EPA United States Environmental Protection Agency Office of Water

The Quality of Our Nation's Water

Introduction

The 1992 Report to Congress describes the geographic extent of water pollution across the country and identifies specific pollutants and sources of pollutants contaminating our waters. This national snapshot of water quality conditions summarizes information submitted by the States, the District of Columbia, Territories, Interstate Water Basin Commissions, and one American Indian Tribe in their 1992 water quality assessment reports (required under Clean Water Act Section 305(b)). The 1992 Section 305(b) reports contain assessments of each State's water quality during 1990 and 1991.

This report displays and summarizes data provided by the States to EPA. EPA has not determined the accuracy of these data. It is important to note that these State-reported data are intended to provide a snapshot of the quality of the waters they assessed and cannot be used to determine trends in our Nation's water resources. These limitations are due to major differences from year to year in assessment methods within and between States as well as differences in the waters assessed in each 2-year period. In addition, not all States follow EPA's guidance on procedures for determining whether waters are supporting the uses designated in their water quality standards. EPA and the States are taking many steps toward transforming the 305(b) process into one that provides comparable data with known accuracy. These steps include implementing the recommendations of the National 305(b) Consistency Workgroup and the Intergovernmental Task Force on Monitoring Water Quality, as well as improving the Section 305(b) guidelines and implementing the Office of Water's Monitoring Strategy. These efforts will foster consistency and accuracy among the States and allow better sharing of data for watershed protection and across political boundaries.

Why Is It Important To Learn About Water Pollution?

The EPA encourages each citizen to become a steward of our precious natural

resources. Complex environmental threats and diminishing funds for pollution control force us to jointly solve the pollution problems that foul our beaches and lakes or close our favorite fishing sites. We need to understand these problems and become a part of their solution. Once we understand these pollution problems and what is needed to combat them, we will be better able to prioritize our efforts, devise sound solutions, take appropriate action, monitor progress after solutions are implemented, and modify behavior that contributes to the problems.

This document provides fundamental water quality information needed to resolve our persistent water pollution problems. This Report to Congress:

- Defines key water quality concepts
- Discusses the leading pollution problems in rivers and streams, lakes, estuaries, coastal waters, wetlands, and ground water as reported to EPA by the States
- Briefly describes major State and Federal activities to control water pollution
- Offers several water quality protection actions for every citizen to adopt.

Key Concepts

Measuring Water Quality

The States assess the quality of their waters by determining if their waters attain State water quality standards. Water quality standards consist of beneficial uses, numeric and narrative criteria for supporting each use, and an antidegradation statement:

- Designated beneficial uses are the desirable uses that water quality should support. Examples are drinking water supply, primary contact recreation (such as swimming), and aquatic life support. Each designated use has a unique set of water quality requirements or criteria that must be met for the use to be realized. States may designate an individual waterbody for

multiple beneficial uses.

- Numeric water quality criteria establish the minimum physical, chemical, and biological parameters required to support a beneficial use. Physical and chemical numeric criteria may set maximum concentrations of pollutants, acceptable ranges of physical parameters, and minimum concentrations of desirable parameters, such as dissolved oxygen. Numeric biological criteria describe the expected attainable community attributes and establish values based on measures such as species richness, presence or absence of indicator taxa, and distribution of classes of organisms.
- Narrative water quality criteria define, rather than quantify, conditions and attainable goals that must be maintained to support a designated use. Narrative biological criteria establish a positive statement about aquatic community characteristics expected to occur within a waterbody; for example, "Ambient water quality shall be sufficient to support life stages of all indigenous aquatic species." Narrative criteria may also describe conditions that are desired in a waterbody, such as, "Waters must be free of substances that are toxic to humans, aquatic life, and wildlife."
- Antidegradation statements protect existing designated uses and prevent high-quality waterbodies from deteriorating below the water quality necessary to maintain existing or anticipated designated beneficial uses.

The Clean Water Act provides primary authority to States to set their own standards but requires that all State beneficial uses and their criteria comply with the "fishable and swimmable" goals of the Act. At a minimum, State beneficial uses must support aquatic life and recreational use. In effect, States cannot designate "waste assimilation" as a beneficial use, as some States did prior to 1972.

The EPA recommends that States assess support of the following individual beneficial uses:

- **Aquatic Life Support**
  The waterbody provides suitable habitat for survival and reproduction of desirable fish, shellfish, and other aquatic organisms.
- **Fish Consumption**
  The waterbody supports a population of fish free from contamination that could pose a human health risk to consumers.

- **Shellfish Harvesting**
  The waterbody supports a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.
- **Drinking Water Supply**
  The waterbody can supply safe drinking water with conventional treatment.
- **Primary Contact Recreation - Swimming**
  People can swim in the waterbody without risk of adverse human health effects (such as catching waterborne diseases from raw sewage contamination).
- **Secondary Contact Recreation**
  People can perform activities on the water (such as canoeing) without risk of adverse human health effects from occasional contact with the water.
- **Agriculture**
  The water quality is suitable for irrigating fields or watering livestock.

