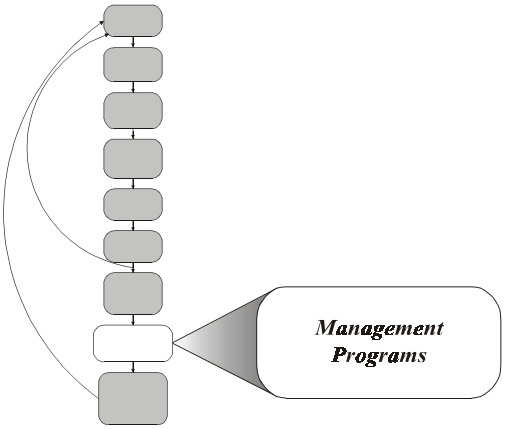
Chapter 8. Management Programs



8.1 INTRODUCTION

This chapter provides information on regulatory and non-regulatory programs that may utilize or be affected by nutrient criteria, as well as management solutions for problems associated with varying streamflow conditions. This chapter is intended to inform resource managers and foster potential links among regulatory and non-regulatory programs to best manage watersheds. Information about other agency programs that may assist in implementing criteria and maintaining water quality is also included.

The information provided by nutrient surveys of stream systems in a region will permit the resource manager to rank stream systems by trophic state; i.e., the manager should be able to classify systems according to the degree of nutrient enrichment. Stream systems can be selected for priority attention for management action. Documented stream nutrient and algal conditions and an understanding of regional public preferences regarding limits of productivity can be used to establish three categories of streams:

1. Systems with algal and/or nutrient problems. The most severely degraded waterbodies requiring extensive, expensive restoration.

2. Systems with a strong potential for developing algal problems (factors other than nutrients are unlikely to be limiting). The intermediate streams in need of remedial management to improve conditions requiring various levels of expense and manpower depending on the characteristics and problems identified in each case.

3. Systems with a low potential for developing algal problems that do not contribute to degraded nutrient conditions in downstream waterbodies. The systems in excellent condition requiring no restoration and for which management is essentially the protection of this resource through careful watershed land use planning and diligent observation of conditions. This is usually a relatively low cost option allowing for the protection of many such waterbodies with little expenditure of budget or personnel.

Systems with high nutrient loading but low potential for developing algal problems due to other limiting factors should be prioritized based on the potential for degradation of downstream receiving waters. The management strategies required for nutrient reduction within streams and those for lakes and estuaries are not different, so these processes should be linked when management plans are being formulated.

The next logical action is the design of management plans to enhance collective water body resources. The initial categorization helps set priorities for the best use of limited personnel and funds by selecting some optimal combination of many low cost but effective projects combined with some important restoration projects, and perhaps long range planning to begin to address major restoration of one or two important stream systems on an incremental basis.

This chapter is separated into discussions of point source and nonpoint source programs. Each program is discussed and a list of source information or contacts is provided. This chapter is intended to aid the resource manager in identifying programs that may assist in implementation of nutrient criteria. These programs include regulatory and non-regulatory programs that address both point and nonpoint sources of nutrients. Consultation with these programs is recommended for watershed and development planning activities. Linking with other programs may allow maximization of resources for addressing water quality concerns.

8.2 MANAGING STREAMFLOW CONDITIONS

LOW FLOWS

Maintaining flow is often essential to habitat protection. In many regions of the United States, stream segments periodically lose water due to irrigation, industrial and municipal withdrawals; and/or diversion for hydroelectric power; evaporation; and groundwater infiltration. Additionally, during low-flow conditions, impacts from point source discharges of chemical stressors are typically greatest, because effluent constitutes a larger percentage of (or sometimes all) stream water at low flow, with increased pollutant concentration. National Pollutant Discharge Elimination System (NPDES) permits based on low flow conditions (e.g., 7Q10) often cannot antic-ipate various combinations of climatic conditions and water demand that lead to exceedingly low flows.

Impacts attributable to low flows caused by human actions can be mitigated by several in-stream restoration techniques, including:

- Reducing channelization,
- Restoring wetlands for conservation and storage purposes thereby restoring natural hydrologic regimes,
- Controlling evaporation through restoration of the riparian canopy,
- Replacing exotic riparian plant species that have high evapotranspiration rates with native species that have lower transpiration rates,
- Constructing drop structures to create pools that provide protection for aquatic life during low-flow periods,

- Increasing channel depth and undercut banks to provide protective areas for fish and other species during periods of low flow, and
- Increasing groundwater recharge to streams through increased infiltration (e.g., reduced imperviousness in recharge areas).

