CHAPTER 1: INTRODUCTION

The Nation's aquatic resources are among its most valuable assets. Although environmental protection programs in the United States have successfully improved water quality during the past 25 years, many challenges remain. Significant strides have been made in reducing the effects of discrete pollutant sources, such as factories and sewage treatment plants (called point sources). But aquatic ecosystems remain impaired, mostly because of complex problems caused by polluted runoff, known as nonpoint source pollution.

Every 2 years the U.S. Environmental Protection Agency (EPA) reports to Congress on the status of the Nation's waters. The *1998 National Water Quality Inventory* (USEPA, 2000) reports that the most significant source of water quality impairment to rivers and streams and lakes, ponds, and reservoirs is agriculture, and the most significant source of impairment to estuaries is municipal point sources of pollution (Table 1-1). Other important sources of impairment or alterations that can impair water quality include hydrologic modifications like dams and channelization (a leading cause of impairment to rivers and streams and lakes, ponds, and reservoirs), urban runoff and storm sewer discharges (leading sources of impairment to all surface waters), and pollutants deposited from the atmosphere (a leading source of impairment to estuaries). The five leading pollutants impairing the Nation's waters are siltation, nutrients (from fertilizers and animal waste), bacteria, toxic metals, and organic enrichment that lowers dissolved oxygen (USEPA, 2000).[1] Siltation is the leading cause of water quality impairment to rivers and streams and the third leading cause of impairment to lakes, ponds, and reservoirs. Nine states list silviculture as a leading source of impairment to rivers and streams.[2]

This guidance is designed to provide current information to state forestry program managers and foresters, commercial forest managers, private foresters and loggers, and nonindustrial private forest owners on nonpoint source pollution from forestry activities.

The Purpose and Scope of This Guidance

This guidance document is intended to provide technical assistance to state water quality and forestry program managers, nonindustrial private forest owners, industrial forest owners, and others involved with forest management on the best available, most economically achievable means of reducing the nonpoint source pollution of surface and groundwaters that can result from forestry activities. The guidance provides background information about nonpoint source pollution from forestry activities, including where it

[1] The term *pollutant* means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water (Clean Water Act [Title 33, Chapter 26, Subchapter III, Section 1329]). The term *pollution* means the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water (Clean Water Act [Title 33, Chapter 26, Subchapter V, Sec. 1362(19)]).

[2] Nine states list silviculture as a major source of impairment to assessed rivers and streams: Arizona, California, Kentucky, Louisiana, Maine, New Mexico, Tennessee, Vermont, and West Virginia; 11 states/tribes list silviculture as a minor/moderate source of impairment to assessed rivers and streams: Coyote Valley Reservation, Florida, Hawaii, Minnesota, Mississippi, Ohio, Oklahoma, Oregon, South Carolina, Virginia, and Wisconsin; 6 states list silviculture as a source of impairment to assessed rivers and streams without specifying whether it is a major or minor/moderate source: Alaska, Colorado, Montana, North Carolina, Pennsylvania, and Washington. (Source: USEPA, 2000; National Water Quality Inventory, Appendix A-5.)

Table 1-1. Leading Pollutants and Sources Causing Impairment in Assessed Rivers, Lakes, and Estuaries (USEPA, 2000)

	Rivers and Streams[a]	Lakes, Ponds, and Reservoirs[b]	Estuaries[c]
Pollutants	Siltation	Nutrients	Pathogens (bacteria)
	Pathogens (bacteria)	Metals	Organic enrichment/ Low dissolved oxygen
	Nutrients	Siltation	Metals
Sources	Agriculture	Agriculture	Municipal Point Sources
	Hydromodification	Hydromodification	Urban runoff/ Storm sewers
	Urban runoff/ Storm sewers	Urban runoff/ Storm sewers	Atmospheric deposition

[a] Based on states' surveys of 23% of total river and stream miles.
[b] Based on states' surveys of 42% of total lake, reservoir, and pond acres.
[c] Based on states' surveys of 32% of total estuary square miles.

comes from and how it enters our waters. It presents the most current technical information about how to minimize and reduce nonpoint source pollution to forest waters, and it discusses the broad concept of assessing and addressing water quality problems on a watershed level. By assessing and addressing water quality problems at the watershed level, state program managers and others involved with forest management can integrate concerns about forestry activities with those of other resource management activities to identify conflicting requirements and provide balance between short-term impacts and long-term benefits (Table 1-2). This approach can maximize the potential for overall improvement and protection of watershed conditions and provide multiple environmental benefits.