EPA recognizes five levels of use support. If possible, the States determine the level of use support by comparing monitoring data with numeric criteria for each use designated for a particular waterbody. If monitoring data are not available, the State may determine the level of use support with qualitative information. Valid qualitative information includes land use data, fish and game surveys, and predictive model results. **Monitored assessments** are based on monitoring data. **Evaluated assessments** are based on qualitative information or monitored data more than 5 years old.

After the States determine the level of use support for each individual designated use in each waterbody, the States consolidate individual use support assessments to determine the level of overall use support for each waterbody.

- Fully Supporting Overall Use All designated beneficial uses are fully supported.
- Threatened Overall Use One or more designated beneficial uses are threatened and the remaining uses are fully supported.
- Partially Supporting Overall Use One or more designated beneficial uses are partially supported and the remaining uses are fully supported.
- Not Supporting Overall Use One or more designated beneficial uses are not supported.
- Not Attainable The State has performed a use-attainability study and

documented that use support of one or more designated beneficial uses is not achievable due to natural conditions or human activity that cannot be reversed without imposing widespread economic and social impacts.
- Impaired Waters The sum of waterbodies partially supporting uses and not supporting uses.

Water Quality Monitoring Inset

The EPA then aggregates the State use support information into a national assessment of the Nation's water quality.

How Many of Our Waters Were Assessed for 1992?

National estimates of the total waters of our country provide the foundation for determining the percentage of waters assessed by the States and the portion impaired by pollution. In 1992, EPA provided the States with estimates of total river miles and lake acres derived from the EPA Reach File, a database containing traces of waterbodies adapted from 1:100,000 scale maps prepared by the U.S. Geological Survey. The States modified these total water estimates where necessary. Based on the new EPA/State figures, the national estimate of total river miles doubled in 1992 in large part because the EPA/State estimates included nonperennial streams, canals, and ditches that were previously excluded from estimates of total stream miles.

Current estimates indicate that the United States has:

- More than 3.5 million miles of rivers and streams, which range in size from the Mississippi River to small streams that flow only when wet weather conditions exist (i.e., intermittent streams)
- Approximately 40 million acres of lakes, ponds, and reservoirs
- About 37,000 square miles of estuaries (excluding Alaska)
- More than 56,000 miles of ocean shoreline, including 36,000 miles in Alaska
- 5,382 miles of Great Lakes shoreline
- More than 277 million acres of wetlands such as marshes, swamps, bogs, and fens, including 170 million acres of wetlands in Alaska.

Due to factors such as funding limitations, most States assess a subset of their

total water resources during each 2-year reporting cycle required under Clean Water Act Section 305(b). States are more capable of assessing all of their waters over a 5- to 10-year period. The figure to the right presents the percentage of total waters assessed by the States for the 1992 report. It should be noted that the percentage of perennial rivers and streams assessed is much greater than the percentage of total rivers and streams assessed.

The summary information based on assessed waters may not represent overall conditions in the Nation's total waters because States often focus on monitoring and assessing major perennial rivers, estuaries, and public lakes with suspected pollution problems. Many States lack the resources to collect use support information for intermittent streams, small tributaries, and private ponds. EPA cannot predict the health of these unassessed waters.

The Intergovernmental Task Force on Monitoring Water Quality Inset

Pollutants That Degrade Water Quality

Where possible, States identify the pollutants or processes that degrade water quality and indicators that document impacts of water quality degradation. Pollutants include sediment, nutrients, and chemical contaminants (such as dioxin and metals). Processes that degrade waters include habitat modification (such as destruction of streamside vegetation) and hydrologic modification (such as flow reduction). Indicators of water quality degradation include physical, chemical, and biological parameters. Examples of biological parameters include species diversity and abundance. Examples of physical and chemical parameters include pH, turbidity, and temperature. Following are descriptions of the effects of the pollutants and processes most commonly identified in rivers, lakes, estuaries, coastal waters, wetlands, and ground water.

> **Nutrients** include nitrates found in sewage and fertilizers and phosphates found in detergents and fertilizers. In excess levels, nutrients overstimulate the growth of aquatic plants and algae. Excessive growth of these organisms, in turn, can clog navigable waters, use up dissolved oxygen as they decompose, and block light to deeper waters. This seriously affects the respiration of fish and aquatic invertebrates, leads to a decrease in animal and plant diversity, and affects our use of the water for fishing, swimming, and boating. In ground water, fertilizers and

nitrates are among the principal contaminants that can lead to drinking water well closures.

Silt and other suspended solids wash off plowed fields, construction and logging sites, urban areas, strip-mined land, and eroded stream banks when it rains. As these sediments enter rivers, lakes, coastal waters, and wetlands, fish respiration is impaired, plant productivity and water depth are reduced, aquatic organisms and their habitats are smothered, and our aesthetic enjoyment of the water is reduced.