Minimum flows can also be addressed by applying techniques in the surrounding watershed, such as managing watershed land use to prevent excessive dewatering. Restoration practices to mitigate low velocity/low-flow conditions often require close collaboration with other resource management agencies (e.g., USDA Forest Service), zoning authorities (e.g., county governments), and agricultural extension agencies. Several agricultural activities contribute to low velocity/low flow conditions. Agricultural extension agencies have developed specific techniques to modify the practices that result in low-flow impact to streams. For example, irrigation plans can be optimized to reduce the demand for water that is diverted directly from the stream. Changing crop rotations and using less water-intensive crop alternatives are other tools that have been used effectively to address low velocity/low-flow situations. Source: [http://www.epa.gov/owowwtr1/NPS/Ecology/chap3.html]

HIGH FLOWS

High-energy flows can erode substrate and bank materials, destabilize the physical structure of aquatic habitats, eradicate resident aquatic organisms, and destroy eggs located in the benthic environment. Seasonal cycles of high-energy flow events (e.g., spring floods) are typical in most aquatic systems. Habitat alteration and degradation, however, may exacerbate impacts of high-energy flows and contribute to impairment of designated uses. For instance, in a channelized stream with minimal riparian vegetation, flow velocity and volume will likely be much greater than would be expected in a "natural stream," thereby increasing its erosive potential.

Two aspects of flooding are considered here. It has recently been recognized that water retention structures remove the natural flooding that is part of a normal stream ecosystem (the flood pulse concept). Such floods are known to reduce levels of algae and macrophytes and may be beneficial to stream communities otherwise. The floods appear destructive on the short term, but most stream organisms are adapted to some level of flooding.

Alternatively, channel alteration and watershed modification can lead to abnormally high water velocities through the stream channel and amplify the effects of floods. For example, channelization can reduce the amount of refugia used by stream organisms to escape floods. Removal of riparian vegetation, urbanization, and deforestation of watersheds can lead to much greater peak flows during floods for a given amount of rain. Watershed disturbance can also lead to increases in sedimentation, which will scour away excessive algal biomass and, if deposited, make it difficult for periphyton to become established. However, such sediment will compromise the ecological integrity by harming fish and invertebrates in the stream channels.

In-stream and riparian techniques that can mitigate high flow impacts include:

- Restoring natural stream meander and channel complexity;
- Increasing substrate roughness;
- Promoting growth of riparian vegetation, which serves as a drag on flows;

- Modifying land use along buffers and other source areas; and
- Creating plunge pools and flow baffles to decrease the high energy of discharged waters.

These in-stream practices may need to be accompanied by techniques applied in the surrounding watershed, such as upland revegetation or the establishment of nonpoint source best management practices (BMPs).

Resource management agencies, for example, can encourage or allow beavers to colonize stream segments; beaver dams create wetlands and retain water that supplements low flow during dry periods. Restored wetlands can have the same effect as a beaver dam. In areas below dams where flow is very stable and excessive growths of macrophytes and periphyton are common, water releases to mimic natural floods may be considered. Local zoning authorities have also begun to encourage impervious area reduction in watersheds through land-use ordinances. Increased infiltration and reduced peak flows from rapid runoff contributes to a more sustained base flow to the stream from groundwater discharge. Source: [http://www.epa.gov/owowwtr1/watershed/wacademy/acad2000/river/]

8.3 MANAGING POINT SOURCE POLLUTION

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 discharges and return flows from irrigated agriculture. This section describes some of the regulatory programs that permit point source discharges into rivers and streams. The regulatory programs discussed here apply to federal requirements of the Clean Water Act (Section 303). State, Tribal, and local governments frequently have regulatory programs that operate on agency specific requirements. These agencies should be considered in management planning activities.

WATER QUALITY STANDARDS

Anti-degradation

Water quality standards include an anti-degradation policy and methods through which the State or Tribe implements the anti-degradation policy. Anti-degradation is a policy required in State water quality standards to protect waters from degradation. At a minimum, States must maintain and protect the quality of waters to support existing uses. Anti-degradation was originally based on the spirit, intent, and goals of the Clean Water Act, especially the clause "...restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (USEPA 1994). The water quality standards regulation sets out a three-tiered anti-degradation approach for the protection of water quality.

Tier 1

Maintains and protects existing uses and the water quality necessary to protect these uses (40 CFR 131.12[a][1]). An existing use can be established by demonstrating that fishing, swimming, or other uses have actually occurred since November 28, 1975, or that the water quality is suitable to allow such uses to occur, whether or not such uses are designated uses for the water body in question.

Tier 2
Protects the water quality in waters whose quality is better than that necessary to protect "fishable/swimmable" uses of the water body (40 CFR 131.12[a][2]). The water quality standards regulation requires that certain procedures be followed and certain showings be made (an "anti-degradation review") before lowering water quality in high quality waters. In no case may water quality for a tier 2 water body be lowered to a level at which existing uses are impaired.

Tier 3
Preserves outstanding national resource waters (ONRWs), which are provided the highest level of protection under the anti-degradation policy (40 CFR 131.12[a][3]). ONRWs generally include the highest quality waters of the United States. However, the ONRW anti-degradation classification also offers special protection for waters of "exceptional ecological significance," i.e., those water bodies which are important, unique, or sensitive ecologically, but whose water quality, as measured by the traditional parameters such as dissolved oxygen or pH, may not be particularly high. Waters of exceptional ecological significance also include waters whose characteristics cannot adequately be described by traditional parameters (such as wetlands and estuaries).

