piedmont	8	59	24	100.00%	0
Upper Coastal Plain	3	20	9	100.00%	0
Lower Coastal Plain	10	82	30	100.00%	0
Ridge and Valley	4	20	12	100.00%	0
Total	33	202	99	100.00%	0
11c. Equipment Servicing and Trash Clean-up - Corporate					
Region	No. Sites	Landings	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	1	9	3	100.00%	0
Piedmont	16	60	47	100.00%	0
Upper Coastal Plain	10	33	30	100.00%	0
Lower Coastal Plain	28	124	84	100.00%	0
Ridge and Valley	2	4	6	100.00%	0
Total	57	230	170	100.00%	0
11d. Equipment Servicing and Trash Clean-up - All Ownership					
Region	No. Sites	Landings	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	12	40	36	100.00%	0
Piedmont	66	234	197	99.49%	0
Upper Coastal Plain	51	182	153	98.04%	0
Lower Coastal Plain	111	396	333	99.70%	0
Ridge and Valley	18	61	54	100.00%	0
Total	258	913	773	99.35%	0

Table 12 a – d: Distribution of Sites and 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	3	1.24	100.00%	0.2	100.00%	100.00%
Piedmont	36	8.49	98.82%	15.09	99.87%	99.49%
Upper Coastal Plain	19	6.28	96.97%	4.53	100.00%	98.24%
Lower Coastal Plain	32	10.59	99.43%	7.78	98.71%	99.13%
Ridge and Valley	10	4.11	83.21%	6.92	99.57%	93.47%
Total	100	30.71	96.61%	34.52	99.57%	98.18%
12b. Stream Assessment - Public						
Region	No. Sites	Intermittent Miles Assessed	% Miles Compliance	Perennial Miles Assessed	% Miles Compliance	Total % Miles Compliance
Mountains	6	2.54	100.00%	4.06	100.00%	100.00%
Piedmont	9	6.19	100.00%	11.2	100.00%	100.00%
Upper Coastal Plain	3	2.41	100.00%	0.29	100.00%	100.00%
Lower Coastal Plain	5	0.71	100.00%	2.56	100.00%	100.00%
Ridge and Valley	4	1.8	100.00%	3.75	98.67%	99.10%
Total	27	13.65	100.00%	21.86	99.77%	99.86%
12c. Stream Assessment - Corporate						
Region	No. Sites	Intermittent Miles Assessed	% Miles Compliance	Perennial Miles Assessed	% Miles Compliance	Total % Miles Compliance
Mountains	1	1.29	96.90%	1.81	100.00%	98.71%
Piedmont	16	4.8	99.38%	8.99	99.78%	99.64%
Upper Coastal Plain	8	3	100.00%	3.52	100.00%	100.00%
Lower Coastal Plain	7	1.17	100.00%	4.22	100.00%	100.00%
Ridge and Valley	1	0.1	100.00%	0.24	100.00%	100.00%
Total	33	10.36	99.32%	18.78	99.89%	99.69%
12d. Stream Assessment - All Ownership						
Region	No. Sites	Intermittent Miles Assessed	% Miles Compliance	Perennial Miles Assessed	% Miles Compliance	Total % Miles Compliance
Mountains	10	5.07	99.21%	6.07	100.00%	99.64%
Piedmont	61	19.48	99.33%	35.28	99.89%	99.69%
Upper Coastal Plain	30	11.69	98.37%	8.34	100.00%	99.05%
Lower Coastal Plain	44	12.47	99.52%	14.56	99.31%	99.41%
Ridge and Valley	15	6.01	88.52%	10.91	99.27%	95.45%
Total	160	54.72	97.97%	75.16	99.71%	98.98%

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	243.6	96	100.00%	0
Piedmont	43	5733.38	1789	95.14%	8
Upper Coastal Plain	38	12344.47	1311	95.80%	3
Lower Coastal Plain	74	11746.1	2082	97.02%	5
Ridge and Valley	12	1637.6	533	94.00%	3
Total	170	31705.15	5811	95.94%	19
13b. Overall Distribution - Public					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	9	530.24	305	100.00%	0
Piedmont	9	2819.08	355	97.46%	1
Upper Coastal Plain	4	1764.24	124	100.00%	0
Lower Coastal Plain	11	3857.25	335	97.91%	0
Ridge and Valley	4	651.07	187	97.33%	0
Total	37	9621.88	1306	98.39%	1
13c. Overall Distribution - Corporate					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	1	354	54	81.48%	5
Piedmont	16	2786.79	744	98.12%	4
Upper Coastal Plain	11	1950.09	357	98.60%	0
Lower Coastal Plain	29	9903.15	753	99.47%	0
Ridge and Valley	2	156.7	68	100.00%	0
Total	59	15150.73	1976	98.33%	9
13d. Overall Distribution - All Ownership					
Region	No. Sites	Acres	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	13	1127.84	455	97.80%	5
Piedmont	68	11339.25	2888	96.19%	13
Upper Coastal Plain	53	16058.8	1792	96.65%	3
Lower Coastal Plain	114	25506.5	3170	97.70%	5
Ridge and Valley	18	2445.37	788	95.30%	3
Total	266	56477.76	9093	96.81%	29

