IMPACT OF THE CLEAN WATER ACT ON STATE FORESTRY PROGRAMS TO CONTROL NONPOINT SOURCE POLLUTION

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Introduction

The wise management of forests is only possible where consideration for protecting water quality and other values is as important as the efficient harvest of timber. Clean water is a vital national resource largely derived from forested watersheds. In the continental United States, forests occupy one third of the land base. However, they receive one half of the total precipitation and yield two thirds of the total runoff (Satterlund 1972). Forested watersheds are recognized for their ability to produce plentiful and pristine water. In an actively growing or mature forest, water quality problems are virtually nonexistent. The forest ecosystem (i.e. vegetative cover, litter layer, and soil) functions to regulate both the quantity and quality of flow.

Natural resource managers and the public are increasingly concerned about the ecological and visual impacts of forest management activities on the nation’s water resources. Water originating from forested lands is often viewed by the public as pristine, to be maintained at the highest standard of quality in perpetuity. These concerns are indicative of the pervasive worry that the general health of the environment is deteriorating. Hewlett (1964) noted that “Human activities of the land always have some influence on the water resource. Any continuing activity which damages the water resource cannot help in the long run but to damage the total productivity, usefulness, and beauty of the land. Thus we have in water a sensitive indicator of the long-term success or failure of land management programs and resource conservation.”

The principal forestry related water quality concern is nonpoint source (NPS) pollution generated from silvicultural activities associated with timber harvesting and regeneration. Nonpoint source is diffuse pollution that occurs from over the landscape; it even occurs naturally to a certain extent. It is caused by rainfall or snowmelt moving over or through the ground and carrying natural or artificial pollutants to surface or ground water. The amount from any particular spot is generally small and insignificant, but when combined from over the landscape, can create water quality problems. Forestry is credited with one to five percent of NPS pollution in assessed surface waters in the United States and is ranked fifth out of seven categories according to the GAO (U.S. General Accounting Office 1991). This is a relatively small portion when compared to the extent of the forest land base in the United States. However, forested watersheds are valued for the high quality, often pristine nature of the water they produce. Therefore, when silvicultural activities cause NPS pollution, they will often impact a high quality environment.

The leading NPS pollutant accompanying silvicultural activities is stream sedimentation. Sediment originating from the construction and use of logging roads and skid trails generally exceeds that from all other activities (Megahan 1972). Other management prescriptions such as fire line construction and mechanical site preparation for tree planting also contribute to NPS pollution. Pesticide, fertilizer and other chemical use in conjunction with silvicultural activities can impact surface water and groundwater. Increased nutrient loadings to aquatic systems are a likely result of forest disturbance. Slash accumulations in stream channels can deplete dissolved oxygen. The removal of shading vegetation adjacent to streams
can increase water temperatures, potentially degrading fish and aquatic habitat. The cumulative effects on water quality of multiple forestry activities, often in conjunction with other land uses within a watershed, are a growing concern.

Silvicultural NPS differs from that generated in other land uses. Forest management is characterized by short periods of intense activity followed by extensive periods of minimal management. Intensive site activities are periodic and transitory in nature. Management activities associated with harvesting and reforestation on a particular site generally occur over a one to three year period. Further silvicultural prescriptions may not occur for another 25 to 100 years or more. Because of the dispersed nature of these activities and long rotations, NPS pollution problems are generally localized and short term (Curtis et al. 1990). However, stream sedimentation and other NPS concerns associated with poorly designed and maintained road systems can cause significant and prolonged problems.

**Historical Perspective**

The desire to protect forests and water resources is not exclusively confined to modern times. The interrelationship of land and water was expressed in the ancient Chinese proverb “To rule the mountains is to rule the river.” Decrees to protect watershed values were issued as far back as 1215 by Louis IV of France and in 1342 in Switzerland. These stewardship efforts were continued in Switzerland with more than 300 decrees issued between 1535 and 1777 (Kittredge 1948).

Modern efforts to protect water resource values in the United States can be traced back to the turn of the last century. Efforts to preserve forests began in 1891 when Congress authorized the President to set aside areas in the public domain as forest reserves. Protection of watershed values was a goal of this early legislation. Watershed protection was further enhanced by passage of the Forest Reserve Organic Act of 1897. This Act stipulated that “No public forest reservation shall be established, except to improve and protect the forest within the reservations, or for the purpose of securing favorable conditions of waterflows,...”. With passage of the Weeks Act in 1911, Congress reaffirmed the value of the National Forests in protecting water flows.

