Results of Georgia's
2013 Silvicultural Best Management Practices Implementation and Compliance Survey

Prepared by the

Georgia Forestry Commission

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of the
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EXECUTIVE SUMMARY

By designation from the Georgia Environmental Protection Division (GAEPD), the Georgia Forestry Commission (GFC) is the lead agency for statewide development, education, implementation and monitoring of forestry Best Management Practices (BMPs). Beginning in January of 2013, the GFC began the ninth Statewide Forestry BMP Implementation and Compliance Survey.

The objectives of the 2013 Statewide Forestry BMP Survey were to determine the: rates of BMP implementation; acres in BMP compliance; effectiveness of BMPs for any needed modifications; actual miles of streams that may have forestry water quality impairments; and ownerships and regions to target for future training.

The protocol and scoring methodology for this ninth 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 2013 Statewide Forestry BMP Survey evaluated 209 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, 138 sites occurred on non-industrial private forest land (NIPF), 47 sites on forest industry / corporate land and 24 sites on public land. By region, 7 sites were in the Mountains, 10 sites were in the Ridge & Valley, 51 sites were in the Piedmont, 40 sites were in the Upper Coastal Plain and 101 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 and summarized for each practice or category, overall site, region and statewide. **Of the 6,025 individual BMPs evaluated, the statewide percentage of correct implementation was 89.9 percent. This is a 5.3 percentage point decrease in BMP implementation from the 2011 survey**. By ownership, the percentage of BMP implementation statewide was 94.5 percent on forest industry / corporate lands, 96.7 percent on public lands and 86.6 percent on NIPF lands.

Of particular interest, the number of Water Quality Risks observed increased to 100. The number of Water Quality Risks for this survey is calculated at 0.48 Water Quality Risks per site, significantly higher than the 0.13 risks per site seen in the 2011 BMP Survey. A more detailed discussion of Water Quality Risks can be found later in this report.

Additionally, a per unit of measure BMP compliance scoring methodology was assessed on all sites evaluated 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 the units of measure specific to the forestry practice (# acres, # miles of stream, etc.) that were in compliance with BMPs by the total number of units measured for that particular practice. On the 209 sites, 27,499 acres of separate forestry operations were evaluated. Approximately 99.6 percent of those acres were in compliance with BMPs. This rate is statistically the same as was recorded in the 2011 survey. Of the 81.24 miles of stream evaluated, 77.42 miles, or 95.30 percent, were observed to have no impacts or impairment from the forestry practices. This figure is slightly **higher** than the 2011 survey, representing a **1.7 percentage point increase** over the 2011 survey. By practice or category, statewide percentage of BMP implementation and compliance were as follows:

	2011 Survey Results		2013 Survey Results	
Practice or Category	Implementation (% BMPs Implemented)	Compliance (% Unit of Measure Meeting BMPs)	Implementation (% BMPs Implemented)	Compliance (% Unit of Measure Meeting BMPs)
Streamside Management Zones (SMZs)	95.0	99.1 (acres)	86.5	98.8 (acres)
Stream Crossings	92.9	NA	85.5	NA
Main Haul Roads	93.7	95.0 (miles)	86.0	88.9 (miles)
Timber Harvesting	98.1	99.8 (acres)	96.8	99.5 (acres)
Mechanical Site Preparation	95.0	99.9 (acres)	95.4	99.9 (acres)
Chemical Site Preparation	100	100 (acres)	100	99.9 (acres)
Control Burning	100	100 (acres)	100	100 (acres)
Firebreaks	NA	NA	92.3	92.2 (miles)
Artificial Regeneration	100	100 (acres)	100	100 (acres)
Equipment Servicing	97.9	NA	96.1	NA
Special Management Areas	95.7	NA	91.2	NA
Stream Miles	NA	93.6 (miles)	NA	95.3 (miles)
Overall	***95.3***	***99.8(acres)***	***89.9***	***99.6(acres)***

Even though some reductions in BMP Implementation have been observed, forest operators continue to do a good job of protecting sensitive areas such as streamside management zones, stream crossings and special management areas. In addition, with basically a 90 percent overall statewide BMP implementation rate, and with 99.6 percent of surveyed acres in compliance with BMPs, forest operators as a whole are doing a good job of implementing forestry BMPs.

Streamside management zones, stream crossings, and forest roads all underwent decreases in BMP implementation of between 7.4 and 8.5 percentage points, compared to the percentages in these categories for the 2011 survey. So, there continues to be some room for improvement in these areas, particularly on private lands in the Coastal Plain and Piedmont areas of Georgia. In addition, streamside management zones on private lands in the Ridge and Valley area of Northwest Georgia, and in the Lower Coastal Plain across all ownership groups, could use significant improvement. There were 135 stream crossings evaluated on 65 sites with an

overall implementation rate of 85.5 percent, which represents a 7.4 percentage point reduction over the 2011 survey. In spite of this, we continue to see an increased effort to avoid stream crossings in carrying out forest operations. Most noted stream crossing problems were associated with approach design, culvert sizing and installation. BMPs related to these issues accounted for 39 water quality risks. A more detailed discussion of the reasons seen as the causes of the observed BMP Implementation declines is located in the *Educational Opportunities* and *Conclusion* section of this report on pp. 14 – 16. As always, where any water quality problems were found, landowners were advised of remediation options in a letter.

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 24.7 million acres (2011 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

As a result of the 1972 Federal Clean Water Act, the Georgia Environmental Protection Division (GAEPD) has been responsible for managing and protecting the state's waters from point and nonpoint sources of pollution. Since 1977, the GAEPD 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 our 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. The guidance states: ***"It is recognized that Best Management Practices, designed in accordance with a state approved process, are the primary mechanism to enable the achievement of water quality standards."*** It goes on to explain: ***"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 revised and 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. This new guidance was incorporated into an updated BMP manual released in summer 2009. Since 1981, over 90,000 BMP manuals and brochures have been distributed.

The main role of the GFC is to educate and inform the forestry community of these common sense recommendations, known as BMPs, through workshops and field demonstrations. Since publication of the first BMP manual, the GFC has given 2,672 BMP talks to over 86,500 persons and participated in 492 field demonstrations of BMPs (through June 2013). The education process is ongoing, with workshops routinely provided for foresters, timber buyers and loggers through the Sustainable Forestry Initiative® (SFI®) Program in Georgia. GFC foresters have also provided BMP advice in over 77,500 cases covering almost 5.23 million acres.

Implementation of BMPs is determined through monitoring surveys. Georgia Forestry Commission 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 conducted BMP Implementation and Compliance Surveys in 1991, 1992, 1998, 2002, 2004, 2007, 2009 and 2011. This current 2013 statewide survey continues over 20 years of BMP monitoring in Georgia. The statewide average BMP implementation over this period has ranged from 65 percent in 1991 to the current rate of 90 percent. The purpose of this report is to present the results of the 2013 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 for 2011. GFC's forest inventory analysis data collection is overseen by the US Forest Service. This methodology resulted in 209 sites being targeted to survey. The next step was to target the sample to reflect ownership where the practices occurred. Ownership classes are categorized into non-industrial private forest (NIPF) land, forest industry (FI), Timber Investment Management Organizations (TIMOs) or corporate lands, 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 2013 BMP survey, 138 sites (66.0 percent) were inspected on NIPF lands, 47 sites (22.5 percent) on corporate, and 24 sites (11.5 percent) on public lands were inspected. Of interest in this discussion is the fact that forest industry has divested almost 2.1 million acres of former company-owned lands. These lands are now held by TIMO/corporate landowners or by NIPF landowners, resulting in some of the negative changes in the level of forest management being observed.

In order to randomize the stratified sample, GFC personnel went to county government offices and researched timber harvests using the PT 283-T "Report of Timber Harvest" notification forms in the county tax assessor's office or the county's "Notification of Timber Harvesting Activity" records. Only harvest information from the past two years and preferably during the previous six months was used to compile a list of potential random selection sites. The forms were separated by ownership category and the appropriate number of sites was drawn randomly. Figure 1 in the appendix shows the distribution of survey sites by county.

Site Evaluation

For this ninth 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, attempts to contact all landowners were made to obtain permission to conduct site evaluation. All evaluations were conducted by trained forest water specialists or by district water quality foresters to provide accuracy, consistency and quality control using the BMP Implementation Survey Form. For a blank copy of the 11 page 136 question form, please contact John Colberg at jcolberg@gfc.state.ga.us .

Once a site was selected, the forest water specialist or district water quality forester completed the survey form. Each site was identified by county, district, physiographic region, ownership, river basin and sub-basin, forest types before treatment, terrain class, soil erodibility class, hydric soil limitation class, type water bodies within the practice area and miles of stream 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 then 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 occurred at three levels on each site: (1) individual BMP; (2) category of practice; and (3) overall site implementation.

For a level 1 individual BMP, implementation was recorded as either a *NOT APPLICABLE, YES* or *NO*. For simplification, each question was worded so that a positive answer was recorded as a *YES* while a negative answer, indicating a significant departure from BMP recommendations, was answered with a *NO*. If an individual BMP that was applicable and needed was not fully implemented over the entire area, it received a *NO*. The "all or none principle," as recommended by the SGSF framework, applied.

For 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
Main Haul Roads
Timber Harvesting Outside SMZs
Mechanical Site Preparation Outside SMZs
Chemical Site Preparation Outside SMZs
Fire Breaks
Control Burning Outside SMZs
Artificial Regeneration Outside SMZs
Equipment Servicing Outside SMZs
Special Management Areas
Stream Miles

Firebreak construction BMPs have been included in this survey, including data from a separate statewide survey carried out by GFC of firebreak BMPs completed in 2012. Forest fertilization BMPs have been excluded, due to a lack of verifiable sites.