The causes of nonpoint source pollution from forestry activities, the specific pollutants of concern, and general approaches to reducing the effect of such pollutants on aquatic resources are discussed in the Overview (Chapter 2). Also included in Chapter 2 is a general discussion of best management practices (BMPs) and the use of combinations of individual practices (BMP systems) to protect surface and groundwaters. Management measures for forest management and management practices that can be used to achieve the management measures are described in Chapter 3. Chapter 4 summarizes watershed planning principles and the application of management measures in a watershed context. Chapter 5 provides an overview of nonpoint source monitoring and tracking techniques.

This guidance does **not** replace the 1993 *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters.* The 1993 guidance still applies to coastal states.

Because this document is national in scope, it cannot address all practices or techniques specific to local or regional soils, climate, or forest types. Field research on management practices is ongoing in different parts of the country and under different harvesting circumstances to provide more guidance on how the practices mentioned in this guide and other management practices should be applied under specific circumstances. State laws and programs, or regional guidances published by the U.S. Forest Service, for instance, will have the criteria for site-specific management practice implementation. EPA encourages states to review their existing laws and programs for their relevance to forestry activities and to implement the management measures in this guidance within the context of state laws and programs wherever possible. In some cases very few adjustments to state laws and programs will be necessary to fully meet EPA's management measures. In other cases, major revisions or an entirely new program focus may be necessary. This guidance should prove useful in directing states toward those improvements that are necessary to protect water quality from forestry activities. Consult with

Table 1-2. Miles of Rivers and Streams Affected By Sources (USEPA, 2000).

SOURCE	MAJOR	MINOR	NOT SPECIFIED	TOTAL	TOTAL as Percent of Assessed Miles
Agriculture	21,856	102,264	46,630	170,750	20.3
Hydromodification	7,930	30,266	19,567	57,763	6.9
Nonirrigated Crop Production	2,551	34,747	9,186	46,484	5.5
Natural Sources	7,437	11,980	13,587	33,004	3.9
Urban Runoff/ Storm Sewers	5,747	20,060	6,504	32,310	3.8
Irrigated Crop Production	3,123	20,784	7,250	31,156	3.7
Municipal Point Sources	6,667	15,293	7,127	29,087	3.5
Animal Feeding Operations	2,736	24,908	108	27,751	3.3
Resource Extraction	5,948	9,771	9,612	25,231	3.0
Silviculture	717	14,884	4,420	20,020	2.4
Land Disposal	2,030	9,565	8,333	19,928	2.4
Range Grazing - Riparian and/or Upland	2,434	10,382	6,653	19,469	2.3
Habitat Modification (other than Hydro)	2,169	11,713	4,569	18,451	2.2
Channelization	3,024	9,677	4,802	17,503	2.1
Industrial Point Sources	3,409	7,335	3,051	13,795	1.6
Construction	1,653	6,331	4,452	12,436	1.5
Onsite Wastewater Systems (Septic Tanks)	874	3,123	7,834	11,831	1.4
Pasture Grazing - Riparian and/or Upland	1,262	9,335	0	10,597	1.3
Bank or Shoreline Modification	1,308	4,472	4,114	9,894	1.2
Other	768	4,375	2,495	7,638	0.9

state or local agencies, including the U.S. Department of Agriculture's Forest Service (USDA-FS), Natural Resources Conservation Service (NRCS), and Cooperative State, Research, Education, and Extension Service (CSREES); soil and water conservation districts; state forestry agencies; local cooperative extension services; and professional forestry organizations for additional information on nonpoint source pollution controls for forestry activities applicable to your local area. Resources and Internet sites related to forestry are listed in Appendices A and B.