**Federal Mandates**

The United States Congress first expressed its intent to address pollution of the nation’s water resources with the passage of the 1948 Water Pollution Control Act (PL 80-845). The goal was the reduction of pollution to the nation’s interstate waters. For the first time, limited federal funding was available to states and local governments to finance water quality policies. A succession of laws followed over the next two decades including the Federal Water Pollution Control Act of 1956 (PL 84-660), the 1961 Amendments to the Federal Water Pollution Control Act (PL 87-88), the Water Quality Act of 1965 (PL 89-234), and the Clean Water Act of 1966 (PL 89-753). In this early legislation, point sources of pollution were targeted, states retained the authority to regulate water quality, and states were required to develop water quality standards.

It was not until the 1970’s that the need to control NPS pollution became a specific feature of federal legislation. Water quality and forestry were linked with passage of the 1972 Federal Water Pollution Control Act (PL 92-500). For the first time, silvicultural activities were identified in federal water legislation. The 1972 Act was an ambitious piece of legislation with a declared objective to “restore and maintain the chemical, physical, and biological integrity of the nation’s waters.” It envisioned zero discharge to the nation’s water bodies by 1985 and to attain, where possible, waters considered “fishable and swimmable” by 1983. The waters affected by this legislation now included headwater streams, lakes and wetlands. The federal role in regulating pollution was increased, and emphasis was shifted to a technology based approach. Congress was specific about control efforts targeted for point sources of pollu-
tion. A permitting program for all point sources and a grants program to build municipal sewage treatment facilities served as the basis for the point source control program. Less clear was how to deal with NPS pollution. Because of the complexity and site-specific nature of NPS, Congress provided the states with the responsibility for developing local solutions to NPS problems. Congress considered that addressing the issue of NPS would likely involve the control of individual activities and actions associated with land use. That control had historically been the prerogative of state and local governments.

The 1972 Act and subsequent amendments in 1977 and 1987 serve as the basis for current efforts to maintain and protect water quality. Specifically, Sections 208 and 404 of the 1972 Amendments to the Clean Water Act and Section 319 of the 1987 Amendments provided the framework for the development of state water quality protection programs for silvicultural activities.

Section 208

Under Section 208, states were mandated to identify nonpoint sources and develop planning measures to control NPS pollution "to the extent feasible". These measures were to be developed in the state Water Quality Management Plan, commonly referred to as the "208 plan." As a response to Section 208, many states developed Best Management Practices (BMPs) to protect water quality for a variety of silvicultural activities. These BMPs were not to be applied individually, but as a system. Efforts were made with varying degrees of enthusiasm by states to either enact regulatory or nonregulatory (voluntary) programs to ensure compliance with preventative practices. Most states opted for nonregulatory approaches.

Section 404

Dredge and fill operations in navigable waters and wetlands are regulated through a permitting process by the Army Corps of Engineers under Section 404. Key amendments to the Clean Water Act of 1977 exempt "normal" or ongoing silvicultural activities, minor drainage, and construction and maintenance of forest roads from the permitting requirements when these activities follow state approved BMPs. While conversion of forest land to other uses, such as agricultural production, is not exempt from the permitting requirements, the conversion from one tree species to another, such as hardwood to pine, has generally been considered exempt. Defining what practices constitute ongoing or "normal" silvicultural activities and minor drainage and qualify for a 404 exemption continues to be controversial. EPA has considered tightening the silvicultural exemption.

Section 319

The passage of the 1987 Amendments to the Clean Water Act (PL 100-4) was a recognition by Congress that NPS pollution was not being adequately controlled. As the point sources have come under greater control, the proportion of pollution attributed to NPS has increased to 60 percent of the current water quality standards violations. (Copeland 1992). Enacting Section 319 of the Clean Water Act established a comprehensive national program to control NPS pollution and, for the first time, made federal funding available to the states to control nonpoint sources. To be eligible for the funding, states were required to develop 1) an assessment report detailing the extent of NPS pollution problems and 2) a management program specifying NPS pollution controls to address those problems.