Chart 1a: Statewide Trends in BMP Implementation

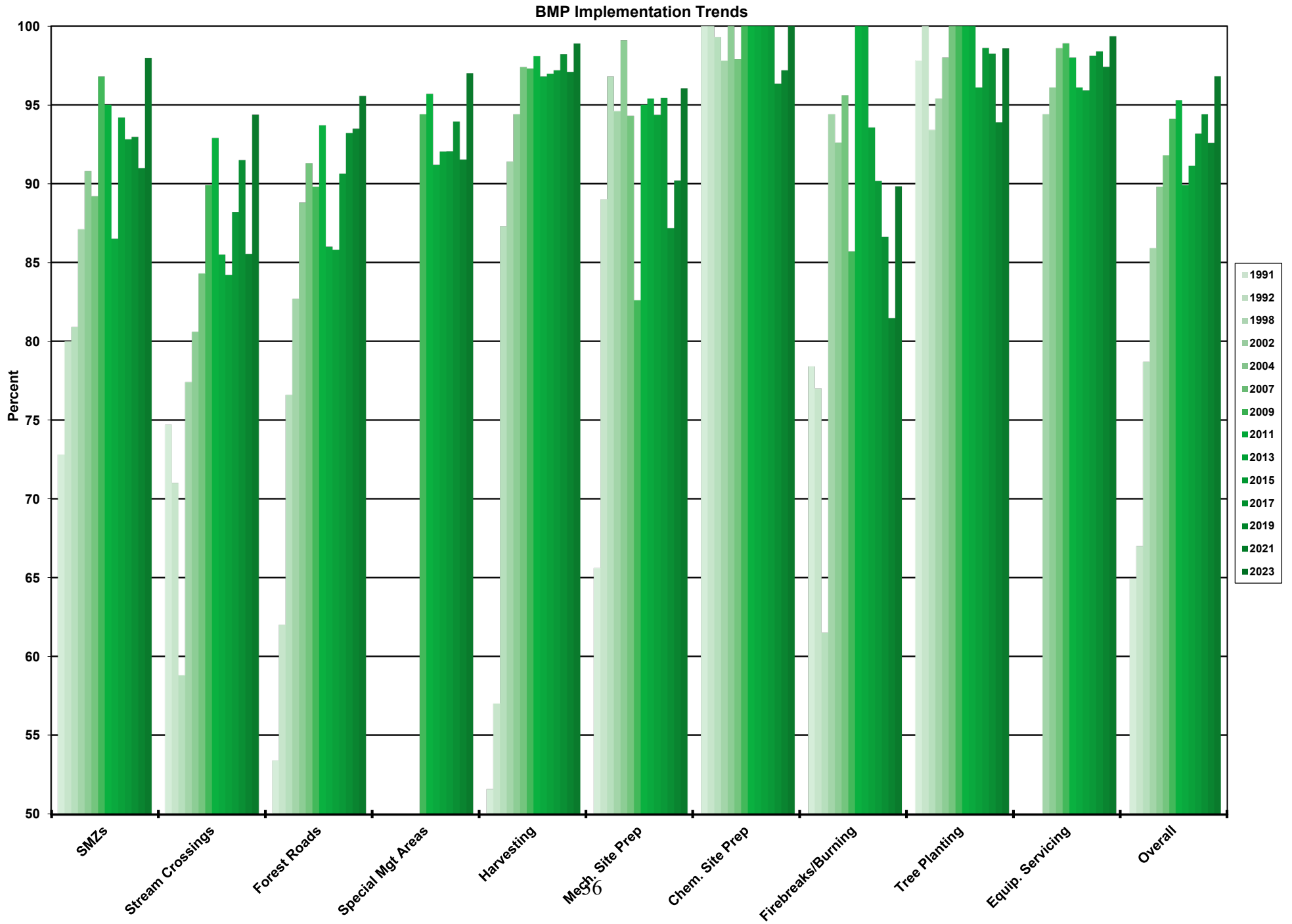


Chart 1b: Statewide Trends in BMP Implementation

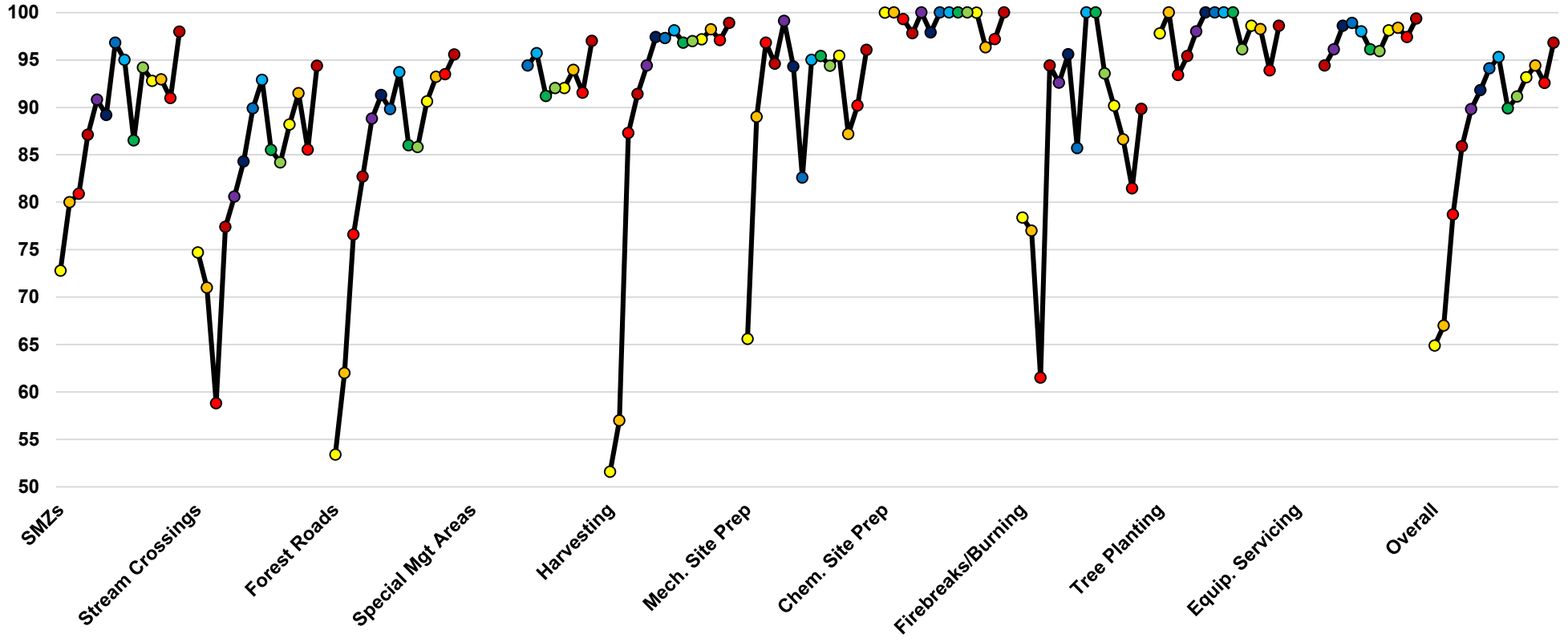


Chart 2: Statewide Trends in BMP Implementation on NIPF

Statewide BMP Implementation Trends - NIPF