Significant Water Quality Risk

Each BMP was further evaluated in terms of "significant water quality risk." 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. Fourth, 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 each category of practice and overall site where the units of measure were the same. 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. Streamside Management Zones (SMZs), harvesting, mechanical site preparation, chemical applications, control burning and artificial regeneration were all measured in *acres*. Main haul roads, firebreaks, and streams were measured in *miles*. Scores were expressed as a percent of units of measure in 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 effects on the landscape. As with the implementation evaluation, the lack of BMP implementation may not necessarily equate to large-scale areas being out of compliance. For those areas out of compliance, it provides a better picture of locations to be prioritized for improvements.

RESULTS AND DISCUSSION

The 2013 Statewide Forestry BMP Survey evaluated 209 sites comprising 27,502 acres. One hundred thirty-five stream crossings, 162.7 miles of main haul roads and 81.2 stream miles were evaluated. Table 1, pages 18-21, shows the distribution of survey sites by county. Figure 1, page 43, shows the spatial location of the 209 survey sites. Figure 2, page 44, is a map of the state showing the different physiographic regions for reference. Charts 1 through 5, pages 38 to 42, show trends in BMP Implementation rates, both statewide and for individual landowner classes over various BMP survey cycles. Finally, Chart 6, page 45, depicts the statewide trends in Water Quality Risk occurrence since these risks were first assessed during the 1998 BMP Implementation survey cycle.

Statistical Analysis

The 209 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 range from 7,000 to 10,000. Therefore, one could assume the sample reflects a 3.0 percent or 2.1 percent sample at best. In order to result in a statistically valid monitoring report, Georgia has adopted the guidance, *Statistical Guidebook 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 guidebook should be 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 to 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 which differs from p by a value of m.
- A margin of error at five percent was recommended by the SGSF framework.

Use of the formula gives a needed sample size of 72 sites in order achieve a five percent margin of error. We have evaluated more than twice the needed number of sites, so, using the formula, this level of survey should yield a margin of error of 3.0% 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 were used to identify these types of streams. In these zones, forest management practices are modified in order to minimize potential impacts so as to protect water quality, fish or other aquatic resources. According to the 2009 BMP manual, zones along intermittent streams vary in width from 20 to 50 feet on most streams, depending on slope, and 100 feet along trout streams. Zones along perennial streams vary from 40 to 100 feet, depending on slope. Clear cutting is not recommended in the SMZs, except during the control of southern pine beetles or salvage operations from natural disasters.

Table 2 (pages 22-23) provides summaries of the results by ownership, region and state totals. Notable findings include:

- Statewide implementation for SMZs is 86.5 percent, representing an 8.5 point decline from 2011
- Statewide BMP compliance for SMZs is 98.8 percent.
- 28 WQRs were identified.
- Implementation for SMZs in the lower coastal plain region declined by 20.2 percentage points across all ownership categories compared with the 2011 survey.
- Stormwater control structures in roads within SMZ's along with logging debris left in stream channels seem to be the most common BMP deficiencies found in the SMZ category. In addition to this, SMZ width and residual tree canopy density are also significant issues seen on this survey.

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, which does affect water quality. Types of acceptable crossings include main haul road fords, culvert crossings or bridges. Debris and dirt type crossings or skidder fords are not acceptable crossing types. Permanent crossings were considered to be 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 (pages 23-24) provides a summary of the results by ownership, region and state totals. A total of 135 crossings were evaluated on 65 sites statewide.

Significant findings include:

- Statewide implementation for stream crossings is 85.5 percent. This is a 7.4 percentage point decline from 2011.
- The largest decline in implementation occurred in the lower coastal plain region which declined by 19.5 percentage points.
- The NIPF ownerships have the most problems, as compared with corporate and public ownerships.
- Areas for improvement in stream crossing design continue to be stream crossing approach design, culvert sizing with respect to storm flow, and culvert placement with respect to migration of aquatic species.
- 39 WQRs were associated with stream crossings.

Forest Roads

Permanent or temporary access roads are an essential part of any forest management operation and provide access for other activities. 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 or poorly maintained roads can result in sediment reaching streams, which may lead to changing stream flow patterns, degrading fish and aquatic organism habitat, and adversely affected aesthetics.

Table 4 (page 24-25) provides a summary of the results by region, ownership and state totals. Approximately 162.73 miles of road were evaluated on 185 sites.

Significant findings include:

- Forest roads BMP implementation across all ownerships is 86.0 percent.
- Forest roads compliance is 88.9 percent.
- There were 22 WQRs associated with forest roads.
- Challenges for forest roads BMP implementation continue to be properly installing water diversions and the stabilizing and reshaping of forest roads after activities are complete.

A notable finding about forest roads BMP implementation was a decline of 7.7 percentage points from the 2011 survey.

Special Management Areas

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

Table 5 (page 26-27) provides a summary of the results by region, ownership and state totals. Statewide, there were 142 sites with canals, ditches, ephemeral areas, gullies and wetland features.

Other significant findings include:

- Special management area BMP implementation across all ownerships was 91.2 percent.
- There were six WQRs associated with special management areas.
- A notable finding is that Special Management Area BMP implementation declined by 4.5 percentage points overall.

Timber Harvesting Outside of SMZs

Outside of SMZs, timber harvesting 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 27-28) provides a summary of the results by ownership, region and state total. Approximately 15,805.94 acres were evaluated on 183 sites.

A total of 571 log decks were evaluated, of which 97.7 percent were in compliance. A total of 1,162 main skid trails were evaluated, of which 96.8 percent were in compliance.

Other significant findings include:

- Timber harvesting outside SMZs BMP implementation across all ownerships is 96.8 percent.
- BMP compliance is 99.5 percent.
- All BMP categories for Timber Harvesting scored 90 percent or better for BMP implementation, except for stabilization of skid trails with water diversions or slash dispersal, which scored 89.2 percent.

- There were two WQRs associated with Timber Harvesting.

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, sub-soiling, chopping, windrowing, piling, bedding, and other physical methods to cut, break apart or move logging debris, or 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 28-29) provides a summary of the results by region, ownership and state totals. Statewide, approximately 4,313.26 acres were evaluated on 48 sites.

Significant findings include:

- Mechanical Site Prep BMP implementation is 95.4 percent
- BMP compliance for Mechanical site prep is 99.9 percent.
- Mechanical Site Prep for pine regeneration in wetlands identified in EPA/Corps of Engineers memo did not occur on any applicable sites surveyed.
- The one challenge observed for Mechanical Site Prep is bedding directing water into roadways and ditches.
- There were no WQRs associated with Mechanical Site Prep.

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 better 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 30-31) provides a summary of the results by region, ownership and state totals. Statewide, approximately 2793.2 acres were evaluated on 31 sites.

Significant findings include:

- BMP implementation and compliance for Chemical Site Prep is 100 percent.
- No challenges were observed for Chemical Site Prep.

Controlled Burning Outside SMZs and Firebreaks

Controlled fire 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 2,245.8 acres were evaluated for burning on 34 sites. BMP implementation and compliance was 100 percent. No challenges were observed. No water quality risks were identified.

Firebreaks are created by various methods to contain and control fires, both controlled burning and wildfires. If properly installed according to BMP guidelines, firebreak impacts on water quality can be minimized.

For this survey report we evaluated 34 sites containing a total of 54.7 miles of firebreaks. In addition to this, data from a 2012 GFC statewide survey specifically looking at GFC installed firebreaks has been included with this report. This prior survey looked at 168 sites statewide covering 125.58 miles of firebreaks. Together with the previously mentioned 34 sites, this section of this report covers data from a total of 185 sites with 180.26 miles of firebreaks. BMP implementation across these 185 sites was 92.3 percent, with 166.26 miles of firebreak, or 92.2 percent, in compliance with BMPs. Of the 185 sites, 14 sites were landowner or contractor installed firebreaks where to date, no firebreak BMP training has occurred. Survey findings indicate that proper installation of water diversions in firebreaks and proper firebreak crossings of gullies continue to be issues for continued BMP training. Along these lines, BMP educational outreach for non-GFC installers of firebreaks is a need that perhaps can be addressed with internet based education tools.

Artificial Regeneration 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 9 (page 31-32) provides a summary of the results by region, ownership and state totals. Approximately 2675.6 acres were evaluated on 31 sites. Overall, the percentage of acres in BMP compliance was 100 percent. A total of 50 BMPs were evaluated, and overall BMP implementation was 100 percent. No water quality risks were identified.

Significant findings include:

- Machine planting on slopes of five to 20 percent generally followed the contour on 100 percent of sites. No water quality risks were identified.
- On slopes > 21 percent, hand planting was conducted on 100 percent of sites.
- Pine establishment was avoided on specified wetlands identified in the EPA/COE memo.

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. According to the Georgia Environmental Protection Division's (GA EPD) Emergency Response Program, fuel and oil spills into soils or waterways which produce a visible sheen should be immediately contained and removed. In addition, chemical spills of 25 gallons or more should be reported to GA EPD.

Table 10 (page 32-33) provides a summary of the results by region, ownership and state totals. A total of 592 landings were evaluated on 197 sites.

Significant findings include:

- BMP implementation for Equipment Servicing was 96.1 percent.
- All BMPs assessed for Equipment Servicing were implemented at or above 93 percent.

Stream Assessments

Perhaps the most important observation in assessing the effectiveness of BMPs was the visual assessment of the water bodies on each site. A total of 81.2 miles of streams on 107 sites were evaluated for visual signs of impairment. Those signs include obvious soil erosion entering the stream, logging debris left in the channel, improper stream crossings resulting in blocked flow, removal of excess canopy trees within the SMZs exposing the stream to elevated temperatures, or impaired stream bank or channel integrity due to forestry practices.

Table 11 (page 34-35) provides a summary of the results by region, ownership and state totals by stream type. A total of 44.5 miles of perennial streams were assessed on these sites. Of these, 97.0 percent are in compliance. A total of 36.7 miles of intermittent streams were assessed on these sites. Of these, 93.2 percent are in compliance.