Pathogens (certain waterborne bacteria, viruses, and protozoans) can cause human illnesses that range from typhoid and dysentery to minor respiratory and skin diseases. These organisms can enter waterways through a number of routes, including inadequately treated sewage, storm water drains, septic systems, runoff from livestock pens, and boats that dump sewage. Because it is impossible to test water for every type of disease-causing organism, States usually measure indicator bacteria such as fecal coliforms that suggest the water may be contaminated with untreated sewage and that other, more dangerous, organisms may be present.

Organic material may enter waterways in many different forms as sewage, as leaves and grass clippings, or as runoff from livestock feedlots and pastures. When natural bacteria and protozoans in the water break down this organic material, they begin to use up the oxygen dissolved in the water. Many types of fish and bottom-dwelling animals cannot survive when levels of dissolved oxygen drop below 2 to 5 parts per million.

Metals (such as mercury, lead, and cadmium) and **toxic organic chemicals** (such as PCBs and dioxin) may originate in industrial discharges, runoff from city streets, mining activities, leachate from landfills, and a variety of other sources. These toxic chemicals, which are generally persistent in the environment, can cause death or reproductive failure in fish, shellfish, and wildlife. In addition, they can accumulate in animal and fish tissue, be absorbed in sediments, or find their way into drinking water supplies, posing long-term health risks to humans.

Pesticides and herbicides used on croplands, lawns, and in termite control can be washed into ground and surface waters by rainfall, snowmelt, and irrigation practices. These contaminants are generally very persistent in the environment and may accumulate in fish, shellfish, and wildlife to levels that pose a risk to human health and the environment. Pesticides are among the principal contaminants causing drinking water well closures in the southern and western regions of the country.

Habitat modification results from activities such as grazing, farming, channelization, dam construction, and dredging. Typical examples of the effects of hydrologic modification include loss of streamside vegetation, siltation, smothering of bottom-dwelling organisms, and increased water temperatures.

Other pollutants include salts, acidic contaminants, and oil and grease. Fresh waters may become unfit for aquatic life and some human uses when they become contaminated by salts. Sources of salinity include irrigation runoff, brine used in oil extraction, road deicing operations, and the intrusion of sea water into ground and surface waters in coastal areas. Acidity problems are of concern in areas with many abandoned mines (acid mine drainage) and areas susceptible to acid rain. Changes in acidity (measured as pH) can alter the toxicity of other chemicals in water and can render lakes and streams unfit for aquatic life.

Other pollutants of concern include crude oil and processed petroleum products spilled during extraction, processing, or transport or leaked from underground storage tanks; noxious aquatic plants, particularly introduced species that compete against native plants; and increased water temperatures resulting from industrial cooling processes or habitat modification.

Fish Kills Inset

Sources of Water Pollution

Often we associate water pollution with images of oil spills or raw sewage and toxic chemicals spewing from pipes at industrial facilities and sewage treatment plants. Although point source discharges still produce some pollution, most are

controlled with specific permit conditions that they usually meet. Currently, less visible nonpoint sources of pollution are more widespread and introduce vast quantities of pollutants into our surface and ground waters. Nonpoint sources deliver pollutants to waterbodies in a dispersed manner rather than from a discrete pipe or other conveyance. Nonpoint sources include atmospheric deposition, contaminated sediments, and many land activities that generate polluted runoff, such as agriculture, logging, and onsite sewage disposal.

In contrast, point sources discharge wastes into waterbodies from a discrete point that is easily identified. The most common point sources are industrial facilities, municipal treatment plants, and combined sewers. Diffuse runoff is a point source if it enters and is discharged from a conveyance such as those described in CWA Section 502(14) (such as pipes, ditches, and canals). The table on the previous page defines the categories of pollution sources most frequently cited in this document. The table on this page lists the leading sources of impairment reported by States for their rivers, lakes, and estuaries. Other sources cited less frequently include atmospheric deposition, in-place contaminants, and natural sources. Atmospheric deposition refers to contaminants entering waters from polluted air. In-place contaminants were generated by past activities, such as discontinued industrial discharges, logging, or one-time spills. In-place contaminants often reside in sediments but continue to release pollutants back into the water column. Natural sources refer to an assortment of water quality problems:

- Natural deposits of salts, gypsum, nutrients, and metals in soils that leach into surface and ground waters
- Warm weather and dry conditions that raise water temperatures, depress dissolved oxygen concen-trations, and dry up shallow waterbodies
- Low-flow conditions and tannic acids from decaying leaves that lower pH and dissolved oxygen concentrations in swamps draining into streams.

With so many potential sources of pollution, it is difficult and expensive for States to identify specific sources responsible for water quality impairments. Many States lack funding for monitoring to identify all but the most apparent sources degrading waterbodies. State management priorities may focus monitoring budgets on other water quality issues, such as identification of contaminated fish populations that pose a human health risk. Management priorities may also direct monitoring efforts to larger waterbodies and overlook

sources impairing smaller waterbodies. As a result, the States do not associate every impacted waterbody with a source of impairment in their 305(b) reports, and the summary cause and source information presented in this report applies exclusively to a subset of the Nation's impaired waters.