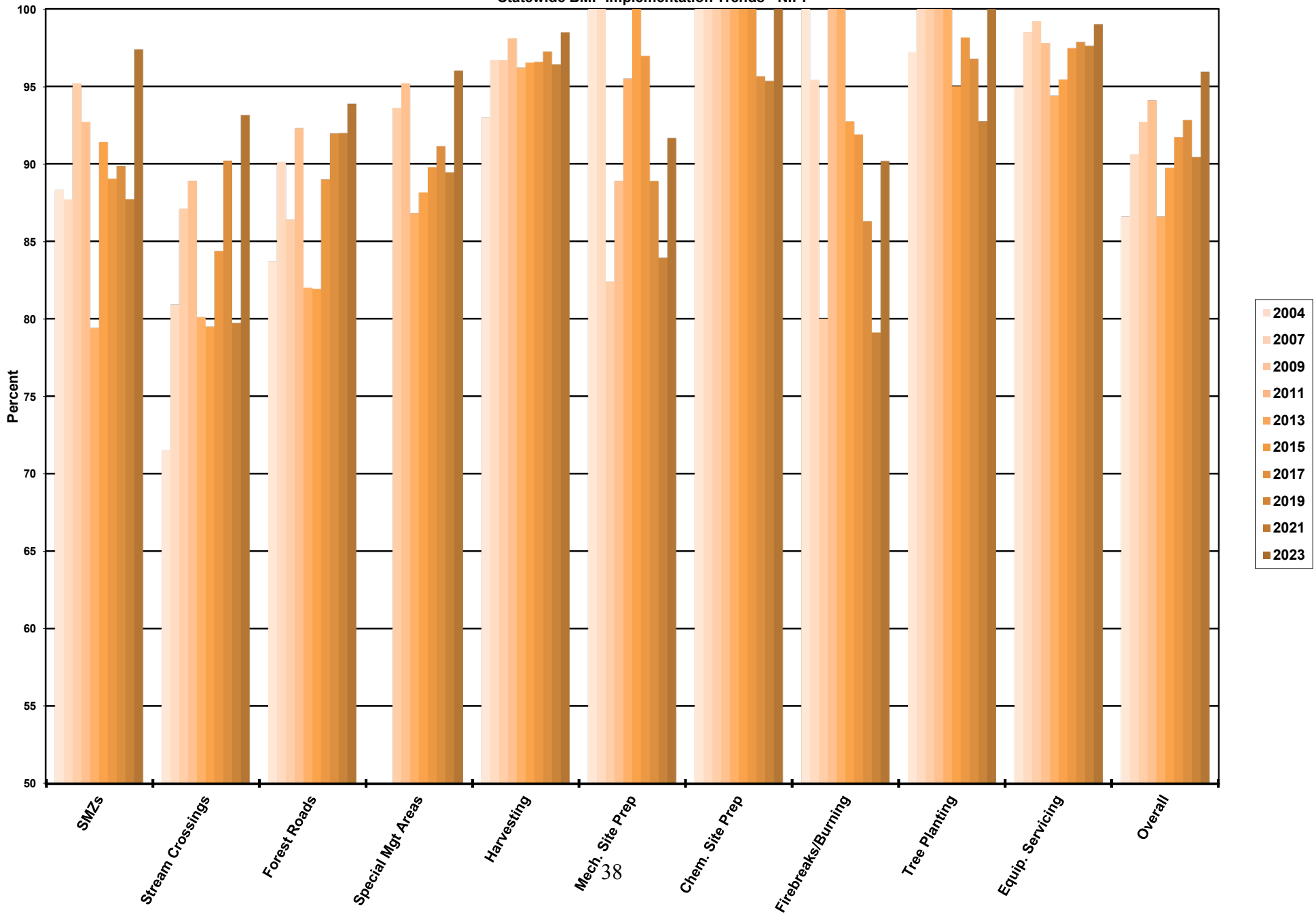


Chart 3: Statewide Trends in BMP Implementation on Corporate Sites

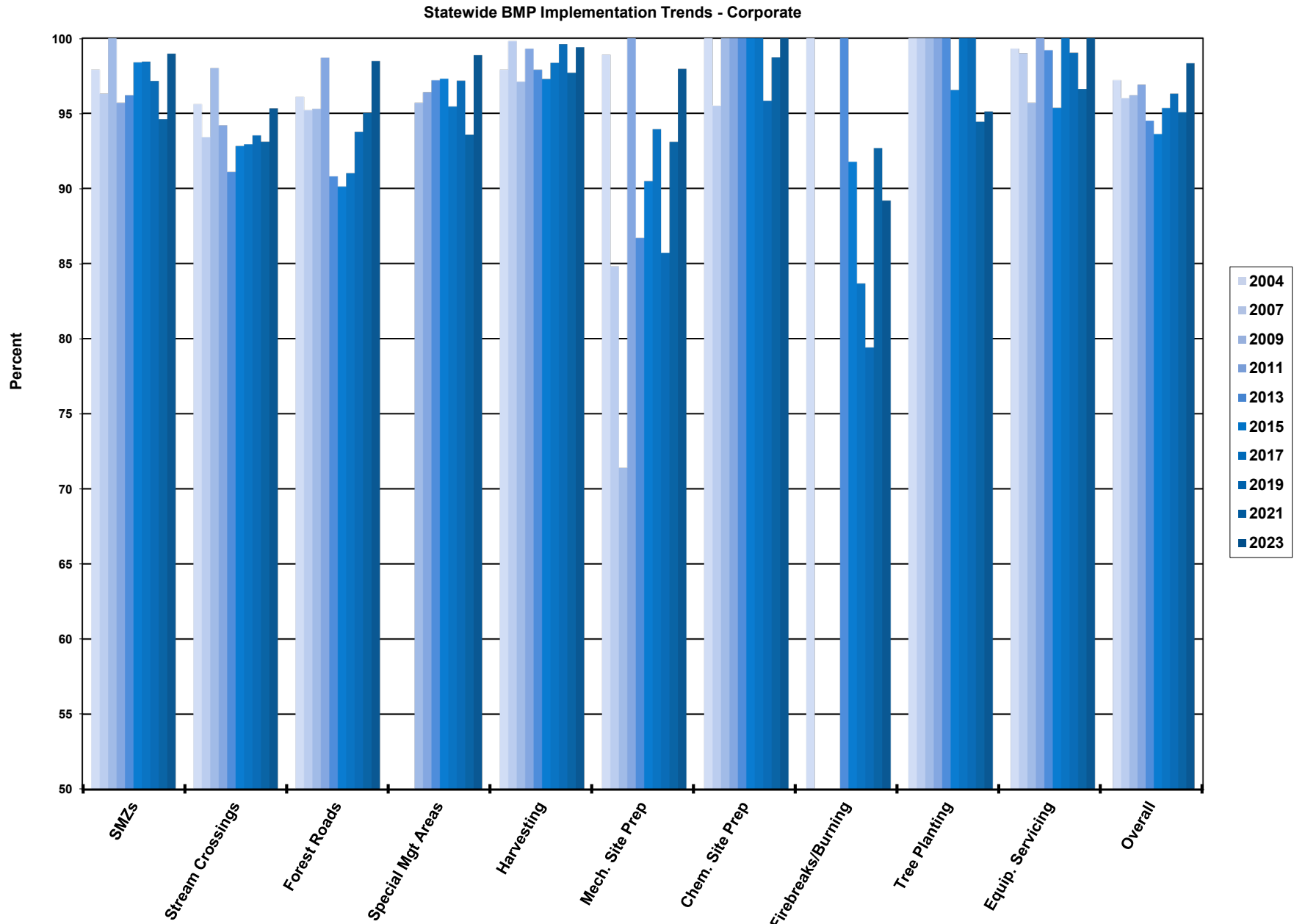


Chart 4: Statewide Trends in BMP Implementation on Public Sites

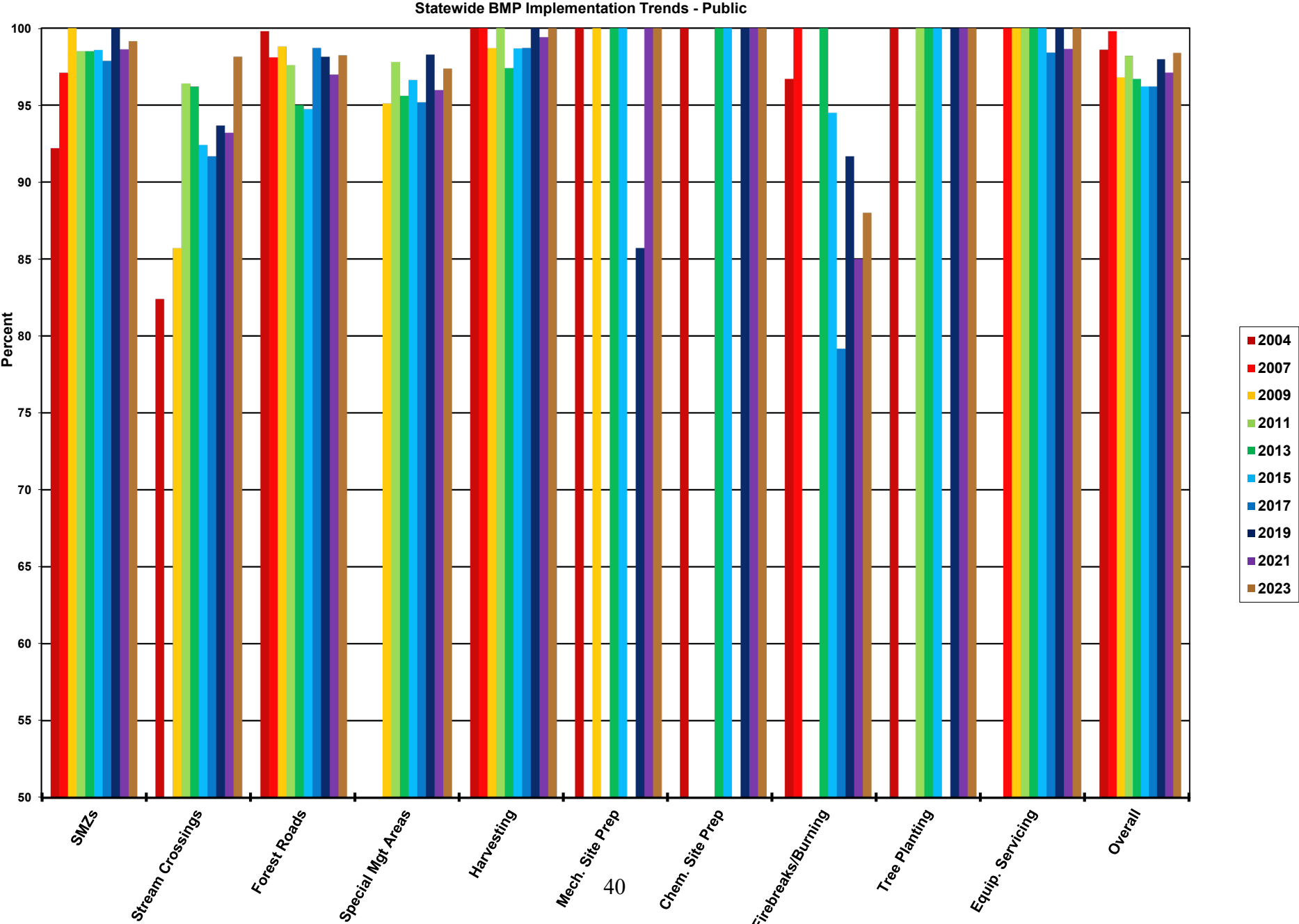
