State Survey of Silviculture Nonpoint Source Programs: A Comparison of the 2000 Northeastern and National Results

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ABSTRACT: *The National Association of State Foresters conducts surveys of silviculture nonpoint source (NPS) pollution control programs to measure progress and identify needs. The 2000 survey results are summarized here for the nation and for the 20-state northeastern region. Current emphasis of NPS pollution programs is on education, training, and monitoring. Educational efforts are used to make more landowners aware of their responsibilities to control pollution during timber harvesting and to make the public and lawmakers more aware of effective pollution control procedures for forestry. Training of foresters, loggers, and landowners in NPS pollution control expanded during the last 4 yr in part due to forest industry's Sustainable Forest Initiative and increased logger accreditation and forester licensing programs. Several states reported improved compliance and performance in controlling NPS pollution as a result of certification and licensing programs. Recommendations are made to continue the progress in NPS pollution control in forestry. North. J. Appl. For. 19(3):122–127.*

Key Words: Nonpoint source pollution, best management practices, regulatory controls, emerging issues.

The National Association of State Foresters (NASF) completed its first three surveys of state pollution control programs for silviculture in 1992, 1994, and 1996. Forty-eight state foresters (and two territories not included in this summary) responded to its fourth and most recent 2000 survey (National Association of State Foresters 2000). The 2000 survey repeated many of the same questions from previous surveys to examine trends. Results are used to track progress and provide opportunities for state forestry agencies to compare programs.

In this article, we summarize the results of the 2000 NASF survey for the United States and for the northeastern region of the country comprised of the 20 states: Connecticut, Delaware, Iowa, Illinois, Indiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin.

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Results of the 2000 Survey

Role of Forestry Agencies

Forestry agencies play an active role in state nonpoint source (NPS) pollution control programs. Most forestry agencies have good-to-excellent working relationships with their water quality agency counterparts and are effective in shaping their state's NPS pollution control plan. Forestry agencies in 38 states nationwide and in 14 states in the northeast have the lead for controlling pollution from silvicultural sources, but only half of the forestry agencies have enforcement responsibility. In many cases, enforcement actions are deferred to another agency with appropriate legal authority, such as the state's department of environmental protection.

Partnership use continues to increase (Table 1). Partners were involved in developing and revising best management practices (BMPs), conducting education and training, and doing field monitoring. Partners complement the expertise of forestry agencies and broaden the base of support for programs.

Best Management Practices

BMP use is the primary approach for controlling NPS pollution. All 48 responding states have developed and published BMPs for silviculture, but few states have the same set they started with in the 1970s. Twenty-three states have

Table 1. Partners involved with states from 1996–2000 in BMP development, education, training, and monitoring. All states did not have activities in all categories. States that did not work on BMP development or revision during that period did not list partners.

	Program activities			
Partner groups	BMPs	Education	Training	Monitoring
State or territory agencies				
Environmental	14	6	4	6
Water quality	17	8	5	9
Fisheries	10	5	2	5
Local government organizations	5	4	4	4
Universities and extension	16	13	12	8
Forest industry	14	12	13	9
Loggers	12	9	10	5
Consulting foresters	12	8	6	4
Landowners	10	7	5	3
Federal				
USDA Forest Service	12	7	5	5
Other USDA	4	2	1	2
Environmental groups	5	2	2	4
Conservation groups	7	6	6	3
Wildlife and fishery groups	5	11	1	2
Forestry organizations	13	10	8	5

revised their BMPs since 1990, including nine in the northeast. Three common reasons were given for revision: to provide updates, to strengthen riparian aspects, and to address changing laws.

In 1982, 35 states had forestry BMP implementation programs. Today 42 states nationwide and 18 northeastern states have implementation programs designed to increase BMP use. Thirty-six of the 42 programs are sustained programs that include education, training, tours, and demonstrations. Of these four categories, training has increased the most.

