

# Evaluation of Methods and Procedures for Best Management Practices Monitoring and Reporting in the Southeast United States

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**ABSTRACT:** Every state in the Southeast US has developed a set of Best Management Practices (BMPs) to protect water quality during silvicultural activities. These BMPs are either voluntary or quasi-regulatory in the Southeast, though water quality protection is mandatory under the Clean Water Act. Although the Southern Group of State Foresters (SGSF) has adopted a Silvicultural BMP Implementation Monitoring Protocol, each state Forestry agency has developed a particular inspection and reporting methods, that accompany their own set of BMPs, to comply with EPA requirements. Inconsistencies among the States have led to a concern about the ability to measure progress within a particular state, and to make meaningful comparisons between states. This paper evaluates the methods and procedures that each state has developed for both operational inspections as well as implementation and effectiveness inspections for EPA reporting purposes. Four of the nine state forestry agencies reviewed had the right to trespass and only one state had enforcement powers. The number of sites inspected for EPA reporting purposes varied between 200 and 400. Site selection procedures included aerial reconnaissance, timber receipts and geographical stratification. This paper concludes that the development and utilization of uniform terminology, assessment methodology and standard reporting procedures, by states, would be beneficial to address the inconsistencies identified.

## INTRODUCTION

The Clean Water Act of 1972, particularly section 208, exempts timber-harvesting activities from acquiring a permit for nonpoint pollution discharge (known as Section 404 permit) as long as best management practices are used to protect water quality. The EPA has since required proof that these BMPs are being implemented (Ryder 2003). The monitoring of implementation and effectiveness of these practices will help foresters and other land managers understand the value of these techniques and help in making sound decisions to protect water quality.

Generally, the southern states have employed a voluntary non-regulatory approach to BMP implementation and monitoring. This system relies heavily on education and other incentives like cost-sharing to encourage BMPs (Ice 1985). In comparison, the Pacific Northwest states and some Northeastern have developed Forest Practices Acts, in which silvicultural activities are highly regulated. A study in Virginia showed that a non-regulatory BMP system, compared to a hypothetical regulatory system, resulted in a better costs benefits ratio (Aust et al 1996). The EPA has

approved silviculture BMPs for each southern state (SGSF 2002). Each state has also developed individual monitoring and formal reporting systems.

Inspections of BMPs are undertaken to determine if technical specifications are being met, also called compliance monitoring, and to reveal if the implementation actually protects site and water quality, also known as effectiveness monitoring (Ellefson 2001). Another goal of inspecting is for enforcement of water quality infringements. Other objectives include education, environmental and site quality protection and detection of any adjustments that may need to be made to the technical requirements of BMP implementation.

Monitoring inspections occur either during or after closure of routine operations or formal reporting of BMP implementation. Figure 1 illustrates how these two levels reveal information about BMP compliance and water quality protection.

Due to the importance of protecting and evaluating impacts of silviculture on water quality, the recommended protocol of the SGSF provides a recommended set of standards and inspecting procedures to promote better management and

understanding of the rates of BMP implementation throughout a state.

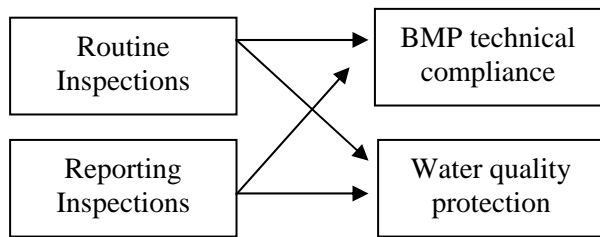


Figure 1. Flow chart demonstrating how routine monitoring inspections and formal reporting inspections relate to BMP compliance and water quality protection.

Continuity among the states would encourage understanding of the progress, effectiveness and compliance of BMPs within the states as well as promote meaningful comparisons between the states.

## METHODS

Information regarding BMP inspecting and reporting procedures, on all southern states with a coastline, was collected. Phone interviews were held with most state BMP coordinators or their equivalents. BMP manuals and reporting surveys were obtained online and through the state forestry offices where possible. Additional information was collected through journal articles and conference proceedings, including the Southern Group of State Foresters (SGSF) Silviculture BMP Implementation Monitoring Protocol (SGSF 2002).