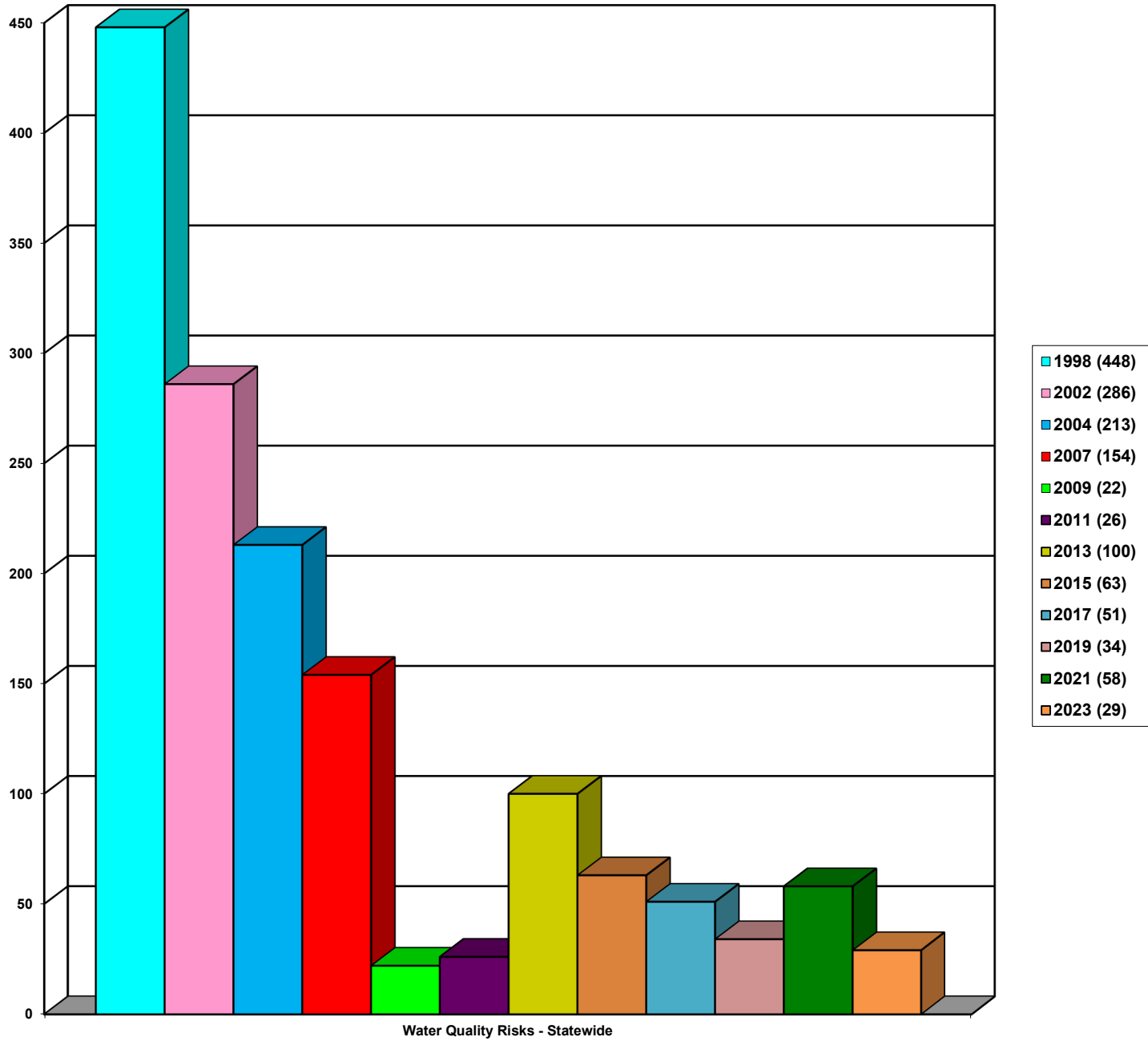
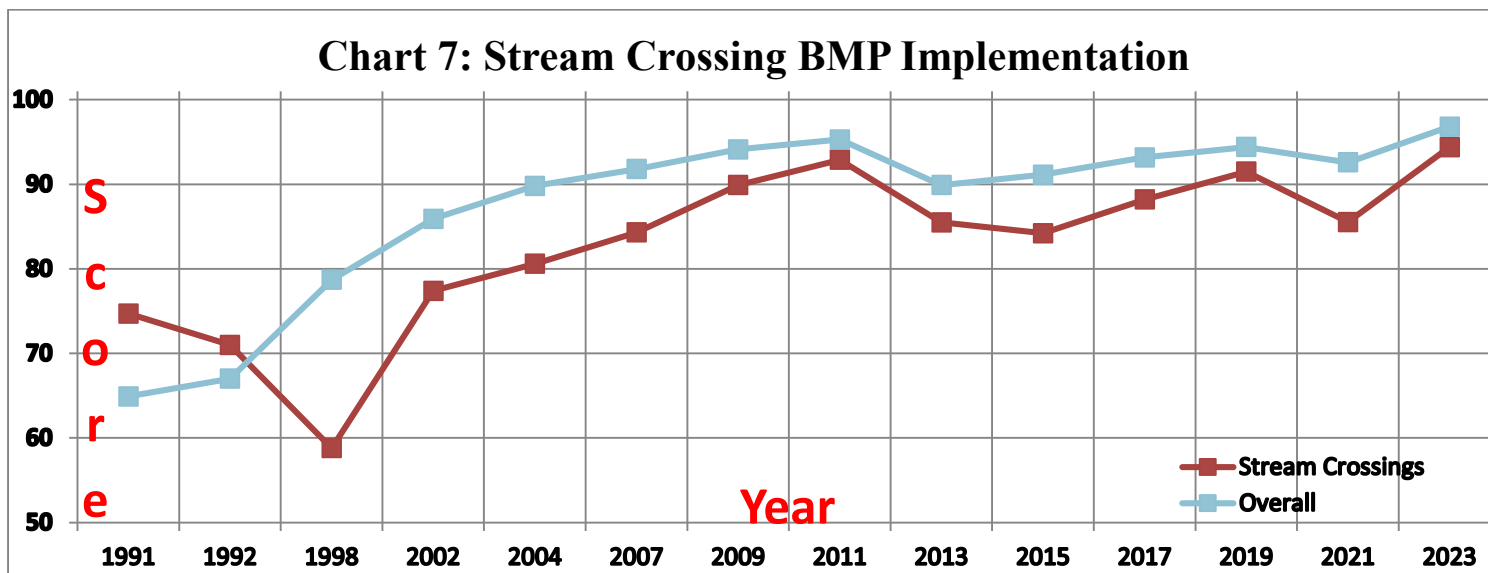
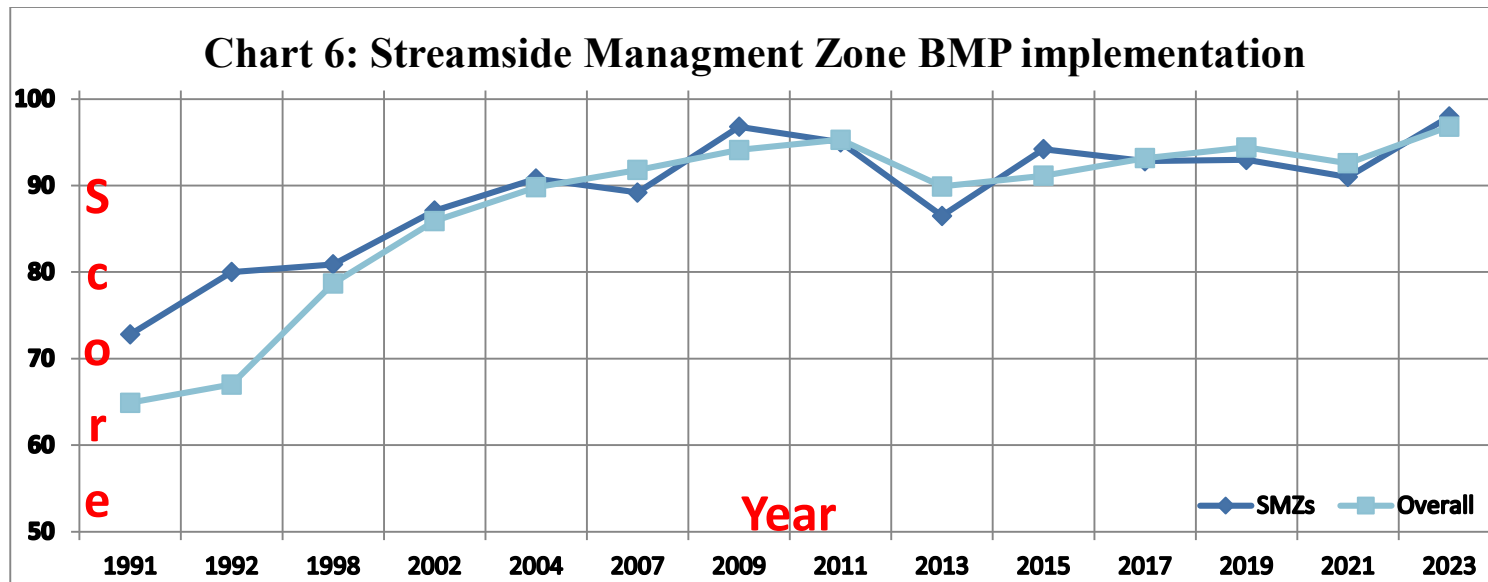
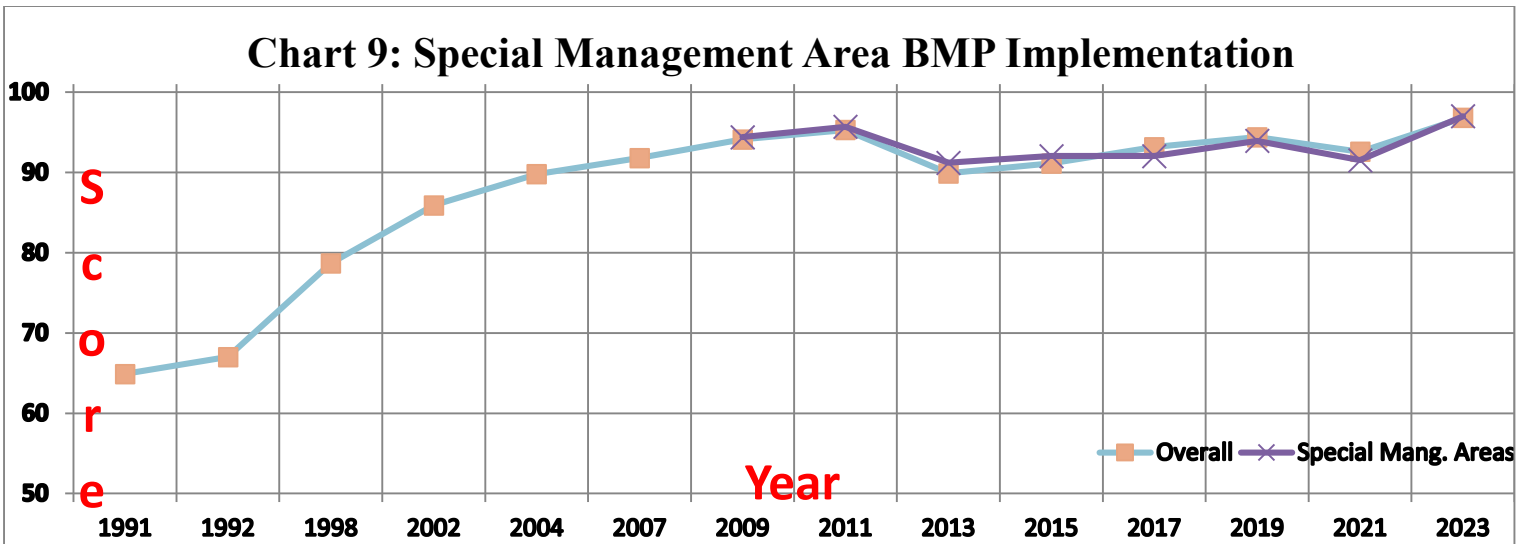
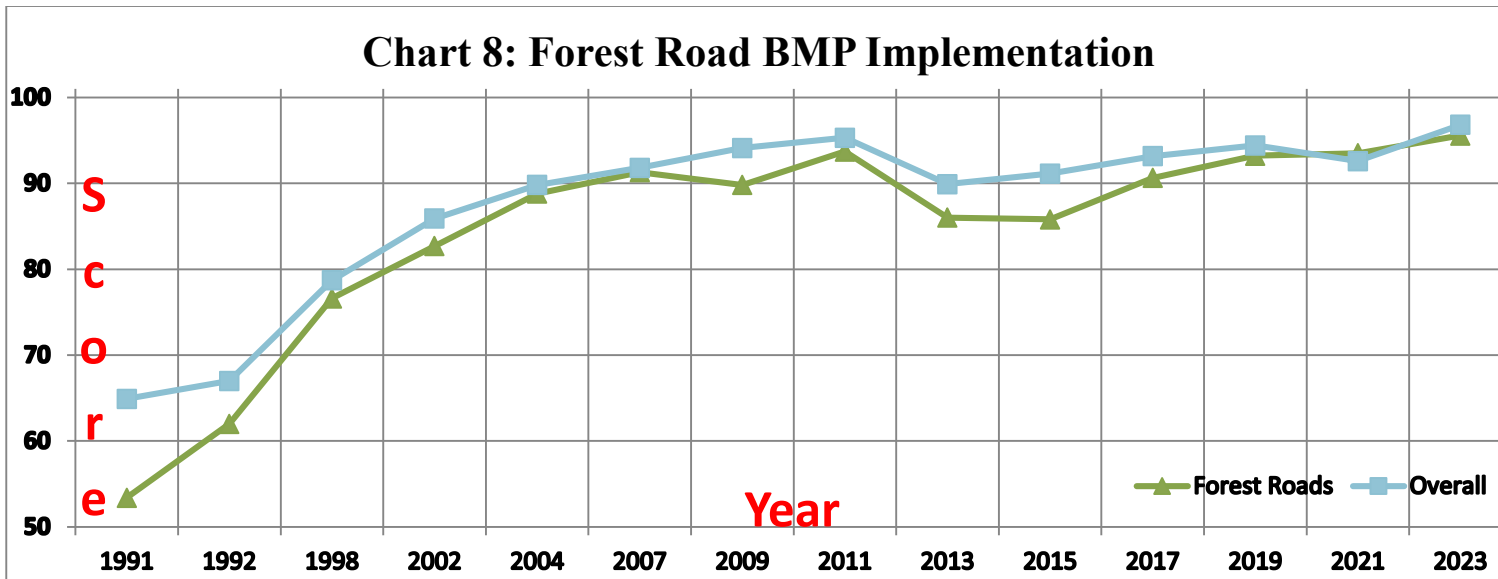
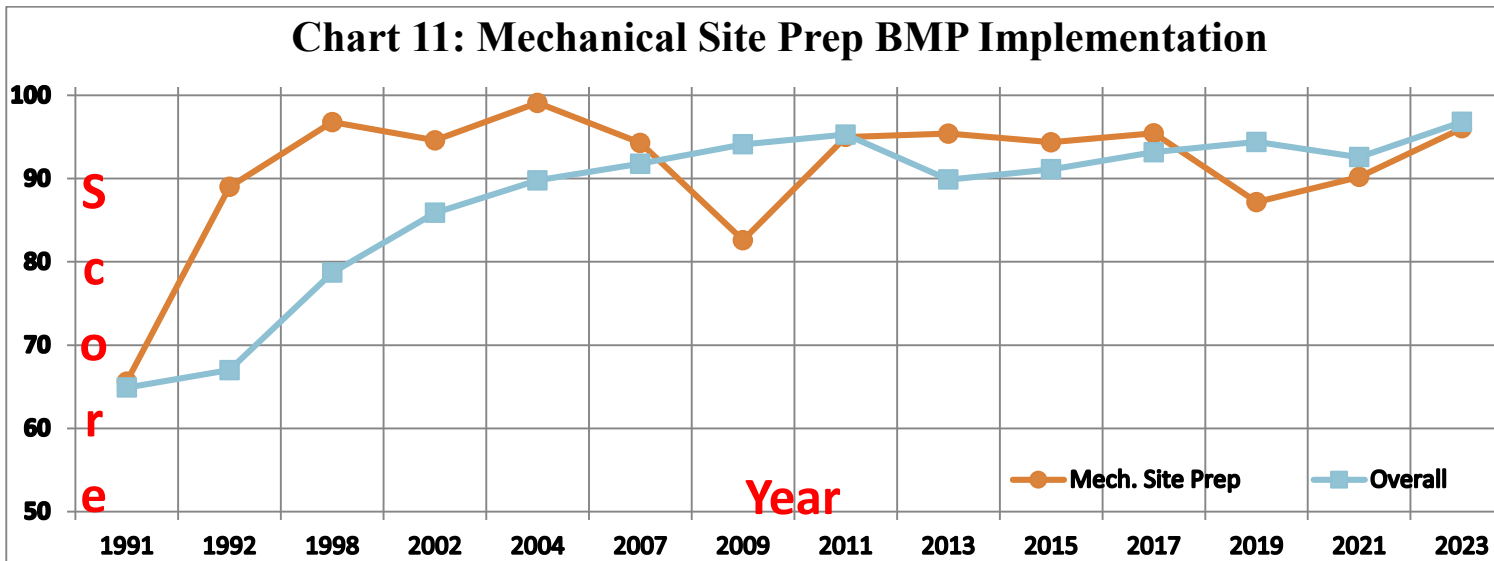
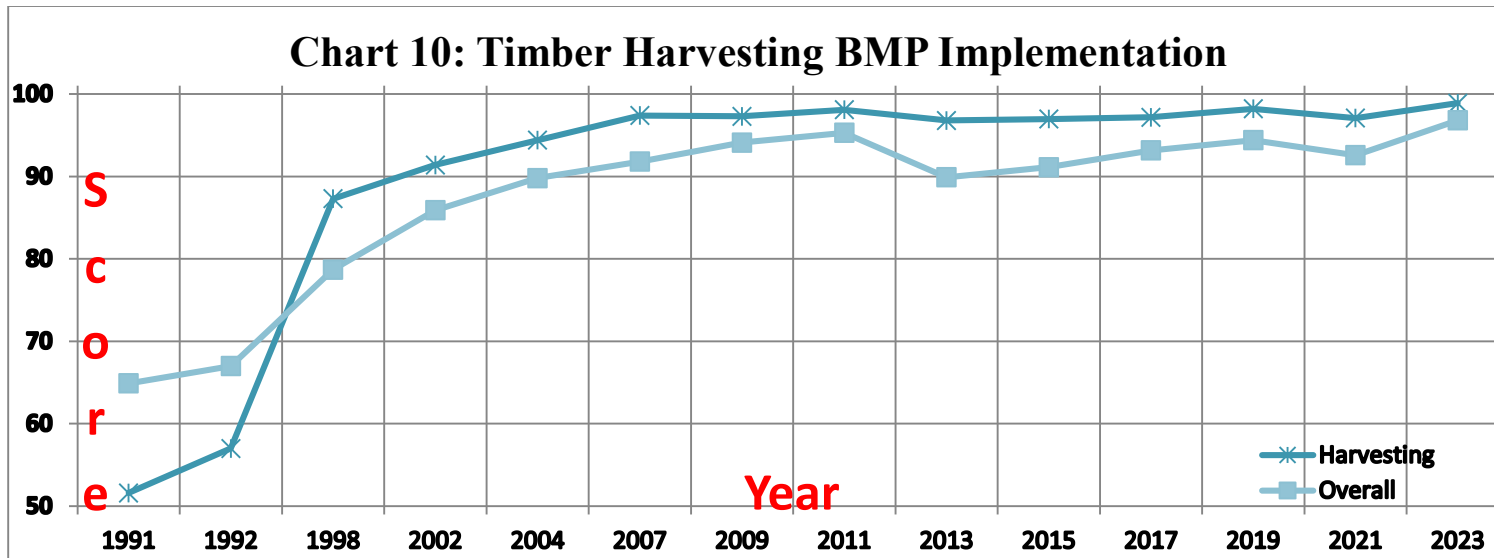


