GEORGIA FORESTRY
COMMISSION

Results of Georgia's 2004 Silvicultural Best Management Practices Implementation and Compliance Survey

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Conducted by the
Georgia Forestry Commission
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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 the summer of 2004, the GFC completed the fifth statewide forestry BMP Implementation and Compliance Survey.

The objectives of the 2004 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 fifth survey was consistent with the Southern Group of State Foresters (SGSF) BMP Monitoring Task Force revised recommendations developed and adopted in June 2002 titled *Silvicultural Best Management Practices Implementation Monitoring, a Framework for State Forestry Agencies*. The SGSF Task Force is composed of hydrologist and water specialists from state forestry agencies, US Forest Service, forest industry, and the National Council of the Paper Industry for Air and Stream Improvement (NCASI) in consultation with EPA Region IV nonpoint source specialists.

The 2004 Statewide Forestry BMP Survey evaluated 412 sites that were selected in a stratified random sample. These sites had to have been silviculturally treated within the past 2 years, preferably within the past 6 months. By ownership, 283 sites occurred on the non-industrial private forest landowner (NIPF), 107 sites on forest industry land, and 22 sites on public land. By Region, 26 sites were in the Mountains, 152 sites in the Piedmont, 86 sites in the Upper Coastal Plain, and 148 sites 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 12,093 individual BMPs evaluated, the statewide percentage of correct implementation was 89.8%. This is a 3.9% increase from the 2002 survey.** By ownership, the percentage of BMP implementation statewide was 97.2% on forest industry lands, 92.2% on public lands, and 86.6% on NIPF lands.

BMP Compliance was determined by dividing the units of measure specific to the forest practice (# acres, # stream crossings, # miles of road) that were in compliance with BMPs by the total number of units measured for that particular practice. Because multiple operations occurred over the same acres on numerous sites, acreage figures were duplicated. Therefore, of the 43,947 acres contained on the 412 sites, approximately 49,789 acres of separate forest operations were evaluated. Approximately 99.4% of those acres were in compliance with BMPs. **This rate is 0.3 percent higher than the 2002 survey.** Of the 234.68 miles of stream evaluated, 225.01 miles, or 95.9%, were observed to have no impacts or impairment from the forestry practices. **This is an improvement of 1.7% from the 2002 survey.**

By practice or category, statewide percentage of BMP Implementation and Compliance were as follows:

Practice or Category	% BMP Implementation	% BMP Compliance
Streamside Management Zones (SMZs)	90.8	96.3 (acres)
Stream Crossings	80.6	44.1 (# crossings)
Main Haul Roads	88.1	93.4 (miles)
Timber Harvesting	94.4	99.5 (acres)
Mechanical Site Preparation	99.1	100 (acres)
Chemical Site Preparation	100	100 (acres)
Firebreak Construction	84.6	93.0 (miles)
Control Burning	92.6	98.4 (acres)
Artificial Regeneration	98.0	99.6 (acres)
Forest Fertilization	100	100 (acres)
Equipment Servicing	96.1	
Special Management Areas	87.7	
Stream Miles		95.9 (miles)
Overall	89.8	99.4 (acres)

With public attention focusing on the protection of riparian areas or streamside management zones, a BMP Implementation rate of 90.8% with 96.3% of those acres in compliance with BMPs, forest operators are doing an excellent job of protecting these sensitive areas. In addition, with basically a 90% overall statewide BMP Implementation rate with 99.4% of those acres in compliance with BMPs, as a whole, forest operators appear to be doing a very good job of implementation.

There is, however, room for improvement in certain categories. As with the previous survey, stream crossings is one category where improvement is needed. It should be noted that many roads and crossings, that did not meet BMPs, existed prior to the forestry practice being conducted and were not necessarily associated with the forestry operation evaluated. Therefore, this survey attempted to differentiate existing forest roads and stream crossings from newly constructed forest roads and crossings. Approximately 349 crossings were evaluated on 170 sites. There were 142 pre-existing crossings with 88 or 62% being in full compliance with BMPs. There were 207 new crossings where only 66 or 31.9% were in full compliance. Added together, only 154 or 44.1% were in full compliance with BMPs. **This is a 6% increase from the 2002 survey.**

Most noted problems were that of the 349 total crossings, 115 or 33% were associated with skidder fords or debris type crossings. These automatically count as non-compliant since the BMPs do not recommend their use. Just eliminating these type crossings offers the greatest potential to increase compliance.

Landowners having potential water quality problems were advised by letter with recommendations for remediation.

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 23.6 million acres of commercial forestland (2/3rds 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 states 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 (primarily erosion and sedimentation) contributions. 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 state: *"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 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, state and federal water quality personnel. Since 1981 over 82,600 BMP manuals and brochures have been given out.

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 provided 1,957 BMP talks to over 64,462 persons and participated in 357 field demonstrations of BMPs through June 2005. The education process is on going, with workshops routinely provided for foresters, timber buyers and loggers through the American Forest and Paper Association's (AF&PA) Sustainable Forestry Initiative (SFI) Program in Georgia. GFC foresters have also provided BMP advice on 75,700 cases covering over 4 million acres.

Implementation of BMPs is determined through monitoring surveys and during the complaint resolution procedures. Of statistical importance are the monitoring surveys. The GFC conducted BMP Implementation and Compliance Surveys in 1991, 1992, 1998 and 2002. The statewide percentage of acres in compliance averaged 86% in 1991, 92% in 1992, 98% in 1998 and 99.1% in 2002.

The purpose of this report is to present the results of the 2004 BMP Implementation and Compliance Survey.

SURVEY PROCEDURE

Methodology for Sampling Intensity and Site Selection

The number of sites to evaluate in each of Georgia's 159 counties was based on the amount of timber harvested in each county as determined using the US Forest Service's "Forest Statistics for Georgia, 1997" report, Table 35 - Average Annual Removals of Growing Stock on Timberland by County and Species Group. The following criteria were used:

Thousand Cords	Thousand Cubic Feet	Target Sites
< 50	< 3,715	1
50 – 100	3,716 – 7,430	2
101 – 200	7,431 – 14,860	3
201 – 300	14,861 – 22,290	4
>301	> 22,291	5

This method resulted in approximately 421 sites being targeted to survey. The next step was to target the sample to reflect ownerships where the practices occurred. This was determined also using the US Forest Service's "Forest Statistics for Georgia, 1997" report, Table 47 - Area of Timberland Treated or Disturbed Annually and Retained in Timberland by Treatment or Disturbance and Ownership Class. The ownership classes are categorized into non-industrial private forest (NIPF) land, forest industry (FI), and public lands, which includes federal, state, county or city ownership. Of the total annual acres silviculturally treated by county, the percentage for each ownership category was determined and multiplied by the number of sites to sample in each county. Of the 421 sites targeted, 283 sites (69%) would be on (NIPF) land, 107 sites (26%) would be on FI, and 22 sites (5%) would be on public lands resulting in a stratified sample. Nine sites in metropolitan counties were not available to survey since they were converted to development use.

In order to randomize the stratified sample, GFC personnel went to the county tax assessor's office and used the Georgia Department of Revenue's PT 283-T "Report of Timber Harvest" notification forms on record. Only landowner information from "lump sum" sales or "owner harvests" during the past 2 years and preferably during the last 6 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. Information from "unit sales" is confidential and therefore unavailable for target sites. Figure 1 shows the distribution of survey sites by county.

Site Evaluation

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* for this fifth survey as noted in the Executive Summary.

After being selected and verified in the field by County Foresters or Chief Rangers that the practice had indeed taken place, attempts to contact all landowners were made to obtain permission prior to the site being evaluated. All evaluations were conducted by trained District Water Quality Foresters to provide accuracy, consistency, and quality control using the BMP Compliance Survey Form. See Exhibit 1 in Appendix.

Once selected, the 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 where available or USGS Topographical maps. Data could be extracted by 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 108 specific, YES/NO answer type 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, the score was 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%. 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
- Firebreak Construction
- Control Burning outside SMZs
- Artificial Regeneration outside SMZs
- Forest Fertilization outside SMZs
- Equipment Servicing outside SMZs
- Special Management Areas
- Stream Miles

Water Quality Risk

In addition, each BMP was further evaluated in terms of "water quality risk". A risk is defined as "a situation or set of conditions that has resulted, or may result, in erosion or other pollutants entering a water body, an increase in stream temperature, or the physical degradation or obstruction of water bodies observed at each BMP question. 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, by recognizing 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 and the lack of BMPs during a silvicultural operation may not necessarily equate to or result in a water quality standards violation. 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 allowed for comparison with previous surveys in determining trends. Streamside Management Zones (SMZs), harvesting, mechanical site preparation, chemical applications, control burning, and artificial regeneration all used *acres* as the unit of measure. Stream crossing was the *actual number* present. Main haul roads, firebreaks, and streams used *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 in 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 where attention should be focused to make improvements.

RESULTS AND DISCUSSION

The 2004 Statewide Forestry BMP Survey evaluated 412 sites comprising 43,947 acres. Because multiple practices occurred on these same areas, approximately 49,789 acres, 349 stream crossings, 346.9 miles of main haul roads, and 234.7 stream miles were evaluated. The map on page 43 is of the State showing the different physiographic regions for reference. The map on page 45 shows the distribution of sites by county. The Statewide BMP Compliance Survey Report in the Appendix provides a summary of the distribution of the sites evaluated by region, ownership, specific questions regarding timber sales on NIPF lands, and specific site information and the BMP implementation and compliance results for each practice and BMP evaluated.

By practice or category, the statewide percentage of BMP Implementation and Compliance are as follows and will be explained in further detail in the following sections.

Practice or Category	% BMP Implementation	% BMP Compliance
Streamside Management Zones (SMZs)	90.8	96.3 (acres)
Stream Crossings	80.6	44.1 (# crossings)
Main Haul Roads	88.1	93.4 (miles)
Timber Harvesting	94.4	99.5 (acres)
Mechanical Site Preparation	99.1	100 (acres)
Chemical Site Preparation	100	100 (acres)
Firebreak Construction	84.6	93.0 (miles)
Control Burning	92.6	98.4 (acres)
Artificial Regeneration	98.0	99.6 (acres)
Forest Fertilization	100	100 (acres)
Equipment Servicing	96.1	
Special Management Areas	87.7	
Stream Miles		95.9
Overall	89.8	99.4 (acres)

Of the 234.7 miles of stream evaluated on 277 sites, 225 miles or 95.9% were observed to have no impacts or impairment from the forestry practices. The total number of water quality risks checked was 220.

Statistical Analysis

The 412 sites evaluated during this survey represent only a sample of all operations that met the criteria for selection. Data compiled from county tax assessor's offices indicate that the number of timber harvesting operations conducted annually range from 7,000 to 10,000. Therefore one could assume the sample reflects a 4.1% or 5.9% sample at best. Having enough samples to pass a statistical analysis with some degree of confidence is a concern. Therefore, the SGSF appointed a sub-task force composed of Dr. Ron McNew, Professor, University of Arkansas; John Greis, USFS; and Hughes Simpson, Texas BMP Coordinator to develop the *Statistical Guidebook for BMP Implementation 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 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%)

Notes:
- 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%.
- 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 5% was recommended by the SGSF framework.

Using the above formula and the overall statewide BMP implementation rate of 85.95% from the 2002 survey results for p and margin of error at 5 the formula would be:

$$n = \frac{4(85.95) * (100 - 85.95)}{5^2} = \frac{343.8 * 14.05}{25} = \frac{4,830.39}{25} = 193 \text{ sites}$$

This equation calculates the minimum number of sites necessary to evaluate. Increasing the sample size will yield an even more accurate estimate of BMP implementation. Therefore the 412 sites evaluated are more than was necessary.