Significant findings include:

- Overall stream BMP compliance is 95.3 percent.
- 100 water quality risks were identified statewide.
- There were 39 WQRs (39 percent of the total) involving stream crossings.
  - ✓ Eleven of these were associated with steam crossing approaches.
- Forest roads accounted for 22 water quality risks (approximately 22 percent of the total).
  - ✓ The lack of properly installed water diversions at SMZs accounted for six of the 22 risks for forest roads.
  - ✓ The failure to adequately reshape and stabilize critical road segments also resulted in five WQRs.
- Within SMZs, there were 28 WQRs (28 percent of the state total).
  - ✓ Eight of the WQRs were associated with lack of water diversions in roads and skid trails near streams.
- Six WQRs were associated with Special Management Areas.
- Two WQRs were associated with Timber Harvesting outside of SMZs.
- Three WQRs were associated with Pre-suppression Firebreaks on slopes greater than three percent.

The overall 95.3 percent stream compliance figure in Georgia supports assessments by the US Environmental Protection Agency that silvicultural operations contribute less than 10% of the nonpoint pollution to streams in the United States.

Overall Statewide Results

Table 12 (page 35-36) provides the statewide compliance and 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. Statewide, the overall BMP implementation for all practices, all landownership classes, and all regions, is approximately 89.9 percent. **This is a 5.3 percentage point decline from the 2011**

survey. Overall, statewide acres in BMP compliance have remained statistically unchanged at 99.6 percent for another survey cycle, indicating a plateau.

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 were observed at 100 specific locations on 24 of the 209 sites for this 2013 survey. The total of 100 Water Quality Risks is significantly higher than has been seen in the past two BMP survey cycles, but still lower than seen in the 2007 BMP survey, where 154 Water Quality Risks were observed, and considerably lower than in surveys carried out during 1998, 2002, and 2004. Chart 6, page 45, shows Water Quality Risk assessment over the past seven survey cycles.

Looking into the 2013 numbers a little deeper, it can be seen that 88.5 percent of the sites surveyed for 2013 had no Water Quality Risks, while roughly 95 percent of sites had no Water Quality Risks over the past two survey cycles. Overall, it is clear that a small percentage of the sites surveyed account for all the observable Water Quality Risks seen. In fact, for this survey cycle, only about 5 percent of the sites (11) had about two thirds of all the Water Quality Risks. Below is a table showing the distribution of Water Quality Risk occurrence over the past five survey cycles.

Survey Year	No. Sites Assessed	Sites With 0 WQ Risks		Sites With 1-3 WQ Risks		Sites With 4-6 WQ Risks		Sites With 7-9 WQ Risks		Sites With 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%

Educational Opportunities

BMPs for roads, stream crossings, and streamside management zones all experienced a seven to eight percentage point decline from our 2011 survey. Therefore, our educational opportunities will be focused on those categories. In particular, educational opportunities in these categories include:

- For streamside management zones
  - ✓ Stormwater control structure design needs for forest roads in SMZs
  - ✓ SMZ width and residual forest cover requirements
  - ✓ Stream classification information for proper recognition of stream type
  - ✓ Logging slash removal and rehab in stream channels and SMZs following harvest
- For stream crossings
  - ✓ Culvert crossing design and installation information
  - ✓ Basic stream crossing design needs, including storm flow and aquatic migration requirements
  - ✓ Stream crossing approach design and stabilization
  - ✓ Temporary portable bridge use
- For forest roads
  - ✓ Stormwater control structure design and placement
  - ✓ Proper closeout needs following harvest activities
- In addition, for timber harvesting

- ✓ Information on basic timber harvesting BMPs, including log deck and skid trail stabilization requirements

Charts 1 through 6 (pages 38-42, and page 45) 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 and compliance by practice and ownership over recent survey cycles. They also provide impetus for continued training and improvement.

Data from this survey shows that BMP implementation decreases on average according to tract size categories. The table below illustrates this point, showing BMP Implementation average for three tract size groupings.

BMP Implementation and Compliance by Tract Size – 2013 Survey						
Tract Size	**No. Sites**	**Acres**	**% BMP Compliance (%Acres meeting BMPs)**	**BMPs Assessed**	**% BMP Implementation**	**WQ Risks**
Under 100 Acres	137	9318.9	98.99%	3598	88.19%	78
100-200 Acres	43	7459.5	99.89%	1358	92.34%	14
201 Acres or more	28	10424.36	99.94%	1062	92.66%	8
All	209	27499.35	99.61%	6025	89.93%	100

This survey captures data from sites recently divested from corporate ownership, and it is thought that this divestiture may have resulted in what is known as "parcelization" (breaking into smaller parcels) of some of the effected tracts. As we can see from the above table, smaller tracts have a lower BMP implementation on average than larger tracts. So, divestiture of large percentages of properties in Georgia may have actually resulted in lower BMP implementation rates that have been observed in this survey. There are several reasons smaller tracts on average experience lower BMP implementation rates. These 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; as well as more roads and stream crossings simply because there are more landowners needing access across their parcels. When the land was under corporate ownership, there was a single owner of a much larger tract with a need for only one access point from a public road system.

Another potential issue seen in these survey results is the part that weather extremes may have played. Though the role played by the weather may be difficult to show in the statistics, anecdotal experience of the GFC inspectors is that many of the individual forestry activities surveyed and assessed may have been planned and arranged during extremely dry weather prior to 2013, possibly resulting in improper identification of water features, i.e. intermittent streams may have been overlooked. The actual activities assessed were carried out during the unusually wet weather prevailing immediately prior to and during 2013, possibly resulting in many of the lower BMP implementation numbers observed.

Another trend seen in these survey results is the lower BMP implementation rates when using a consulting forester versus BMP implementation rates for tracts not using consulting foresters. The average BMP implementation rate observed for tracts where consulting foresters were used is 86 percent, while the average BMP implementation rate for tracts not using consulting foresters is 92 percent. These results seem counter intuitive.

All of these results seem to indicate a need for additional outreach to landowners of tracts of all sizes and to consulting foresters. The GFC has already undertaken efforts to make BMP educational information available online. Currently, GFC already has five BMP learning modules available for anyone to access at any time to learn about forestry BMPs. Module titles include *Temporary Stream Crossings*, *Stream Classification*, *Forest Roads*, and *Pre-Harvest Planning*, along with a slide-show depicting detailed installation steps for Geoweb rocked ford stream crossing installation. These modules are located on GFC's public website at: http://gatrees.org/forest-management/water-quality/ . Additional modules are planned in the near future to continue to address these needs. In addition, these modules are available through GFC partner SWPA for loggers to obtain their required Master Timber Harvester continuing education credits. In addition, a continued effort should be made to further promote 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, ongoing issues persist with loaded log trucks using inadequate permanent crossings. An increased use of temporary and/or portable logging bridge stream crossings would help avoid many of these problems.

BMP Implementation data available by River Basin and ecoregion

Similar statistics can be extracted for each of the 14 major river basins (page 16), 52 sub-basins and 12-digit HUCs for use by Regional Water Councils in accordance to the Georgia Comprehensive State-wide Water Management Plan. The survey statistics can also be extracted by each of Georgia's 29 Ecoregions (page 16).

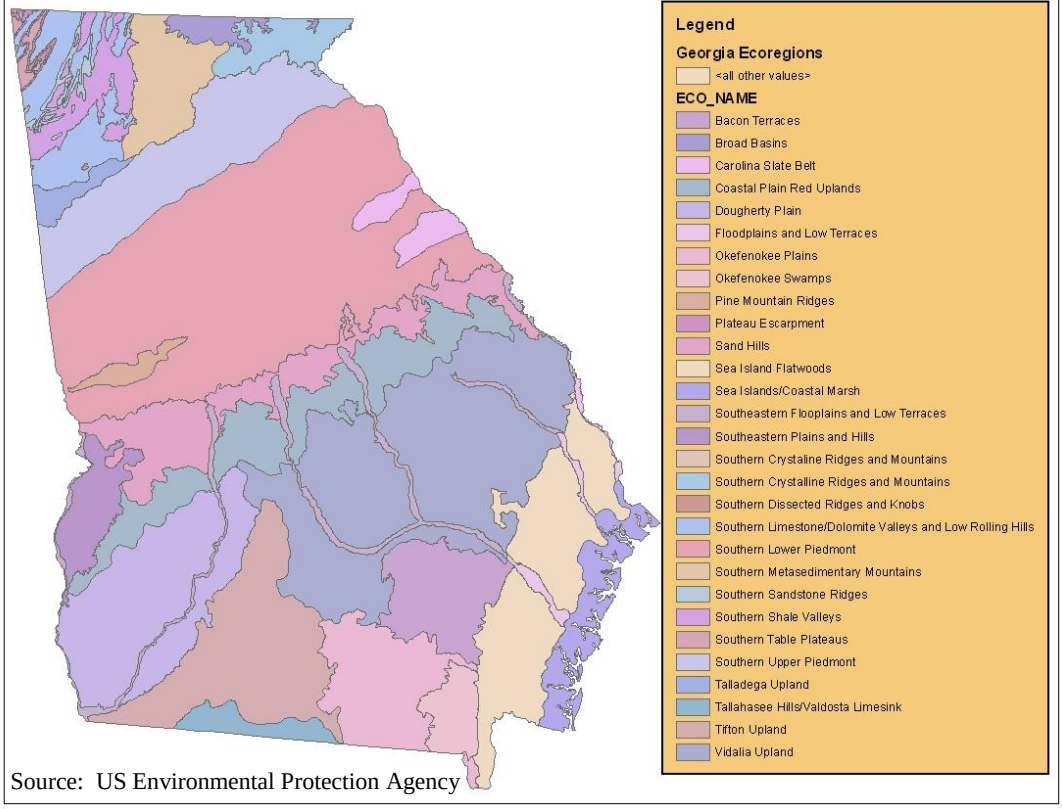
CONCLUSION

Since the 1991 survey, the percentage of acres in BMP compliance has increased from 86 percent to 99.6 percent. The percentage of BMP implementation has increased from 64.9 percent in 1991 and has settled to approximately 90 percent for the current survey. The percentage of stream miles in compliance has increased to around 95.3 percent. Since the 1998 survey, the number of water quality risks has decreased significantly, but seems to have experienced a significant upswing with this current survey. Chart 6 (page 44) tracks the level of observed Water Quality Risks since the 1998 survey.