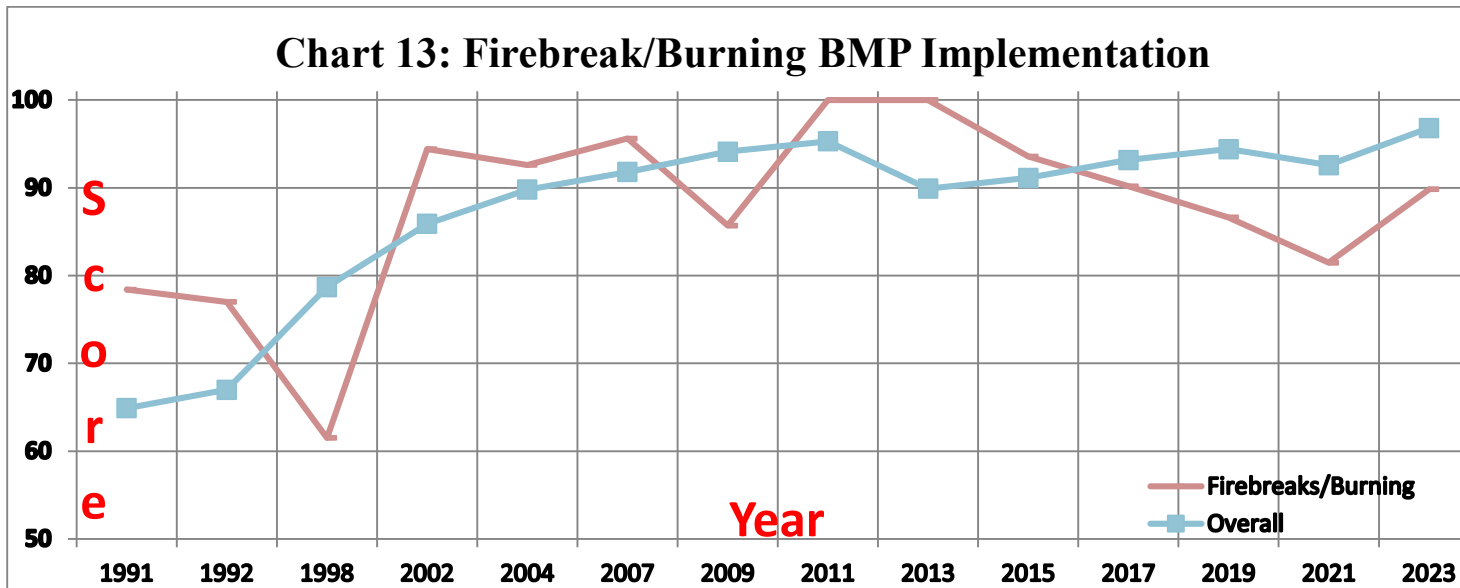
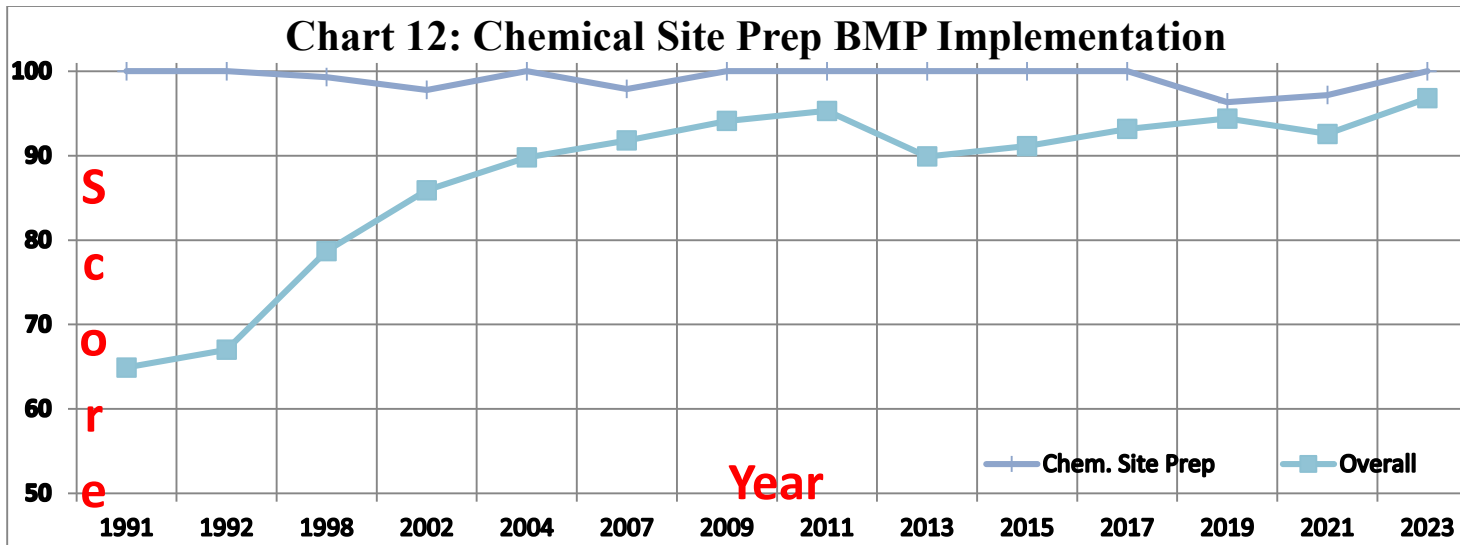
Chart 5: Statewide Trends in Reduction of WQRs from 1998 through 2023 Surveys