Standard Error (se): $se = \sqrt{\frac{p(1-p)}{n}}$

Where p = estimate of statewide BMP implementation (89.8)
n = total applicable BMPs evaluated (12,093)

$$se = \sqrt{\frac{.898(1 - .898)}{12,093}} = \sqrt{\frac{0.898\ (.102)}{12,093}} = \sqrt{\frac{.091596}{12,093}}$$

$se = .0000075743 = .0028$

95% Confidence Interval (ci)

The 95% confidence interval is a tool that statisticians use to demonstrate their confidence in the measured mean of a sample. It provides a range for which they are 95% confident that the actual mean will be found within that range. To calculate confidence interval, the mean, variance, standard deviation, standard error, and margin of error must also be calculated.

$$Ci = p \pm 2\ se$$

$= .898 \pm 2(.0028) = .898 \pm .005 = .893,\ .903$

For the 2004 survey, the overall estimate of statewide BMP implementation (p) is 89.8% with an estimated standard error of .0028. Using the 95% confidence interval (ci), the data indicates that 95% of the time it is reasonable to expect implementation with BMPs to be at least 89.3% but no more than 90.3%.

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 type 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 1999 BMP manual, zones along intermittent streams vary in width from 20 feet to 50 feet on most streams, depending on slope, and 100 feet along trout streams. Zones along perennial streams vary from 40 feet to 100 feet, depending on slope. Clear cutting is not recommended in the SMZs except for control of Southern pine beetle or salvage operations from natural disasters.

Table 1, page 26, provides a summary of the results by ownership, region and state total. Statewide, approximately 2,104 acres within the SMZ were evaluated on 277 sites. Approximately 2,026 acres or 96.3% were in compliance with BMPs. A total of 2,420 applicable BMPs was evaluated of which 2,197 or 90.8% were fully implemented. A total of 32 water quality risks was identified when BMPs were not implemented. Specific findings include:

- Appropriate SMZ widths were established on 89.4% of the sites. Three water quality risks were identified.
- The recommended tree canopy was maintained on 89.6% of the SMZs. Two water quality risks were identified.
- As recommended, stream bank trees were left unharvested within SMZs on 92.9% of the sites. Two water quality risks were identified.
- Soil disturbance by harvesting equipment within SMZs was minimized on 91.4% of the sites. Three water quality risks were identified.
- Treetops, limbs, and logging debris were kept out of stream channels on 82.8% of the sites. One water quality risk was identified.
- New forest roads were located outside the SMZs on 100% of the sites. Where roads did occur within SMZs, they were stabilized on 71% of the sites. Four water quality risks were identified.
- Water control structures directed surface flow away from stream and water bodies on 78.3% of sites. Nine water quality risks were identified.
- Skid trails, log decks, and staging areas were located outside SMZs on 92% of sites. Four water quality risks were identified.
- Mechanical site preparation was kept out of SMZs on 100% of 14 sites.
- The handling, mixing, loading, and application of chemicals were kept out of SMZs on 16 (94.7%) of 17 sites.
- Pre-suppression firebreaks were installed outside the SMZs on 76% of sites. One water quality risk was identified. Breaks tied into streams had adequate diversions installed at SMZ margins on 53.3% of sites. Two water quality risks were identified. Where prescribed fire occurred within SMZs, the intensity of the fire was minimized on 85.7% of the sites with 1 water quality risk identified.
- Machine tree planting was kept outside SMZs on 100% of sites.
- Equipment was improperly serviced on 1 (0.4%) of 251 sites.

SMZs BY REGION

In the Mountain region, approximately 227 SMZ acres were evaluated on 21 sites. The percentage of acres in BMP Compliance was 89.6%. A total of 184 individual BMPs were evaluated of which 78.8% were fully implemented. There were 4 water quality risks identified.

In the Piedmont, approximately 1,015 SMZ acres were evaluated on 116 sites. The percentage of acres in BMP Compliance was 97.6%. A total of 1,034 individual BMPs were evaluated of which 91.4% were fully implemented. There were 20 water quality risks identified.

In the Upper Coastal Plain, approximately 332 SMZ acres were evaluated on 47 sites. The percentage of acres in BMP Compliance was 97.2%. A total of 380 individual BMPs were evaluated of which 95.3% were fully implemented. There were 3 water quality risks identified.

In the Lower Coastal Plain, approximately 530 SMZ acres were evaluated on 93 sites. The percentage of acres in BMP Compliance was 96.2%. A total of 822 individual BMPs were evaluated of which 90.6% were fully implemented. There were 5 water quality risks identified.

SMZs by OWNERSHIP

For NIPF land ownership, approximately 811 acres were evaluated on 186 sites. Overall, the percentage of acres in BMP Compliance was 93.4% and ranged from a low of 75.5% in the Mountains to a high of 96.4% in the Upper Coastal Plain. Overall BMP Implementation was 88.3% and ranged from a low of 74.3% in the Mountains to a high of 93.4% in the Upper Coastal Plain. There was a total of 30 water quality risks with 19 occurring in the Piedmont. The main problems and challenges associated with NIPF lands involved the stabilization of roads located within SMZs, where only 58 % of the roads were stabilized. Water control structures in roads directed runoff into streams on 31% of the sites. Logging debris (tops and limbs) was left in stream channels on 23% of the sites, and excessive soil disturbance within the SMZs occurred on 12% of the sites. Firebreaks were located within the SMZs on 21% of the sites and connected directly to streams on 9 sites but, 78% of those had adequate water control structures in place at the SMZ boundary.

On forest industry lands (FI), approximately 1,076 acres were evaluated on 76 sites. Overall, the percentage of acres in BMP Compliance was 99.4% and ranged from a low of 97.5% in the Upper Coastal Plain to highs of 99.9% in the Piedmont and Lower Coastal Plain. Overall BMP Implementation was 97.9% and ranged from a low of 94.2% in the Mountains to a high of 98.7% in the Piedmont. There was a total of 1 water quality risk identified. All BMPs were implemented in the 90-percentile range.

On public lands, approximately 217 acres were evaluated on 15 sites. Overall, the percentage of acres in BMP Compliance was 92.2% and ranged from a low of 77.7% in the Lower Coastal Plain to a high of 98.4% in the Piedmont. Overall BMP Implementation was 85.3% and ranged from a low of 66.7% in the Mountains to a high of 91.2% in the Piedmont. There was 1 water quality risk identified which occurred in the Mountains. The main problems identified were: of 3 roads located within the SMZ, one was not stabilized; one site had an unstabilized log deck within the SMZ; and logging debris was left in stream channels on 2 (22%) of 9 sites. There were other opportunities for improvement involving firebreaks and burning within the SMZs. There were 5 sites with firebreaks tied directly into streams without any water bars established to keep erosion from entering the streams.

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 can affect water quality. Types of acceptable crossings include main haul road fords, culverts, or bridges. Debris and dirt type or skidder fords are not acceptable methods of crossings. Undersized culverts were considered temporary type crossings and should have been removed after the operation was completed.

Table 2, page 27, provides a summary of the results by ownership, region and state total. A total of 349 crossings was evaluated on 170 sites statewide. According to the survey, 30 main haul road fords, 132 permanent culverts, 41 temporary culverts, 31 bridges, 73 skidder fords, and 42 debris and dirt type crossings were observed. Multiple numbers and types of crossings occurred on many sites.

Of the 349 total crossings, 142 existed prior to the forestry practice being conducted and 62% of those were in compliance. There were 207 new crossings associated with the forest practice that were evaluated, of which, 31.9% were in compliance. Overall stream crossing compliance was 44.1%.

The biggest concern and area for the greatest improvement is eliminating the skidder fords and debris and dirt type crossings. Together they make up 33% of the total non-compliance. New permanent culvert installation compliance was 33%.

A total of 1,975 individual stream crossing BMPs was evaluated, of which 80.6% were fully implemented. A total of 120 water quality risks was identified.

Other significant findings and areas for improvement include:

- Crossings were minimized on 91% of the sites. Five water quality risks were identified
- Approaches to stream crossings were within acceptable road grades on 91% of the sites. Six water quality risks were identified
- Of the 102 pre-existing permanent culverts, 66% were in compliance. Of the 5 pre-existing temporary culverts, 40% were in compliance.
- Of the 30 new permanent culverts, only 10% were in compliance. Of the 36 new temporary culverts, 81% were in compliance.
- Culverts on 62.5% of the sites were of the recommended size diameter for the watershed. Fifteen water quality risks were identified where they were not adequately sized.
- Fill over culvert ends meets a 2:1 slope or was armored only on 63% of the sites. Eleven water quality risks were identified.
- Exposed soils in wetland fill roads and at stream crossings were stabilized on 54% of the sites. Thirteen water quality risks were identified.
- Fords for skidder crossings occurred at 73 different places on 38 sites. Fourteen water quality risks were identified.
- Debris and dirt type crossings occurred at 42 different places.
- Only 53% of the sites with temporary crossings were removed and approaches stabilized as recommended. Twelve water quality risks were identified.
- 120 or 54% of the total water quality risks identified statewide over all practices were attributed to stream crossings.

Stream Crossings by Region

In the Mountains, 31 crossings were evaluated on 15 sites. Overall the percentage of crossings in BMP Compliance was 39.0% and BMP implementation was 72.7%. There were 10 water quality risks identified.

In the Piedmont, 132 crossings were evaluated on 69 sites. Overall the percentage of crossings in BMP Compliance was 41.7% and BMP Implementation was 78.2%. There were 87 water quality risks identified.

In the Upper Coastal Plain, 44 crossings were evaluated on 26 sites. Overall the percentage of crossings in BMP Compliance was 47.7% and BMP Implementation was 85.9%. There were 11 water quality risks identified.

In the Lower Coastal Plain, 142 crossings were evaluated on 60 sites. Overall the percentage of crossings in BMP Compliance was 46.5% and BMP Implementation was 83.1%. There were 12 water quality risks identified.

Stream Crossings by Ownership

On NIPF land, 248 crossings were evaluated on 115 sites. Overall the percentage of crossings in BMP Compliance was 29.8% and ranged from a low of 16.7% in the Mountains to a high of 32.7% in the Piedmont. Overall BMP implementation was 71.5% and ranged from a low of 56.3% in the Mountains to a high of 73.2% in the Lower Coastal Plain. There were 117 water quality risks identified with the majority (86) occurring in the Piedmont. The main problem identified was that a total of 66 skidder fords and 39 debris and dirt type crossings made up 42% of the 248 total crossings on NIPF lands. These are automatic non-compliant. In fact 91% of these type crossings occurring statewide across all ownerships were found on the NIPF lands. Other problems were similar to those found statewide.

On forest industry lands, 84 crossings were evaluated on 46 sites. Overall the percentage of crossings in BMP Compliance was 78.6% and ranged from a low of 63.6% in the Upper Coastal Plain to a high of 85.0% in the Lower Coastal Plain. Overall BMP Implementation was 95.6% and ranged from a low of 90.2% in the Mountains to a high of 96.9% in the Piedmont. There were 3 water quality risks identified. Again the biggest problem involved skidder fords and debris crossings as they made up almost 12% of the non-compliance.

On public lands, 17 crossings were evaluated on 9 sites. Overall the percentage of crossings in BMP Compliance was 82.4% and ranged from a low of 63.0% in the Mountains to highs of 100% in the other three regions. Overall BMP Implementation was 96.0% and ranged from a low of 88.6% in the Mountains to highs of 100% in the other three regions. There were no water quality risks identified. The only area of concern was with pre-existing culverts in the Mountain region.

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 cause minimal soil and water quality impacts. However, poorly located, poorly constructed, or poorly maintained roads can result in sediment reaching streams that may result in changing stream flow patterns, degrading fish and aquatic organism habitat, and adversely affecting aesthetics.

Table 3, page 28, provides a summary of the results by region, ownership and state totals. Approximately 347 miles of road were evaluated on 378 sites. The number of miles in BMP Compliance was 93.4%. A total of 2,730 individual BMPs was evaluated and the percentage of BMP Implementation was 88.1%. There were 37 water quality risks identified.