This document provides guidance to states, territories, authorized tribes; commercial and nonindustrial private forest owners and managers; and the public regarding management measures that may be used to reduce nonpoint source pollution from forestry activities. At times this document refers to statutory and regulatory provisions that contain legally binding requirements. This document does not substitute for those provisions or regulations, nor is it a regulation itself. Thus, it does not impose legally binding requirements on EPA, states, territories, authorized tribes, or the public and may not apply to a particular situation based upon the circumstances. EPA, state, territory, and authorized tribe decision makers retain the discretion to adopt on a case-by-case basis approaches to control nonpoint source pollution from forestry activities that differ from this guidance where appropriate. EPA may change this guidance in the future.

Readers should note that this guidance is entirely consistent with the *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* (USEPA, 1993), published under section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA). This guidance, however, does not supplant or replace the 1993 coastal management measures guidance for the purpose of implementing programs under section 6217.

Under CZARA, states that participate in the Coastal Zone Management Program under the Coastal Zone Management Act are required to develop coastal nonpoint pollution control programs that ensure the implementation of EPA's management measures in their coastal management area. The 1993 guidance continues to apply to that program.

This document modifies and expands upon supplementary technical information contained in the 1993 coastal management measures guidance both to reflect circumstances relevant to differing inland conditions and to provide current technical information. It does not set new or additional standards for section 6217 or Clean Water Act section 319 programs. It does, however, provide information that government agencies, private sector groups, and individuals can use to understand and apply measures and practices to address sources of nonpoint source pollution from forestry.

What Is Nonpoint Source Pollution?

Nonpoint source pollution usually results from precipitation, atmospheric deposition, land runoff, infiltration, drainage, seepage, or hydrologic modification. As runoff from rainfall or snowmelt moves, it picks up and carries natural pollutants and pollutants resulting from human activity, ultimately dumping them into rivers, lakes, wetlands, coastal waters, and groundwater. Technically, the term *nonpoint source* is defined to mean any source of water pollution that does not meet the legal definition of *point source* in section 502(14) of the Clean Water Act of 1987:

> The term *point source* means any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft from which pollutants are or may be discharged. This term does not include agricultural storm water and return flows from irrigated agriculture.

Although diffuse runoff is typically treated as nonpoint source pollution, runoff that enters and is discharged from conveyances such as those described above is treated as a point source discharge and therefore is subject to the permit requirements of the Clean Water Act. In contrast, nonpoint sources, including runoff from forestry activities, are not subject to federal permit requirements. Point source discharges usually enter receiving water bodies at some identifiable site and carry pollutants whose generation is controlled by some internal (e.g., industrial) process or activity, not by the weather. Point source discharges like municipal and industrial wastewaters, runoff or leachate from solid waste disposal sites, and storm sewer outfalls from large urban centers are regulated and permitted under the Clean Water Act.

Nonpoint sources, i.e., sources not defined by statute as point sources as described above, include return flow from irrigated agriculture, other agricultural runoff and infiltration, urban runoff from small or non-sewered urban areas, flow from abandoned mines, hydrologic modification, and runoff from forestry activities.

Although water program managers understand and manage nonpoint sources in accordance with legal definitions and requirements, the nonlegal community often characterizes nonpoint sources in the following ways:

- Nonpoint source discharges enter surface and/or groundwaters in a diffuse manner at irregular intervals related mostly to weather.
- The pollutants arise over an extensive land area and move overland before they reach surface waters or infiltrate into groundwaters.
- The extent of nonpoint source pollution is related to uncontrollable climatic events and to geographic and geologic conditions and varies greatly from place to place and from year to year.
- Nonpoint sources are often more difficult or expensive to monitor at their point(s) of origin than point sources.
- Abatement of nonpoint sources is focused on land and runoff management practices, rather than on effluent treatment.
- Nonpoint source pollutants can be transported and deposited as airborne contaminants.