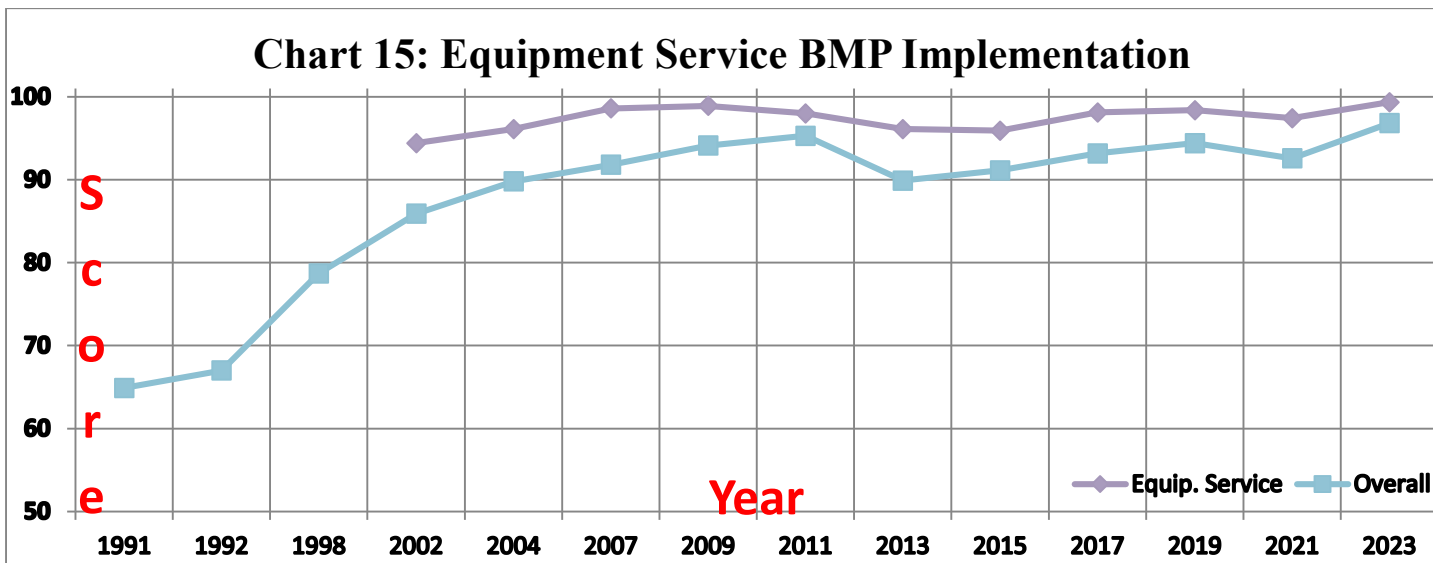
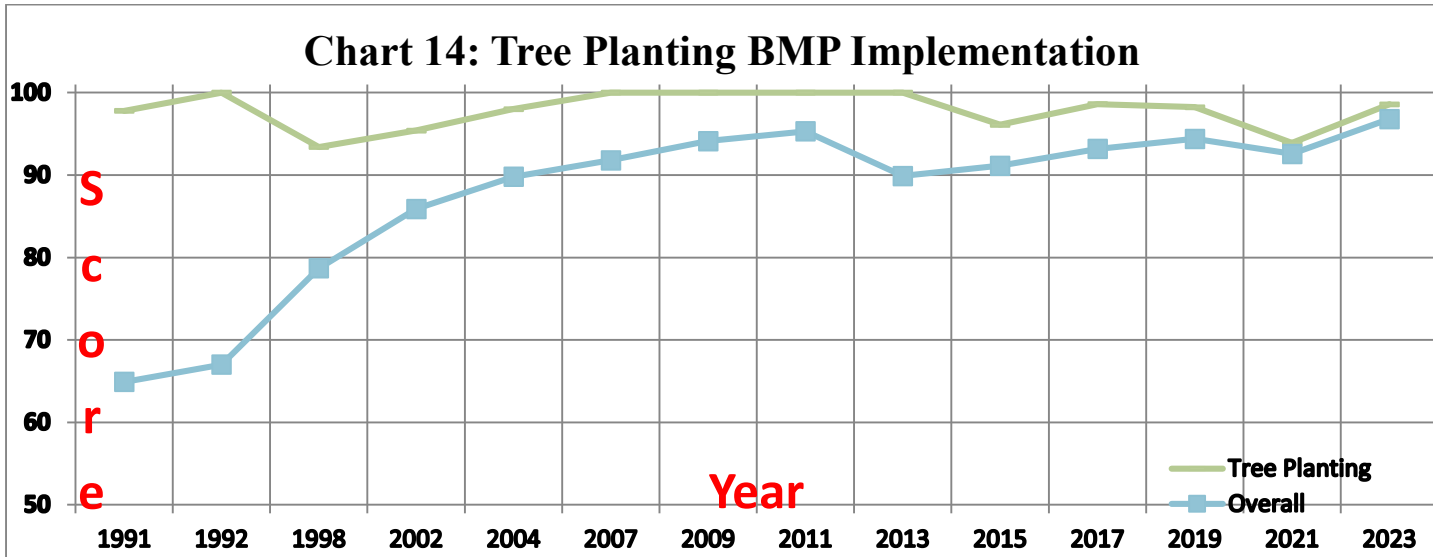












Forest Fertilization: Historically, forest fertilization has only been surveyed on a few sites each year. Due to the continually low sample size, a chart would likely not accurately represent trends.