Anti-degradation implementation procedures address the measures used by States and Tribes to ensure that permits and control programs meet water quality standards and anti-degradation requirements.

General Policies
The water quality standards regulation allows States and Tribes to include implementation in their standards policies and provisions, such as mixing zones, variances, and low-flow exemptions. Such policies are subject to EPA review and approval. These policies and provisions should be specified in the State or Tribe's water quality standards document. The rationale and supporting documentation should be submitted to EPA for review during the water quality standards review and approval process.

Mixing Zones
States and Tribes may, at their discretion, allow mixing zones for dischargers. The water quality standards should describe the methodology for determining the location, size, shape, outfall design, and in-zone quality of mixing zones. Careful consideration must be given to the appropriateness of a mixing zone where a substance discharged is bioaccumulative, persistent, carcinogenic, mutagenic, or teratogenic.

Low-Flow Provisions
State and Tribal water quality standards should protect water quality for the designated and existing uses in critical low-flow situations. States and Tribes may, however, designate a critical low-flow below which numerical water quality criteria do not apply. When reviewing standards, States and Tribes should review their low-flow provisions for conformance with EPA guidance.

Water Quality Standards Variances
As an alternative to removing a designated use, a State or Tribe may wish to include a variance as part of a water quality standard, rather than changing the entire standard, especially if the State or Tribe believes that it can ultimately be attained. By maintaining the standard rather than changing it, the State or Tribe will assure that further progress is made in improving water quality and attaining the standard. Variances are temporary, subject to review every three years, and may be extended upon expiration. If a

variance specifies an interim criterion applicable for the duration of the variance for a particular pollutant, a long-term underlying goal criterion is also specified that is adequate to protect the designated use. EPA has approved variances in the past and will continue to do so if:

- The variance is included as part of the water quality standard;
- The variance is subjected to the same public review as other changes in water quality standards;
- The variance is granted based on a demonstration that meeting the standard is not feasible due to the presence of any of the same conditions as if a designated use were being removed (these conditions are listed in section 131.10(g) of the water quality standards regulation); and
- Existing uses will be fully protected.

For additional information, see http://www.epa.gov:80/ostwater/econ/chaptr5.pdf.

NPDES PERMITS

The Clean Water Act requires wastewater dischargers to have a permit establishing pollution limits, and specifying monitoring and reporting requirements. More than 200,000 sources are regulated by the NPDES permits nationwide. These permits regulate household and industrial wastes that are collected in sewers and treated at municipal wastewater treatment plants. Permits also regulate industrial point sources and concentrated animal feeding operations that discharge into other wastewater collection systems or that have the potential to discharge directly into receiving waters. Permits regulate discharges with the goals of 1) protecting public health and aquatic life, and 2) assuring that every facility treats wastewater. Typical pollutants regulated by NPDES are "conventional pollutants" such as fecal coliforms or oil and grease from the sanitary wastes of households, businesses, and industries and "toxic pollutants" including pesticides, solvents, polychlorinated biphenyls (PCBs), dioxins, and heavy metals that are particularly harmful to animal or plant life. "Non-conventional pollutants" are any additional substances that are not conventional or toxic that may require regulation, including nutrients such as N and P. [Source: http://www.epa.gov/owm/gen2.htm].

Discharge monitoring data for pollutants limited and/or monitored pursuant to NPDES permits issued by States, Tribes, or EPA are required to be stored in the central EPA Permit Compliance System (PCS). The assessment of point source loadings is not a simple process of assessing PCS data, even though PCS is an important data source. The PCS database does not provide complete information for important N sources. Most PCS N data is generated by water quality-based permit limitations on ammonia, often applied in discharges to smaller streams. Few data exist in PCS on other forms of N, or TN; and data for TP is not frequently found in PCS. This situation exists largely because most permits do not include limits and/or monitoring requirements for N or P. The lack of nutrient limits and/or monitoring requirements in permits is due to a general lack of State water quality standards for these parameters. [Source: http://www.epa.gov/msbasin/protocol.html]

The NPDES Storm Water Permitting Program

Storm water runoff is one of the remaining causes of contaminated lakes, streams, rivers, and estuaries throughout the country. Pollution in storm water runoff is responsible for closing beaches and shellfish harvesting areas, contaminating fish, and reducing populations of water plants and other aquatic life. High flows of storm water runoff cause flooding, property damage, erosion and heavy siltation. The

Clean Water Act requires EPA and States/Tribes to implement a national storm water control program to correct these problems. In the first phase of the program, discharges of storm water from municipal separate storm sewers serving populations of over 100,000 and from industrial facilities are illegal unless controlled by an NPDES storm water permit. Phase II of the program required that EPA, in consultation with the States, conduct a study identifying additional sources of storm water contamination and establish procedures and methods to control these discharges.
Source: [http://www.epa.gov/owmitnet/pipes/wetlib/disc_pap.txt]

Construction Permits
The 1987 Congressional Amendments to the Clean Water Act required EPA to control pollution from storm water discharges. Phase I storm water regulations were finalized by EPA in 1990, and NPDES permit coverage was required for construction sites disturbing five or more acres beginning in 1992. General permits provide EPA with an effective mechanism to regulate these discharge from tens of thousands of construction sites, thus protecting and improving surface water quality across the nation.