The nonpoint source pollutant of greatest concern with respect to forestry activities is sediment. The potential for sediment delivery to streams is a long-term (beyond 2 years) concern from almost all forestry harvesting activities and from forest roads regardless of their level of use or age (i.e., for the life of the road). Other pollutants of significance, including nutrients, temperature, toxic chemicals and metals, organic matter, pathogens, herbicides, and pesticides, are also of concern, and problems associated with these other pollutants (in the context of forestry activities) generally do not extend beyond 2 years from the time of harvest or are associated with a specific activity, such as an herbicide application. Nevertheless, all of these pollutants have the potential to affect water quality and aquatic habitat, and minimizing their delivery to surface waters and groundwater deserves serious consideration before and during forestry activities. Forest harvesting can also affect the hydrology of a watershed, and hydrologic alterations within a watershed have the potential to degrade water quality.

Programs to Control Nonpoint Source Pollution

During the first 15 years of the national program to abate and control water pollution (1972–1987), EPA and the states focused most of their water pollution control activities on traditional point sources. They regulated these point sources (and continue to regulate them) through the National Pollutant Discharge Elimination System (NPDES) permit program established by section 402 of the 1972 Federal Water Pollution Control Act (Clean Water Act). Under section 404 of the Clean Water Act, the U.S. Army Corps of Engineers and EPA also have regulated discharges of dredged and fill materials into wetlands.

As a result of the above activities, the United States has greatly reduced pollutant loads from point source discharges and has made considerable progress in restoring and maintaining water quality. However, the gains in controlling point sources have not solved all of our water quality problems. Studies and surveys conducted by EPA, other federal agencies, and state water quality agencies indicate that most of the remaining water quality impairments in our rivers, streams, lakes, estuaries, coastal waters, and wetlands result from nonpoint source pollution and other nontraditional sources, such as urban storm water discharges and overflows from combined sewers (sewers that carry both wastewater and storm water runoff). Summarized below are some legislative and programmatic efforts to control nonpoint source pollution from forestry activities.

Coastal Nonpoint Pollution Control Program

The Federal Coastal Nonpoint Pollution Control Program (6217) is designed to enhance state and local efforts to manage land use activities that degrade coastal habitats and waters.

In November 1990, Congress enacted the Coastal Zone Act Reauthorization Amendments (CZARA). These amendments were intended to address several concerns, including the effect of nonpoint source pollution on coastal waters.

To more specifically address the effects of nonpoint source pollution on coastal water quality, Congress enacted section 6217, *Protecting Coastal Waters* (codified as 16 U.S.C. section 1455b). Section 6217 requires that each state with an approved Coastal Zone Management Program develop a Coastal Nonpoint Pollution Control Program and submit it to EPA and the National Oceanic and Atmospheric Administration (NOAA) for approval. The purpose of the program is "to develop and implement management measures for nonpoint source pollution to restore and protect coastal waters, working in close conjunction with other state and local authorities."

Coastal Nonpoint Pollution Control Programs are not intended to replace existing coastal zone management programs and nonpoint source management programs. Rather, they are intended to serve as an update and expansion of existing programs and are to be coordinated closely with the coastal zone management programs that states and territories are already implementing in keeping with the Coastal Zone Management Act of 1972. The legislative history indicates that the central purpose of section 6217 is to strengthen the links between federal and state coastal zone management and water quality programs and to enhance state and local efforts to manage land use activities that degrade coastal waters and habitats.

Section 6217(g) of CZARA requires EPA to publish, in consultation with NOAA, the U.S. Fish and Wildlife Service, and other federal agencies, "guidance for specifying management measures for sources of nonpoint pollution in coastal waters." Section 6217(g)(5) defines management measures as

> economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint source control practices, technologies, processes, siting criteria, operating methods, and other alternatives.

EPA published *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* (USEPA, 1993). In that document, management measures for urban areas; agricultural sources; forestry; marinas and recreational boating; hydromodification (channelization and channel modification, dams, and streambank and shoreline erosion); and wetlands, riparian areas, and vegetated treatment systems were defined and described. The management measures for controlling forestry nonpoint source pollution discussed in Chapter 3 of this document are based on those outlined by EPA in the coastal management measures guidance.