State assessment reports required identification of four categories of information:

1. navigable waters within the state which could not meet the state water quality goals without additional actions to control NPS pollution;

2. categories and subcategories of NPS which were responsible for failure to achieve the water quality goals of the state;
3. the process, including intergovernmental coordination and public participation, for identifying BMPs to control NPS “to the extent practicable;” and

4. a description of state and local programs to control NPS pollution in problem areas.

State management programs required inclusion of the following:

1. identification of BMPs and measures to reduce NPS pollution for all major categories and subcategories, taking into account the impact of the practice on ground water quality;

2. programs (including nonregulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, technology transfer, and demonstration projects) to achieve implementation of the BMPs;

3. a schedule containing annual milestones for implementing the program and implementing the BMPs;

4. certification that the laws of the state provided sufficient authority to implement the management program, or where there is not adequate authority, a schedule for seeking the additional authority; and

5. sources of federal and other funding for program implementation.

By the summer of 1991, all states had approved assessment reports and NPS management programs or portions of those programs, and Congress had appropriated $91 million to assist states in implementing their management programs (U.S. EPA 1991).

An effective NPS control program must be based on the use of preventative practices. EPA has recognized the difficulty of applying WQS to NPS pollution and has indicated that state approved BMPs are the primary mechanisms for meeting WQS (Jensen 1987). Proper installation, operation and maintenance of state approved BMPs are presumed to meet a landowner’s obligation for compliance with applicable WQS. EPA intends that approved BMPs be aggressively implemented.
by the states. NPS program success will depend on: 1) a high level of conformance with BMPs and 2) the ability to identify and respond effectively to specific implementation and compliance problems. The WQS should serve as a means for measuring BMP effectiveness and for determining needed changes in the NPS control program. EPA has also incorporated “flexibility in water quality standards to address the impact of time and space components of NPS as well as naturally occurring events”. This allows states to consider natural variability, magnitude and frequency of the impact, and determine a level of acceptable risk. In Minnesota, designated uses of a waterbody are fully supported if WQS are violated less than 10 percent of the time (MN Pollution Control Agency et al. 1988).

The use of BMPs as a surrogate for WQS has been challenged in court (United States Court of Appeals for the Ninth Circuit in Northwest Indian Cemetery Protection Association v. Peterson, 1986). The court ruled that a proposed U.S. Forest Service road would result in instantaneous violations of state WQS and, thus violate the Clean Water Act. It further ruled that since adherence to the BMPs did not automatically ensure that the state standards were being met, WQS superseded the use of BMPs as the regulatory device. The ruling affected forest management only for lands within the jurisdiction of the Ninth Circuit Court of Appeals. However, the trend towards more stringent control of silvicultural activities continues at the national, state and local level (Cubbage 1990; Cubbage and Siegel 1985; Siegel 1989). There is general agreement that regulation of silvicultural activities through forest practices legislation has significantly improved protection of water quality and other non-timber forest resource values (Henly et al. 1988). Minimizing further legislative restrictions will depend on the ability of the states to implement effective water quality protection programs.

State Responses

Under Section 319, states have the primary responsibility for NPS program development and implementation while EPA retains responsibility for program approval and oversight. In developing the NPS control strategies, states have the option to base compliance on either WQS or BMPs. Many of the states’ forestry organizations have been delegated the major responsibility for controlling silvicultural NPS pollution. All of these organizations agree on the need to ensure comprehensive and effective NPS control programs. Best Management Practices serve as the cornerstone for the water quality protection programs developed by the states. These programs have been shaped by the particular physiographic, economic, technical, and political characteristics of each state. Silvicultural NPS management programs vary from nonregulatory (voluntary) to mandated compliance by state law. Which approach is best is unclear.

Currently, thirty-five states have nonregulatory programs, six states have the authority to make their program regulatory, and in ten states the nonregulatory program is backed by regulations that compel compliance with BMPs. Nine states have regulatory programs which are generally part of comprehensive state forest practices acts. Western states (e.g. Alaska, California, Idaho, Oregon, and Washington) have been most active in protecting water quality through forest practices legislation (Salaza and Cubbage 1990). Reasons cited include: 1) prevalence of pristine lakes and streams, 2) sensitivity of fish species to environmental disruption, 3) concern about potential environmental damage from operating on steep terrain, 4) effectiveness of the environmental community, and 5) high percentage of public forest lands. In other parts of the country, states such as Alabama, Arkansas, Florida, Maryland, Minnesota, Vermont and West Virginia have opted for nonregulatory (voluntary) or quasi-regulatory programs. The nonregulatory approach requires a sustained effort and long-term commitment by the state forestry agency to ensure implementation.