Significant findings include the following:

- Construction of new roads was kept within allowable grades on 95% of the sites. Only 1 water quality risk was identified for this BMP.
- Roads were located on the sides of ridges to allow for proper drainage on 93.8% of sites. No water quality risks were associated with this BMP.
- Roads were well drained by the use of adequately installed and spaced water diversion measures on 69.9% of sites. There were 5 water quality risks identified.
- Water diversion measures with turnouts were installed prior to SMZs only on 66.1% of sites leading to 14 water quality risks.
- Rutting of roads was avoided on 97.2% of sites.
- Roads were reshaped and adequately stabilized on 77% of sites. Ten water quality risks were identified.
- Mud and debris were kept off public roads at tract entrances on 98.0% of sites.

Roads by Region

In the Mountain region, 15.11 miles were evaluated on 26 sites. The percentage of miles in BMP Compliance was 87.0%. A total of 52 BMPs was evaluated of which 83.2% were implemented. There were 2 water quality risks identified.

In the Piedmont, approximately 118 miles of roads were evaluated on 139 sites. Overall the percentage of miles in BMP Compliance was 98.7%. A total of 1,110 BMPs was evaluated of which 86.8% were implemented. There were 33 water quality risks identified.

In the Upper Coastal Plain, 91.35 miles of road were evaluated on 83 sites. Overall the percentage of miles in BMP Compliance was 94.6% and BMP Implementation was 89.0%. There was 1 water quality risk identified.

In the Lower Coastal Plain, 122.45 miles of road were evaluated on 130 sites. Overall the percentage of miles in BMP Compliance was 96.9% and BMP Implementation was 90.6%. There was 1 water quality risk identified.

Roads by Ownership

On NIPF lands, a total of 182.22 miles of road was evaluated on 256 sites. Overall the percentage of miles in BMP Compliance was 88.7% and ranged from a low of 73.0% in the Mountains to a high of 95.2% in the Lower Coastal Plain. Overall BMP Implementation was 83.7% and ranged from a low of 74.4% in the Mountains to a high of 86.5% in the Lower Coastal Plain. There was a total of 36 water quality risks identified, with the majority (32) occurring in the Piedmont. The main findings and concerns were that roads were well drained with diversion measures only on 55.5% of the sites and were reshaped and stabilized only on 68% of the sites.

On forest industry lands, a total of 134.1 miles of road was evaluated on 102 sites. Overall the percentage of miles in BMP Compliance was 98.4% and ranged from a low of 92.0% in the Mountains to a high of 99.6% in the Upper Coastal Plain. Overall BMP implementation was 96.1% and ranged from a low of 92.3% in the Mountains to a high of 96.7% in the Lower Coastal Plain. There was 1 water quality risk identified in the Piedmont.

On public lands, a total of 30.6 miles of road was evaluated on 20 sites. Overall the percentage of miles in BMP Compliance was 99.8% and ranged from a low of 99.7% in the Piedmont to highs of 100% in the other three regions. Overall BMP Implementation was 98.5% and ranged from a low of 96.6% in the Piedmont to highs of 100% in the other three regions. There were no water quality risks identified.

TIMBER HARVESTING OUTSIDE OF SMZs

Outside of SMZs, this activity poses little threat to water quality in Georgia. Potential impacts can be avoided or minimized if seasonal weather conditions, soil type, soil moisture, topography, and matching the type of equipment to use with the site are considered. The location, construction, and maintenance of log decks and skid trails are the primary concerns.

Table 4, page 29, provides a summary of the results by ownership, region and state total. Approximately 37,407 acres were evaluated on 375 sites. Approximately 99.5% were in compliance with BMPs. A total of 3,110 applicable BMPs was evaluated of which 94.4% were fully implemented. A total of 19 water quality risks was identified.

A total of 1, 271 log decks was evaluated of which 95.8% were in compliance. A total of 2,456 main skid trails was evaluated of which 95.5% were in compliance.

Other significant findings and areas for improvement include:

- Log decks were minimized on 98.9% of sites.
- Log decks were located properly on stable, well-drained areas on 98.9% of sites.
- Log decks were stabilized on 98.3% of erodible sites.
- Main skid trails on rolling terrain were adequately water barred and stabilized on 72% of sites; a total of 10 water quality risks was identified.
- Rutting was minimized on 89.7% of wetlands or sites with saturated soils. Three water quality risks were identified.

Timber Harvesting by Region

In the Mountain region, 1,182 acres were evaluated on 22 sites. The percentage of acres in BMP Compliance was 96.2% and BMP Implementation was 81.2% with 5 water quality risks identified. There were 64 log decks on those sites with 92.2% in compliance with BMPs. There were 121 main skid trails with 86.0% in compliance with BMPs.

In the Piedmont, 13,745 acres were evaluated on 141 sites. The percentage of acres in BMP Compliance was 99.5% and BMP Implementation was 94.0% with 10 water quality risks identified. There were 501 log decks evaluated of which 94.0% were in compliance. There were 1,131 main skid trails with 95.2% in compliance.

In the Upper Coastal Plain, 10,395 acres were evaluated on 84 sites. The percentage of acres in BMP Compliance was 99.9% and BMP Implementation was 95.1% with 2 water quality risks identified. There were 307 log decks evaluated of which 98.1% were in compliance. There were 657 main skid trails evaluated of which 95.1% were in compliance.

In the Lower Coastal Plain, 12,055 acres were evaluated on 129 sites. The percentage of acres in BMP Compliance was 99.5% and BMP Implementation was 96.6% with 2 water quality risks identified. There were 399 log decks evaluated of which 97.0% were in compliance. There were 547 main skid trails evaluated of which 98.5% were in compliance.

Timber Harvesting By Ownership

On NIPF lands, 21,855 acres were evaluated on 273 sites. The percentage of acres in BMP Compliance was 99.3% and ranged from a low of 92.2% in the Mountains to a high of 99.9% in the Upper Coastal Plain. Overall BMP Implementation was 93.0% and ranged from a low of 83.8% in the Mountains to a high of 95.5% in the Lower Coastal Plain. There was a total of 19 water quality risks identified with the majority of 10 occurring in the Piedmont. Significant findings and concerns were that skid trails on erodible sites should have been stabilized and retired better. Implementation rates were 65.6% for skid trails.

On forest industry land, 13,402 acres were evaluated on 91 sites. The percentage of acres in BMP Compliance was 99.9% and ranged from a low of 99.2% in the Mountains to highs of 100% in the Upper and Lower Coastal Plains. Overall BMP implementation was 97.9% and ranged from a low of 90.2% in the Mountains to a high of 99.1% in the Lower Coastal Plain. There were no water quality risks identified.

On public land, 2,149 acres were evaluated on 12 sites. The percentage of acres in BMP Compliance was 100%. Overall BMP Implementation was 99.0% and ranged from a low of 97.9% in the Piedmont to highs of 100% in the other regions. There were no water quality risks identified.

MECHANICAL SITE PREPARATION OUTSIDE SMZs

Site preparation methods prepare harvested and non-forested areas for both natural and artificial regeneration for desired tree species and stocking. Methods include shearing, raking, sub-soiling, chopping, windrowing, piling, and 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 debris, lessen logging impacts, 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 5, page 30, provides a summary of the results by region, ownership and state totals. Statewide, approximately 3,062 acres were evaluated on 28 sites. Approximately 100% were in compliance with BMPs. A total of 113 applicable BMPs was evaluated of which 99.1% were fully implemented. No water quality risks were identified.

Significant findings include:

- Site prep bedding prevented surface runoff into roadways and road ditches on 94.7% of the sites.
- Mechanical site prep for pine regeneration in wetlands identified in EPA/Corps of Engineers memo did not occur on any applicable sites surveyed.

Mechanical Site Prep by Region

In the Mountains, no sites were evaluated.

In the Piedmont, no sites were evaluated.

In the Upper Coastal Plain, 432 acres were evaluated on 4 sites. The percentage of acres in BMP Compliance was 100% and BMP Implementation was 100.0% with no water quality risks identified.

In the Lower Coastal Plain, 2,630 acres were evaluated on 24 sites. The percentage of acres in BMP Compliance was 100% and BMP Implementation was 99.0% with no water quality risks identified.

Mechanical Site Prep by Ownership

On NIPF lands, approximately 546 acres were evaluated on 7 sites. Overall the percentage of acres in BMP Compliance was 100% on the sites in the Upper and Lower Coastal Plains. No sites were evaluated in the Mountains or Piedmont. Overall BMP Implementation was 100% in both regions. No water quality risks were identified.

On forest industry land, approximately 2,321acres were evaluated on 20 sites in the Upper and Lower Coastal Plains. No sites were evaluated in the Mountains or Piedmont. Overall the percentage of acres in BMP Compliance was 100%. BMP implementation was 98.9% and ranged from a low of 98.8% in the Lower Coastal Plain to a high of 100% in the Upper Coastal Plain. No water quality risks were identified. All BMPs were implemented 100% except for site preparation bedding where avoiding directing surface runoff into roadbeds and ditches occurred on 93.8% of the sites.

On Public land, approximately 195 acres were evaluated on 1 site, which occurred in the Upper Coastal Plain. Overall the percentage of acres in BMP Compliance was 100% and BMP Implementation was 100%.

CHEMICAL SITE PREPARATION OUTSIDE SMZs

Herbicides are valuable tools used in forest management to control competing vegetation and enhance tree survival and growth. On many highly erodible sites, the use of herbicides is actually better than exposing so much surface area by mechanical site preparation methods. By following EPA approved labels that govern storage, transportation, handling, and application their applications should not pose any threat to water quality.

Table 6, page 31, provides a summary of the results by region, ownership, and state totals. Statewide, approximately 1,946 acres were evaluated on 23 sites. Overall the percentage of acres in BMP Compliance was 100%. A total of 44 BMPs was evaluated of which 100% were fully implemented. No water quality risks were identified.

Chemical Site Prep by Region

In the Mountain region, 162 acres were evaluated on 2 sites, all of which were on forest industry lands. The percentage of acres in BMP Compliance was 100% and BMP Implementation was 100%.

In the Piedmont region, 1,198 acres were evaluated on 15 sites. The percentage of acres in BMP compliance was 100% and BMP Implementation was 100%.

In the Upper Coastal Plain region, 529 acres were evaluated on 4 sites. The percentage of acres in BMP Compliance was 100% and BMP Implementation was 100%.

In the Lower Coastal Plain region, 57 acres were evaluated on 2 sites. The percentage of acres in BMP Compliance was 100% and BMP Implementation was 100%.

Chemical Site Prep by Ownership

For the NIPF land, approximately 736 acres were evaluated on 11 sites. Ten sites were located in the Piedmont and 1 site was in the Lower Coastal Plain. No sites were evaluated in the Mountains or Upper Coastal Plain regions. Overall the percentage of acres in BMP Compliance was 100%. Overall BMP Implementation was also 100%.

For the forest industry land, approximately 968 acres were evaluated on 8 sites. Overall, the percentage of acres in BMP Compliance was 100% and BMP Implementation was 100%.

For public lands, approximately 242 acres were evaluated on 4 sites and all occurred in the Piedmont. The percentage of acres in BMP Compliance was 100% and BMP Implementation was 100%.

FIREBREAK CONSTRUCTION

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 to perpetuate certain endangered plant and animal ecosystems. When properly planned and conducted, firebreaks and controlled fire have minimal impacts on water quality. However, firebreaks and fires that expose significant mineral soil on moderate and steep slopes may increase erosion potential.

Table 7, page 32, provides a summary of the firebreak results by region, ownership, and state totals. Approximately 80.23 miles of breaks were evaluated on 47 sites. Overall the percentage of miles in BMP Compliance was 93.0%. A total of 182 BMPs was evaluated on these sites of which 84.6% were fully implemented. A total of 5 water quality risks was identified.