Rivers and Streams

Pollutants discharged upstream often become the problem of someone who lives downstream (or of the aquatic life that exists instream), and all of the activities that take place in a watershed can have a water quality impact elsewhere in the watershed. The term watershed simply refers to a geographic area in which water, sediments, and dissolved materials (contaminants) drain to a common outlet such as a point on a larger river, lake, ground water aquifer, or ocean. It is therefore important to remember that rivers and streams are connected by hydrology, ecology, geology, and social and economic considerations to the lakes, wetlands, and coastal and ground waters we discuss later in this document.

Do Our Rivers and Streams Support Uses?

For the 1992 Report, 54 States, Territories, Tribes, Commissions, and the District of Columbia (hereafter collectively referred to as "States") assessed 642,881 miles (18%) of the Nation's total 3.5 million miles of rivers and streams.

The States assessed about 4,000 fewer river miles in 1992 than in 1990. EPA expected the percentage and amount of waters assessed to decline in 1992 because EPA advised the States to no longer include waters in the assessed categories for which the State lacked specific information. The percentage of waters assessed dropped because the baseline estimate of total waters increased.

Conditions in unassessed rivers cannot be estimated with summary information based on assessed waters because unassessed rivers include an unknown combination of pristine and impaired rivers. Therefore, the following discussion applies exclusively to assessed waters and cannot be extrapolated to describe conditions in the Nation's rivers as a whole. EPA is working with the States to expand assessment coverage of the Nation's waters and expects future

assessment information to cover a greater portion of the Nation's rivers and streams.

Of the Nation's 642,881 assessed river miles, the States found that 56% fully support their designated uses, and an additional 6% support uses but are threatened and may become impaired if pollution control actions are not taken. The States reported that 25% of the assessed river miles partially support uses, and 13% of the assessed river miles do not support designated uses. Only 125 miles (less than one-tenth of 1%) of the assessed waters could not attain designated uses.

What Is Polluting Our Rivers and Streams?

The States reported that siltation and nutrients impair more miles of rivers and streams than any other pollutants, affecting 45% and 37% of impaired stream miles in the States reporting causes, respectively. Other leading causes of impairment include indicators of pathogens, affecting 27%; pesticides, affecting 26%; and organic enrichment and resultant low levels of dissolved oxygen, affecting 24% of impaired stream miles.

Where Does This Pollution Come From?

Forty-eight States identified sources contributing to the impairment of 221,877 miles of their rivers and streams not fully supporting designated uses. These States reported that agricultural runoff is the leading source of pollutants in rivers and streams. Forty-five States identified almost 160,000 river miles impaired by agricultural sources, including nonirrigated crop production, irrigated crop production, rangeland, and animal holding areas. These States found that agricultural activities contribute substantially to the impairment of 72% of the impaired stream miles in the 48 States reporting sources. The States identified other sources of impairment far less frequently, such as municipal point sources, affecting 15%; urban runoff and storm sewers, affecting 11%; and resource extraction, affecting 11% of the impaired waters.

Although this summary provides the best picture of national impacts from sources available to EPA at this time, it has limitations. The information provided applies to only 18% of our Nation's total rivers and streams because the States cannot assess all 3.5 million miles of this Nation's rivers and streams in

a 2-year period and they cannot specify the source of pollution impairing each waterbody assessed. In addition, national summary information can obscure sources with regional or State significance. For example, Oregon reports that silviculture (forestry activity) contributes to the impairment of 46% of their rivers and streams that do not fully support designated uses. Nationally, silviculture impacts only 7% of the impaired rivers and streams. Therefore, it is important to refer to the individual State data presented in the *National Water Quality Inventory: 1992 Report to Congress* for detailed information on significant sources in individual States.

Lakes, Ponds, and Reservoirs

Lakes are sensitive to pollution inputs because lakes flush out their contents relatively slowly. Even under natural conditions, lakes undergo eutrophication, an aging process that slowly fills in the lake with sediment and organic matter (see following sidebar). The eutrophication process alters basic lake characteristics such as depth, biological productivity, oxygen levels, and water clarity. The eutrophication process is commonly defined by a series of trophic states as described in the sidebar.

Do Our Lakes and Reservoirs Support Uses?

Forty-nine States assessed overall use support in more than 18 million lake acres representing 46% of the approximately 40 million total acres of lakes, reservoirs, and ponds in the Nation. For 1992, the States assessed about 180,000 fewer lake acres than in 1990. Overall, 43% of the assessed lake acres fully support designated uses such as swimming, fishing, and drinking water supply. An additional 13% were identified as threatened and could soon become impaired if pollution control actions are not taken. The States reported that 35% of assessed lake acres partially support designated uses, 9% do not support uses, and less than 1% cannot attain uses.

Trophic States Inset

What Is Polluting Our Lakes, Reservoirs, and Ponds?