EPA Regions 1, 2, 3, 7, 8, and 9 have reissued the general permit which authorizes the discharge of storm water associated with construction activity disturbing five or more acres (Phase I sources) and smaller Phase II sources that are designated by the Agency on a case-by-case basis. This multi-regional permit is know as the "Construction General Permit" (CGP). As used in the permit, the term "storm water associated with construction activity" refers to category (x) of the definition of "discharge of storm water associated with industrial activity" which includes construction sites and common plans of development or sale that disturb five or more acres (See 40 CFR 122.26 [b][14]). This permit replaces the Baseline Construction General Permit issued by EPA in September 1992. Issuance of the new CGP will not affect areas where the State is the NPDES permitting authority.

Region 4 has issued a separate construction general permit for the State of Florida and Indian Country lands in Florida, Mississippi, Alabama, and North Carolina. Region 6 is also issuing its own construction general permit for the States of Texas and New Mexico; Indian Country lands in Texas, New Mexico, Oklahoma and Louisiana; and construction activity at oil, gas, and pipeline facilities in Oklahoma in the near future. [Source: http://www.epa.gov/owmitnet/cgp.htm]

COMBINED SEWER OVERFLOWS (CSOS)

Combined sewer overflows, or CSOs, are a significant water pollution and public health threat. EPA's 1994 CSO Control Policy addresses CSOs in a flexible, cost-effective manner that provides for local decision-making and negotiation to achieve compliance with the Clean Water Act. CSOs contain not only storm water but also untreated human and industrial waste, toxic materials, and debris. This is a major water pollution concern for cities with combined sewer systems. CSOs are among the major sources responsible for beach closings, shellfishing restrictions, and other water body impairments. During dry weather, these "combined sewer systems" transport wastewater directly to sewage treatment plants. In periods of rainfall or snowmelt, however, the wastewater volume in a combined sewer system can exceed the capacity of the sewer system or treatment plant. For this reason, combined sewer systems are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, lakes, or estuaries.

EPA's CSO Control Policy published April 19, 1994, is a national framework for control of CSOs through the NPDES permitting program. The Policy resulted from negotiations among municipal organizations, environmental groups, and State agencies. It provides guidance to municipalities and State and Federal permitting authorities on meeting pollution control goals of the Clean Water Act in a flexible, cost-effective manner. Information on EPA's CSO Control Policy can be found on the following Website. Source: [http://www.epa.gov/OWM/cso.htm]

STORMWATER PLANNING

The Watershed Management Institute, Inc. recently published a new manual entitled *Operation, Maintenance, and Management of Stormwater Management Systems* (1998). This manual presents a comprehensive review of the technical, educational, and institutional elements needed to assure that stormwater management systems are designed, built, maintained and operated properly during and after their construction. The manual was developed in cooperation with the U.S. EPA Office of Water to assist individuals responsible for designing, building, maintaining, or operating stormwater management systems. It will also be helpful to individuals responsible for implementing urban stormwater management programs.

The book includes fact sheets on 13 common stormwater treatment best management practices (BMPs). These summarize operation, maintenance, and management needs and obligations, along with construction recommendations. Other chapters review planning and design considerations, programmatic and regulatory aspects, considerations for facility owners, construction inspection, inspection and maintenance after construction, costs and financing, and disposal of stormwater sediments. Forms for inspecting BMPs during construction and determining maintenance needs afterwards are included in the book and in a separate supplement.
Source: [http://www.epa.gov/owowwtr1/NPS/wmi/index.html]
Additional information: [http://www.epa.gov/owowwtr1/NPS/ordinance/osm6.htm] and [http://www.epa.gov/owowwtr1/info/NewsNotes/issue05/nps05sto.html]

TOTAL MAXIMUM DAILY LOAD

States, territories, and authorized Tribes establish section 303(d) lists of impaired waters based on information contained in their 305(b) reports as well as other relevant and available water quality data. The section 303(d) list is a prioritized list of waters not meeting water quality standards. The USEPA has 30 days in which to approve the lists or add waters to the State's lists, if the Agency determines the list is not complete. Once a waterbody is placed on the 303(d) list, a TMDL must be prepared for the system.

A TMDL is a written, quantitative plan and analysis for attaining and maintaining water quality standards in all seasons for a specific waterbody and pollutant. Specifically, a TMDL is the sum of the allowable loads of a pollutant from all contributing point, nonpoint, and background sources. Total maximum daily loads may be established on a coordinated basis for a group of waterbodies in a watershed. Total maximum daily loads must be established for waterbodies on the list of impaired waterbodies and must include the following 11 elements:

1. The name and geographic location of the impaired waterbody;
2. Identification of the pollutant and the applicable water quality standard;
3. Quantification of the pollutant load that may be present in the waterbody and still ensure attainment and maintenance of water quality standards;
4. Quantification of the amount or degree by which the current pollutant load in the waterbody, including the pollutant load from upstream sources that is being accounted for as background loading, deviated from the pollutant load needed to attain and maintain water quality standards;
5. Identification of source categories, source subcategories or individual sources of pollutant;
6. Wasteload allocations;
7. Load allocations;
8. A margin of safety;
9. Consideration of seasonal variations;
10. Allowance for reasonably foreseeable increases in pollutant loads including future growth; and
11. An implementation plan.