Other significant findings and areas for improvement include:

- On slopes greater than 3%, water bars or turnouts were constructed in pre-suppression firebreaks on 56% of sites.
- Water bars or turnouts were installed in pre-suppression breaks at approaches to SMZs, roads and gullies on 52.4% of sites.
- Pre-suppression firebreaks were back bladed away from the edge of streams or roads on 67.9% of sites.
- Prescribed burning minimized soil exposure on 92.6% of sites. During the 1998 survey this figures was 81%.
- Wildfire breaks were rehabbed with appropriate water diversion measures on 2 (40%) of 5 sites.

Firebreaks by Region

In the Mountain region, 8.71 miles were evaluated on 6 sites. The percentage of miles in BMP Compliance was 74.1% and BMP Implementation was 60%. There was 1 water quality risk identified.

In the Piedmont region, 25.58 miles were evaluated on 14 sites. The percentage of miles in BMP Compliance was 88.2% and BMP Implementation was 75.0% with 4 water quality risks identified.

In the Upper Coastal Plain region, 20.72 miles of firebreak were evaluated on 7 sites. The percentage of miles in BMP Compliance was 100% and BMP implementation was 94.4%.

In the Lower Coastal Plain region, there were 25.22 miles of pre-suppression firebreaks evaluated on 20 sites of which 98.8% of the miles were in compliance. BMP Implementation was 93.9% with no water quality risks.

Firebreaks by Ownership

On NIPF land, approximately 62.52 miles of breaks were evaluated on 35 sites of which 95.6 % miles were in compliance. BMP Compliance ranged from a low of 88.2% in the Piedmont to a high of 100% in the Upper Coastal Plain. BMP Implementation was 84.3% and ranged from a low of 72.7% in the Mountains and Piedmont to a high of 94.6% in the Lower Coastal Plain. Four water quality risks were identified with 3 being in the Piedmont. Significant findings were that water diversions were adequately installed in pre-suppression breaks on only 64.7% of sites. Pre-suppression breaks were back bladed away from the edge of streams or roads on 76.2% of sites. Water bars or turnouts were installed at approaches to SMZs, roads, and gullies on 68.8% of sites.

For forest industry lands, there were 6.5 miles of pre-suppression breaks evaluated on 5 sites of which 96.9% of the miles were in compliance with BMPs. Compliance ranged from a low of 96.7% in the Lower Coastal Plain to a high of 100% in the Piedmont. No sites were evaluated in the Mountains or Upper Coastal Plain. BMP Implementation was 92.3% and ranged from a low of 90% in the Lower Coastal Plain to a high of 100% in the Piedmont. No water quality risks were identified on industry lands.

For public lands, there were 11.21 miles of pre-suppression breaks evaluated of which 76.5% of the miles were in compliance. Compliance ranged from a high of 86.9% in the Piedmont to a low of 71.6% in the mountains. No sites on public land were evaluated in the Upper or Lower Coastal Plain. The overall BMP Implementation rate was 63.2% and ranged from a high of 78.6% in the Piedmont to a low of 54.2% in the Mountains. Specific findings indicate that water diversions were adequately installed in pre-suppression breaks on 33% of the sites. Pre-suppression breaks were back bladed away from streams and roads on 33% of the sites. Water bars were not installed at SMZ borders at any of the applicable sites. All other BMPs had 100% implementation. One water quality risk in the Piedmont was identified.

CONTROL BURNING OUTSIDE SMZs

Table 8, page 33, provides a summary of the control burned sites by region, ownership and state totals. Approximately 2,962 acres were evaluated on 28 sites. Overall the percentage of acres in BMP Compliance was 98.4%. A total of 27 BMPs was evaluated and overall BMP Implementation was 92.6%. No water quality risks were identified.

Burning by Region

In the Mountain region, approximately 1,328 acres were evaluated on 4 sites. The percentage of acres in BMP compliance was 98.6. BMP implementation was 100% with no water quality risks identified.

In the Piedmont region, 783 acres were evaluated on 12 sites. The percentage of acres in compliance was 96.3% with BMP implementation at 83.3%. No water quality risks were identified.

In the Upper Coastal Plain, 200 acres were evaluated on 2 sites. The percentage of acres in BMP Compliance was 100% and BMP Implementation was 100% with no water quality risks identified.

In the Lower Coastal Plain region, 651 acres were evaluated on 10 sites. The percentage of acres in BMP Compliance was 99.8% and BMP Implementation was 100% with no water quality risks identified.

Burning by Ownership

On NIPF land, approximately 1,121 acres were evaluated on 17 sites. Overall the percentage of acres in BMP Compliance was 99.9% and ranged from a low of 99.6% in the Lower Coastal Plain to highs of 100% in the Piedmont and Upper Coastal Plain. No sites were evaluated in the Mountains. Overall BMP Implementation was 100%. There were no water quality risks identified.

On forest industry lands, approximately 399 acres were evaluated on 4 sites. All 4 sites occurred in the Lower Coastal Plain. Overall the percentage of acres in BMP Compliance was 100%. Overall BMP Implementation was 100% with no water quality risks identified.

For public lands, approximately 1,442 acres were evaluated on 7 sites. Overall the percentage of acres in BMP Compliance was 96.7%. BMP Implementation was 71.4% and ranged from a low of 33.3% in the Piedmont to a high of 100% in the Mountains. No public sites were evaluated in the Upper or Lower Coastal Plain. No water quality risks were identified.

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 as opposed to mechanical methods.

Table 9, page 34, provides a summary of the results by region, ownership and state totals. Approximately 2,083 acres were evaluated on 29 sites. Overall the percentage of acres in BMP Compliance was 99.6%. A total of 49 BMPs was evaluated and overall BMP Implementation was 98.0%. No water quality risks were identified.

Significant findings include:

- Machine planting on slopes of 5 -20% generally followed the contour on 85.7% of sites. No water quality risks were identified.
- On slopes greater than 21%, hand planting was conducted on 100% of sites.
- Pine establishment was avoided on specified wetlands identified in the EPA/COE memo.

Regeneration by Region

In the Mountain region, approximately 27 acres were evaluated on 1 site. Overall the percentage of acres in BMP Compliance was 100% and BMP Implementation was 100%. No water quality risks were identified.

In the Piedmont region, approximately 834 acres were evaluated on 15 sites. Overall the percentage of acres in BMP Compliance was 98.9% and BMP Implementation was 96.2%. No water quality risks were identified.

In the Upper Coastal Plain region, approximately 195 acres were evaluated on 1 site. Overall the percentage of acres in BMP Compliance was 100% and BMP Implementation was 100% with no water quality risks identified.

In the Lower Coastal Plain region, approximately 1,027 acres were evaluated on 12 sites. Overall the percentage of acres in BMP Compliance was 100% and BMP Implementation was 100% with no water quality risks identified.

Regeneration by Ownership

On NIPF land, approximately 1,279 acres were evaluated on 21 sites. Overall the percentage of acres in BMP Compliance was 99.3% and ranged from a low of 98.9% in the Piedmont to a high of 100% in both the Lower Coastal Plain. No sites were evaluated in the Mountains or Upper Coastal Plain. Overall BMP Implementation was 97.2% and ranged from a low of 96% in the Piedmont to a high of 100% in the Lower Coastal Plain. No water quality risks were identified.

For forest industry land, approximately 569 acres were evaluated on 6 sites. No sites were evaluated in the Piedmont and Upper Coastal Plain. Overall the percentage of acres in BMP Compliance was 100%. Overall BMP Implementation was 100%. No water quality risks were identified.

For public land, 235 acres were evaluated on 2 sites with one each in the Piedmont and Upper Coastal Plain region. BMP Compliance and Implementation rates were 100%.

FOREST FERTILIZATION OUTSIDE SMZs

Forest fertilization is a valuable silvicultural practice that enhances tree survival and growth. The primary nutrients applied are nitrogen and phosphorous. Applications should not be directed into water bodies or into SMZs. When conducted properly, forest fertilization poses little threat to water quality.

Table 10, page 35, provides a summary of the results by region, ownership and state totals. Approximately 225 acres were evaluated on 1 site which occurred on forest industry lands in the Lower Coastal Plain. Overall the percentage of acres in BMP Compliance was 100%. A total of 2 BMPs were evaluated and overall BMP Implementation was 100%. No water quality risks were identified.

Significant findings and areas for improvement include:

- The handling, mixing, loading, and application were conducted away from roadside ditches on 100% of sites.
- Fertilizer excess and containers were disposed of properly on all 3 sites.

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 GA EPD Emergency Response Program, fuel and oil spills should be immediately contained and cleaned up. In addition, chemical spills of 25 gallons or more of fuel and oil to soils, or spills of fuels or oils into waterways which produce a visible sheen should be immediately contained, cleaned up, and reported to GA EPD.

Table 11, page 36, provides a summary of the results by region, ownership and state totals. A total of 379 sites was evaluated. A total of 1,106 BMPs was evaluated of which 96.1% were implemented. Implementation ranged from a low of 93.8% in the Lower Coastal Plain to a high of 99.1% in the Upper Coastal Plain. No water quality risks were identified.

Significant findings and areas for improvement include:

- Equipment was serviced or washed away from areas including ephemeral areas (which may create a water quality problem) on 99.4% of sites.
- Oils, lubricants and containers were disposed of properly on 94.4% of sites.
- Trash, tires, batteries associated with the operation were removed or disposed of properly on 94.7% of sites.

Equipment Servicing by Region

In the Mountain region, a total of 67 BMPs was evaluated on 23 sites. Overall BMP Implementation was 97.0%.

In the Piedmont region, a total of 418 BMPs was evaluated on 142 sites. Overall BMP Implementation was 96.6%.

In the Upper Coastal Plain region, a total of 217 BMPs was evaluated on 75 sites. Overall BMP Implementation was 99.1%.

In the Lower Coastal Plain region, a total of 404 BMPs was evaluated on 139 sites. Overall BMP Implementation was 93.8%.

Equipment Servicing By Ownership

On 262 NIPF sites a total of 769 BMPs was evaluated. Overall BMP Implementation was 94.9% and ranged from a low of 91.9% in the Lower Coastal Plain to a high of 98.6% in the Upper Coastal Plain.

For forest industry land, a total of 298 BMPs was evaluated on 103 sites. Overall BMP Implementation was 99.3% and ranged from a low of 98.5% in the Lower Coastal Plain to highs of 100% in the Mountains, Piedmont, and Upper Coastal Plain.

For public land, a total of 39 BMPs was evaluated on 14 sites. Overall BMP Implementation was 94.9% and ranged from a low of 83.3% in the Lower Coastal Plain to highs of 100% in the Mountains, Piedmont, and Upper Coastal Plain.

OVERALL 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 366 streams encompassing approximately 234.68 miles on 277 sites was 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 the stream bank or channel integrity has been impaired by forestry practices.

Table 12, page 37, provides a summary of the results by region, ownership, and state totals by stream type. Overall a total of 234.68 miles of perennial and intermittent streams was evaluated statewide. The number of miles in BMP compliance was 225.01 or 95.9%. Compliance ranged from a low of 89.9% in the Mountains to a high of 97.3% in the Upper Coastal Plain.

A total of 84.35 miles of perennial stream was assessed on these sites. The number of miles in compliance was 81.16 or 96.2% and ranged from a low of 92.2% in the Mountains to a high of 97.3% in the Piedmont.

A total of 150.33 miles of intermittent stream was assessed on these sites. The number of miles in compliance was 143.85 or 95.7% and ranged from a low of 87.6% in the Mountains to a high of 98.1% in the Upper Coastal Plain. It was suspected that, because of several years of drought, the intermittent streams would be more difficult to recognize, especially in the Lower Coastal Plain, and that these streams might experience more impairment.