Forty-seven States reported causes of impairment in their lakes. Overall, these States reported that metals and nutrients are the most common causes of nonsupport in assessed lakes, affecting 47% and 40% of impaired lake acres, respectively. However, impairments due to metals were concentrated in several States with large numbers of lakes (primarily Minnesota), while nutrient problems were widely reported by 41 States. Other leading causes of lake impairment were organic enrichment, affecting 24% of impaired lake acres; siltation, affecting 22%; and priority organics, affecting 20% of impaired lake acres.

Acid Effects on Lakes Inset

Forty-one States also assessed trophic status, which is associated with nutrient enrichment, in 11,477 of their lakes. Nutrient enrichment tends to increase the proportion of lakes in the eutrophic and hypereutrophic categories. These States reported that 17% of the lakes they assessed for trophic status were oligotrophic, 35% were mesotrophic, 32% were eutrophic, 7.5% were hypereutrophic, and 8.5% were dystrophic. This information may not be representative of national lake conditions because States often assess lakes in response to a problem or public complaint or because of their easy accessibility. It is likely that more remote lakes which are probably less impaired are underrepresented in these assessments.

Where Does This Pollution Come From?

Forty-five States identified individual sources degrading some of their 5.5 million impaired lake acres. These States reported that agriculture impairs more lake acres than any other source. Thirty-eight States found that agriculture contributes to the impairment of 3 million lake acres, or 56% of the impaired lake acres in the 45 States reporting sources of pollution in lakes.

The States also reported that urban runoff and storm sewers contribute to impairments in 24% of their impaired lake acres, hydrologic modifications and habitat modifications affect 23%, municipal point sources affect 21%, and onsite wastewater disposal (such as septic systems) affect 16% of the impaired lake acres.

The Great Lakes

The Great Lakes contain one-fifth of the world's fresh surface water and are stressed by a wide range of pollution sources associated with the large urban centers located on their shores. Many of the pollutants that reach the Great Lakes remain in the system indefinitely because the Great Lakes are a relatively closed water system.

Do the Great Lakes Support Uses?

The States assessed 99% of the Great Lakes shoreline miles in 1992. Less than 3% of the assessed shoreline miles fully support uses due to conditions that also generate fish consumption advisories issued by the Great Lakes States and the Province of Ontario for the nearshore waters of the Great Lakes. Thirty percent of assessed shoreline miles partially support uses, and the remaining 67% do not support uses. These figures do not address water quality conditions in the deeper, cleaner, central waters of the Lakes.

What Is Polluting the Great Lakes?

Most of the Great Lakes shoreline is polluted by toxic organic chemicals primarily PCBs and DDT that are often found in fish tissue samples. The Great Lakes States reported that toxic organic chemicals impact 99% of the impaired Great Lakes shoreline miles. Other leading causes of impairment include metals, affecting 11%; organic enrichment and low dissolved oxygen, affecting 7%; nutrients, affecting 5%; and siltation, affecting 3%.

Where Does This Pollution Come From?

Although information on sources of pollution in the Great Lakes is sketchy, the reported information suggests that atmospheric deposition and contaminated sediments are the leading sources impairing Great Lakes waters. Sediment contamination is a major problem in nearshore waters and harbors. Other sources cited by the States include landfills, urban runoff, and combined sewer overflows.

Estuaries

Estuaries are areas partially surrounded by land where rivers meet the sea. They are characterized by varying degrees of salinity, complex water movements affected by ocean tides and river currents, and high turbidity levels. They are also highly productive ecosystems with a range of habitats for many different species of plants, shellfish, fish, and animals.

Many species permanently inhabit the estuarine ecosystem; others, such as shrimp, use the nutrient-rich estuarine waters as nurseries before traveling to the sea.

Estuaries are stressed by the particularly wide range of activities located within their watersheds. They receive pollutants carried by rivers from agricultural lands and cities; they often support marinas, harbors, and commercial fishing fleets; and their surrounding lands are highly prized for development. These stresses pose a continuing threat to the survival of these bountiful waters.

Do Our Estuaries Support Uses?

Twenty-five coastal States assessed roughly three-quarters of the Nation's total estuarine waters in 1992. Of these, 56% were found to fully support designated uses. An additional 12% are fully supporting uses but are threatened and could become impaired if pollution control actions are not taken. Twenty-three percent of assessed estuarine square miles partially support uses, and the remaining 9% do not support uses.

What Is Polluting Our Estuaries?

States report that the most common causes of nonsupport of designated uses in our Nation's estuaries are nutrients, affecting 55% of the 8,572 impaired square miles; followed by pathogens, affecting 42%; organic enrichment and resulting low levels of dissolved oxygen, affecting 34%; and siltation, affecting 12%. Pathogen contamination is responsible for the closure of shellfishing beds in many areas of the country.

Where Does This Pollution Come From?

States report that municipal sewage treatment plants, urban runoff/storm sewers, and agriculture are the leading sources of pollution in their estuarine waters, affecting 53%, 43%, and 43% of impaired estuarine square miles, respectively. Other leading sources cited by the States include industrial point sources, affecting 23%, and resource extraction, affecting 12%. Point sources continue to have a significant impact on estuarine water quality because concentrated population centers and industrial operations are located adjacent to major estuarine systems. In contrast, rivers and lakes are more dispersed in rural and urban areas throughout the country and tend to support more diverse land uses that generate nonpoint source pollution.