Both the 1996 and 1998 section 303(d) lists, as well as more recent 305(b) reports reflect similar patterns: sediments, nutrients, and pathogens are the top three causes of waterbody impairment.
Source: [http://www.epa.gov/owowwtr1/tmdl/faq.html]

Waste Load Allocation
A waste load allocation (WLA) is the proportion of a receiving water's total maximum daily load that is allocated to point sources of pollution. Water quality models are often utilized by regulatory agencies in conducting an assessment to determine a WLA. Models establish a quantitative relationship between a waste load and its impact on water quality. WLAs are used by permit writers to establish Water Quality Based Effluent Limits (WQBELs).
Source: [http://www.epa.gov:80/owmitnet/permits/pwcourse/chapt_06.pdf]

Continuing Planning Process (CPP)
Each State is required to establish and maintain a continuing planning process (CPP) as described in section 303(e) of the Clean Water Act. A State's CPP contains, among other items, a description of the process that the State uses to identify waters needing water quality-based controls, a priority ranking of these waters, the process for developing TMDLs, and a description of the process used to receive public review of each TMDL. Descriptions may be as detailed as the Regional office and the State determine is necessary to describe each step of the TMDL development process. This process may be included as part of the EPA/State Agreement for TMDL development.
[Source: http://www.epa.gov/owowwtr1/tmdl/decisions/dec4.html]

LOOK TO THE FUTURE ... POLLUTANT TRADING

Point and nonpoint source pollutant trading involves financing reductions in nonpoint source pollution in lieu of undertaking more expensive point source pollution reduction efforts. A trading program is intended to produce cost savings for point source dischargers while improving water quality. Implementing a trading program requires a waterbody identifiable as a watershed or segment, as well as a measurable combination of point sources and controllable nonpoint sources. There must be significant load reductions for which the cost per pound reduced for nonpoint source controls is lower than the cost for upgrading point source controls. Lastly, point source dischargers must face requirements to either

upgrade facility treatment capabilities or trade for nonpoint source reductions in order to meet water quality goals.

Such a program allows the private sector to allocate its resources to reduce pollutants in the most cost-effective manner, and it encourages the development of a watershed-wide or basin-wide approach to water quality protection. A pollutant trading program also requires cooperation between agencies, and requires a system to arrive at trading ratios between point and nonpoint source controls.

For example, in a North Carolina watershed, the Tar-Pamlico Basin Association (a coalition of point source dischargers) and State and regional environmental groups have proposed a two-phased nutrient management strategy that incorporates point and nonpoint source pollutant trading. The plan requires association members to finance nonpoint source reduction activities in the basin if their nutrient discharges exceed a base allowance.
Source: [http://www.epa.gov/OWOW/NPS/MMGI/funding.html#9]

8.4 MANAGING NONPOINT SOURCE POLLUTION

During the first 15 years of the national program to abate and control water pollution, EPA and the States have focused most of their water pollution control activities on traditional "point sources," such as discharges through pipes from sewage treatment plants and industrial facilities. These point sources have been regulated by EPA and the States through the NPDES permit program established by section 402 of the Clean Water Act. Discharges of dredged and fill materials into wetlands have also been regulated by the U.S. Army Corps of Engineers and EPA under section 404 of the Clean Water Act.

The Nation has greatly reduced pollutant loads from point source discharges and has made considerable progress in restoring and maintaining water quality as a result of the above activities. However, the gains in controlling point sources have not solved all of the Nation's water quality problems. Recent studies and surveys by EPA and by State/Tribal water quality agencies indicate that the majority of the remaining water quality impairments in our nation's rivers, streams, lakes, estuaries, coastal waters, and wetlands result from nonpoint source pollution and other nontraditional sources, such as urban storm water discharges and combined sewer overflows.

Nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification. 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, defined in the preceding section. Although diffuse runoff is generally 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 hence is subject to the permit requirements of the Clean Water Act. In contrast, nonpoint sources are not subject to Federal permit requirements.

The pollution of waters by nonpoint sources is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural pollutants and pollutants resulting from human activity, finally depositing them into lakes, rivers, wetlands, coastal waters, and ground waters. Nonpoint source pollution can also be caused by atmospheric deposition of pollutants onto waterbodies. Furthermore, hydrologic modification is a form of nonpoint source pollution that often

adversely affects the biological and physical integrity of surface waters. A more detailed discussion of the range of nonpoint sources and their effects on water quality and riparian habitats is provided in subsequent chapters of this guidance. A summary of State laws related to nonpoint source pollution can be found in the *Almanac of Enforceable State Laws to Control Nonpoint Source Water Pollution* (ELI 1988). This report can be accessed on the internet at http://www.eli.org/bookstore/research.htm.