The 2013 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 BMP implementation improvement within certain BMP categories and across certain landowner groups across the state. The information from this survey will be used to target BMP training at Master Timber Harvester, forester and landowner workshops. In addition, incentives for the increased use of portable logging bridges could be useful in helping increase stream crossing BMP implementation. Additional partnerships and funding for these portable logging bridges are currently being pursued by GFC.

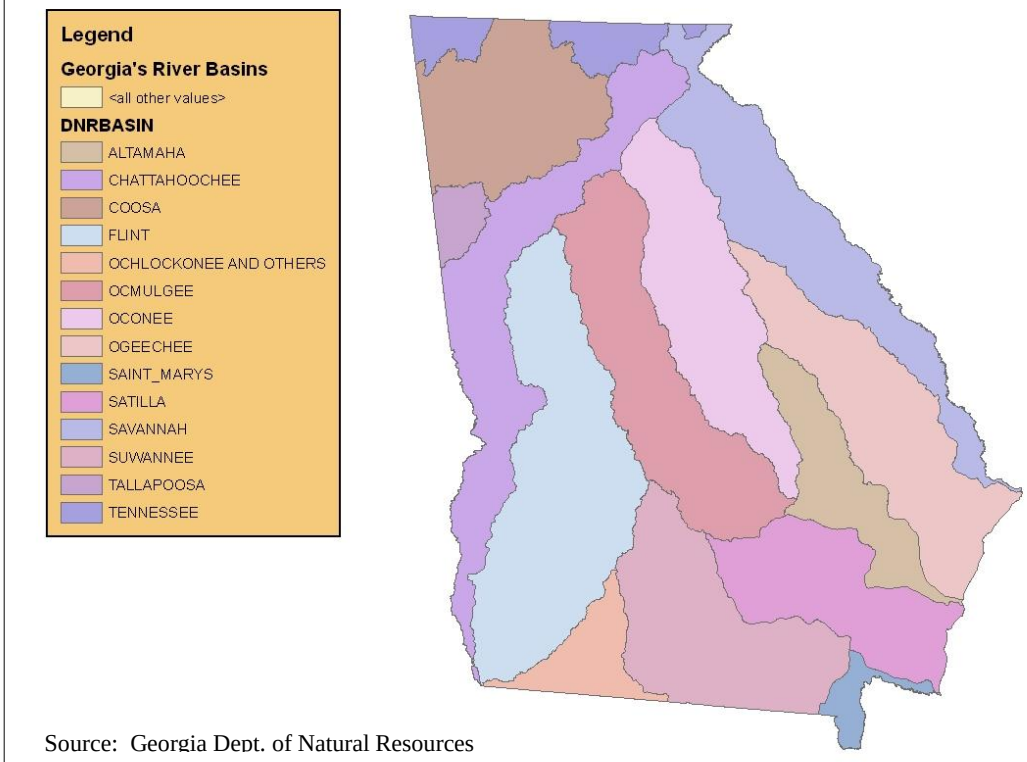
GFC will continue to use available means to resolve forestry BMP complaints. The GFC, the Georgia Forestry Association, the University of Georgia Warnell School of Forestry and Natural Resources, participating companies who subscribe to the Sustainable Forestry Initiative and the Southeastern Wood Producers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

Georgia's 29 Ecoregions



Source: US Environmental Protection Agency

Georgia's 14 Major River Basins



Source: Georgia Dept. of Natural Resources

Table 1 Targeted Sites by County and Ownership

County	Public	TIMO Corporate	NIPF
Atkinson			1
Bacon		1	1
Baker		1	
Baldwin			1
Banks			2
Barrow			1
Bartow			1
Ben Hill			1
Berrien		1	1
Bleckley			1
Brantley		1	3
Brooks			1
Bryan		1	1
Bulloch			3
Burke	1	2	
Calhoun	1		
Camden	1		2
Candler			1
Carroll		1	1
Charlton		1	2
Chattooga		1	
Clay			1
Clinch		2	2
Coffee			2
Colquitt			2
Columbia			1
Cook			1
Coweta			1
Crawford		1	
Dade			1
Dawson	1	1	
Decatur	1		

County	Public	TIMO Corporate	NIPF
Dodge		2	1
Dooly			1
Douglas	1		
Early			1
Echols		1	1
Effingham			3
Elbert			1
Emanuel			3
Evans			1
Fannin	1		
Floyd		1	1
Franklin			1
Gilmer		1	
Glascock			1
Glynn			2
Gordon			1
Grady			1
Greene	1	1	
Habersham	1		1
Hancock			2
Haralson		1	
Harris		1	1
Hart			1
Heard		1	1
Henry			1
Houston			1
Irwin			1
Jackson			1
Jasper			1
Jefferson			2
Jenkins			2
Johnson			2
Jones			1
Lamar		1	
Lanier			1
Laurens			4

County	Public	TIMO Corporate	NIPF
Lee			1
Liberty	1		1
Lincoln			1
Long			2
Lowndes			2
Lumpkin	2		
Macon			2
Madison			1
Marion		1	1
McDuffie	1		
McIntosh	1		1
Meriwether			1
Miller			1
Monroe		1	1
Montgomery			1
Morgan			1
Murray		1	
Newton			1
Oglethorpe			1
Paulding			1
Pickens		1	
Pierce			3
Pike			1
Polk			1
Pulaski			1
Putnam	1		
Quitman		1	
Rabun	1		
Randolph		1	
Richmond		1	
Schley			1
Screven			3
Seminole			1
Spalding			1
Stephens		1	
Stewart		2	
Sumter		1	1

County	Public	TIMO Corporate	NIPF	
Talbot		2		
Tattnall			2	
Taylor			2	
Telfair			3	
Terrell			1	
Thomas	1	1	1	
Tift			1	
Toombs	1		1	
Treutlen			1	
Troup	1		1	
Turner			1	
Twiggs		1		
Union	1			
Upson	1	1		
Walker			1	
Ware		1	3	
Warren		1		
Washington			3	
Wayne		1	2	
Webster		1		
Wheeler			1	
White	1			
Whitfield			1	
Wilcox			3	
Wilkes			1	
Wilkinson		2		
Worth			1	
Totals	24	46	138	Total Sites 209

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

Table 2a						
Streamside Management Zones - NIPF						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	5	112.51	97.32%	55	67.27%	0
Piedmont	18	216.84	98.68%	154	95.45%	2
Upper Coastal Plain	6	8.5	91.88	57	89.47%	3
Lower Coastal Plain	36	134.47	89.31%	316	71.84	22
Total	65	472.32	96.02%	582	79.38%	27

Table 2b						
Streamside Management Zones - Public						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	5	178.18	99.47%	47	95.74%	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	7	291.98	100%	55	100%	0
Upper Coastal Plain	0	0	NA	0	NA	0
Lower Coastal Plain	4	20.61	100%	34	100%	0
Total	16	490.77	99.81%	136	98.53%	0

Table 2c						
Streamside Management Zones - Corporate						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	2	120	100%	19	100%	0
Ridge & Valley	3	74.9	99.73%	31	93.55%	0
Piedmont	9	323.21	99.07%	81	96.3%	1
Upper Coastal Plain	9	187.93	100%	91	100%	0
Lower Coastal Plain	5	153.09	99.90%	38	86.84	0
Total	28	859.13	99.61%	260	96.15%	1

Table 2d						
Streamside Management Zones – All Ownership						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	7	298.18	99.68%	66	96.97%	0
Ridge & Valley	8	187.41	98.29%	86	76.74%	0
Piedmont	34	832.03	99.56%	290	96.55%	3
Upper Coastal Plain	15	196.43	99.65%	148	95.95%	3
Lower Coastal Plain	45	308.17	95.28%	388	75.77%	22
Total	109	1822.22	98.73%	978	86.50%	28

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

Table 3a					
Stream and Wetland Crossings - NIPF					
Region	**No. Sites**	**Crossings**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	0	NA	0
Ridge & Valley	4	10	61	88.52%	0
Piedmont	11	15	134	79.1%	11
Upper Coastal Plain	3	3	38	86.84%	5
Lower Coastal Plain	21	42	230	77.93%	17
Total	39	70	463	80.13%	33

Table 3b					
Stream and Wetland Crossings - Public					
Region	**No. Sites**	**Crossings**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	4	29	69	95.65	0
Ridge & Valley	0	0	0	NA	0
Piedmont	2	2	24	95.83%	0
Upper Coastal Plain	0	0	0	NA	0
Lower Coastal Plain	1	1	11	100.00%	0
Total	7	32	104	96.15%	0

Table 3c					
Stream and Wetland Crossings - Corporate					
Region	**No. Sites**	**Crossings**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	2	6	34	100%	0
Ridge & Valley	2	5	34	85.29%	0
Piedmont	4	8	59	84.75%	2
Upper Coastal Plain	7	7	81	96.30%	3
Lower Coastal Plain	3	7	40	87.5%	1
Total	19	33	248	91.13%	6

Table 3d					
Stream and Wetland Crossings – All Ownership					
Region	**No. Sites**	**Crossings**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	6	35	103	97.09%	0
Ridge & Valley	7	15	95	87.37%	0
Piedmont	17	25	217	82.49%	13
Upper Coastal Plain	10	10	119	93.28%	8
Lower Coastal Plain	25	50	281	79.72%	18
Total	65	135	815	85.52%	39