Nonpoint Source Program—Section 319 of the Clean Water Act

In 1987, in view of the progress achieved in controlling point sources and the growing national awareness of the increasingly dominant influence of nonpoint source pollution on water quality, Congress amended the Clean Water Act to focus greater national effort on nonpoint sources. Under this amended version, called the 1987 Water Quality Act,

Congress revised section 101, "Declaration of Goals and Policy," to add the following fundamental principle:

> It is the national policy that programs for the control of nonpoint sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint sources of pollution.

Section 319 requires states to assess nonpoint source pollution and implement management programs, and authorizes EPA to provide grants to assist state nonpoint source pollution control programs.

More important, Congress enacted section 319 of the 1987 Water Quality Act, which established a national program to control nonpoint sources of water pollution. Under section 319, states, tribes, and territories address nonpoint source pollution by assessing the causes and sources of nonpoint source pollution and implementing management programs to control them. Section 319 authorizes EPA to issue grants to states, tribes, and territories to assist them in implementing management programs or portions of management programs that have been approved by EPA. In fiscal year 2001, Congress appropriated $237,476,800 for this purpose.

Section 319 nonpoint source pollution control programs are an important element of coastal states' efforts to comply with section 6217 Coastal Nonpoint Pollution Control Programs. Under section 6217, coastal states are directed to coordinate development of their coastal waters protection programs with their section 319 programs and related programs developed under other sections of the Clean Water Act, and two primary means of complying with section 6217 are through changes made to section 319 and Coastal Zone Management Programs.

National Estuary Program—Section 320 of the Clean Water Act

EPA also administers the National Estuary Program under section 320 of the Clean Water Act. This program focuses on point source and nonpoint source pollution in geographically targeted, high-priority estuarine waters. In this program, EPA assists state, regional, and local governments in developing comprehensive conservation and management plans that recommend priority corrective actions to restore estuarine water quality, fish populations, and other designated uses of the waters.

Section 404 of the Clean Water Act

Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged and fill materials into waters of the United States, including wetlands. Activities regulated under this program include fills for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands to uplands for farming and forestry. The U.S. Army Corps of Engineers and EPA jointly administer the section 404 program. The Corps administers the day-to-day program, including permit decisions and jurisdictional determinations; develops policy and guidance; and enforces section 404 provisions. EPA develops and interprets environmental criteria used in evaluating permit applications; determines the scope of geographic jurisdiction; and approves and oversees state assumption. EPA also identifies activities that are exempt, enforces section 404 provisions, and has the authority to elevate or veto Corps permit decisions. In addition, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and state resource agencies have important advisory roles.

Clean Water State Revolving Fund

The Water Quality Act of 1987, the last full reauthorization of the Clean Water Act, replaced the act's Clean Water Construction Grants Program with the Clean Water State Revolving Fund (CWSRF). The CWSRF is a state-based program to provide assistance to municipalities to construct wastewater treatment works, nonpoint source pollution control projects, and estuary protection. Congress insured that CWSRF could address all state water quality program priorities. CWSRF programs provided an average of $3.4 billion per year over the past 5 years, primarily in low-interest loans, to fund such water quality protection projects as well as watershed management projects. The CWSRF have provided more than $38.7 billion in funding over the life of the program.

Nationally, interest rates for CWSRF loans in 2002 averaged 2.5 percent, compared to market rates that averaged 5.1 percent. A CWSRF-funded project would therefore cost about 21 percent less than a project funded at the market rate. CWSRF loans can fund 100 percent of the project cost and provide flexible repayment terms up to 20 years.

States are required to match the federal funds received from CWSRF, but this match requirement is not passed on to loan recipients. Furthermore, the money received as a CWSRF loan can be leveraged as matching funds to obtain funding under other federal programs, such as 319 grants and USDA cost-share programs. This is because much of the CWSRF funds are recycled through loans, so fewer federal requirements apply to them compared to other federal funding sources.