NONPOINT SOURCES OF NUTRIENTS

Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (USEPA 1993a) was developed by EPA for the planning and implementation of Coastal Nonpoint Pollution Programs. The guidance focuses on controlling five major categories of nonpoint sources that impair or threaten waters nationally. Management measures are specified for (1) agricultural runoff; (2) urban runoff (including developing and developed areas); (3) silvicultural (forestry) runoff; (4) marinas and recreational boating; and (5) hydromodification (e.g., channelization and channel modification, dams, and streambank and shoreline erosion). EPA guidance also includes management measures for wetlands, riparian areas, and vegetated treatment systems that apply generally to various categories of sources of nonpoint pollution. Management measures are defined in the Coastal Zone Act Reauthorization Amendments of 1990 as economically achievable measures to control the addition of pollutants to waters, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives.

The following section outlines some of the management measures specified in the CZARA guidance for the various types of nonpoint sources. These measures should be considered when implementing programs targeting nutrient releases into waters of the U.S.

Agricultural Runoff

- erosion and sediment control
- control of facility wastewater and runoff from confined animal facilities
- nutrient management planning on cropland
- grazing management systems
- irrigation water management

Urban Runoff

- control of runoff and erosion from existing and developing areas
- construction site runoff and erosion control
- construction site chemical control (includes fertilizers)
- proper design, location, installation, operation, and maintenance of on-site disposal systems
- pollution prevention education (e.g., household chemicals, lawn and garden activities, golf courses, pet waste, on-site disposal systems, etc.)
- planning, siting, and developing roads, highways, and bridges (including runoff management)

Silvicultural Runoff

- streamside management
- road construction and management
- forest chemical management (includes fertilizers)

- revegetation
- preharvest planning, harvesting management

Marinas and Recreational Boating

- siting and design
- operation and maintenance
- storm water runoff management
- sewage facility management
- fish waste management
- pollution prevention education (e.g., proper boat cleaning, fish waste disposal, and sewage pump out procedures)

Hydromodification (i.e., channelization, channel modification, dams)

- minimize changes in sediment supply and pollutant delivery rates through careful planning and design
- erosion and sediment control
- chemical and pollutant control (includes nutrients)
- stabilization and protection of eroding streambanks or shorelines

Wetlands, Riparian Areas, Vegetated Treatment Systems

- protect the NPS abatement and other functions of wetlands and riparian areas through vegetative composition and cover, hydrology of surface and ground water, geochemistry of the substrate, and species composition
- promote restoration of preexisting function of damaged and destroyed wetlands and riparian systems
- promote the use of engineered vegetated treatment systems if they can serve a NPS pollution abatement function

EFFORTS TO CONTROL NONPOINT SOURCE POLLUTION

Efforts to control nonpoint source pollution include nonpoint source management programs, the National Estuary Program, atmospheric deposition, coastal nonpoint pollution control programs, and Farm Bill conservation provisions. These efforts are described below.

Nonpoint Source Management Programs

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 efforts on nonpoint sources. In the Water Quality Act of 1987, Congress amended 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.

More importantly, Congress enacted section 319 of the Clean Water Act, which established a national program to control nonpoint sources of water pollution. Under section 319, States address nonpoint pollution by assessing nonpoint source pollution problems and causes within the State, adopting management programs to control the nonpoint source pollution, and implementing the management programs. While not required, many States have incorporated the management measures specified in the 1993 CZARA guidance into their State Nonpoint Source Management Programs.

Section 319 also authorizes EPA to issue grants to States to assist them in implementing those management programs or portions of management programs which have been approved by EPA. As of FY 2000, over $1 billion in grants have been given to States, Territories, and Tribes for the implementation of nonpoint source pollution control programs.

For additional information on the Nonpoint Source Management Program and distribution of Section 319 grants in your State, contact your State's designated nonpoint source agency. For many states, the nonpoint source agency is the State Water Quality Agency. However, in several instances, other agencies or departments are given nonpoint source responsibility (see Table 5).

National Estuary Program

EPA also administers the National Estuary Program under section 320 of the Clean Water Act. This program focuses on point and nonpoint pollution in geographically targeted, high-priority estuarine waters. Under 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. For additional information, contact your local estuary program. The following estuaries are currently enrolled in the program:

- Albemarle-Pamlico Sounds, NC
- Barataria-Terrebonne Estuarine Complex, LA
- Barnegat Bay, NJ
- Buzzards Bay, MA
- Casco Bay, ME
- Charlotte Harbor, FL
- (Lower) Columbia River Estuary, OR and WA
- Corpus Christi Bay, TX
- Delaware Estuary, DE, NJ, and PA
- Delaware Inland Bays, DE
- Galveston Bay, TX
- Indian River Lagoon, FL
- Long Island Sound, NY and CT
- Maryland Coastal Bays, MD

Table 5. States for which the nonpoint source agency is not the water quality agency.