The Sustainable Forestry Initiative (SFI), which is a forest industry-wide initiative to improve many aspects of forestry including meeting water quality goals, along with the growing trend for logger certification and forester licensing appear to have intensified training efforts. Training includes many members of the forestry community, from landowners to agency staff; one state even trained all the county road crews. Nationwide, the number of people trained increased from an average of 5,000 per year from 1992 through 1996 to an average of 16,000 per year from 1996 through 2000. In the Northeast, approximately 4,000 individuals were trained annually from 1992 through 1996. However, the number of different individuals being trained is not as high as these statistics suggest. For example, an active logger may have participated in multiple training sessions that included NPS pollution control during the 4 yr period, resulting in this individual being counted more than once.

Demonstration areas are important parts of implementation programs. Twenty-five states nationally and eight northeastern states have demonstration areas administered by a variety of organizations, most commonly state forestry agencies and/or universities.

The number of states monitoring BMP use has increased gradually since 1980. Thirty states now monitor use compared to 18 in 1990. BMP monitoring is commonly referred to as "compliance surveys." While monitoring has increased, rates of compliance have not changed greatly since the last survey. The overall compliance rate is about 86% nationally and 82% in the Northeast. However, more states now are reporting rates for various types of BMPs. Sale closures tend to have lower compliance rates compared to site preparation, chemical use, and preharvest planning.

This NASF survey asked questions regarding how compliance surveys were done (Table 2). Originally, compliance surveys were special projects, in some cases involving teams doing fieldwork using special funding. Now, increasing numbers of states combine compliance surveys with regular visits to harvesting operations by field foresters. This approach potentially could create a gray area between compliance surveys and harvest administration. For example, approximately 35,000 sites across the country and 10,000 sites in the Northeast were checked for BMP use between 1996 and 2000, according to the 2000 survey results, but this number may include all the site visits rather than true compliance surveys. To be considered a compliance survey, the work should collect information on BMP use, and the results should be analyzed to determine the rate of BMP use.

Conducting compliance surveys with only forestry agency staff loses the advantage of a team approach in terms of a comprehensive assessment and acceptance of results. To get around cost constraints and still build acceptance, two states use a quality control team comprised of different interest groups to field check compliance reports (Table 2). However, many of the special project compliance surveys review harvesting after operations are complete, and whether timely installation is done is often decided after the fact. Shifting the surveys so they are done during routine visits will provide more checks when the harvesting is in progress, which is typically when BMPs are needed most.

States are split on assessment of BMP use. Five evaluation criteria are used to judge whether proper BMPs are employed (Table 2). Some states look at BMPs individually over the entire harvest; others consider them collectively for specific areas or activities (Table 2). While examining BMPs individually provides information on the effectiveness of each, considering them collectively for roads, riparian areas, or closures may address a wider range of conditions than using a fixed, single BMP check-off list.

Table 2. State methods for BMP compliance surveys.

Question	Nationally	Northeast
	(no. of states)	
States doing surveys	30	11
Who does the field work?		
a. Forestry staff	22	6
b. Contractor	3	1
c. Team	7	5
d. Staff with review by a quality control team	2	1
How are BMPs reviewed?		
a. As individual BMPs	15	6
b. As combinations	13	6
How is proper use judged?		
a. Proper for site	30	11
b. Proper installation	30	11
c. Timely installation	30	9
d. Function during operation	12	10
e. Function after operation	10	9
The survey included BMPs for other resources.	9	3
BMPs for other resources are included in the NPS results.	4	1
Surveys are designed for statistical analysis.	12	3
The state Water Quality Agency accepts the results.	22	8

Approximately 40% of states monitor BMP effectiveness. Visual observation that soil is not eroding into streams and/or that stream biology or water uses are not impaired is the most common method for verifying effectiveness.

Respondents were asked for their observations on two aspects of BMP effectiveness: the control of pollution when BMPs are used, and the occurrence of pollution when BMPs are not used (Table 3). The answers are professional opinions of the respondents based on a combination of experience and effectiveness monitoring. All 18 responses to the first question indicate that NPS pollution is usually or always controlled when BMPs are employed. Fourteen of the 18 responses to the second question indicate that NPS pollution is usually but not always a problem when BMPs are not employed in forestry operations. Because BMPs are the primary means for protecting against NPS pollution (Water Quality Act of 1987, P.L. 100-4), an overwhelming response that NPS pollution control is achieved with BMPs is not surprising. Some of this protection comes from the redundancy in various BMPs, which compensates for mistakes that would otherwise result in pollution. For example, road stabilization and filter strips have some degree of overlapping effectiveness.