## TERMINOLOGY

Some confusion exists regarding how to refer to the types of inspections and or visits that are carried out by the state agency. ‘Monitoring’ and ‘Auditing’ are terms often used to describe these inspections. The terms courtesy exam, courtesy audits and self-audits are used in the South. The Oxford American Dictionary (1980) defines the terms as follows:

- Monitor: to watch over, to record or test or control the working of.
- Audit: an official examination of accounts to see that they are in order.

- Inspect: to examine officially, to visit in order to make sure that certain rules and standards are being observed.

In this paper, we will use the term inspection for active site visits by the state agency – regardless of the purpose of their visit. Each state may refer to these visits using its own terminology.

## KEY RESULTS

A summary of the BMP inspecting protocols from the selected Southern states is broken down in Table 1. Notification of harvest operations to the state forestry agency is categorized as not required, voluntary or mandatory. Active harvest and closeout inspections are addressed through a courtesy exam or audit, performed upon request from the landowner or logger, mandatory or as response from citizen complaint. Both notification and active/closeout inspections are performed for routine harvest activities. State forestry agencies are responsible for developing and implementing BMPs, though Virginia is the only state responsible for enforcing water quality infringements. Four of the nine states examined have the right to trespass to inspect for BMP implementation and compliance. The number of sites inspected for formal reporting is listed along with whether the state monitors for water quality, BMP compliance or both.

The following is a brief summary from each of the states:

**Alabama:** Alabama has voluntary BMPs. They do not routinely visit individual logging sites unless they are invited by the landowner for a preharvest consultation, or are responding to a complaint. They do pursue an invitation upon the discovery of an operation. The Alabama Forestry Commission does not have the right to trespass. Six random sites per county per year in half the state (total of 34 counties per year) are selected for ‘aerial monitoring’ of BMP implementation. The site is evaluated on implementation for each BMP category on a yes/no basis and also reports overall implementation (Greis *pers. com.* 2003; Hyland *pers. com.* 2003). The Commission follows most of the protocols set forth in the SGSF protocol. The Alabama Department of

Environmental Management handles the enforcement of water quality impairment and penalties (Hyland *pers. com.* 2003). To date there

are no published reports on BMP implementation (Prud'homme and Greis 2002).

**Table 1. Summary of information gathered by state.**

States	Routine operations				EPA Reporting	
	Notification	Active Harvest / Closeout Inspection	Enforcement Agency	Right to Trespass	Number of Sites Inspected	Inspect for Water Quality or BMP Implementation
Alabama	N	CE	N	N	200	BMP
Florida	V	CA	N	N	>200	Both
Georgia	V	CE	N	Y	>400	Both
Louisiana	N	~	N	Y	>250	BMP
Mississippi	N	~	N	Y	>250	BMP
North Carolina	V	SA	N	Y	>200	Both
South Carolina	N	CE	N	N	>200	Both
Texas	N	~	N	N	150	Both
Virginia	Y	Y	Y	Y	>50	Both

N = no, Y = yes/always, V = voluntary  
 CE = courtesy exam, SA = self audit, CA = courtesy audit  
 ~ = depends on invitation from appropriate party

**Florida:** Florida has a quasi-regulatory system of BMP enforcement and has recently initiated a 'notification rule' (Vowell *pers. com.* 2003). Upon request from loggers, landowners, foresters or timber buyers, a BMP forester will perform a courtesy audit. These can take place before, during or after a harvesting operation. Usually those sites that have a courtesy audit before or during harvest have another after closeout. Since 1981 and every other year, Florida conducts a statewide implementation survey to determine BMP compliance (Vowell *pers. com.* 2003). These surveys comply with the SGSF framework for

aircraft or on the ground and distributed by timber receipts (Prud'homme Greis 2002). They examine 14 BMP categories and record yes/no answers then report compliance as a percentage (Prud'homme Greis 2002). The Department of Environmental Regulation is responsible for handling water quality violations. Vowell also stated, "Florida also evaluates potential water quality impacts by assessing significant risk, and with follow-up actions – both of which area also required for compliance with the SGSF Framework" (Vowell *pers. com.* 2003).