The Chesapeake Bay

Since its inception in 1975, the Chesapeake Bay Program has coordinated numerous studies by the Chesapeake Bay States, the EPA, and other Federal agencies (see page 35 for programmatic information). These studies have defined water quality problems in the Bay, identified sources of water quality degradation, and documented water quality improvements in the Bay.

The Problem

Studies completed in the 1970s substantiated that increases in agricultural development, population growth, and sewage treatment plant flows were generating large quantities of nutrients (primarily phosphorus and nitrogen) flowing into the Bay. The nutrients cause excessive algae growth that initiates a chain reaction with two effects:

- In shallow areas, the excess algae shade underwater bay grasses, blocking light essential for plant growth. The habitat degradation causes the eventual loss of grass beds that provide food for waterfowl and critical habitat for other creatures, such as juvenile blue crabs and Bay scallops.
- In deeper areas, the algae die and sink to the bottom where their

decomposition consumes oxygen. During the warm summer months, oxygen in the bottom waters can be depleted. Bottom-dwelling organisms, such as oysters, clams, and worms, which provide food for fish and crabs, cannot survive this prolonged period of low oxgen concentrations.

The Sources

Point sources, nonpoint sources, and atmospheric deposition generate the nutrients that enter Chesapeake Bay. The Chesapeake Bay Program developed a model to estimate the 1985 base load of nutrients entering the Bay because it was not feasible to monitor the wide array of nonpoint sources generating nutrients. The model estimates that nonpoint sources contribute 51% of the total nitrogen load into the Chesapeake Bay, followed by atmospheric deposition (26%) and point sources (23%). Atmospheric loads of nitrogen include nitrogen deposited on the tidal waters of the Bay (9%) and nitrogen deposited on the watershed lands surrounding the Bay that wash into Bay waters (17%). The model also estimates that nonpoint sources contribute 61% of the phosphorus load entering the Bay, followed by point sources (34%) and atmospheric deposition (5%).

Improvements in Bay Water Quality

Annual discharges of phosphorus into Chesapeake Bay dropped by 40% (4.7 million pounds) between 1985 and 1991 as a result of wastewater plant upgrades, enhanced compliance with permits, and bans on phosphorus detergents in the Bay watersheds. Overall, water quality monitoring data confirm that the reduction in phosphorus loading is reducing phosphorus concentrations in Bay waters. Total phosphorus concentrations in the Bay decreased by 16% between 1984 and 1992. However, total nitrogen concentrations have remained stable in the mainstem of the Bay and increased in some tributaries.

Ocean Coastal Waters

We know less about the condition of our ocean coastal waters than we do about

our estuarine or inland waters. In part, this may be because we tend to think that only oil spills or similar disastrous events could possibly affect a resource as vast as an ocean.

In fact, we are seeing evidence that our ocean waters particularly the waters near our coasts suffer from the same pollution problems that affect our inland waters. Beach debris cleanups are cataloging tons of trash carried into the oceans by rivers, washed in from city storm sewers, thrown in by beach visitors, or dumped overboard by boaters. Beaches are closed to swimming every summer due to pathogens from inadequately treated wastes. Marine mammals are suffering from pollution-related stresses. Fragile coral reefs in Florida and Hawaii show signs of pollution impacts. Coastal development is increasing at a rapid rate. Clearly we can no longer assume that the oceans can take care of themselves.

Do Ocean Shores Support Uses?

Twelve of the 29 coastal States assessed only 6% of the Nation's estimated 56,121 miles of ocean coastline. Of these, 80% were found to fully support their designated uses, and 7% are supporting uses but are threatened and likely to become impaired if pollution control actions are not taken. Nine percent of assessed ocean shore miles partially support designated uses, and 5% do not support uses. These figures do not necessarily represent water quality conditions in the Nation's ocean coastal waters as a whole because they apply to only 6% of the Nation's coastline miles. Data on pollutants and sources of pollution are too sparse to be included in this report.

Wetlands

Wetlands are areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support (and that under normal circumstances do support) a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Often in the past, wetlands were considered wastelands the source of

mosquitoes, flies, and unpleasant odors to be filled or drained and put to "better use." When European settlers first arrived in America, over 200 million acres of wetlands existed in the conterminous States. Today, half of our Nation's wetlands have been destroyed by filling, draining, polluting, channelizing, grazing, clearing, and other modifications resulting from human activity.

Wetlands are now recognized as some of the most unique and important natural areas on earth. They vary in type according to differences in local and regional hydrology, vegetation, water chemistry, soils, topography, and climate. Coastal wetlands include estuarine marshes; mangrove swamps found in Puerto Rico, Hawaii, and Florida; and Great Lakes coastal wetlands. Inland wetlands, which may be adjacent to a waterbody or isolated, include marshes and wet meadows, bottomland hardwood forests, Great Plains prairie potholes, cypress-gum swamps, and southwestern playa lakes.