By contrast, three respondents, all from the Northeast, indicated that NPS pollution was seldom a problem when BMPs were not used, and one respondent outside of the Northeast indicated that there was no relationship between NPS pollution control and BMP use (Table 3). The rationale behind these responses was not sought, but several explanations might exist. Some BMPs are applied in areas where the risk of pollution is low or the harvesting activity has a low risk for causing pollution. Another reason for explaining the lack of relationship between BMP use and pollution might be that BMP use has been expanded to address other resources not related to pollution. For example, nine states include BMPs for aesthetics, wildlife, or other resources in their pollution control program (Table 2).

Regulatory Controls on Silviculture Activities

Most states use a "nonregulatory with enforcement" approach to BMPs (Table 4). However, it is becoming more difficult for states to categorize their BMP program strictly as regulatory or nonregulatory. In some cases, a quasiregulatory approach is taken where regulatory controls are applied to certain aspects of harvesting, such as stream crossings, while the rest of the program is not regulated. Regulatory programs include administrative permit procedures or simply the mandatory use of BMPs.

There is a long-standing debate about the effectiveness of voluntary versus regulatory BMP programs. There are no truly voluntary pollution control programs because creating pollution is illegal in all states. Furthermore, the Section 404 Dredge and Fill exemption within the Clean Water Act (P.L. 95-217) for forest roads requires the use of state BMPs.

Comparing the results of BMP programs with varying degrees of regulations shows great inconsistencies and differences across states. Most states have multiple laws addressing NPS pollution from silviculture. The 1996 survey documented 144 state laws nationally and 81 state laws in the Northeast that were applicable to controlling NPS pollution from silviculture (Table 5). Seventeen new laws have been

Table 3. Relationships between BMP use and pollution control.

	Always	Generally	Seldom	No relation
Nationally				
BMP use controls NPS pollution.	8	10	0	0
Lack of BMPs causes NPS pollution.	0	14	3	1
Northeast				
BMP use controls NPS pollution.	4	6	0	0
Lack of BMPs causes NPS pollution.	0	7	3	0

Table 4. Types of legal programs for silviculture.

Degree of regulation	Nationally		Northeast	
	1996	2000	1996	2000
	(no. of states)			
Nonregulatory with no enforcement	17	11	6	2
Nonregulatory with enforcement	18	18	8	10
Quasiregulatory (part regulatory)	5	8	1	3
Regulatory	10	12	5	5

enacted since 1996 (Table 5). Three states reported laws that provide conflicting direction. There is little relationship between the number of laws within each state and BMP compliance rates. Furthermore, some states that have the most laws generally report the most impairment of water quality. This indicates a need to improve the quality of the assessments and the effectiveness of regulations.

Certification

An increasing number of states have certification programs for loggers and foresters that contribute to the increased level of training described previously. Twenty-six states nationwide and 11 northeastern states reported certification programs for loggers. These certification programs are run by state agencies, logger associations, and wood products industries. Six of the 13 states that have forester certification programs are in the Northeast. Forester certification commonly takes the form of licensing. Nationally, the respondents from 17 states indicated that logger and/or forester certification has improved NPS pollution compliance; six states said it was too early to tell whether certification has improved compliance.

Future Needs

Table 6 shows the rankings of "future needs" from the 1996 and 2000 surveys. Improving landowner and logger awareness and providing preharvest assistance received the highest rankings nationally in both the 1996 and 2000 surveys. However, in the Northeast, increased monitoring is a slightly higher priority than education and training. Temporal changes in other anticipated needs probably represent shifting issues and priorities. Because specific reasons for these shifts were not sought or identified in the survey, we can only speculate as to their cause. The nationwide decline in research needs might be due to the role of increased technology transfer in providing information. Increases in monitoring may be due to demands for information about local harvesting. Increased needs for water quality information may be linked to total maximum daily load (TMDL) implementation. Ultimately, future success at improving NPS pollution control may depend on increasing staffing, funding, and landowner knowledge, as these items were given as the top barriers to improving NPS pollution control in both the 1996 and 2000 surveys.