Significant findings and areas for improvement include:

- 220 water quality risks were identified statewide.
- There were 120 risks (54% of the total) involving stream crossings. The lack of water diversions at the stream approaches was the number one area of concern and accounted for 12.5% of the 120 risks. Secondly, improper culvert sizes and/or debris crossings that restricted flow accounted for 12.5% of the risks. Thirdly, even though there were 73 skidder fords, their impact only resulted in 11.7% of the 120 risks. The lack of stabilization of exposed soil over culverts accounted for 11% of the risks.
- Forest roads accounted for 37 risks (approximately 16.8% of the total). The lack of installing water diversions at SMZ boundaries accounted for 37.8% of those 37 risks. Secondly the lack of reshaping and stabilizing roads accounted for 33% of the water quality risks. Finally the lack of installing water diversions uphill of the SMZs accounted for 14% of the risks.
- Within the SMZ, there were 32 risks or 14.5% of the state total. Some water diversions on pre-existing and new roads actually directed runoff into streams and accounted for 28% of the 32 risks identified. Secondly, the lack of stabilization on roads within SMZs accounted for 12.5% of the 32 risks. Thirdly, skid trails and log decks that were located within SMZs accounted for 12.5% of the 32 risks identified in the SMZ. Removal of more than the recommended number of trees accounted for 6% of the risks. Logging debris left in streams accounted for 3% of the risks.
- Harvesting practices resulted in 19 risks or approximately 8.6% of the state total. The biggest concern was the lack of retiring skid trails that led into SMZs, which accounted for 52.6% of the 19 risks.
- Installation of firebreaks resulted in 5 risks or approximately 2% of the total risks. Mainly the lack of installing water diversion measures at stream approaches accounted for 60% of the 5 risks.
- The remaining practices contributed less than 1% of the total risks each.

Stream Compliance by Region

In the Mountains, a total of 19.29 miles of stream was assessed on 21 sites. Overall the percentage of miles in BMP Compliance was 89.9%. There were 23 water quality risks identified.

In the Piedmont, a total of 112.81 miles of stream was assessed on 116 sites. Overall the percentage of miles in BMP Compliance was 96.5%. There were 160 water quality risks identified.

In the Upper Coastal Plain, 39.39 miles were assessed on 47 sites. Overall the percentage of miles in BMP Compliance was 97.3%. There were 17 water quality risks identified.

In the Lower Coastal Plain, 63.19 miles of stream were assessed on 93 sites. Overall the percentage of miles in BMP Compliance was 95.6%. There were 20 water quality risks identified.

Stream Compliance by Ownership

On 186 NIPF land sites, approximately 113.41 miles of stream were assessed. Overall the percentage of miles in BMP Compliance was 93.2% and ranged from a low of 73.0% in the mountains to a high of 93.9% in the Lower Coastal Plain. A total of 213 water quality risks was identified. This represents 96.8% of the total 220 risks occurring statewide across all ownerships. The majority of the risks (156 or 73%) occurred in the Piedmont. Stream crossings accounted for 117 or 53% of the total 213 risks followed by roads and then practices within the SMZs as described above in the significant findings.

On forest industry land, approximately 92.28 miles of stream were assessed on 76 sites. Overall the percentage of miles in BMP Compliance was 99.6% and ranged from a low of 98.0% in the Mountains to highs of 99.9% in the Piedmont and Lower Coastal Plain. There were 5 water quality risks identified statewide. This represents 2.3% of the 220 total risks occurring statewide across all ownerships. The majority of the risks (3) found on industry lands occurred in the Piedmont and all 3 involved stream crossings. This accounts for 60% of the risks followed by roads and then practices within the SMZs as described above in the significant findings.

On public land, approximately 28.99 miles of stream were assessed on 15 sites. Overall the percentage of miles in BMP Compliance was 94.4% and ranged from a low of 85.2% in the Lower Coastal Plain to a high of 96.9% in the Piedmont. There were 2 water quality risks identified statewide. Streamside management zones accounted for one and firebreaks accounted for the other. This represents 0.9% of the statewide total.

The overall 95.9% 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.

SPECIAL MANAGEMENT AREAS (SMA)

This category applies to areas not normally addressed by the BMPs but should be provided some measure of protection. These areas include ephemeral areas, canals, ditches, gullies, seeps, sinkholes, and isolated sloughs and wetlands.

Statewide, there were 7 canals, 47 ditches, 201 ephemeral areas, 80 gullies, 17 seeps, 1 sinkhole, 4 sloughs, and 83 wetlands evaluated on 297 sites. They were adequately protected on 86.5% of the sites. Overall BMP implementation was 87.7%. There were 7 water quality risks identified.

SMAs by Region

In the Mountains, a total of 3 ditches, 25 ephemeral areas, 2 gullies, and 2 seeps was assessed on 25 sites. They were adequately protected on 64.0% of the sites. Mechanical site prep and high intensity burns were kept out of ephemeral areas above trout streams on 100% of sites. Overall BMP Implementation was 66.7%. There was one water quality risk identified.

In the Piedmont, a total of 12 ditches, 117 ephemeral areas, 55 gullies, 12 seeps, and 7 wetlands was assessed on 135 sites. They were adequately protected on 85.2% of the sites. Overall BMP implementation was 85.3%. There were 6 water quality risks identified.

In the Upper Coastal Plain, a total of 5 ditches, 30 ephemeral areas, 20 gullies, 3 seeps, and 13 wetlands was assessed on 48 sites. They were adequately protected on 95.8% of the sites. Overall BMP implementation was 96.4%. No water quality risks were identified.

In the Lower Coastal Plain, a total of 7 canals, 27 ditches, 29 ephemeral areas, 3 gullies, 1 sinkhole, 4 sloughs, and 63 wetlands was assessed on 89 sites. They were adequately protected on 89.9% of the sites. Overall BMP implementation was 91.7%. There were no water quality risks identified.

SMAs by Ownership

On 194 NIPF land sites, a total of 5 canals, 23 ditches, 142 ephemeral areas, 51 gullies, 14 seeps, 1 sinkhole, 3 sloughs, and 45 wetlands was assessed. They were adequately protected on 81.4% of the sites. Overall BMP implementation was 82.7%. There were 7 water quality risks identified.

On 85 forest industry sites, 24 ditches, 49 ephemeral areas, 19 gullies, 3 seeps, 1 slough, and 36 wetlands were assessed. They were adequately protected on 98.8% of the sites. Overall BMP implementation was 99.0%. There were no water quality risks.

On 23 Public land sites, a total of 2 canals, 10 ephemeral areas, 10 gullies, and 2 wetlands was assessed. They were adequately protected on 83.3% of the sites. Overall BMP implementation was 85.7%. There were no water quality risks identified.

OVERALL STATEWIDE RESULTS

Table 13, page 38, 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, approximately 49,789 acres were evaluated on 412 sites. Overall the percentage of acres in BMP Compliance was 99.4%. **This is a 0.3% increase from the 99.1% in the 2002 survey.** A total of 12,093 individual BMPs was evaluated for full implementation. Overall statewide implementation was 89.8%. **This is a 4.2% increase from the 2002 survey.** While these scores are not statistically different from the 2002 survey, **the most significant finding was that the number of significant water quality risks dropped from 362 in the 2002 survey down to 220 in the 2004 survey. This is a reduction or improvement of 39%.** Where BMPs were correctly applied, there were no water quality risks identified.

Overall Results by Region

In the Mountains, approximately 2,926 acres were evaluated on 26 sites. The percentage of acres in BMP Compliance was 97.0% and BMP Implementation was 80.9%. There were 23 water quality risks identified. *During the 2002 survey, BMP Compliance was 97.9% and BMP Implementation was 82.4% with 32 water quality risks identified.*

In the Piedmont, approximately 17,605 acres were evaluated on 152 sites. The percentage of acres in BMP Compliance was 99.3% and BMP Implementation was 89.0%. There were 160 water quality risks identified, which represents a **21.2% reduction (improvement)** from the 2002 survey. *During the 2002 survey, BMP Compliance was 98.3% and BMP Implementation was 85.2%. The number of water quality risks checked was 203.*

In the Upper Coastal Plain, approximately 12,083 acres were evaluated on 86 sites. The percentage of acres in BMP Compliance was 99.9% and BMP Implementation was 92.7%. There were 17 water quality risks identified, which represents an **82.5% reduction (improvement)** from the 2002 survey. *During the 2002 survey, BMP Compliance was 99.4% and BMP Implementation was 83.8% with 97 water quality risks identified.*

In the Lower Coastal Plain, approximately 17,175acres were evaluated on 148 sites. The percentage of acres in BMP Compliance was 99.5% and BMP Implementation was 91.4%. There were 20 water quality risks identified which represents a **33% reduction (improvement)** from the 2002 survey. *During the 2002 survey, BMP Compliance was 99.6% and BMP Implementation was 88.8% with 30 water quality risks identified.*

Overall Results by Ownership

On NIPF lands, approximately 26,348 acres were evaluated on 283 sites. The percentage of acres in BMP Compliance was approximately 99.2% and ranged from a low of 91.0% in the Mountains to a high of 99.8% in the Upper Coastal Plain. Overall BMP Implementation was 86.6% and ranged from a low of 75.0% in the Mountains to a high of 89.2% in the Lower Coastal Plain. There were 213 water quality risks identified with the majority of 156 (73%) occurring in the Piedmont. *During the 2002 survey, BMP Compliance was 98.6% and ranged from a low of 93.9% in the Mountain region to a high of 99.6% in the Upper Coastal Plain. BMP Implementation was 83.8% and ranged from a low of 79.8% in the Mountain region to a high of 85.9% in the Lower Coastal Plain. The number of water quality risks identified was 286 with the majority 168 (58%) occurring in the Piedmont.*

On forest industry (FI) lands, approximately 18,961 acres were evaluated on 107 sites. The percentage of acres in BMP Compliance was 99.9% and ranged from a low of 99.0% in the mountains to a high of 100% in the Lower Coastal Plains. Overall the BMP Implementation was 97.2% and ranged from a low of 92.4% in the mountains to a high of 97.8% in the Lower Coastal Plain. There were 5 water quality risks identified with 3 occurring in the Piedmont. **This reduction represents a 90% improvement from the 2002 survey.** *During the 2002 survey, BMP Compliance was 99.8% and ranged from a low of 98.0% in the Mountain region to a high of 99.9% in both Upper and Lower Coastal Plain. BMP Implementation was 90.7% and ranged from a low of 85.0% in the Mountain region to a high of 94.1% in the Lower Coastal Plain. The number of water quality risks identified was 50 with 23 occurring in the Upper Coastal Plain.*

On Public land, approximately 4, 480 acres were evaluated on 22 sites. The percentage of acres in BMP Compliance was 98.6% and ranged from a low of 97.6% in the Piedmont to a high of 100% in the Upper Coastal Plain. Overall BMP Implementation was 92.2% and ranged from a low of 83.0% in the Mountains to a high of 100% in the Upper Coastal Plain. There were 2 water quality risks identified which represents a **92.3% reduction or improvement** from the 2002 survey. *During the 2002 survey, BMP Compliance was 98.5% and ranged from a low of 97.6% in the Upper Coastal Plain region to a high of 99.7% in the Mountain region. BMP Implementation was 86.9% and ranged from a low of 83.8% in the Upper Coastal region to a high of 87.9% in the Mountain region. The number of water quality risks identified was 26.*

OVERALL STATEWIDE RESULTS FOR COMPLIANCE AND IMPLEMENTATION BY PRACTICE, REGION, AND OWNERSHIP

Tables 14 and 15, pages 39 and 40, are perhaps the most important tables in this document with regards to where to emphasize further training to improve compliance. They provide an overall summary and comparison of BMP Compliance and Implementation by practice, ownership, and by region. This will help guide future Master Timber Harvester, consulting forester, and landowner training to those ownerships and regions.