Wetlands provide food and shelter to countless animal species including many fishes, birds, reptiles, and mammals. A high percentage of federally listed threatened or endangered animals and plants depend directly or indirectly on wetlands for their survival. Wetlands also provide spawning habitat and nursery grounds for an estimated 71% of commercially valuable fish and shellfish consumed in this country. In addition, they also serve as feeding areas along migration routes for waterfowl and other wildlife.

Wetlands soil and vegetation help in flood control by acting as natural sponges that attenuate flooding water. Wetlands plants also help control erosion in two ways: their roots bind the soil and their leaves slow the movement of water. Wetlands help purify water by processing nutrients and other pollutants and filtering suspended materials. They also help regulate water quantity by absorbing water in wet seasons and releasing it through seeps, springs, and open outlets during dry seasons.

In addition, wetlands are widely enjoyed by hikers, birdwatchers, hunters, fishermen, photographers, and boaters and play an important role in our Nation's natural and cultural heritage. Millions of people spend nearly $10 billion each year observing and photographing wetlands-dependent wildlife.

Do Our Wetlands Support Uses?

In 1992, most States could not assess use support in wetlands because they were still developing wetlands water quality standards. As a result, only eight States (California, Colorado, Hawaii, Iowa, Kansas, Nevada, North Carolina, and Oklahoma) reported use support for 10.5 million acres of their wetlands. These States assessed use support in approximately 4% of the Nation's 277 million acres of wetlands. North Carolina assessed 98% of the assessed wetlands; therefore, the summary information on use support describes conditions primarily in North Carolina's wetlands rather than the Nation's wetlands as a whole.

These States reported that 50% of the assessed wetlands fully support designated uses, less than 1% are threatened, 26% partially support uses, and 24% do not support designated uses. However, this information does not accurately reflect water quality conditions in the Nation's wetlands due to the skewed distribution of the assessed wetlands. Despite limitations in the data, the summary information suggests that water quality problems exist in our remaining wetlands.

What is Polluting Our Wetlands?

Of the eight States reporting overall use support in wetlands, only three States (Iowa, Kansas, and Nevada) quantified the wetlands acreage degraded by specific pollutants or processes causing wetlands impairment. Although the data submitted by these States are not representative of national conditions in wetlands, these States did report that metals impair over 60,000 acres of wetlands, salinity and chlorides impair over 42,000 acres of wetlands, and siltation impairs almost 29,000 acres of wetlands. Fourteen States did not quantify the acreage affected but did identify pollutants and processes that degrade some unknown quantity of their wetlands. Most of these States cited sediment and nutrients as pollutants of concern in wetlands. Fewer States reported that water diversions, pesticides, salinity, heavy metals, ponding, weeds, low dissolved oxygen, and pH impact their wetlands.

Where Does This Pollution Come From?

Iowa, Kansas, and Nevada also reported that agriculture impairs 76,000 acres of wetlands, hydrologic habitat modification impairs 48,000 acres, and municipal point sources impair over 11,000 acres of wetlands. Fourteen States did not

quantify the acreage affected but did identify sources of pollutants that degrade some unknown quantity of wetlands. Most of these States reported that agriculture, development, channelization, and road construction degrade wetlands integrity. These States also reported that urban runoff, resource extraction, landfills, natural conditions, industrial runoff, onsite systems, irrigation, recreation, point sources, and silviculture impact wetlands.

Wetlands Loss: A Continuing Problem

Despite what we have learned about the value of our wetlands, these national treasures continue to be threatened by a variety of human activities. A U.S. Fish and Wildlife Service study of wetlands loss found that 2.6 million acres of wetlands were lost over the 9-year study period from the mid-1970s to the mid-1980s, or 290,000 acres a year. This is an improvement from the 1950s to the 1970s when wetlands were lost at a rate of 458,000 acres per year. Serious consequences have resulted nationwide from the loss and degradation of wetlands, including species decline and extinction, water quality decline, and increased incidences of flooding.

In 1992, 27 States reported on sources of current wetlands losses. These include agriculture, commercial development, residential development, highway construction, impoundments, resource extraction, industry, and dredge disposal.

More information on wetlands
can be obtained from the
EPA Wetlands Hotline at
1-800-832-7828

Ground Water

Ninety-five percent of all fresh water available on earth (exclusive of icecaps) is ground water. Ground water water found in natural underground rock formations called aquifers is a vital natural resource with many uses. The extent of the Nation's ground water resources is enormous. At least 60% of the land area in the conterminous United States overlies aquifers. Usable ground water exists in every State.

Aquifers can range in size from thin surficial formations that yield small quantities of ground water to large systems such as the High Plains aquifer that underlies eight western States and provides water to millions. Although most of the Nation's ground water is considered to be of good quality, an increasing number of pollution events have threatened the integrity of the resource.