CWSRF loans provide more than $200 million annually to control pollution from nonpoint sources and to protect estuaries, and total funding for these purposes has exceeded $1.6 billion. Some innovative funding examples follow.

- The Ohio EPA and Ohio Department of Natural Resources, Division of Forestry, are using Ohio's CWSRF to help Master Loggers and Certified Foresters purchase logging and tree planting equipment. Financed equipment includes bulldozers, tracked forwarders and hydro-bunchers, bridges, and mulching machines. Ohio hopes that this type of funding will support the successful use of BMPs on logging operations.
- The California CWSRF provided funds to landowners in the Tahoe Basin to assist them with the removal of dead and dying trees in a manner that minimized erosion and fully protected water quality. The area had a high risk of fire due to the large quantities of natural fuel for fires located on public and private lands throughout the basin.
- The Nature Conservancy of Ohio received three CWSRF loans totaling $264,000 for riparian zone conservation. The funds are used to protect 383 acres along Ohio's Brush Creek. The Nature Conservancy purchased 62 acres and obtained conservation easements on 321 acres. Protection measures include planting the riparian corridor with hardwood trees for streambank stabilization. "Restoring and preserving these riparian areas is an important part of controlling contaminated runoff that threatens water quality and stream habitat," said the director of Ohio EPA.
- Ohio EPA has worked to fund both point and nonpoint source projects through the newly developed Water Resource Restoration Sponsor Program (WRRSP). The WRRSP provides low-interest loans to communities for wastewater treatment plant improvements if the communities also sponsor water resource restoration projects. Provided that both projects qualify, CWSRF provides the financial support for both projects and reduces a community's interest rate on the total amount borrowed. As a result, the total amount repaid on the CWSRF loan for both projects is less than what would have been repaid on the wastewater treatment plant project alone. Ohio communities used $24 million of CWSRF loan funds to protect and restore 1,850 acres of riparian lands and wetlands and 38 miles of Ohio's stream corridors in 2000 and 2001. The WRRSP was designed to help prevent the loss of biodiversity and to maintain ecological health, and it has supported the acquisition of conservation easements, restoration of habitats, and modification of dams. The CWSRF program has assisted a variety of borrowers such as municipalities, communities of all sizes, farmers, homeowners, businesses, and nonprofit organizations. CWSRF recipients often partner with banks, nonprofits, local governments, and other federal and state agencies to leverage the maximum financing for their communities.

Sources: USEPA, undated a, undated b, 2002a, 2002b.

The basic premise of the program is that no discharge of dredged or fill material can be permitted if a practicable alternative exists that is less damaging to the aquatic environment or if the Nation's waters would be significantly degraded. In other words, an applicant for a permit is asked to show that

- Wetland effects have been avoided to the maximum extent practicable.
- Potential effects on wetlands have been minimized.
- Compensation has been provided for any remaining unavoidable effects through activities such as wetlands restoration and creation.

Regulated activities are controlled by a permit review process. An individual permit is required for potentially significant effects. However, for most discharges that will have only minimal adverse effects, the Army Corps of Engineers often grants general permits. These may be issued on a nationwide, regional, or state basis for particular categories of activities (for example, minor road crossings, utility line backfill and bedding) as a means to expedite the permitting process.

Section 404(f) exempts normal forestry activities that are part of an established, ongoing forestry operation. This exemption does not apply to activities that represent a new use of the wetland and that would result in a reduction in reach or impairment of flow or circulation of waters of the United States, including wetlands. In addition, section 404(f) provides an exemption of discharges of dredged or fill material for the purpose of constructing or maintaining forest roads, where such roads are constructed or maintained in accordance with BMPs to ensure that the flow and circulation patterns and chemical and biological characteristics of the navigable waters are not impaired, that the reach of the navigable waters is not reduced, and that any adverse effect on the aquatic environment will be otherwise minimized. (More information on wetlands and forestry, including a list of the aforementioned BMPs, is provided in Chapter 3, section J.)