Whatever the degree of regulation, BMPs must be viewed as an iterative process. Initially the BMPs are developed and then promoted through
education and technical assistance. Following development, BMPs must be monitored for implementation and effectiveness. The monitoring information is then used to adjust or modify the BMPs to improve efficacy, then monitored again. To be effective, the BMP process must be viewed as a continuous loop, where adjustments can be incorporated into the NPS control program in response to new information.

With the development of silvicultural BMPs virtually complete in most states, attention will continue to focus on the major components of the implementation program: education, technical assistance, monitoring and research.

**Education:** Formal BMP training sessions and workshops for loggers, foresters and other resource managers are becoming a normal aspect of business in many states. Continued and expanded emphasis on public and professional education programs in timber harvesting and land stewardship are needed to reduce NPS pollution from silviculture.

Providing information and training to non-industrial private forest (NIPF) landowners is a critical need. Historically, few of these landowners have utilized the assistance of a professional forester in designing management prescriptions. Increased efforts are needed to ensure that NIPF landowners understand their responsibilities to protect water quality.

**Technical assistance:** Assistance to landowners in designing proper timber sale and harvesting plans and guaranteeing performance in contracts should be expanded. Financial incentives to NIPF landowners tied to the use of an approved management plan should also be initiated or expanded utilizing tax breaks or cost share programs. Field reviews of BMP implementation indicate that where assistance is provided by a professional forester, NIPF compliance with BMPs is increased (Conner et al. 1989; Schultz 1990).

**Monitoring:** It is not enough that BMPs are developed by the states. Landowners, loggers and foresters must take the responsibility to ensure that these practices are applied in silvicultural activities. Obtaining widespread use of BMPs requires the commitment, leadership, coordination and cooperation of all in the forestry community and allied organizations. The ability to demonstrate compliance with forestry BMPs on all land ownerships is essential if the BMP process is to be credible. Foresters can no longer stand on their professionalism and ask the public to “trust me.” As a profession, forestry will continually be challenged to “prove” its good intentions and effectiveness.

The forestry community in many states uses annual or biennial field audits or surveys to determine the degree of compliance with silvicultural BMPs and to help identify specific implementation and practice deficiencies. The field audits are undertaken by trained professionals or interdisciplinary teams. The audit process has been fundamental to education and to improving awareness of BMP requirements, whether implementation is through a regulatory or nonregulatory approach. The results from these audits are used to target future education efforts, identify program deficiencies, provide the water quality agencies with information on the degree of compliance by landowner class, and focus future water quality research needs.

The field audits provide a qualitative measure of the effectiveness or inadequacy of specific practices. They are a snapshot-in-time of practices employed and a measure of subsequent impact. The utility of this approach to evaluating compliance has been demonstrated in Florida (Conner et al. 1989) and Montana (Schultz 1990).

**Research:** Increased research efforts are required to document the effectiveness of existing BMPs and to identify areas where the development of additional practices is warranted. There is a need to quantify the interrelationship between specific site characteristics and silvicultural activities that impact beneficial uses. There is also a need to
expand research and develop technologies for evaluating and controlling cumulative effects on watersheds of mixed ownership. The concern with cumulative effects is that impacts from forest management and other land uses will accumulate in streams and negatively affect beneficial uses.

Given that limited federal funding will be available to the states, intensive water quality monitoring programs are not likely. However, if the effectiveness of BMPs can be demonstrated or improved in targeted studies, and if field audits show a high degree of compliance with BMPs, then presumably water quality will be adequately protected.

What is the progress to date on implementing state management programs to control silvicultural NPS pollution? Recently, the National Association of State Foresters' (NASF) Water Resources Committee completed a national survey of state forestry organizations to specifically answer that question (NASF 1991). Responses from forty-five states and one territory were received. Key results from the survey are summarized below:

Forty of forty-six state foresters were involved in developing their state's NPS assessment. Half of the respondents reported that silvicultural impaired water bodies were identified in the state assessments, but in only six states was the impairment considered common and scattered.