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

Table 4a						
Forest Road Sites - NIPF						
Region	**No. Sites**	**Miles**	**% Miles Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	7	4.09	99.51%	90	90%	0
Piedmont	26	20.47	85.64%	206	83.01%	6
Upper Coastal Plain	21	10.78	74.49	131	80.15%	4
Lower Coastal Plain	66	45.31	81.37%	446	80.49%	12
Total	120	80.65	82.46%	873	82.02%	22

Table 4b						
Forest Road Sites - Public						
Region	**No. Sites**	**Miles**	**% Miles Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	4	5.23	100%	52	100%	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	8	9.97	95.59%	80	93.75%	0
Upper Coastal Plain	1	3.32	100%	7	100%	0
Lower Coastal Plain	6	8.2	96.1%	41	90.24%	0
Total	19	26.72	97.16%	180	95%	0

Table 4c						
Forest Road Sites - Corporate						
Region	**No. Sites**	**Miles**	**% Miles Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	2	3.01	100%	33	100%	0
Ridge & Valley	3	1.95	100%	34	100%	0
Piedmont	12	13.35	92.58%	122	88.52%	0
Upper Coastal Plain	16	26.89	94.24	123	86.99%	0
Lower Coastal Plain	13	10.16	94.49%	81	92.59%	0
Total	46	55.36	94.4%	393	90.84%	0

Table 4d						
Forest Road Sites - All Ownership						
Region	**No. Sites**	**Miles**	**% Miles Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	6	8.24	100%	85	100%	0
Ridge & Valley	10	6.04	99.67%	124	92.74%	0
Piedmont	46	43.79	90.02%	408	86.76%	6
Upper Coastal Plain	38	40.99	89.51%	261	83.91%	4
Lower Coastal Plain	85	63.67	85.36%	568	82.92%	12
Total	185	162.73	88.93%	1446	86.03	22

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

Table 5a				
Special Management Areas - NIPF				
Region	**No. Sites**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0
Ridge & Valley	6	20	80%	0
Piedmont	23	128	91.41%	0
Upper Coastal Plain	11	39	89.74%	0
Lower Coastal Plain	52	145	82.76%	3
Total	92	332	86.75%	3

Table 5b				
Special Management Areas - Public				
Region	**No. Sites**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	5	32	100%	0
Ridge & Valley	0	0	NA	0
Piedmont	9	53	98.11%	0
Upper Coastal Plain	0	0	NA	0
Lower Coastal Plain	2	6	50%	0
Total	16	91	95.6%	0

Table 5c				
Special Management Areas - Corporate				
Region	**No. Sites**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	2	9	100%	0
Ridge & Valley	2	15	100%	0
Piedmont	11	76	98.68%	0
Upper Coastal Plain	12	58	94.83%	3
Lower Coastal Plain	7	19	94.74%	0
Total	34	177	97.18%	3

Table 5d				
Special Management Areas - All Ownership				
Region	**No. Sites**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	7	41	100%	0
Ridge & Valley	8	35	88.57%	0
Piedmont	43	257	94.94	0
Upper Coastal Plain	23	97	92.78%	3
Lower Coastal Plain	61	170	82.94%	3
Total	142	600	91.17%	6

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

Table 6a						
Timber Harvesting Outside SMZs - NIPF						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	7	381.68	99.3%	54	88.89%	0
Piedmont	29	2258.25	99.15%	207	96.62%	0
Upper Coastal Plain	21	1427.17	96.33%	141	96.45%	0
Lower Coastal Plain	64	4149.6	99.9%	422	96.92%	1
Total	121	8216.7	99.05%	824	96.24%	1

Table 6b						
Timber Harvesting Outside SMZs - Public						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	5	417	99.92%	38	97.37%	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	9	1173.66	99.83%	65	95.38%	0
Upper Coastal Plain	1	62.97	100%	6	100%	0
Lower Coastal Plain	7	753.45	100%	46	100%	0
Total	22	2407.08	99.9%	155	97.42%	0

Table 6c						
Timber Harvesting Outside SMZs - Corporate						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	2	195	100%	16	100%	0
Ridge & Valley	2	165	100%	16	100%	0
Piedmont	12	1352.09	99.96%	93	94.62%	1
Upper Coastal Plain	16	2435.52	99.99%	108	99.07%	0
Lower Coastal Plain	8	1034.55	100%	53	100%	0
Total	40	5082.16	99.99%	286	97.9%	1

Table 6d						
Timber Harvesting Outside SMZs - All Ownership						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	7	612	99.94%	54	98.15%	0
Ridge & Valley	9	546.68	99.51%	70	91.43%	0
Piedmont	50	4784	99.55%	365	95.89%	1
Upper Coastal Plain	38	3925.66	98.66%	255	97.65%	0
Lower Coastal Plain	79	5937.6	99.93%	521	97.5%	1
Total	183	15805.94	99.49%	1265	96.76%	2

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

Table 7a						
Mechanical Site Preparation Outside SMZs - NIPF						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	14	1280.21	99.67%	23	91.30%	0
Piedmont	0	0	NA	0	NA	0
Upper Coastal Plain	1	71.1	98.59%	1	100%	0
Lower Coastal Plain	13	1209.11	99.74%	22	90.91%	0
Total	28	2560.42	99.17%	46	95.46%	0

Table 7b						
Mechanical Site Preparation Outside SMZs - Public						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	0	0	NA	0	NA	0
Upper Coastal Plain	0	0	NA	0	NA	0
Lower Coastal Plain	2	345.01	100%	7	100%	0
Total	2	345.01	100%	7	100%	0

Table 7c						
Mechanical Site Preparation Outside SMZs - Corporate						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	8	531.44	99.91%	17	88.24%	0
Piedmont	1	41.4	100%	2	100%	0
Upper Coastal Plain	0	0	NA	0	NA	0
Lower Coastal Plain	7	490.04	99.9%	15	86.67%	0
Total	16	1062.88	99.90%	34	86.67%	0

Table 7d						
Mechanical Site Preparation Outside SMZs - All Ownership						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	24	2156.63	99.83%	45	91.11%	0
Piedmont	1	41.4	100%	2	100%	0
Upper Coastal Plain	1	68.1	100%	1	100%	0
Lower Coastal Plain	22	2047.13	99.82%	42	90.48%	0
Total	48	4313.26	99.91%	90	95.40%	0

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

Table 8a						
Chemical Site Preparation Outside SMZs - NIPF						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	1	113	100%	2	100%	0
Piedmont	6	455.46	100%	12	100%	0
Upper Coastal Plain	4	264.19	100%	8	100%	0
Lower Coastal Plain	7	287.06	100%	14	100%	0
Total	18	1119.71	100%	36	100%	0

Table 8b						
Chemical Site Preparation Outside SMZs - Public						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	1	38.7	100%	2	100%	0
Upper Coastal Plain	0	0	NA	0	NA	0
Lower Coastal Plain	1	92.98	100%	2	100%	0
Total	2	131.68	100%	4	100%	0

Table 8c						
Chemical Site Preparation Outside SMZs - Corporate						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	3	363.39	100%	6	100%	0
Upper Coastal Plain	6	995.96	100%	12	100%	0
Lower Coastal Plain	2	182.41	100%	4	100%	0
Total	11	1541.76	100%	22	100%	0

Table 8d						
Chemical Site Preparation Outside SMZs - All Ownership						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	1	113	100%	2	100%	0
Piedmont	10	857.55	100%	20	100%	0
Upper Coastal Plain	10	1260.15	100%	20	100%	0
Lower Coastal Plain	10	562.45	100%	20	100%	0
Total	31	2793.15	100%	62	100%	0

Table 9 a – d: Distribution of Artificial Regeneration Operations Evaluated By Region, Ownership, Acres Assessed, % Compliance, BMPs Assessed, % BMP Implementation, and Water Quality Risks

Table 9a						
Artificial Regeneration Outside SMZs - NIPF						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	2	97.46	100%	3	100%	0
Upper Coastal Plain	4	264.19	100%	7	100%	0
Lower Coastal Plain	12	814.06	100%	17	100%	0
Total	18	1175.71	100%	27	100%	0

Table 9b						
Artificial Regeneration Outside SMZs - Public						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	1	38.7	100%	2	100%	0
Upper Coastal Plain	0	0	NA	0	NA	0
Lower Coastal Plain	2	158.49	100%	3	100%	0
Total	3	197.19	100%	5	100%	0

Table 9c						
Artificial Regeneration Outside SMZs - Corporate						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	5	668.79	100%	11	100%	0
Upper Coastal Plain	3	451.52	100%	4	100%	0
Lower Coastal Plain	2	182.41	100%	3	100%	0
Total	10	1302.72	100%	18	100%	0

Table 9d						
Artificial Regeneration Outside SMZs - All Ownership						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	8	804.95	100%	16	100%	0
Upper Coastal Plain	7	715.71	100%	11	100%	0
Lower Coastal Plain	16	1154.96	100%	23	100%	0
Total	31	2675.62	100%	50	100%	0

Table 10 a – d: Distribution of Equipment Servicing Operations Evaluated By Region, Ownership, No. of Landings Assessed, BMPs Assessed, % BMP Implementation, and Water Quality Risks

Table 10a						
Equipment Servicing and Trash Clean-up - NIPF						
Region	**No. Sites**	**Landings**	**% Landings Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	7	20	100%	21	100%	0
Piedmont	29	72	100%	86	100%	0
Upper Coastal Plain	23	59	94.92%	68	95.59%	0
Lower Coastal Plain	73	196	91.33%	219	91.32%	0
Total	132	341	94.24%	394	94.42%	0

Table 10b						
Equipment Servicing and Trash Clean-up - Public						
Region	**No. Sites**	**Landings**	**% Landings Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	5	12	100%	15	100%	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	7	31	100%	21	100%	0
Upper Coastal Plain	1	2	100%	3	100%	0
Lower Coastal Plain	8	16	100%	24	100%	0
Total	21	61	100%	63	100%	0