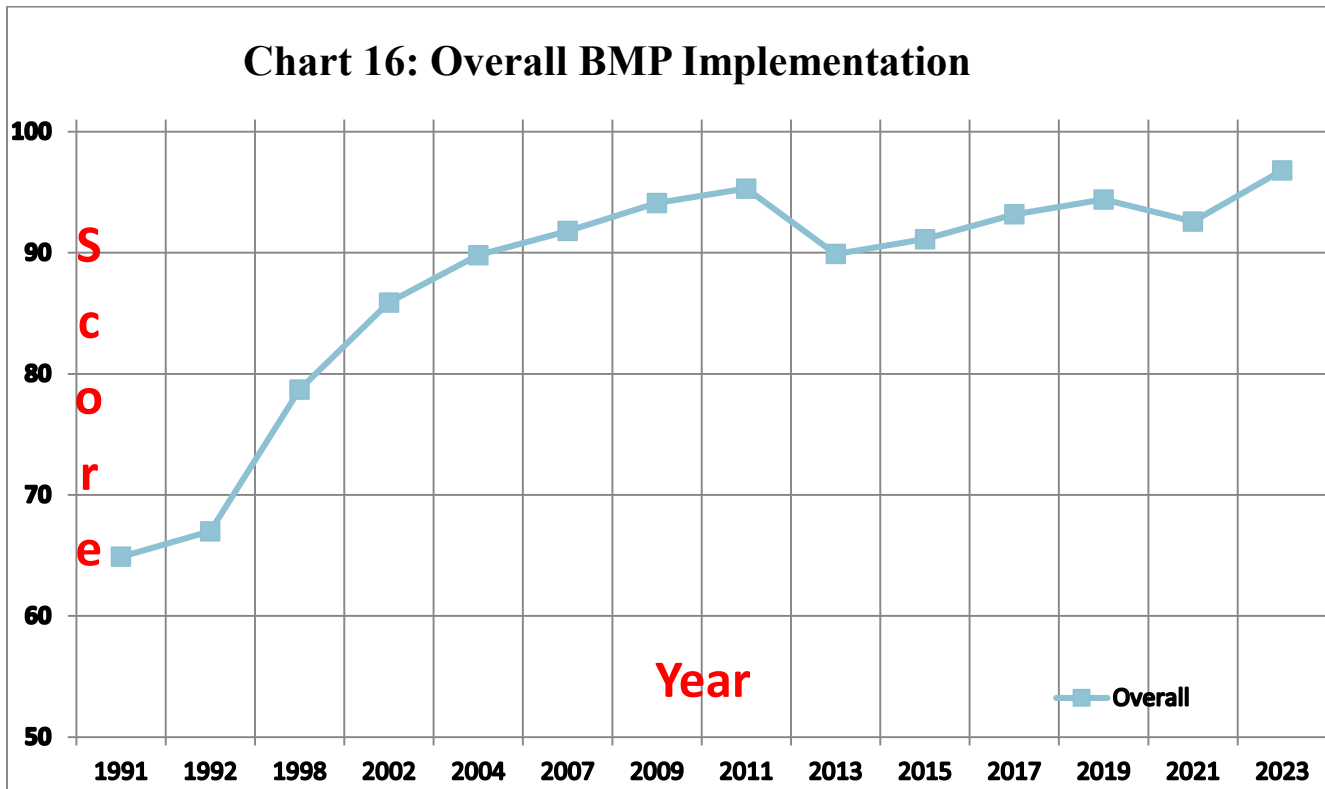
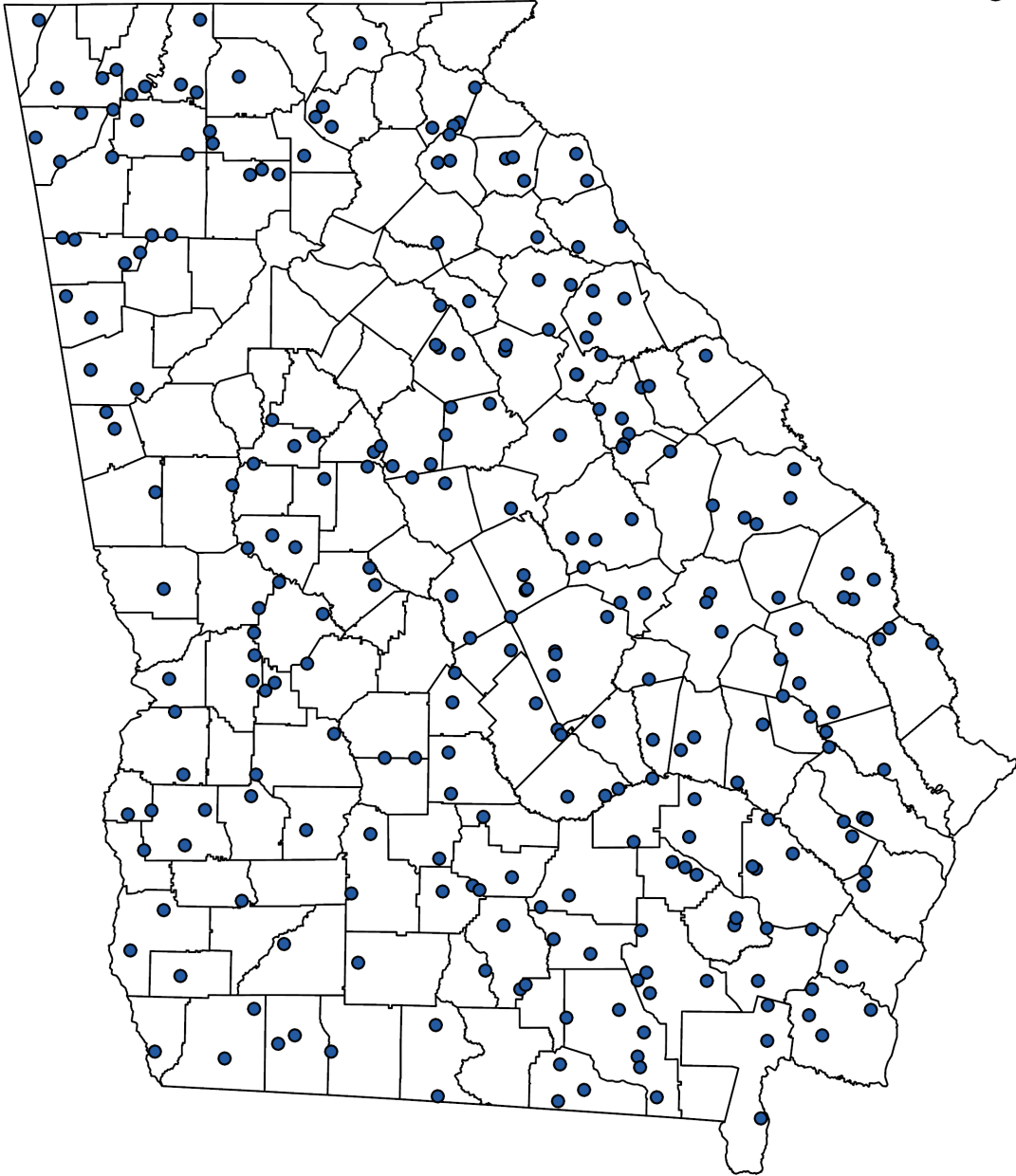
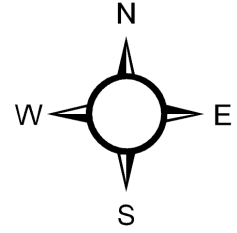