Thirty-nine of the respondent state foresters participated in the development of the state NPS management plan.

Forty-three states reported good to excellent working relationships between the state forester's office and the state water quality agency.

Thirty-eight states have developed BMPs, and three additional states indicated that BMPs would be developed within a year. Specifically, BMPs have been developed for: road location (34 states), road construction (36 states), road drainage (36 states), revegetation of road cuts and fills (29 states), road surfacing (18 states), water barreing and closing skid trails and roads (36 states), revegetation of abandoned roads, decks and skid trails (37 states), stream crossing (34 states), use of streamside management zones (32 states), filter strips (28 states), shade strips (21 states), and the use of forest chemicals (12 states).

Thirty-two states have a forestry BMP implementation program and three states indicated that a program would be developed within a year.

A majority of states have implemented major education and information efforts about forestry BMPs and the management of NPS pollution. Included in these efforts are the publication and distribution of BMP books (28 states), BMP brochures (18 states), posters and displays (13 states), videos and slide programs (20 states), field tours on BMPs (24 states), and workshops and training sessions for loggers, landowners, and professional foresters (29 states).

Eighteen states have ongoing implementation monitoring programs to evaluate BMP compliance. Monitoring programs are being developed in another seven states.

Twelve states reported a monitoring program to document the effectiveness of forestry BMPs, with five more states in the process of developing such a program.

Lack of adequate funding (38 states), staffing constraints (28 states), and lack of technical personnel (17 states) were
most often cited as barriers to implementing NPS management programs.

The knowledge, skills and expertise vary widely among the states as do coordination efforts between state water quality agencies and state forestry agencies. The survey results indicate an overall willingness by state forestry agencies to target NPS pollution. Lack of funding and personnel in many states will continue to be a constraint on implementation efforts, but not a legitimate reason for failure to fully address the issue.

Future Directions

The direct federal role in controlling NPS pollution is likely to be strengthened in the future. Key members of Congress have expressed reservations that current nonregulatory programs are not adequately protecting water quality (NACD 1991). The federal government has stated its intent to provide national solutions to local nonpoint source problems in the provisions of the Omnibus Budget Reconciliation Act of 1990 (Section 6217 of PL 101-508). The Coastal Zone Management Act currently before Congress will require coastal zone states to develop NPS control programs for land use practices that impact coastal waters. It will also likely serve as the model for the reauthorization of the Clean Water Act which will be a priority for the 102nd Congress (Copeland 1991).

The Coastal Zone Management Act intends that states will develop and implement specific management measures (MMs) to control NPS pollution in coastal waters that are in conformance with, at a minimum, the national guidance developed by EPA (U.S. EPA 1991). The reality behind the Coastal Zone Management Act is that neither the states nor EPA have sufficient funds to directly establish cause and effect linkages between land use and water quality problems. The intent, then, is to develop and implement MMs that experts generally agree will effectively control NPS pollution.

State forestry organizations are concerned that national standards will bring too great a degree of specificity to the enormous range of physiographic diversity across the United States. The preference for the state forestry organizations is to continue the 319 approach that delegates the authority to the states to develop and implement management programs that are responsive to local needs and conditions. Water quality problems that are presently attributed to silvicultural activities are not due to the ineffectiveness of the preventative practices, but to the failure to implement them properly. What is needed is not a new program or direction, but the time and resources to ensure broad implementation of BMPs under the guidance of the 319 program. Additional measures or programs should complement and blend with, rather than duplicate or conflict with existing state programs that are meeting the water quality goals of the state.

Conclusion

Recent state implementation efforts have earned the forestry agencies greater credibility and have given the forestry community the opportunity to direct and strongly influence its own destiny. The state foresters must continue to assume the mantle of leadership to improve and accelerate progress in the implementation of forestry NPS control programs. The state forestry organizations must continue to support education efforts, technical assistance to landowners, compliance monitoring, and research to ensure that forestry continues to show progressive improvement in the adoption and use of BMPs. We must work to develop a BMP ethic as a normal part of our land management strategy. Proactive management will preclude water quality from being a negative issue for forestry in the 1990’s. Complacency, on the other hand, will reduce the credibility of forestry and could result in the passage of inflexible forest practices legislation.

References

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