Silviculture BMP Implementation Monitoring. Over 200 sites are randomly selected for reporting by

**Georgia:** Georgia has voluntary BMPs except in certain sensitive areas like public water supply watersheds, waterways that flow over 400 cfs and

mountaintops that exceed 2,200 feet in elevation (Green *pers. com.* 2003). Stream crossings and wetlands are regulated under the CWA and must meet baseline standards to be exempt from Section 404 permitting (Green *pers. com.* 2003). Some counties in Georgia that have logging ordinances require written notification of a harvesting operation (Green *pers. com.* 2003). Routine inspections are made monthly and reporting inspections are conducted biennially. Routine BMP implementation inspections are performed on a sample of active harvest or site preparation operations through a courtesy exam program similar to South Carolina. This program utilizes a series of questions answered by either yes/no/ or not applicable. After a harvest is examined and closed out, a follow-up inspection is performed. During the biennial reporting inspections random site selection for reporting is determined using a stratified sample based on timber harvesting across ownership classes in each county resulting in 420 sites for 2002. Implementation in various BMP categories is reported as percent compliance based on the yes/no/na questions (Prud'homme Greis 2002). The information can be classified by ownership classes, physiographic region and river basin (Green *pers. com.* 2003). They attempt to perform the statewide reporting survey every 2 years and follow the SGSF protocol for implementation monitoring of BMPs. The Georgia Environmental Protection Division is responsible for enforcing water quality violations (Green *pers. com.* 2003).

**Louisiana:** Louisiana Department of Agriculture and Forestry has voluntary BMPs except in wetland and other sensitive areas. They do not routinely inspect active or closed logging operations but will do an inspection upon invitation by landowner or responding to a complaint. Every three years they select at least 250 sites (or amount needed to achieve 95% confidence of BMP implementation) using aerial reconnaissance and inspect for BMP compliance using the SGSF protocol for Silviculture BMP Implementation Monitoring (Heaton *pers. com.* 2003; Thomas *pers. com.* 2003). Reporting is performed across 5 BMP categories and is listed as exceeding guidelines, full implementation, minor departure of BMP (still considered in compliance), needed but not applied or not applicable (Prud'homme and Greis 2002). BMP compliance is reported as percentage of implementation. All enforcement issues and fines are handled through the Louisiana Department of Environmental Quality.

**Mississippi:** The Mississippi Forestry Commission has voluntary, nonregulatory BMPs but they will offer advice upon invitation. Routine inspections are performed on a discovery basis. Mississippi forest rangers do have the right to trespass for water quality monitoring. Attempts are made to mitigate water quality violations but penalties are handled through the Mississippi Department of Environmental Quality. Mississippi Forestry Commission has adopted SGSF recommended framework for BMP implementation inspecting (Sampson *pers. com.* 2003). To date there is no published formal report on BMP implementation though the state is undergoing changes in their BMP monitoring procedures (Prud'homme and Greis 2002).

**North Carolina:** North Carolina, like Florida and Virginia, has quasi-regulatory system that involves a mandatory water quality program though BMPs are voluntary. They have a set of 'forest practice guidelines' (FPGs) pertaining to the protection of water quality that contain nine performance standards pertaining to all site disturbing silvicultural activities. BMPs are recommended by the FPGs for protecting water quality. (Gerow *pers. com.* 2003; Gueth *pers. com.* 2003). Rangers and foresters will perform routine water quality inspections in response to complaints or upon request. If a problem is noted then the Division of Forest Resources will try to mitigate the problem. The NC Division of Water Quality and Division of Land Resources both handle the enforcement of water quality impairments, depending on the type of impairment (Gerow *pers. com.* 2003). Loggers, landowners, timber buyers or consultants can perform their own water quality evaluation through the self-audit program (Gerow *pers. com.* 2003; Gueth *pers. com.* 2003). For SGSF compliance reporting, a minimum of 200 randomly selected that fit the selection criteria are located aerially or on the ground, and then an on-the-ground survey is completed. The sites are evaluated and yes/no implementation questions are answered as well as an assessment threat to water quality.