In the Mountain region more SMZ education is needed for NIPF land owners and managers; stream crossing education is needed for NIPF and forest industry lands; main haul road education is needed for NIPF land and forest industry landowners and managers.

In the Piedmont region, more education is needed for stream crossings on all ownerships; NIPF land ownerships and managers need more education regarding main haul roads.

In the Upper Coastal Plain region, all owners and managers need more stream crossing, main haul road construction, and firebreak and burning training.

In the Lower Coastal Plain region, roads and stream crossing education is needed for all ownerships.

EVALUATIONS OF BMP COMPLIANCE AND IMPLEMENTATION BY RIVER BASIN

These same type tables and analysis will be extracted for each of the 14 major river basins and sub-basins in Georgia in accordance to the Georgia River Basin Management Plan.

STATEWIDE TRENDS

Tables 16 and 17, pages 41 and 42, provide a summary and comparison of the previous surveys of 1991, 1992, 1998, 2002, with the 2004 survey.

Because the 1998 survey separated the number of acres for SMZs for the first time, a comparison could not be made with the previous surveys. This was also the case with stream crossings. Additionally, the number of acres for chemical applications and control burning were included with site preparation in the 1992 survey so a direct comparison could not be made. Forest Fertilization and Equipment Servicing were new categories identified. With the new SGSF protocol, more consistency has been added for a basis for comparison between the practices.

From a BMP compliance standpoint, with the exception of forest roads on NIPF and public lands, the other practices show improvements with each survey across all ownerships.

Table 16 provides a statewide BMP Compliance summary for each forest practice by ownership, and previous survey results. Significant observations are as follows:

- SMZs – 6% decrease in compliance on public lands
- Stream Crossings – significant increases of 21.1% on forest industry lands and 52.7% on public lands; no change on NIPF lands
- Forest Roads –slight increase of 3.4% on forest industry lands, significant increases of 13.4% on NIPF lands and 15% on public lands
- Harvesting –slight improvement on all lands with compliance at 99.3% or better
- Mechanical Site Preparation – 100% across all ownerships
- Chemical Applications – 100% across all ownerships
- Firebreak construction – Significant increases of 12% on NIPF lands and 38.3% on forest industry. Significant decrease of 18.4% on public lands
- Control Burning – remains steady near 100% across all ownerships
- Artificial Regeneration – at or near 100% across all ownerships.
- Fertilization - mainly practiced by forest industry.
- Equipment Servicing - only one year of data.
- Overall – steady improvements across all ownerships.

CONCLUSION

Since the 1991 survey, the percentage of acres in BMP compliance has increased from 86% to 99.4%. The percentage of BMP implementation has increased from 64.9% to 89.8%. The percentage of stream miles in compliance has remained around 95%. Since the 1998 survey, the number of water quality risks has decreased from 544 to 220 or 59.6%.

Existing roads and stream crossings were differentiated from newly constructed forest roads and crossings in this survey. Overall compliance of pre-existing roads was 94.7% and of newly constructed roads 83.7%. Stream crossings are still a concern. Pre-existing crossings scored 62.0% in compliance. New crossings scored 31.9% in compliance. Skidder fords and debris and dirt crossings made up 52% of the non-compliance for new crossings. Otherwise the other new type crossings would have scored a 66.7% compliance rate.

New stream crossings, especially culverts and bridges, are expensive to purchase and install. Because stream crossings are often not considered in the negotiation process during a timber sale, the responsibility and costs are often passed to the logger who is often not the timber buyer. Consequently, the type crossings the loggers use are not adequate. Better planning and understanding of who is going to bear the cost of culverted or bridged stream crossings at the time of timber negotiations should result in better compliance. Loggers are being encouraged through training workshops to purchase portable timber bridges that can be reused and are cost effective. This should cut down on the use of temporary culverts, skidder fords, and dirt and debris type crossings.

Future Master Timber Harvesters (MTH) workshops and other BMP training for landowners and foresters should result in improved rates of BMP compliance and implementation resulting in better stream protection. Future topics will include field instruction on installing stream crossings properly. Another statewide survey is scheduled for 2006.

“Bad actors” should be dealt with expeditiously and judiciously by the regulatory agencies to ensure a level playing field. The GFC, the Georgia Forestry Association, the University of Georgia School of Forest Resources, member companies of the American Forest & Paper Association who support the Sustainable Forestry Initiative, and the Southeastern Wood Producers Association support this concept. The Georgia SFI committee will continue to monitor and deal with “bad actors” as reported to their Inconsistent Practices sub-committee. Non-compliance cases will be referred to the state or federal regulatory agencies.

TABLE 1: Distribution of Sites with Streamside Management Zones Evaluated By Region Ownership, Acres Evaluated, %Compliance, BMP Assessed, and %BMPs Implemented, and # Water Quality Risks

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	11	37.5	75.5	105	74.3	3	5	61.5	99.0	52	94.2	0
Piedmont	84	405.75	94.3	751	89.2	19	25	529.3	99.9	223	98.7	1
U. C. Plain	27	94.86	96.4	211	93.4	3	20	237.38	97.5	169	97.6	0
L. C. Plain	64	272.62	93.4	577	87.7	5	26	248.1	99.9	223	98.2	0
Total	186	810.73	93.4	1,644	88.3	30	76	1,076.28	99.4	667	97.9	1
	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	5	127.95	89.3	27	66.7	1	21	226.95	89.6	184	78.8	4
Piedmont	7	80.06	98.4	60	91.2	0	116	1,015.11	97.6	1,034	91.4	20
U. C. Plain	0						47	332.24	97.2	380	95.3	3
L. C. Plain	3	8.96	77.7	22	90.9	0	93	529.68	96.2	822	90.6	5
Total	15	216.97	92.2	109	85.3	1	277	2,103.98	96.3	2,420	90.8	32

TABLE 2: Distribution of Sites with Stream Crossings Evaluated by Region, Ownership, and # Crossings Assessed, % Compliance, # BMPs Assessed, % BMPs Implemented and Water Quality Risks

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Crossings	% Crossings Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Crossings	% Crossings Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	8	18	16.7	87	56.3	9	3	5	80.0	41	90.2	1
Piedmont	56	110	32.7	645	72.9	86	10	17	82.4	129	96.9	1
U. C. Plain	11	19	21.1	115	69.6	10	14	22	63.6	194	94.3	1
L. C. Plain	40	101	30.7	385	73.2	12	19	40	85.0	253	96.8	0
Total	115	248	29.8	1,232	71.5	117	46	84	78.6	617	95.6	3

	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No Sites	Crossings	% Crossings Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Crossings	% Crossings Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	4	8	63.0	44	88.6	0	15	31	39.0	172	72.7	10
Piedmont	3	5	100	48	100	0	69	132	41.7	822	78.2	87
U. C. Plain	1	3	100	17	100	0	26	44	47.7	326	85.9	11
L. C. Plain	1	1	100	17	100	0	60	142	46.5	655	83.1	12
Total	9	17	82.4	126	96.0	0	170	349	44.1	1,975	80.6	120

TABLE 3: Forest Road Sites

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Miles	% Miles Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Miles	% Miles Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	15	5.21	73.0	121	74.4	2	6	6.6	92.0	52	92.3	0
Piedmont	103	68.66	83.5	811	83.6	32	27	34.02	97.9	240	95.0	1
U. C. Plain	55	45.2	89.4	356	83.4	1	26	36.55	99.6	221	97.3	0
L. C. Plain	83	63.15	95.2	496	86.5	1	43	56.91	98.6	303	96.7	0
Total	256	182.22	88.7	1,784	83.7	36	102	134.08	98.4	816	96.1	1

	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No. Sites	Miles	% Miles Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Miles	% Miles Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	5	3.3	100	35	100	0	26	15.11	87.0	208	83.2	2
Piedmont	9	15.29	99.7	59	96.6	0	139	117.97	98.7	1,110	86.8	33
U. C. Plain	2	9.6	100	16	100	0	83	91.35	94.6	593	89.0	1
L. C. Plain	4	2.39	100	20	100	0	130	122.45	96.9	819	90.6	1
Total	20	30.58	99.8	130	98.5	0	378	346.88	93.4	2,730	88.1	37

TABLE 4: Harvesting Operations

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	15	523.47	92.2	154	83.8	5	6	589.5	99.2	61	90.2	0
Piedmont	108	7,967.32	99.4	1,018	92.7	10	28	5,008.5	99.7	269	98.1	0
U. C. Plain	57	5,741.81	99.9	444	93.2	2	25	3,639.87	100	210	98.6	0
L. C. Plain	93	7,622.63	99.2	627	95.5	2	32	4,164.47	100	229	99.1	0
Total	273	21,855.23	99.3	2,243	93.0	19	91	13,402.34	99.9	769	97.9	0
	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	1	69.3	100	9	100	0	22	1,182.27	96.2	224	81.2	5
Piedmont	5	799.04	100	48	97.9	0	141	13,744.86	99.5	1,335	94.0	10
U. C. Plain	2	1,013.2	100	15	100	0	84	10,394.88	99.9	669	95.1	2
L. C. Plain	4	268.04	100	26	100	0	129	12,055.14	99.5	882	96.6	2
Total	12	2,149.58	100	98	99.0	0	375	37,407.15	99.5	3,110	94.4	19

TABLE 5: Mechanical Site Preparation Operations

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0						0					
Piedmont	0						0					
U. C. Plain	1	2.0	100	2	100	0	2	235.0	100	6	100	0
L. C. Plain	6	543.5	100	21	100	0	18	2,086.0	100	82	98.8	0
Total	7	545.5	100	23	100	0	20	2,321.0	100	88	98.9	0

	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0						0					
Piedmont	0						0					
U. C. Plain	1	195.0	100	2	100	0	4	432.0	100	10	100	0
L. C. Plain	0						24	2,629.5	100	103	99.0	0
Total	1	195.0	100	2	100	0	28	3,061.5	100	113	99.1	0

TABLE 6: Chemical Site Preparation Operations

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0						2	162.0	100	4	100	0
Piedmont	10	708.6	100	19	100	0	1	247.2	100	2	100	0
U. C. Plain	0						4	529.29	100	8	100	0
L. C. Plain	1	27.3	100	2	100	0	1	30.0	100	2	100	0
Total	11	735.9	100	21	100	0	8	968.49	100	16	100	0

	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0						2	162.0	100	4	100	0
Piedmont	4	241.78	100	7	100	0	15	1,197.58	100	28	100	0
U. C. Plain	0						4	529.29	100	8	100	0
L. C. Plain	0						2	57.3	100	4	100	0
Total	4	241.78	100	7	100	0	23	1,946.17	100	44	100	0

TABLE 7: Firebreaks

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Miles	% Miles Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Miles	% Miles Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	2	1.1	90.9	11	72.7	1	0					
Piedmont	10	21.58	88.2	55	72.7	2	1	0.4	100	3	100	0
U. C. Plain	7	20.72	100	18	94.4	0	0					
L. C. Plain	16	19.12	99.4	56	94.6	0	4	6.1	96.7	10	90	0
Total	35	62.52	95.6	140	84.3	4	5	6.5	96.9	13	92.3	0

	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No. Sites	Miles	% Miles Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Miles	% Miles Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	4	7.61	71.62	24	54.2	0	6	8.71	74.1	35	60.0	1
Piedmont	3	3.6	86.9	14	78.6	1	14	25.58	88.2	72	75.0	4
U. C. Plain	0						7	20.72	100	18	94.4	0
L. C. Plain	0						20	25.22	98.8	66	93.9	0
Total	7	11.21	76.5	38	63.2	1	47	80.23	93.0	182	84.6	5

TABLE 8: Control Burned Sites

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0						0					
Piedmont	9	669.0	100	9	100	0	0					
U. C. Plain	2	200.0	100	2	100	0	0					
L. C. Plain	6	252.3	99.6	6	100	0	4	399.0	100	3	100	0
Total	17	1,121.3	99.9	17	100	0	4	399.0	100	3	100	0