Emerging Issues

States were asked to identify emerging issues. While a great variety of issues were listed, implementation of TMDLs was the most common concern. Changing the legal status of silviculture and restricting forestland uses to compensate for pollution from other land uses were two other common concerns related to TMDL issues.

TMDLs were established in 1972 in the Federal Water Pollution Control Act Amendments (P.L. 92-500) and were set up to allocate effluent loads from point sources. Since the permit system for point sources allows discharges that fail to meet water quality standards, TMDLs allocate discharges at levels necessary to correct current impairment. States are required to identify and report waters for which effluent limitations are not stringent enough to meet water quality standards. Waters listed in Section 303 (d) of P.L. 92-500 require action such as TMDL development. Even though pollution from silvicultural operations is considered to be nonpoint rather than point source, it has been included in the TMDL program.

The process for addressing TMDLs is further complicated by the inclusion of natural background conditions as pollution. Twenty-one forestry agencies, including eight in the Northeast, reported their list of impaired waters includes natural conditions even though the definition of pollution in Section 502 of P.L. 92-500 excludes natural conditions.

Table 5. Legal requirements applicable to controlling NPS pollution from silviculture.

Type of law	Number of states with requirements in 1996		New laws and changes 1996–2000	
	Nationally	Northeast	Nationally	Northeast
Forest practice and conservation	11	3	0	0
Lake and stream protection	23	11	4	1
Wetland protection	21	13	2	1
Stream crossing	21	13	2	1
Sediment and erosion control	26	15	3	2
Regional authorities	7	2	1	0
Chemical use	14	7	1	0
Bad actor	10	4	2	0
Storm water	10	7	0	0
Citizen complaint	12	6	1	1
Cumulative effects	0	0	1	0

Table 6. Future needs listed by states.

Activity	Nationally		Northeast	
	1996	2000	1996	2000
	(no. of states)			
Increased education and training	43	41	16	16
Increased monitoring	28	34	12	17
Increased research	21	12	6	6
Improved water quality information	30	32	11	14

Other emerging issues included defining when silviculture has controlled NPS pollution, concerns about local ordinances, and disparities between the Clean Water Act, Coastal Zone Act, and Endangered Species Act.

Discussion

In many states, forestry accelerated its efforts to control pollution by adopting statewide BMPs following the 1972 passage of P.L. 92-500, and it has continued that effort. These sustained efforts have shown results. U.S. Environmental Protection Agency data rank forestry seventh as a source of river pollution (U.S. Environ. Protect. Agency 2000). Forestry's contribution to pollution affected only 2.4% of the assessed stream miles (Table 7). As in 1996, forestry was not listed among the leading sources of pollution to lakes, estuaries, or wetlands. Considering the wide dispersal of forest management activities, this is a good record in pollution control.

Much of forestry's success in pollution control is attributable to its early (beginning about 1972) and continued use of BMPs and compliance monitoring, and its recent emphasis on education and training. Although many states have similar BMP practices, development of BMPs at the state level has allowed states more ownership and support for their implementation, improved compliance, avoided a one-size-fits-all approach, fostered more creativity and flexibility, and addressed important local conditions. For example, the customization of silvicultural BMPs for different topographies and to protect different water uses is an advantage; Trimble and Sartz (1957) adjusted the filter strip width in relation to slope and suggested wider strips on municipal water supplies. BMP compliance monitoring ensures that BMPs are implemented where they should be, and funding allocations and needs in the NASF 2000 survey indicate that compliance monitoring will continue to be a top priority.