Total Maximum Daily Loads—Section 303 of the Clean Water Act

A Total Maximum Daily Load (TMDL) is a statement of the total quantity of a pollutant that can be released to a water body or stretch of stream or river on a daily basis to maintain the water quality standard for the pollutant. A single water body might have many TMDLs, one for each pollutant of concern. A TMDL is the sum of the individual wasteload allocations for point sources, load allocations for nonpoint sources and natural background sources, plus a margin of safety for an individual body of water. TMDLs can be expressed in terms of mass of pollutant per unit time, to aquatic organisms toxicity, or other appropriate measures that relate to state water quality standards.

The process of creating TMDLs was established by Clean Water Act section 303(d) to guide the application of state standards to protect the designated "beneficial uses" (e.g. fishing, swimming, drinking water, fish habitat, aesthetics) of individual water bodies. Beginning in 1992, states, territories and authorized tribes were to submit lists of impaired waters (i.e., waters that do not meet water quality standards) to EPA every two years. Beginning in 1994, lists were due to EPA on April 1 of even-numbered years. States, territories, and authorized tribes rank the listed waters by priority, taking into account the severity of the pollution and the water body's designated uses.

A TMDL is established to identify reduction targets for two types of water pollution sources in rivers and streams:

- Point source pollution
- Nonpoint source pollution

While point sources of water pollution are regulated by discharge permits, nonpoint sources are controlled by the installation of BMPs, either voluntarily or by regulatory requirement, depending on the state.

A TMDL is a process as well as an outcome. The following are components of TMDL development:

- Problem identification
- Identification of water quality indicators and target values
- Source assessment
- Linkage between water quality targets and sources
- Allocations
- Follow-up monitoring and evaluation plan
- Assembling the TMDL

Forest harvesting; road construction, maintenance, and use; and abandoned roads in forests are the primary sources of sediment and other pollutants to water bodies from forestry activities. If a state determines that a priority water body is impaired by a pollutant that partially or wholly arises from forestry activities, the state develops a TMDL for the water body and in it determines the maximum allowable quantity of the pollutant that may be released from forestry activities. Some means of ensuring that no more than this quantity is released must then be implemented. BMPs are one method that could be used in conjunction with other methods chosen.

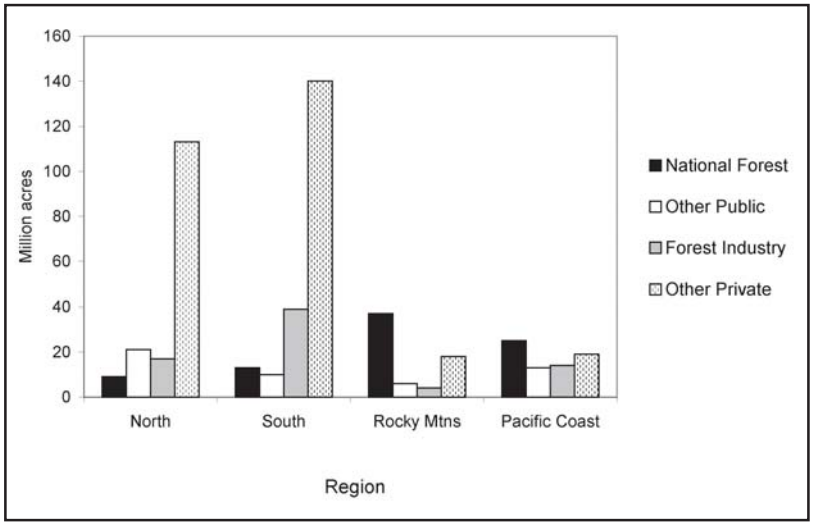

Figure 1-1. Timberland ownership by region (Smith et al., 2001).

Forest Stewardship

Forest stewardship, including implementation of the management measures and BMPs in this guidance or similar ones (for instance, state-recommended BMPs) to minimize water quality impairment due to forest harvesting and associated activities, is the responsibility of those who own and harvest the land. In the United States, timberland ownership is divided among public agencies, the commercial forest industry, and other private timberland owners. On a national scale, 71 percent of timberland is owned privately and 29 percent publicly (Smith et al., 2001). The distribution of ownership among different public and private entities differs widely by region, as summarized in Figure 1-1. Figure 1-2 shows the distribution of forested land throughout the country.