	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	4	1,327.68	98.6	4	100	0	4	1,327.68	98.6	4	100	0
Piedmont	3	114.18	74.4	3	33.3	0	12	783.18	96.3	12	83.3	0
U. C. Plain	0						2	200.0	100	2	100	0
L. C. Plain	0						10	651.3	99.8	9	100	0
Total	7	1,441.86	96.7	7	71.4	0	28	2,962.2	98.4	27	92.6	0

TABLE 9: Artificial Regeneration Operations

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0						1	27.0	100	2	100	0
Piedmont	14	793.95	98.9	25	96.0	0	0					
U. C. Plain	0						0					
L. C. Plain	7	485.46	100	11	100	0	5	542.0	100	9	100	0
Total	21	1,279.41	99.3	36	97.2	0	6	569.0	100	11	100	0

	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No.. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0						1	27.0	100	2	100	0
Piedmont	1	39.88	100	1	100	0	15	833.83	98.9	26	96.2	0
U. C. Plain	1	195.0	100	1	100	0	1	195.0	100	1	100	0
L. C. Plain	0						12	1,027.46	100	20	100	0
Total	2	234.88	100	2	100	0	29	2,083.29	99.6	49	98.0	0

TABLE 10: Forest Fertilization Operations

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0						0					
Piedmont	0						0					
U. C. Plain	0						0					
L. C. Plain	0						1	225.0	100	2	100	0
Total	0						1	225.0	100	2	100	0

	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	0						0					
Piedmont	0						0					
U. C. Plain	0						0					
L. C. Plain	0						1	225.0	100	2	100	0
Total	0						1	225.0	100	2	100	0

TABLE 11: Equipment Servicing Operations

	NIPF				FOREST INDUSTRY			
Region	No. Sites	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	14	42	95.2	0	6	18	100	0
Piedmont	109	321	95.6	0	28	82	100	0
U. C. Plain	50	147	98.6	0	23	65	100	0
L. C. Plain	89	259	91.9	0	46	133	98.5	0
Total	262	769	94.9	0	103	298	99.3	0

	PUBLIC				TOTAL ALL LANDOWNERS			
Region	No. Sites	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	3	7	100	0	23	67	97.0	0
Piedmont	5	15	100	0	142	418	96.6	0
U. C. Plain	2	5	100	0	75	217	99.1	0
L. C. Plain	4	12	83.3	0	139	404	93.8	0
Total	14	39	94.9	0	379	1,106	96.1	0

TABLE 12: Stream Types

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Intermittent Miles Assessed	% Miles Compliance	Perennial Miles Assessed	% Miles Compliance	Total % Miles Compliance	No. Sites	Intermittent Miles Assessed	% Miles Compliance	Perennial Miles Assessed	% Miles Compliance	Total % Miles Compliance
Mountains	11	2.89	65.1	0.92	100	73.0	5	4.40	97.7	0.8	100	98.0
Piedmont	84	35.51	94.6	18.11	92.3	93.8	25	21.95	100	20.22	99.8	99.9
U. C. Plain	27	10.65	96.4	4.74	89.2	94.2	20	18.55	99.0	5.45	100	99.3
L. C. Plain	64	33.10	93.2	7.49	97.2	93.9	26	18.22	99.8	2.69	100	99.9
Total	186	82.15	93.2	31.26	93.2	93.2	76	63.12	99.5	29.16	99.8	99.6

	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No. Sites	Intermittent Miles Assessed	% Miles Compliance	Perennial Miles Assessed	% Miles Compliance	Total % Miles Compliance	No. Sites	Intermittent Miles Assessed	% Miles Compliance	Perennial Miles Assessed	% Miles Compliance	Total % Miles Compliance
Mountains	5	2.51	96.0	7.77	90.5	92.0	21	9.80	87.6	9.49	92.2	89.9
Piedmont	7	1.36	63.2	15.66	99.8	96.9	116	58.82	95.9	53.99	97.3	96.5
U. C. Plain	0						47	29.20	98.1	10.19	95.0	97.3
L. C. Plain	3	1.19	100	0.5	50.0	85.2	93	52.51	95.6	10.68	95.7	95.6
Total	15	5.06	88.1	23.93	95.7	94.4	277	150.33	95.7	84.35	96.2	95.9

TABLE 13: Overall Distribution of Sites

	NIPF						FOREST INDUSTRY					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	15	560.97	91.0	535	75.0	21	6	840.0	99.0	236	92.4	1
Piedmont	114	10,544.62	99.2	3,757	86.4	156	28	5,785.0	99.8	972	97.5	3
U. C. Plain	57	6,038.67	99.8	1,329	89.2	16	26	4,641.54	99.9	892	97.3	1
L. C. Plain	97	9,203.81	99.2	2,496	87.9	20	47	7,694.57	100	1,297	97.8	0
Total	283	26,348.07	99.2	8,117	86.6	213	107	18,961.11	99.9	3,397	97.2	5

	PUBLIC						TOTAL ALL LANDOWNERS					
Region	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks	No. Sites	Acres	% Acres Compliance	BMPs Assessed	% BMPs Implemented	WQ Risks
Mountains	5	1,524.93	98.0	156	83.0	1	26	2,925.9	97.0	927	80.9	23
Piedmont	10	1,275.48	97.6	264	94.7	1	152	17,604.56	99.3	4,993	89.0	160
U. C. Plain	3	1,403.20	100	58	100	0	86	12,083.41	99.9	2,279	92.7	17
L. C. Plain	4	277.0	99.3	101	96.0	0	148	17,175.38	99.5	3,894	91.4	20
Total	22	4,480.07	98.6	579	92.2	2	412	49,789.25	99.4	12,093	89.8	220

TABLE 14: % BMP Compliance by Practice, Region, and Ownership

	Mountain			Piedmont			Upper Coastal Plain			Lower Coastal Plain			Subtotal			State Total
Practice	NIPF	FI	Public	NIPF	FI	Public	NIPF	FI	Public	NIPF	FI	Public	NIPF	FI	Public	All
SMZs (acres)	75.5	99.0	89.3	94.3	99.9	98.4	96.4	97.5		93.4	99.9	77.7	93.4	99.4	92.2	96.3
Stream Xings (#)	16.7	80.0	62.5	32.7	82.4	100	21.1	63.6	100	30.7	85.0	100	29.8	78.6	82.4	44.1
Forest Roads (miles)	72.9	92.4	100	83.5	97.9	99.7	89.4	99.6	100	95.2	98.6	100	88.7	98.4	99.8	93.4
Harvesting (acres)	92.2	99.2	100	99.4	99.7	100	99.9	100	100	99.2	100	100	99.3	99.9	100	99.5
Mech. SP (acres)							100	100	100	100	100		100	100	100	100
Chem. SP (acres)		100		100	100	100		100		100	100		100	100	100	100
Firebreaks (miles)	90.9		71.6	88.2	100	86.9	100			99.4	96.7		95.6	96.9	76.5	93.0
Burning (acres)			98.6	100		74.4	100			99.6	100		99.9	100	96.7	98.4
Artif. Regen. (acres)		100		98.9		100			100	100	100		99.3	100	100	99.6
Fertilization (acres)											100			100		100
Overall acres	91.1	99.0	98.0	99.2	99.8	97.6	99.8	99.9	100	99.2	100	99.3	99.2	99.9	98.6	99.4
Streams (miles)	73.5	98.1	92.0	93.8	99.9	96.9	94.2	99.3		93.9	99.9	85.2	93.2	99.6	94.4	95.9

TABLE 15: % BMP Implementation by Practice, Region, and Ownership

	Mountain			Piedmont			Upper Coastal			Lower Coastal			Subtotal			State Total
Practice	NIPF	FI	Public	NIPF	FI	Public	NIPF	FI	Public	NIPF	FI	Public	NIPF	FI	Public	All
SMZs	74.3	94.2	66.7	89.2	98.7	91.2	93.4	97.6		87.7	98.2	90.9	88.3	97.9	85.3	90.8
Stream Xings	56.3	90.2	88.6	72.9	96.9	100	69.6	94.3	100	73.2	96.8	100	71.5	95.6	96.0	80.6
Forest Roads	74.4	92.3	100	83.6	95.0	96.6	83.4	97.3	100	86.5	96.7	100	83.7	96.1	98.5	88.1
Harvesting	83.8	90.2	100	92.7	98.1	97.9	93.2	98.6	100	95.5	99.1	100	93.0	97.9	99.0	94.4
Mech. SP							100	100	100	100	98.8		100	98.9	100	99.1
Chem. SP		100		100	100	100		100		100	100		100	100	100	100
Firebreak	72.7		54.2	72.7	100	78.6	94.4			94.6	90.0		84.3	92.3	63.2	84.6
Burning			100	100		33.3	100			100	100		100	100	71.4	92.6
Artif. Regen.		100		96.0		100			100	100	100		97.2	100	100	98.0
Fertilization											100			100		100
Equip. Serv	95.2	100	100	95.6	100	100	98.6	100	100	91.9	98.5	83.3	94.9	99.3	94.9	96.1
Overall	75.3	92.4	82.7	86.4	97.5	94.7	89.2	97.3	100	87.9	97.8	96.0	86.6	97.2	92.2	89.8

TABLE 16: Statewide Trends in BMP Compliance by Ownership and Practice

	NIPF					Industry					Public					All				
Practice	1991	92	98	02	04	1991	92	98	02	04	1991	92	98	02	04	1991	92	98	02	04
SMZs (ac)	NA	NA	84.3	93.2	93.4	NA	NA	95.7	99.0	99.4	NA	NA	89	98.5	92.2	NA	NA	89.3	96.6	96.3
Stream Crossings (#)	NA	NA	8.2	30.5	29.8	NA	NA	51.0	57.5	78.6	NA	NA	9.0	29.7	82.4	NA	NA	18.2	38.1	44.1
Forest Roads (mi)	64	86	80.9	75.3	88.7	77	89	92	95.0	98.4	85	96	99.9	84.8	99.8	69	87.4	87.7	84.3	93.4
Harvesting (ac)	75	91	97.6	98.9	99.3	92	93	99.5	99.8	99.9	75	97	99.7	97.8	100	83.2	91.7	98.5	99.1	99.5
Mech. Site Prep (ac)	93	95	99.6	99.6	100	95	98	100	99.9	100	97		100	100	100	94.2	96.5	99.8	99.9	100
Chem. Site Prep (ac)	100	100	100	100	100	100	100	100	99.9	100				100	100	100	100	100	100	100
Firebreaks (mi)				83.6	95.6				58.6	96.9				94.9	76.5				81.0	93.0
Burning (ac)	92		93	99.1	99.9	76		94.6	100	100	99		100	100	96.7	84.6		94.0	99.7	98.4
Art. Regen. (ac)	96	100	99.7	95.6	99.3	96	100	99.8	100	100	98	100	100	100	100	96	100	99.0	98.8	99.6
Fertilization (ac)									100	100								100	100	100
Overall (ac)	80.0	91.0	97.4	98.6	99.2	93.0	93.0	99.1	99.8	99.9	77.0	97.0	99.4	98.5	98.6	86	92	98.2	99.1	99.4
Streams (miles)	94.4	94.9	84.6	90.9	93.2	97.1	96.9	98.5	97.7	99.6	91.7	100	100	97.6	99.6	95.8	95.5	90.7	94.2	95.9