Recent emphasis on education and training is apparent from responses throughout many sections of the 2000 NASF survey. Numbers of loggers, foresters, and landowners being trained have increased substantially. Education and training are top priorities for funding increases, and they top future needs nationally. Licensing of foresters and certification of loggers are other forms of training and, ultimately, self-policing that result from education of and by the forestry community. As a result, about half the states have these programs, and a large number of those see improved on-the-ground performance.

Despite the success of forestry's approach to protecting watersheds, as indicated by its low rank as a pollution source (U.S. Environ. Protect. Agency 2000), there are ongoing efforts to further regulate forestry operations. Many proposed laws lack a sound factual basis (Ice 2000), propose inappropriate tools, or simply add costs without benefits. In many cases, simply enforcing current regulations would eliminate the perceived need for additional regulations. However, adequate enforcement cannot be achieved without adequate manpower and budgetary resources.

A major argument for greater forestry regulation is that BMPs are voluntary and compliance is optional. However, this argument fails to recognize that pollution control is not voluntary; landowners must use BMPs to avoid penalties associated with violating pollution control laws.

Another argument for additional regulation is that the BMPs are based on old science. Many of the arguments against BMP effectiveness originate from old, discredited watershed concepts (Sartz 1969, Verry 1986), such as the idea that cutting trees causes springs to dry up. BMPs are proven technologies that are upgraded regularly, and this continual updating must be recognized.

More attention should be given to the many documented examples where BMPs have been used properly and effectively. For example, road location, stream crossings, and road closure BMPs were used to control turbidity levels in West Virginia (Reinhart et al. 1963), and modified riparian management controlled sediment and stream temperature in Oregon's Deer Creek (Brown and Krygier 1970, 1971). State and federal reports should recognize and employ successful studies as a means of promoting BMP use, such as those recently produced by Florida and Maryland (Florida Dep. Environ. Protect. 1997; Maryland Dep. Natur. Resour. 2000, respectively), where proper application of BMPs adequately protected adjacent streams.

Timber harvesting often is assumed to be the only activity on forested watersheds. In reality, forested watersheds can be affected by a variety of uses, including mineral extraction, recreation, residential development, road systems, and woodland grazing. Water quality goals for sustainable forestry must recognize the impacts of other land uses.

Table 7. Sources impairing assessed rivers and streams. From Appendix A-5 U.S. Environmental Protection Agency (2000).

Source	Percent of assessed miles
Agriculture	20.3
Hydromodification	6.9
Natural sources	3.9
Urban runoff/storm sewers	3.8
Municipal point sources	3.5
Resource extraction	3.0
Silviculture	2.4
Land disposal	2.4

Recommendations

Based on the results of these surveys, we recommend:

- Improving landowner awareness/education and operator execution. The need to improve landowner awareness is identified as a priority future need by many states. These results are consistent with a report by Egan (1999). Logger accreditation and forester licensing programs are reducing NPS pollution, but more work is needed. These certification programs help small landowners, especially absentee landowners, find qualified operators. Increased training is needed to improve the site-specific application of BMPs, and increased monitoring of BMP compliance and effectiveness is needed to document progress and identify needs.

- Continuing to upgrade BMPs. Silviculture continues to change and scientific knowledge pertaining to BMPs continues to expand. Tools of intensive silviculture involve changes in equipment, chemicals, and methods used on small woodlands. NPS pollution control programs need to evolve with these changes.

- Keeping the focus on pollution control. Clearly identify requirements for pollution control. Landowners need to be able to separate legal requirements for pollution control (e.g., buffer strips and filter strips) from the opportunities to manage other resources (e.g., improved riparian corridors for wildlife and birds).

- Applying uniform approaches to solving watershed problems across all land uses. Achieving Clean Water Act (P.L. 95-217) goals requires more effective use of existing information and more uniform application of requirements. Pollution control success at the watershed scale requires more consistent requirements among all point and nonpoint sources. Forestry cannot protect or improve watershed health alone, particularly since stream and river systems that are most at-risk typically exist within watersheds that have multiple land uses, of which forestry comprises only a portion of the acreage.

- Continuing the use of partners from a variety of organizations to complement the expertise of forestry agencies and to broaden the support for sound forest management.

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