Table 10c						
Equipment Servicing and Trash Clean-up - Corporate						
Region	**No. Sites**	**Landings**	**% Landings Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	2	13	100%	6	100%	0
Ridge & Valley	3	11	100%	9	100%	0
Piedmont	12	55	98.18%	36	97.22%	0
Upper Coastal Plain	16	72	100%	48	100%	0
Lower Coastal Plain	11	33	100%	32	100%	0
Total	44	184	99.46%	131	99.24%	0

Table 10d						
Equipment Servicing and Trash Clean-up – All Ownership						
Region	**No. Sites**	**Landings**	**% Landings Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	7	25	100%	21	100%	0
Ridge & Valley	10	31	100%	30	100%	0
Piedmont	48	158	99.37%	143	99.30%	0
Upper Coastal Plain	40	133	97.74%	119	97.48%	0
Lower Coastal Plain	92	245	93.06%	275	93.09%	0
Total	197	592	96.45%	588	96.09%	0

Table 11 a – d: Distribution of Stream Types, Miles Assessed, and % Compliance By Region, and Ownership

Table 11a						
Stream Assessment - NIPF						
Region	**No. Sites**	**Intermittent Miles Assessed**	**% Miles Compliance**	**Perennial Miles Assessed**	**% Miles Compliance**	**Total % Miles Compliance**
Mountains	0	0	NA	0	NA	NA
Ridge & Valley	5	2.49	91.55%	1.87	96.26%	93.58%
Piedmont	18	3.73	98.93%	8.94	97.87%	98.18%
Upper Coastal Plain	6	1.64	95.12%	0.46	86.96%	93.33%
Lower Coastal Plain	34	8.52	80.87%	6.00	83.67%	82.02%
Total	63	16.38	88.03%	17.27	92.47%	90.31%

Table 11b						
Stream Assessment - Public						
Region	**No. Sites**	**Intermittent Miles Assessed**	**% Miles Compliance**	**Perennial Miles Assessed**	**% Miles Compliance**	**Total % Miles Compliance**
Mountains	5	1.95	100%	4.77	100%	100%
Ridge & Valley	0	0	NA	0	NA	NA
Piedmont	7	4.25	100%	5.68	100%	100%
Upper Coastal Plain	0	0	NA	0	NA	NA
Lower Coastal Plain	4	0.07	100%	1.93	100%	100%
Total	16	6.27	100%	12.38	100%	100%

Table 11c						
Stream Assessment - Corporate						
Region	**No. Sites**	**Intermittent Miles Assessed**	**% Miles Compliance**	**Perennial Miles Assessed**	**% Miles Compliance**	**Total % Miles Compliance**
Mountains	2	0.55	100%	2.23	100%	100%
Ridge & Valley	3	3.10	99.35%	0.44	100%	99.44%
Piedmont	9	4.57	99.78%	7.93	99.62%	99.68%
Upper Coastal Plain	9	3.62	89.78%	2.21	100%	93.65%
Lower Coastal Plain	5	2.21	94.12%	2.08	100%	96.97%
Total	28	14.05	96.23%	14.89	99.80%	98.06%

Table 11d						
Stream Assessment - All Ownership						
Region	**No. Sites**	**Intermittent Miles Assessed**	**% Miles Compliance**	**Perennial Miles Assessed**	**% Miles Compliance**	**Total % Miles Compliance**
Mountains	7	2.5	100%	7.0	100%	100%
Ridge & Valley	8	5.59	95.89%	2.31	96.97%	96.20%
Piedmont	34	12.55	99.60%	22.55	99.02%	99.23%
Upper Coastal Plain	15	5.26	91.44%	2.67	97.75%	93.57%
Lower Coastal Plain	43	10.8	83.70%	10.01	90.21%	86.83%
Total	107	36.7	93.22%	44.54	97.01%	95.30%

Table 12 a – d: Overall Distribution of Sites Evaluated By Region, Ownership, Acres Evaluated, % Compliance, BMPs Assessed, % BMPs Implemented, and Water Quality Risks

Table 12a						
Overall Distribution - NIPF						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	0	0	NA	0	NA	0
Ridge & Valley	7	631.19	99.10%	316	85.76%	0
Piedmont	29	3525.07	99.44%	959	90.09%	19
Upper Coastal Plain	23	2228.24	97.62%	507	89.15%	13
Lower Coastal Plain	79	7209.61	99.70%	1894	84.21%	57
Total	138	13594.11	99.26%	3676	86.56%	89

Table 12b						
Overall Distribution - Public						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	5	595.18	99.78%	253	97.63%	0
Ridge & Valley	0	0	NA	0	NA	0
Piedmont	10	1719.3	99.88%	317	96.85%	0
Upper Coastal Plain	1	62.97	100%	16	100%	0
Lower Coastal Plain	8	1466.49	100%	177	94.92%	0
Total	24	3843.94	99.91%	763	96.72%	0

Table 12c						
Overall Distribution - Corporate						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	2	315	100%	117	100%	0
Ridge & Valley	3	354.9	99.94%	144	95.14%	0
Piedmont	12	3062.37	99.89%	500	92.60%	4
Upper Coastal Plain	16	4286.53	100%	535	95.33%	6
Lower Coastal Plain	14	2042.5	99.97%	290	93.45%	1
Total	47	10061.3	99.95%	1586	94.45%	11

Table 12d						
Overall Distribution - All Ownership						
Region	**No. Sites**	**Acres**	**% Acres Compliance**	**BMPs Assessed**	**% BMPs Implemented**	**WQR**
Mountains	7	910.18	99.86%	370	98.38%	0
Ridge & Valley	10	986.09	99.40%	460	88.70%	0
Piedmont	51	8306.74	99.70%	1776	92.00%	23
Upper Coastal Plain	40	6577.74	99.19%	1058	92.44%	19
Lower Coastal Plain	101	10718.6	99.79%	2361	86.15%	58
Total	209	27499.35	99.61%	6025	89.93%	100

WATER QUALITY
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Chart 1: Statewide Trends in BMP Implementation