Figure 1: 2023 BMP Survey Site Locations



- GA Counties
- Site Locations

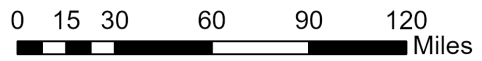




Figure 2: Physiographic Regions of Georgia

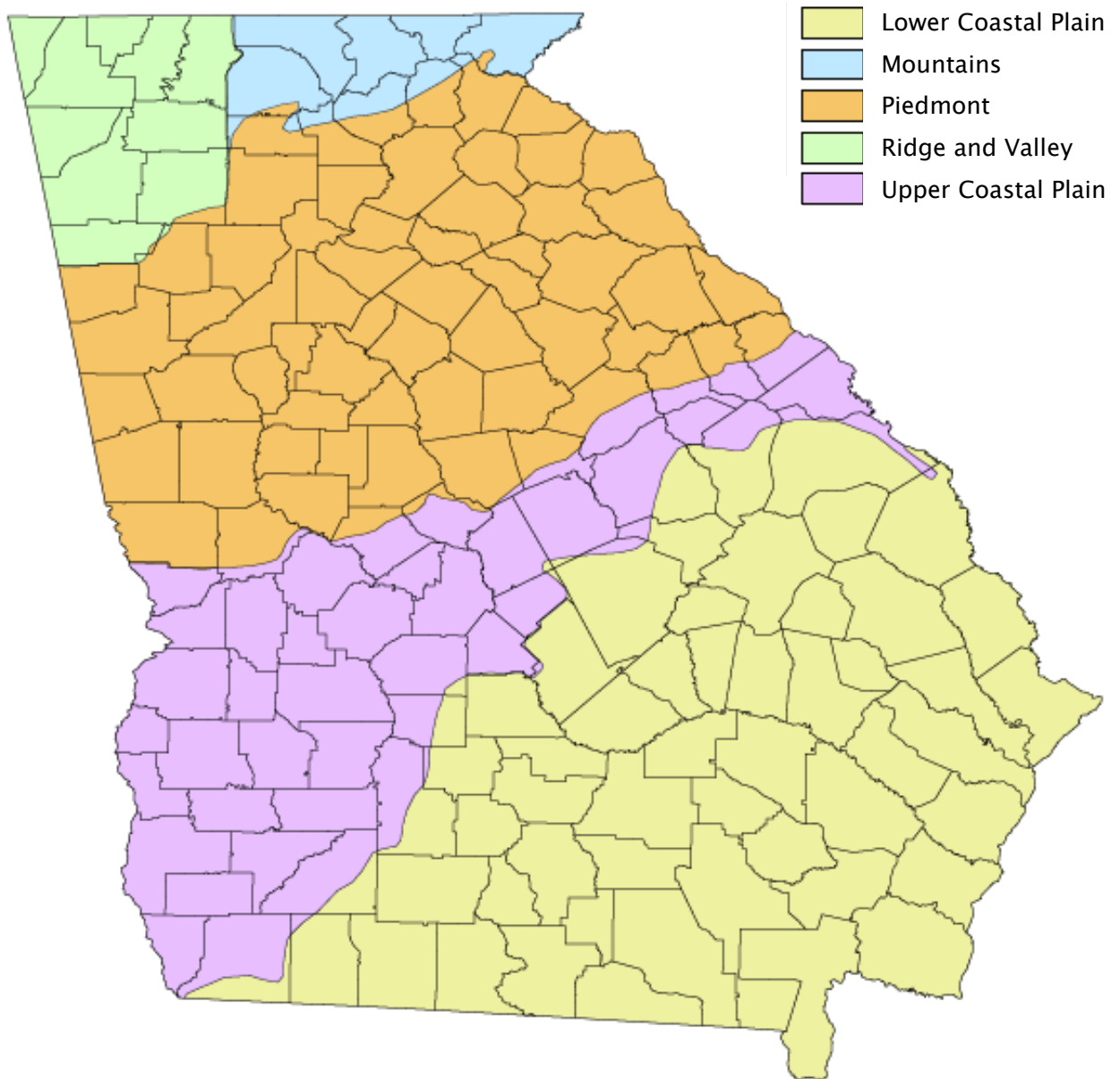
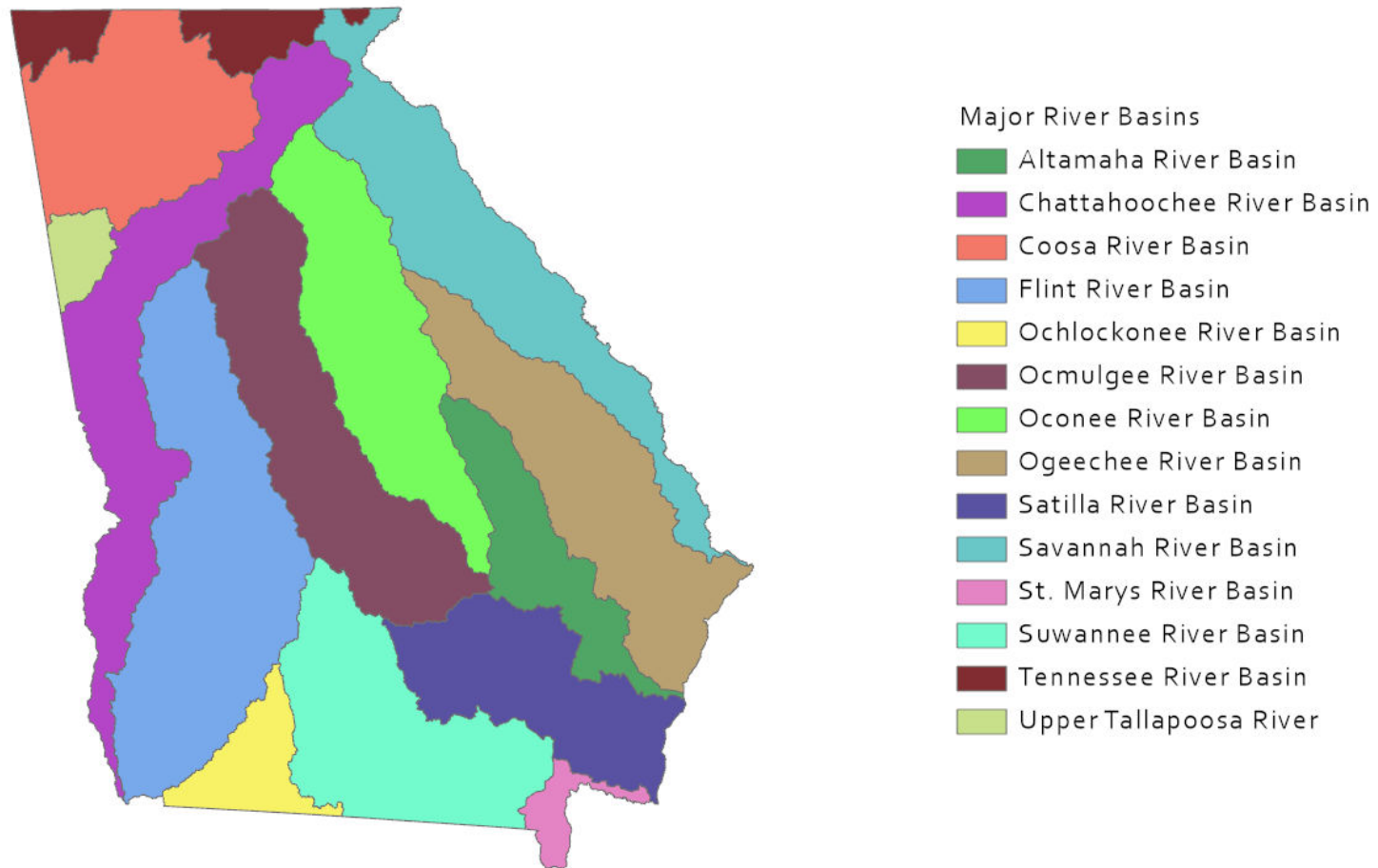
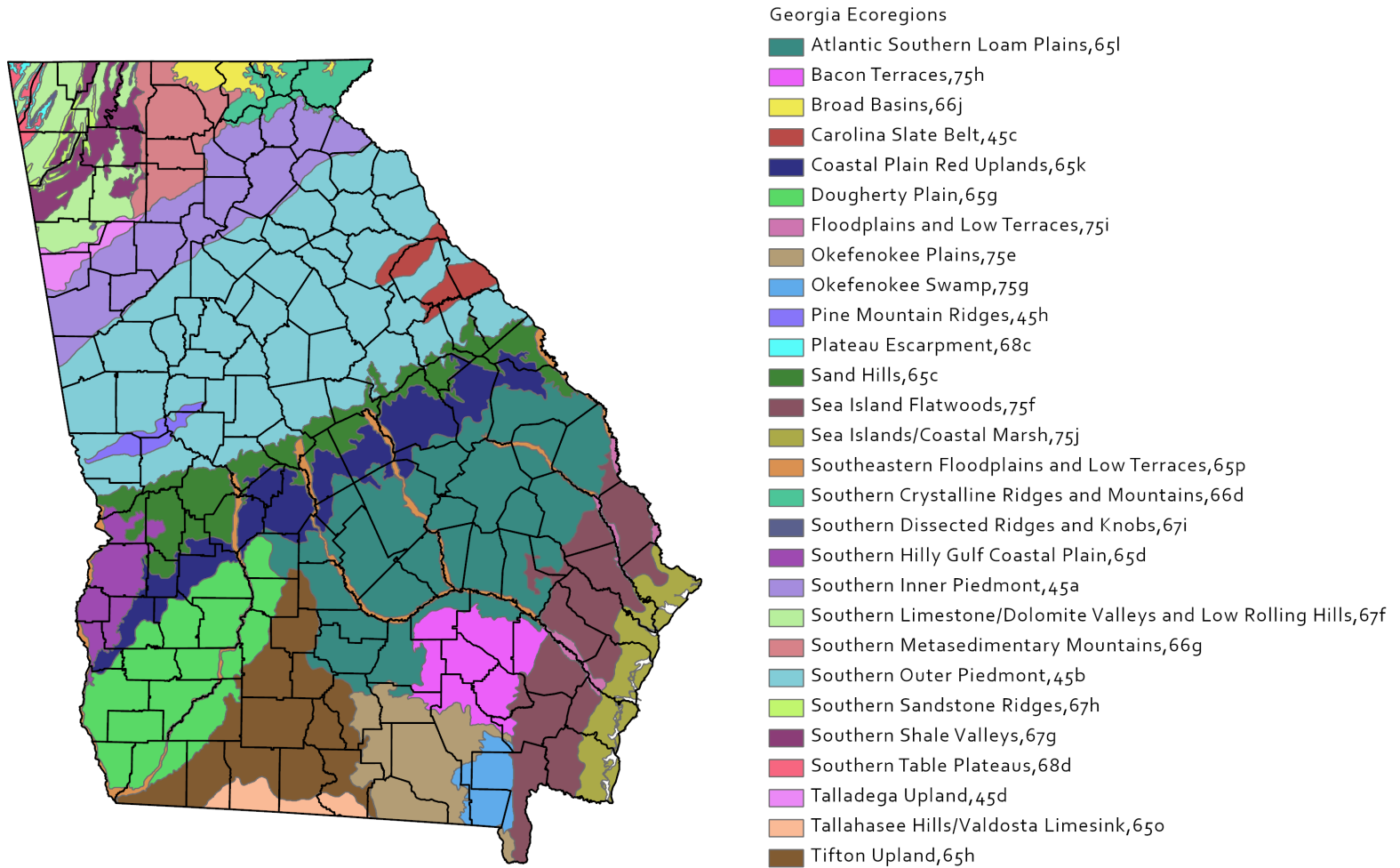


Figure 4: Georgia's 14 Major River Basins



Source: Atlanta Regional Commission

Figure 5: Georgia's Level IV Ecoregions



Source: Atlanta Regional Commission