State	State Nonpoint Source Agency
Arkansas	State Department of Soil and Water Conservation
Delaware	State Department of Soil and Water Conservation
Oklahoma	State Department of Soil and Water Conservation
Tennessee	State Department of Agriculture
Texas	Department of Soil and Water Conservation (for agriculture) Texas Water Quality Board (all other nonpoint sources)
Vermont	State Department of Agriculture
Virginia	State Department of Soil and Water Conservation

- Massachusetts Bays, MA
- Mobile Bay, AL
- Morro Bay, CA
- Narragansett Bay, RI
- New Hampshire Estuaries, NH
- New York-New Jersey Harbor, NY and NJ
- Peconic Bay, NY
- Puget Sound, WA
- San Francisco Estuary, CA
- San Juan Bay, PR
- Santa Monica Bay, CA
- Sarasota Bay, FL
- Tampa Bay, FL
- Tillamook Bay, OR

Atmospheric Deposition

While runoff from agricultural and urban areas may be the largest sources of nonpoint pollution, growing evidence suggests that atmospheric deposition may have a significant influence on nutrient enrichment, particularly from nitrogen (Jaworski et al. 1997). Gases released through fossil fuel combustion and agricultural practices are two major sources of atmospheric N that may be deposited in waterbodies (Carpenter et al. 1998). Nitrogen and nitrogen compounds formed in the atmosphere return to the earth as acid rain or snow, gas, or dry particles (http://www.epa.gov/acidrain/effects/envben.html). EPA has several programs that address the issue of atmospheric deposition, including the National Ambient Air Quality Standards, the Atmospheric Deposition Initiative, and the Great Waters Program.

National Ambient Air Quality Standards

The Clean Air Act provides the principal framework for national, State, and local efforts to protect air quality. Under the Clean Air Act, national ambient air quality standards (NAAQS) for pollutants which are considered harmful to people and the environment are established.

The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings (http://www.epa.gov/airs/criteria.html).

Atmospheric Deposition Initiative

In 1995, EPA's Office of Water established an "Air Deposition Initiative" to work with the EPA Office of Air and Radiation to identify and characterize air deposition problems with greater certainty and examine solutions to address them. The Air and Water Programs are cooperating to assess the atmospheric deposition problem, conduct scientific research, provide innovative solutions to link Clean Air Act and Clean Water Act tools to reduce the of these pollutants, and communicate the findings to the public. To date, most efforts have focused on better understanding of the links between nitrogen and mercury emissions and harmful effects on water quality and the environment. Significant work has also been done towards quantifying the benefits to water quality of reducing air emissions and developing sensible, cost effective approaches to reducing the emissions and their ecosystem and health effects (http://www.epa.gov/owowwtr1/oceans/airdep/index.html).

Great Waters Program

On November 15, 1990, in response to mounting evidence that air pollution contributes to water pollution, Congress amended the Clean Air Act and included provisions that established research and reporting requirements related to the deposition of hazardous air pollutants to the "Great Waters." The waterbodies designated by these provisions are the Great Lakes, Lake Champlain, and Chesapeake Bay. As part of the Great Waters Program, Congress requires EPA, in cooperation with the National Oceanic and Atmospheric Administration, to monitor hazardous pollutants by establishing sampling networks, investigate the deposition of these pollutants, improve monitoring methods, monitor for hazardous pollutants in fish and wildlife, determine the contribution of air pollution to total pollution in the Great Waters, evaluate any adverse effects to public health and the environment, determine sources of pollution, and provide a report to Congress every 2 years. These reports provide an information base that can be used to establish whether air pollution is a significant contributor to water quality problems of the Great Waters, determine whether there are significant adverse effects to humans or the environment, evaluate the effectiveness of existing regulatory programs in addressing these problems, and assess whether additional regulatory actions are needed to reduce atmospheric deposition to the Great Waters. For more detail, the Great Waters biennial Reports to Congress discuss current scientific understanding of atmospheric deposition (http://www.epa.gov/airprogm/oar/oaqps/gr8water/xbrochure/program.html).

Coastal Nonpoint Pollution Control Programs

In November 1990, Congress enacted the Coastal Zone Act Reauthorization Amendments of 1990. These Amendments were intended to address several concerns, a major one of which is the impact of nonpoint source pollution on coastal waters.

To address more specifically the impacts of nonpoint source pollution on coastal water quality, Congress enacted section 6217, "Protecting Coastal Waters," which was codified as 16 U.S.C. -1455b. This section provides that each State with an approved coastal zone management program must develop and submit a Coastal Nonpoint Pollution Control Program for EPA and the National Oceanic and Atmospheric Administration (NOAA) approval. The purpose of the program "shall be 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."

States with Coast Nonpoint Pollution Control Programs are required to include measures in their programs that are “in conformity” with the 1993 CZARA guidance, as discussed previously. A listing of States with Coastal Nonpoint Pollution Control Programs is presented in Table 6. For additional information on the programs in these States, contact the State water quality agency.