**South Carolina:** Routine BMP inspection is performed in South Carolina through the Forestry Commission's courtesy BMP exam program that attempts to identify potential water quality impacts. They make regular flights over drainage basins to

locate harvest and site preparation operations. Then they will approach the landowner and ask permission to do a courtesy BMP exam. On the sites these examinations are performed, they typically visit again after closure. They will also give an exam upon request or to respond to a citizen complaint. Over 200 sites are selected by aircraft and inspected on the ground for reporting purposes. These sites are stratified in a random manner by timber receipts followed by 3 on the ground inspections; one after harvest, one after site preparation and one two years after closure (Greis 2002). All water quality infringements are reported to the South Carolina Department of Health and Environmental Control (Jones *pers. com.* 2003).

**Texas:** Routine inspecting occurs by landowner/logger request. Currently, Texas is relying on education to promote BMP implementation and protect water quality (Carraway *pers. com.* 2003). Texas has redesigned their monitoring and reporting protocol to follow the recommendations of the SGSF. Approximately 150 sites are selected via aerial reconnaissance and distributed regionally by ownership category and also by amount of timber harvested from each county (Simpson *pers. com.* 2003). The BMP categories are assessed using yes/no/NA questions and are then tallied for a rating of compliance (Greis 2002).

**Virginia:** Virginia has a mandatory 3-day notification system (before or after harvest begins). They attempt to visit every logging job and are obligated to visit the harvest site at least 15 days after notification and at least 15 days after closure (Poirot *pers. com.* 2003). The VA Department of Forestry is the only state examined that is responsible for enforcement of water quality infringements. They strategically and randomly select 30 sites from the notification list biannually for auditing. An on the ground inspection determines compliance. To be in compliance the site must use all relevant BMPs 100% of the time and meet 100% technical specifications (Poirot *pers. com.* 2003). This method of reporting gives low compliance though 90% of sites showed effort to implement BMPs (Greis *pers. com.* 2002).

## DISCUSSION

The Southeastern states reviewed in this paper use many different methods for routine inspections and formal EPA reporting inspections. Florida has a voluntary notification system and Georgia loggers are required to notify only when working in those counties with an ordinance that regulates forestry activities (Green *pers. com.* 2003). Virginia is unique in that it is the only state where notification is mandatory and the state is obligated to visit every harvest operation with a \$1000 fine for failing to do so (Poirot *pers. com.* 2003). A notification system does ensure that the state forestry agency is aware of harvesting operations and can inspect routine operations accordingly. Inspections on randomly sampled sites, attempt to accurately represent BMP implementation for reporting purposes.

All of the examined states will give advice on BMPs upon invitations from landowners, loggers, timber buyers or respond to citizen complaints. They are called either courtesy exams or audits and are routine in Alabama, Florida, Georgia, and South Carolina. North Carolina has a similar program called the NC Self-Audit Program. If an agency is invited to perform courtesy exam/audit, it will usually come back after closure to make sure the BMPs are working and there is no threat of sediment entering a waterway. There is much variation in the language used to describe these routine inspections.

Georgia, Louisiana, Mississippi, North Carolina and Virginia and have the right to trespass in order to inspect water quality infringements. Without this inherent right, a state forestry agency may be unable to inspect a questionable operation and offer advice on water quality protection. Generally, state forestry agencies do not feel the lack of the right to trespass is prohibiting amelioration efforts on harvest sites. Instead, they prefer to rely on education and not appear as a 'regulator' to the general public. Virginia is the only state with the responsibility of enforcement and penalizing water quality infringements. In the eight other states reviewed, the responsibility has remained with another state department of environmental health or environmental quality.