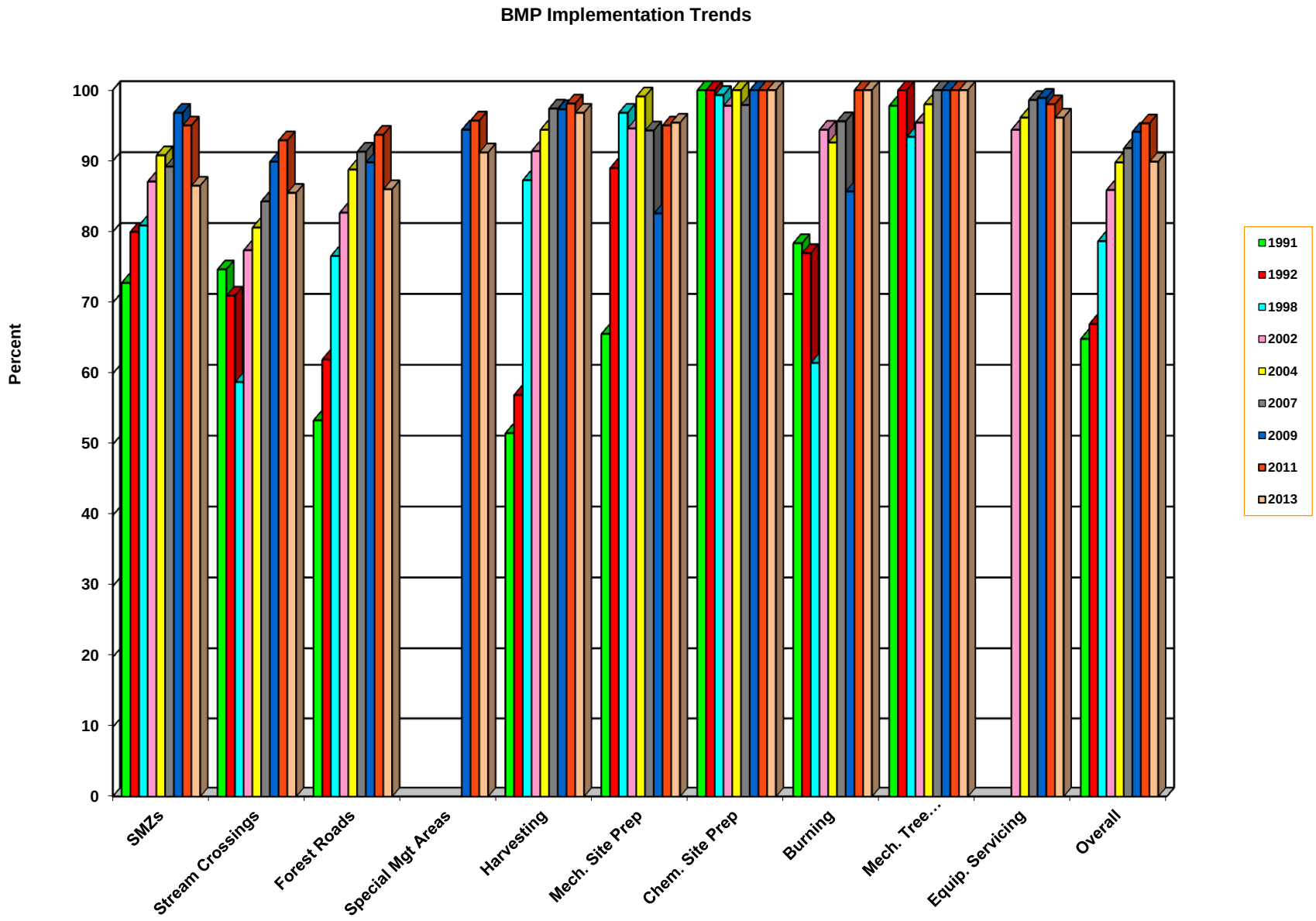

Chart 2: Statewide Trends in BMP Implementation on NIPF Sites

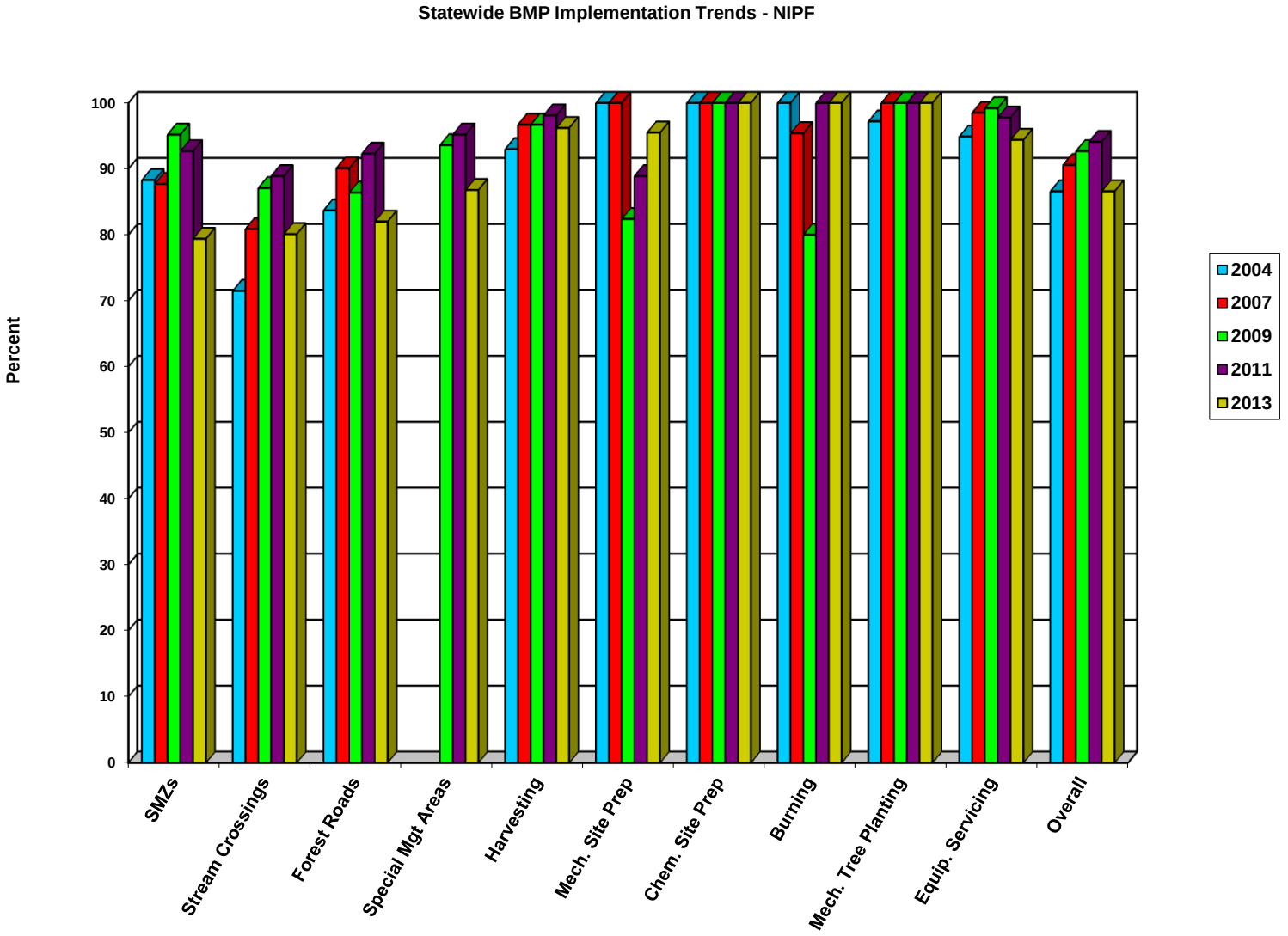

Chart 3: Statewide Trends in BMP Implementation on Corporate Sites

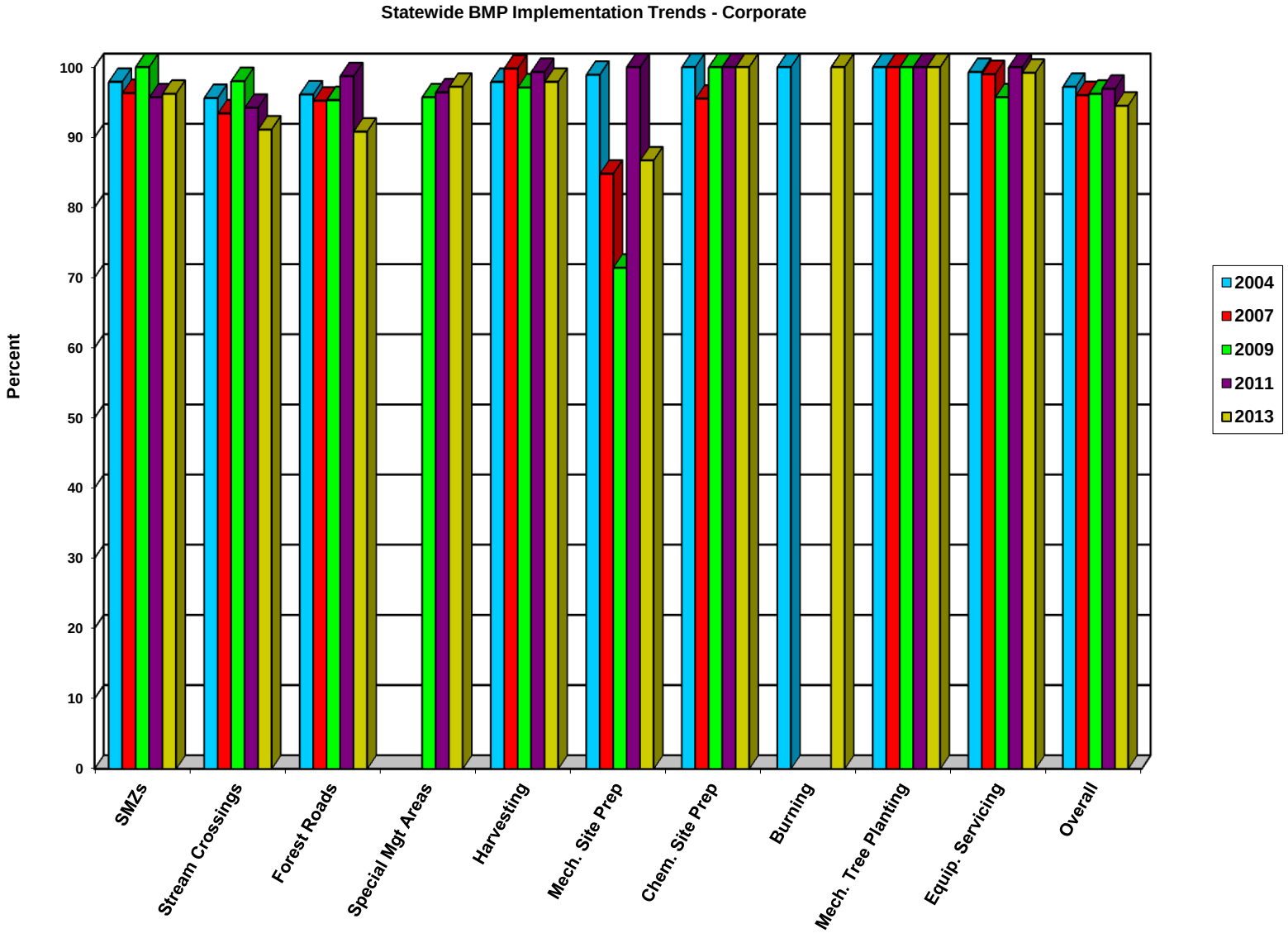

Chart 4: Statewide Trends in BMP Implementation on Public Sites

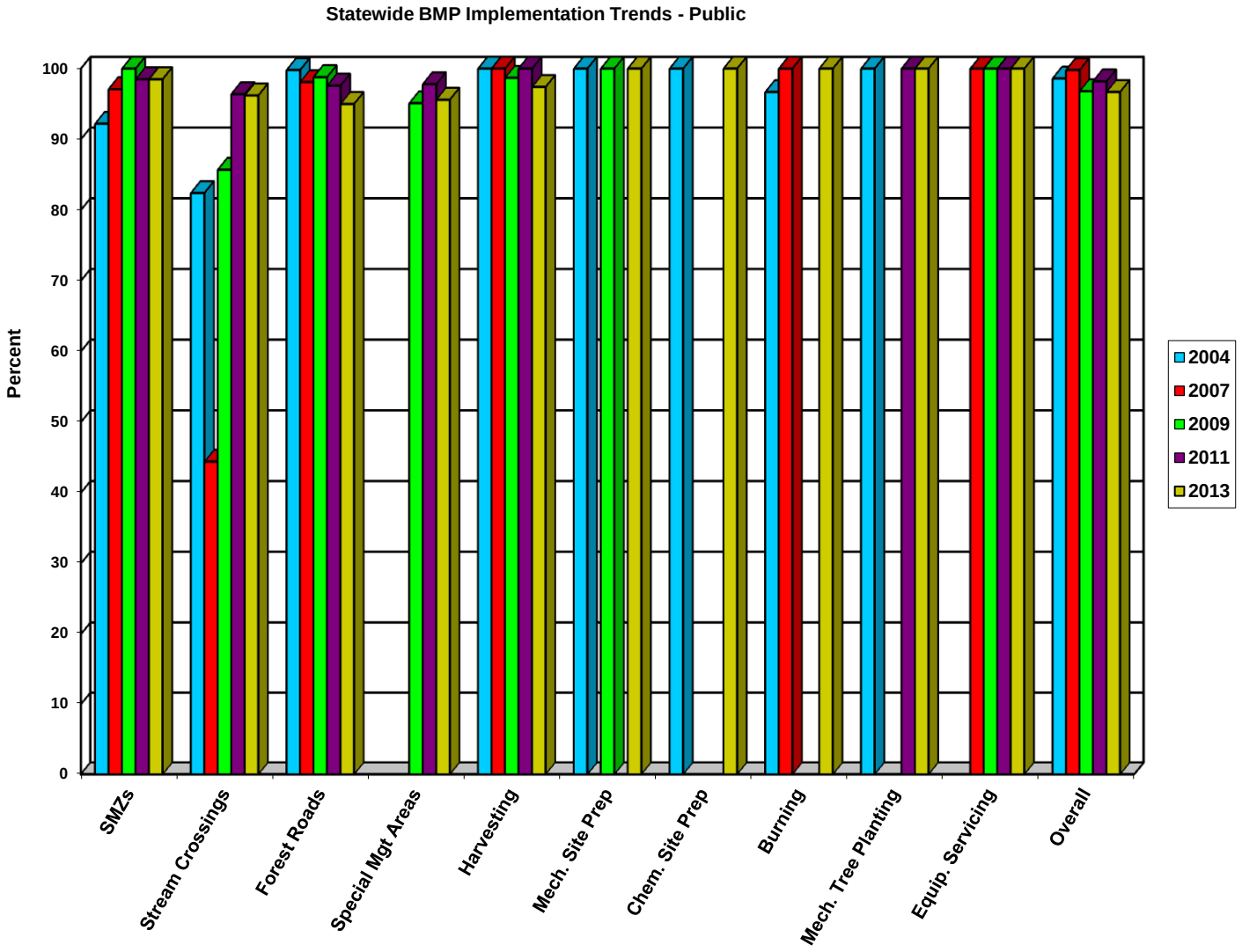