This guidance is oriented toward the implementation of management measures and BMPs that will promote the protection of water quality, but it does not focus on assessing the quality of water that results from forestry activities. Other requirements, notably state water quality standards and designated uses, apply to all ownership categories and types of land-based activities. Thus, while different management measures and BMPs are recommended for forestry activities and agriculture, for instance, maintaining state water quality standards is the responsibility of those who undertake both activities.

Finally, it is important to mention that forests, especially well-managed forests, are a key element in any state, local, or federal water quality protection program. Forests and forested land, whether in a rural setting, along streams on agricultural land, intermixed with other land uses in suburban settings, or in urban locations, are natural filters for storm water runoff and one of the least expensive and most effective means of protecting water quality. It is the hope of EPA that the management measures and BMPs contained in this guidance, and the suggestions for their implementation, will help all persons involved with forestry activities and forest management to maintain the quality of the Nation's surface and groundwaters.

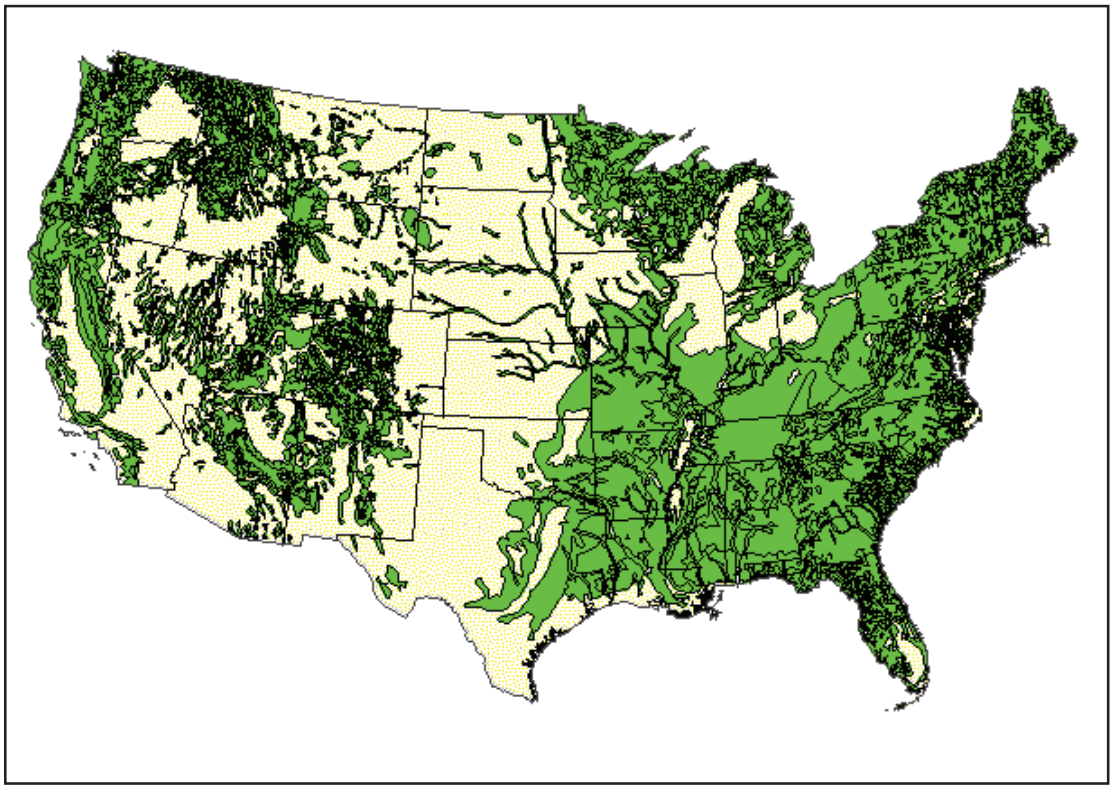

Figure 1-2. Forested lands of the United States.