Farm Bill Conservation Provisions

Technical and financial assistance for landowners seeking to preserve soil and other natural resources is authorized by the Federal Government under provisions of the Food Security Act (Farm Bill). Provisions of the 1996 Farm Bill relating directly to installation and maintenance of BMPs are summarized in the following sections. Contact your Natural Resources Conservation Service (NRCS) State Conservationist’s office for State-specific information.

Environmental Conservation Acreage Reserve Program (ECARP)

ECARP is an umbrella program established by the 1996 Farm Bill which contains the conservation Reserve Program (CRP), Wetlands Reserve Program (WRP), and Environmental Quality Incentives Program (EQIP). It authorizes the Secretary of Agriculture to designate watersheds, multi-state areas, or regions of special environmental sensitivity as conservation priority areas which are eligible for enhanced Federal assistance. Assistance in priority areas is to be used to help agricultural producers comply with NPS pollution requirements of the Clean Water Act and other State or Federal environmental laws. The ECARP is authorized through 2002.

Conservation Reserve Program (CRP)

First authorized by the Food Security Act of 1985 (Farm Bill), this voluntary program offers annual rental payments, incentive payments, and cost-share assistance for establishing long-term, resource-conserving cover crops on highly erodible land. CRP contracts are issued for a duration of 10 to 15 years for up to 36.4 million acres of cropland and marginal pasture. Land can be accepted into the CRP through a competitive bidding process through which all offers are ranked using an environmental benefits index, or through continuous sign-up for eligible lands where certain special conservation practices will be implemented.

The Conservation Reserve Enhancement Program (CREP) is a new initiative of CRP authorized under the 1996 Federal Agricultural Improvement and Reform Act. CREP is a joint, State-federal program designed to meet specific conservation objectives. CREP targets State and Federal funds to achieve shared environmental goals of national and state significance. The program uses financial incentives to encourage farmers and ranchers to voluntarily protect soil, water, and wildlife resources.

Table 6. An alphabetical list of States and Territories with Coastal Nonpoint Pollution Control Programs.

States and Territories with Coastal Nonpoint Pollution Control Programs		
Alabama	Maine	Oregon
Alaska	Maryland	Pennsylvania
American Samoa	Massachusetts	Puerto Rico
California	Michigan	Rhode Island
Connecticut	Mississippi	South Carolina
Delaware	New Hampshire	Virgin Islands
Florida	New Jersey	Virginia
Guam	New York	Washington
Hawaii	North Carolina	Wisconsin
Louisiana	Northern Mariana Islands	

Wetlands Reserve Program (WRP)
The WRP is a voluntary program to restore and protect wetlands and associated lands. Participants may sell a permanent or 30-year conservation easement or enter into a 10-year cost-share agreement with USDA to restore and protect wetlands. The landowner voluntarily limits future use of the land, yet retains private ownership. The NRCS provides technical assistance in developing a plan for restoration and maintenance of the land. The landowner retains the right to control access to the land and may lease the land for hunting, fishing, and other undeveloped recreational activities.

Environmental Quality Incentives Program
The EQIP was established by the 1996 Farm Bill to provide a voluntary conservation program for farmers and ranchers who face serious threats to soil, water, and related natural resources. EQIP offers financial, technical, and educational help to install or implement structural, vegetative, and management practices designed to conserve soil and other natural resources. Current priorities for these funds dictate that one half of the available monies be directed to livestock-related concerns. Cost-sharing may pay up to 75% of the costs for certain conservation practices. Incentive payments may be made to encourage producers to perform land management practices such as nutrient management, manure management, integrated pest management, irrigation water management, and wildlife habitat management.

Wildlife Habitat Incentives Program (WHIP)
This program is designed for parties interested in developing and improving wildlife habitat on private lands. Plans are developed in consultation with NRCS and the local Conservation District. USDA will provide technical assistance and cost-share up to 75% of the cost of implementing the wildlife

conservation practices. Participants generally must sign a 5- to 10-year contract with USDA which requires that they maintain the improvement practices.

Forestry Incentives Program (FIP)

Originally authorized in 1978, the FIP allows cost sharing of up to 65% (up to a maximum of $10,000 per person per year) for tree planting, timber stand improvement, and related practices on nonindustrial private forest land. The FIP is administered by NRCS and the U.S. Forest Service. Cost share funds are restricted to individuals who own no more than 1,000 acres of eligible forest land.

Conservation of Private Grazing Land

This program was authorized by the 1996 Farm Bill for the purpose of providing technical and educational assistance to owners of private grazing lands. It offers opportunities for better land management, erosion reduction, water conservation, wildlife habitat, and improving soil structure.

Cooperative Extension

State land grant universities and Cooperative Extension play an important role in management implementation. They have the expertise to research, transfer, and implement agriculture management systems that will be needed to meet nutrient criteria. In addition, they have developed models and other predictive management tools that will aid in selecting the most appropriate management activities. Contact your local Cooperative Extension Agent, or the Agriculture Department at a State land grant university for more information on the services they can provide.