Chart 5: Statewide Trends in BMP Compliance

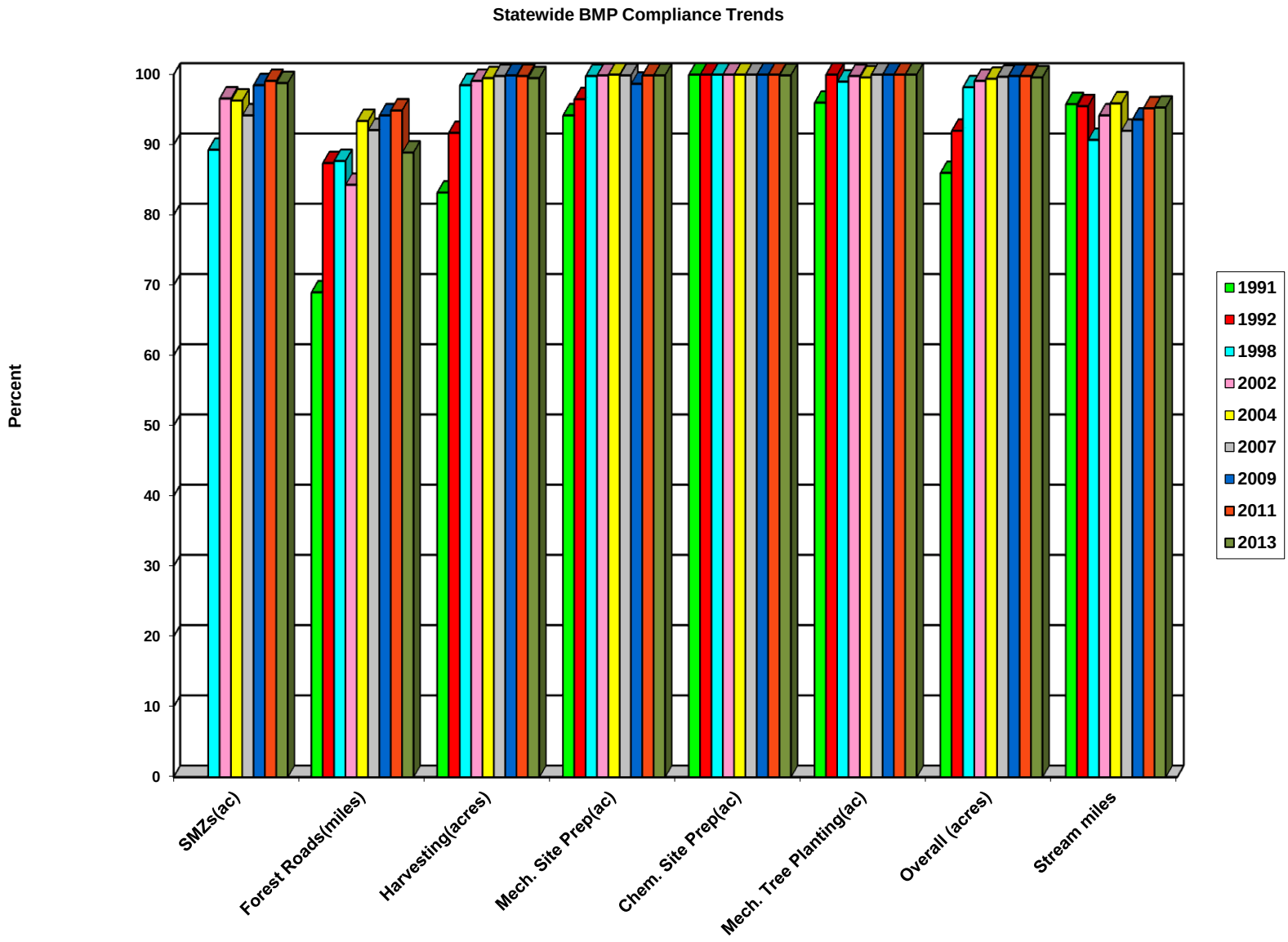

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Figure 1: 2013 Forestry BMP Survey Site Distribution

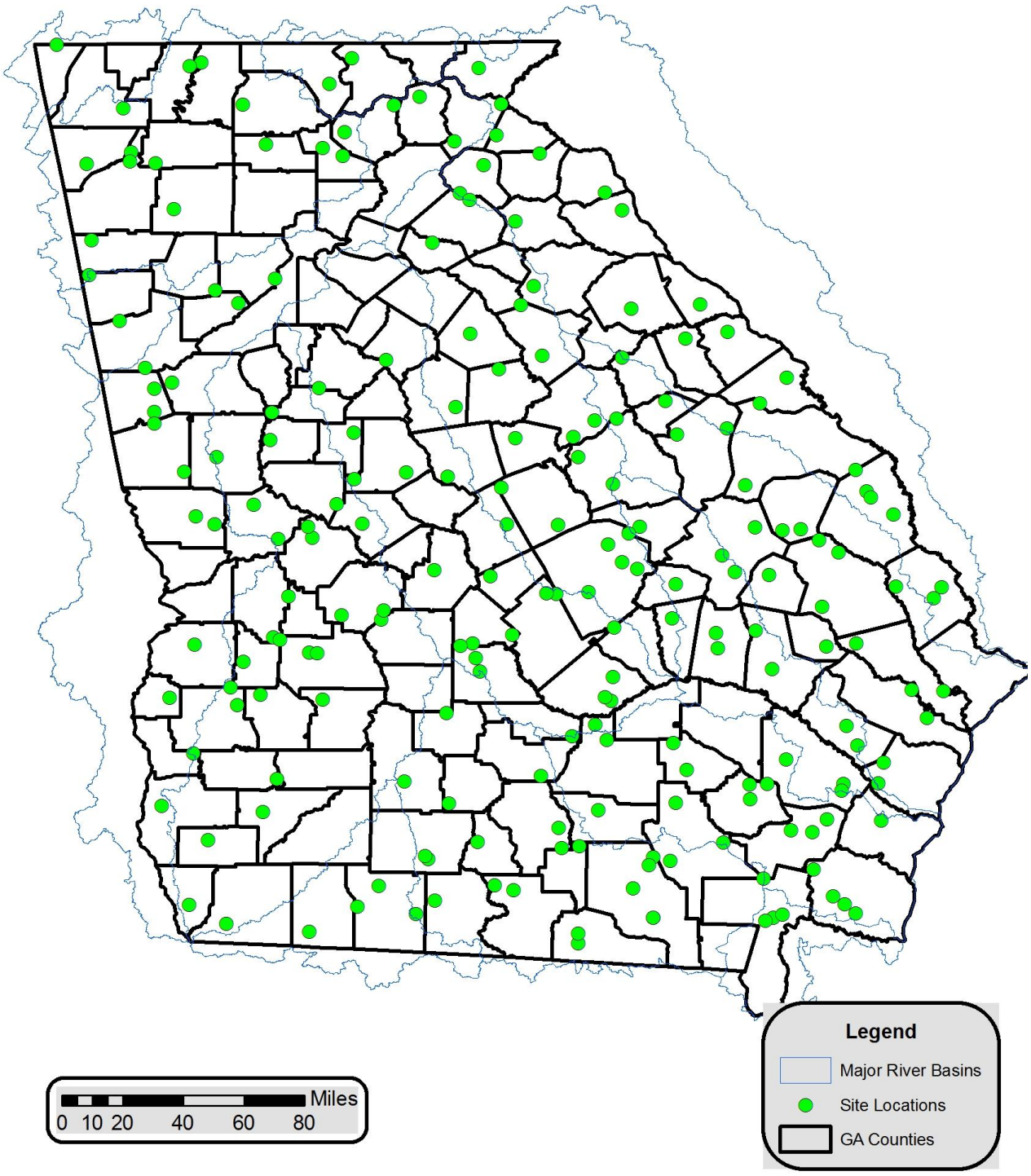

Figure 2

Source: University of Georgia

Chart 6: Statewide Trends in Reduction of Water Quality Risks from 1998 through 2013 Surveys