For formal reporting purposes for the EPA, most states attempt to follow the SGSF recommended framework for implementation of silviculture BMP monitoring (SGSF 2002). Some of the recommended guidelines address frequency of reporting, the

attributes a monitoring site should have, which practices should be evaluated, how the sites should be 'graded' and how potential threat to water quality is evaluated (SGSF 2002). While these recommendations from the SGSF attempt to provide some continuity between the states, the guidelines remain broad, leaving room for each state to tailor the framework to its needs. One of the guidelines include, statewide monitoring to be undertaken at least every three years.

For site selection in the SGSF Protocol, there is no minimum size, no water has to be present on the property, operation must be closed for no longer than two years and sites may be selected by, "aerial reconnaissance, severance tax records, notification logs...it is essential to achieve random, stratified random or randomized cluster statistical design to obtain an unbiased sample" (SGSF 2002). Sites that are considered ineligible are those that are using timber harvesting to undergo a change in land use. Some evaluation categories include the harvesting, site preparation, roads, stream crossings and streamside management zones.

Site selection methods for EPA reporting vary throughout the states, although states attempt to obtain a set of random and unbiased sites to inspect for reporting. Some sites are chosen completely randomly with no stratification while others like Georgia and Texas sort by timber receipts while still others like North Carolina and Virginia sort by region. States that select sites by aerial reconnaissance include Alabama, Florida, Louisiana, North and South Carolina and Texas. The number of sites that each state ultimately chooses varies widely with Virginia having the fewest and Georgia having the most.

Alabama performs their BMP 'implementation monitoring' inspections from the air. Aerial surveying could fall short of accurately measuring the implementation and effectiveness of BMPs. Often BMPs can only be assessed by taking an up close look, for example, spacing between water bars, suitable stream crossings and stream side management zone widths.

In terms of scoring, the SGSF recommend to report a percentage of applicable practices and record BMPs on a yes/no/not applicable basis. The number of sites to monitor must be enough to "achieve an estimate

of implementation that is  $\pm 5\%$  within the 95% confidence interval" (SGSF 2002). These recommendations, while valuable, do not specify exactly how the monitoring should be performed; aerial survey (Alabama), on the ground (Virginia and North Carolina) or combinations, therefore making comparisons between the states difficult even though the reporting methods are consistent.

All the states are inspect for BMP implementation but North and South Carolina, Florida, Texas and Virginia also monitor for threat to water quality, or BMP effectiveness. The SGSF Framework does recommend that an assessment of significant risk/threat to water quality be documented (SGSF 2002). Inspecting for both BMP compliance and water quality protection produces a more thorough approach because 100% implementation in all situations may still leave room for water quality degradation. Just because BMPs have been installed properly does not necessarily mean that no threat to water quality exists though BMPs have been proven effective in protecting water quality (Swift 1988).

In spite of the effort to improve BMP monitoring and reporting processes, there is a remaining inability to compare state compliance ratings. If all states followed the SGSF recommended protocol, there would be more consistency among states. As of 2002, four states, of those discussed in this paper, follow the SGSF monitoring framework (Florida, Georgia, North Carolina, Texas) (Prud'homme Greis 2002). Some suggestions include having an explicit protocol that dictates exactly how the survey is to be conducted, how often how to select sites to survey (whether they are proportional to the amount of harvesting jobs or some other stratified manner), standard terminology and a repeatable inspection method that will produce consistent results. Ample allotment of resources and planning would ensure availability of personnel and efficiency to make reporting as easy as possible.

## CONCLUSION

To be able to compare BMP programs and to measure progress, there is a need for participation among Southern states to follow the SGSF recommended protocol or some uniform procedure for collecting and reporting on BMPs. Standardizing BMP assessment methodology and terminology and reporting will provide consistency. Currently, there

still is an inability to compare monitoring results among states because each state has developed its own methodology. The ability to compare results could provide evidence that technical requirements may need to be adjusted or reveal new innovative methods that are also effective in protecting water quality in a region. Future work should develop a more standardized and utilized BMP monitoring protocol that will be a valuable tool in the future for understanding BMP implementation and effectiveness amongst and between the states.

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