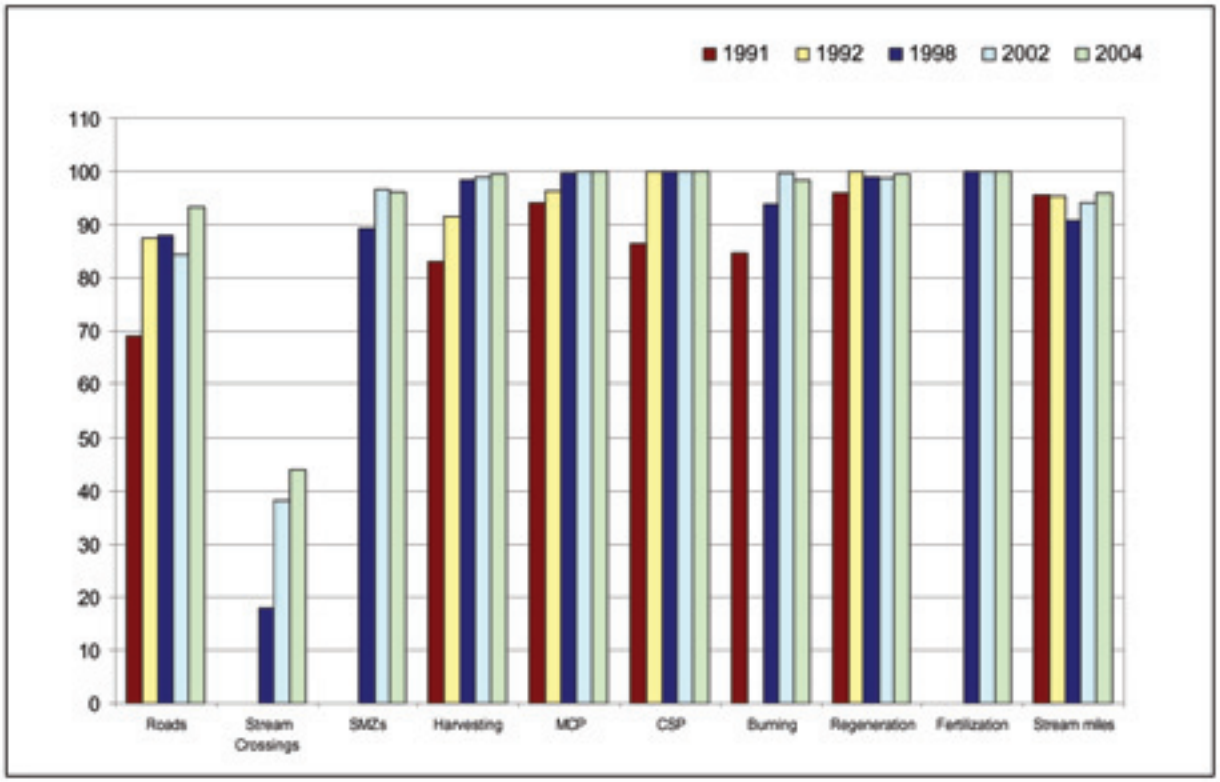
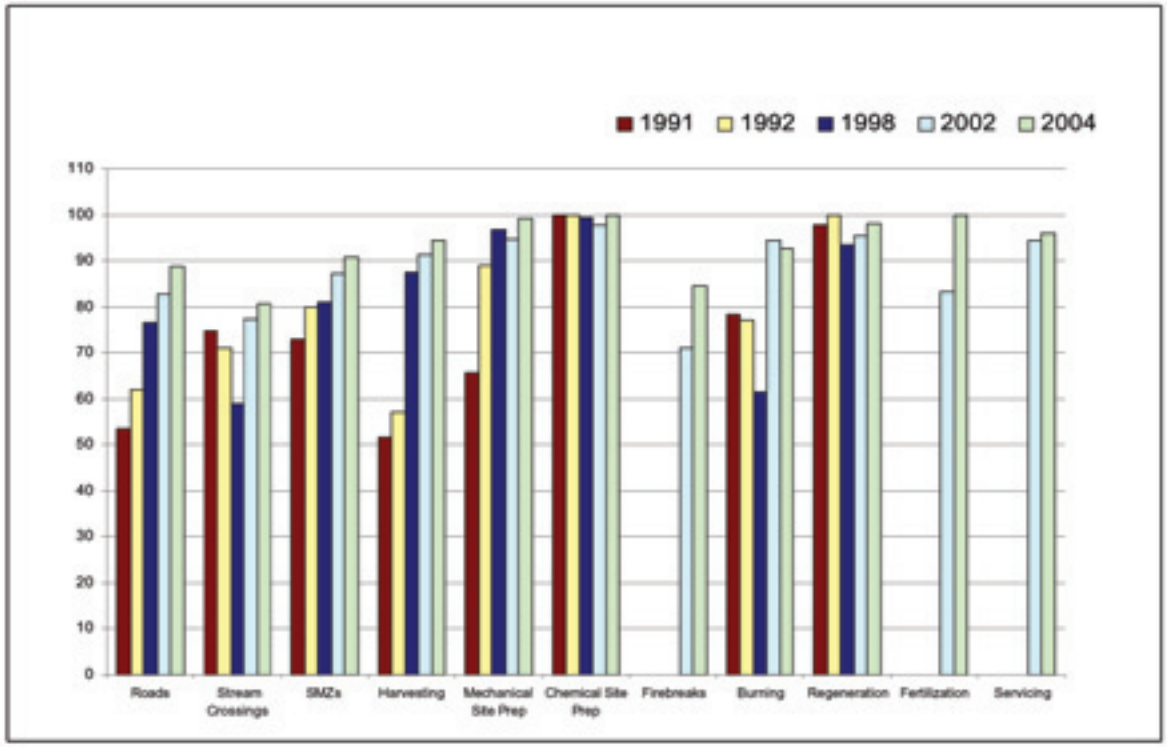


TABLE 17: Statewide Trends in BMP Implementation by Ownership and Practice

	NIPF					Industry					Public					All				
Practice	**1991**	**92**	**98**	**02**	**04**	**1991**	**92**	**98**	**02**	**04**	**1991**	**92**	**98**	**02**	**04**	**1991**	**92**	**98**	**02**	**04**
SMZs	75.9	78	76.9	83.7	88.3	82.8	81	91.2	93.7	97.9	81.1	100	84.0	92.0	85.3	72.8	80	80.9	87.1	90.8
Stream Crossings	72.2	65	49.2	72.6	71.5	77.3	81	78.6	87.2	95.6	90.9	88	63.0	79.0	96.0	74.7	71	58.8	77.4	80.6
Forest Roads	40.8	58	74.0	81.4	83.7	61.7	68	81.0	85.9	96.1	77.5	75	94.0	80.5	98.5	53.4	62	76.6	82.7	88.8
Harvesting	46.2	53	86.3	90.5	93.0	59.8	60	90.5	94.0	97.9	70.7	91	88.0	91.7	99.0	51.6	57	87.3	91.4	94.4
Mech. Site Prep	65.7	87	95.7	96.2	100	66.4	86	98.0	93.6	98.9	54.5		100	100	100	65.6	89	96.8	94.6	99.1
Chem. Site Prep	100	100	98.8	100	100	100	100	100	96.4	100				100	100	100	100	99.3	97.8	100
Firebreaks				69.6	84.3				55.6	92.3				88.2	63.2				71.1	84.6
Burning	77.2	92	61.8	90.9	100	81.6	60	58.8	100	100	70.0		100	100	71.4	78.4	77	61.5	94.4	92.6
Art.Regen.	96.5	100	90.8	92.6	97.2	100		98.0	100	100	100		100	100	100	97.8	100	93.4	95.4	98.0
Fertilization									83.3	100								99.3	83.3	100
Equip. Srvcng				93.3	94.9				97.1	99.3				94.3	94.9				94.4	96.1
Overall	61.4	63.0	75.4	83.8	86.6	72.0	71.0	86.3	90.7	97.2	78.8	86.0	84.0	86.9	92.2	64.9	67.0	78.7	85.9	89.8



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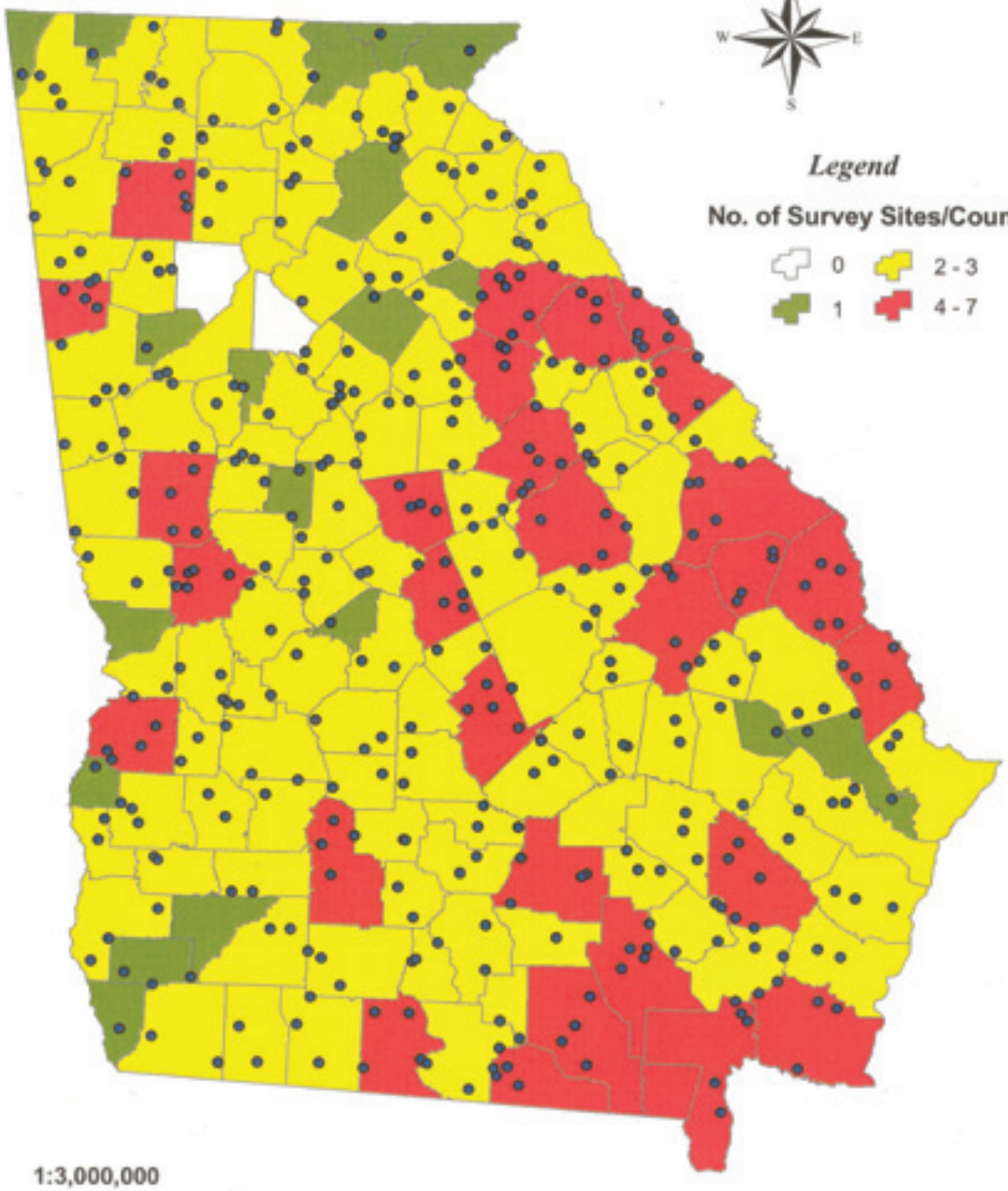

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Disclaimer:

This map is for illustrative purposes and does not imply the expression of any opinion on the part of the BMP Survey, GFC, or the ownership concerning the location of any survey sites or concerning the delimitation of its frontiers or boundaries.

Source: Georgia Forestry Commission
Produced by: Constance Buford, GIS Coordinator

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