Ground Water Use

Nationally, 53% of the population relies to some extent on ground water as a source of drinking water. This percentage is even higher in rural areas where most residents rely on potable or treatable ground water as an economical source of drinking water. Eighty-one percent of community water systems are dependent on ground water. Seventy-four percent of community water systems are small ground water systems serving 3,300 people or less. Ninety-five percent of the approximately 200,000 noncommunity water systems (serving schools, parks, etc.) are ground water systems.

Irrigation accounts for approximately 64% of national ground water withdrawals. Public drinking water supplies account for approximately 19% of the Nation's total ground water withdrawals. Domestic, commercial, livestock, industrial, mining, and thermoelectric withdrawals together account for approximately 17% of national ground water withdrawals.

Ground Water Quality

Although the 1992 Section 305(b) State Water Quality Reports indicate that, overall, the Nation's ground water quality is good to excellent, many local areas have experienced significant ground water contamination. Although the sources and types of ground water contamination vary depending upon the region of the country, those most frequently reported by States include:

- Leaking underground storage tanks. About 400,000 of an estimated 5 to 6 million underground storage tanks in the United States are thought to be leaking. About 30% of all tanks store petroleum or hazardous materials.
- Septic tanks. Approximately 23 million domestic septic systems are in operation in the United States. About half a million new systems are installed each year.

- Municipal landfills. Of the quarter million solid waste disposal facilities in the United States, about 6,000 are municipal solid waste facilities. Approximately 25% of these municipal facilities have ground water monitoring capabilities.
- Agricultural activities. Seventy-seven percent of the 1.1 billion pounds of pesticides produced annually in the United States is applied to land in agricultural production, which often overlies aquifers.
- Abandoned hazardous waste sites. Approximately 33,000 sites have been identified as abandoned hazardous waste sites, of which 42% involve ground water contamination.

The most common contaminants associated with these sources include nitrates, metals, volatile organic compounds (VOCs), and pesticides.

EPA has been working with States to develop a set of ground water quality indicators. These indicators will allow the characterization of trends in ground water quality over space and time. Examples of preliminary indicators include the number of maximum contaminant level violations in public water systems, detections of VOCs in ground water, and the extent of leachable agricultural pesticide use. EPA will continue to work with the States to refine these ground water quality indicators.

Additional ground water monitoring initiatives have been undertaken in numerous States. These initiatives are aimed at characterizing the overall quality of ground water resources and typically include the establishment of ambient monitoring networks, regional monitoring networks that focus on sensitive aquifers, or site-specific monitoring efforts that focus on known or suspected contamination sources.

Water Quality Protection Programs

The EPA works in partnership with State and local governments to improve and protect water quality. Since the 1990 Report to Congress, EPA and many States have moved toward a more geographically oriented approach to water quality management. They share a growing consensus that the Nation's remaining water quality problems can be solved most effectively at the basin or watershed level.

In 1991, EPA highlighted the Watershed Protection Approach (WPA), a framework for focusing and integrating water quality monitoring and management activities in a watershed of concern. The WPA is not a new government program, but rather a means of pulling together the resources and expertise of existing programs at all levels, from Federal to State and local levels.

The EPA, other Federal agencies, State pollution control agencies, and local governments are applying the WPA to existing monitoring and assessment programs as well as water quality protection programs (see sidebar next page). A number of laws provide the authority to develop and implement pollution control programs. The primary statute providing for water quality protection in the Nation's rivers, lakes, wetlands, estuaries, and coastal waters is the Federal Water Pollution Control Act of 1972, commonly known as the Clean Water Act (CWA).

The Clean Water Act

The Clean Water Act of 1972 and its amendments are the driving force behind many of the water quality improvements we have witnessed in recent years. Key provisions of the Clean Water Act provide the following pollution control programs.

Water quality standards and criteria - States adopt EPA-approved standards for their waters that define water quality goals for individual waterbodies. Standards consist of designated beneficial uses to be made of the water, criteria to protect those uses, and antidegradation provisions to protect existing water quality.

Effluent guidelines - The EPA develops nationally consistent guidelines limiting pollutants in discharges from industrial facilities and municipal sewage treatment plants. These guidelines are then used in permits issued to dischargers under the National Pollutant Discharge Elimination System (NPDES) program. Additional controls may be required if receiving waters are still affected by water quality problems after permit limits are met.

Total Maximum Daily Loads - The development of Total Maximum Daily Loads, or TMDLs, establishes the link between water quality standards and point/NPS source pollution control actions such as permits or Best Management Practices (BMPs). A TMDL calculates allowable loadings from the contributing point and nonpoint sources to a given waterbody and provides the quantitative basis for pollution reduction necessary to meet water quality standards. States develop and implement TMDLs for high-priority impaired or threatened waterbodies.

Permits and enforcement - All industrial and municipal facilities that discharge wastewater must have an NPDES permit and are responsible for monitoring and reporting levels of pollutants in their discharges. EPA issues these permits or can delegate that permitting authority to qualifying States. The States and EPA inspect facilities to determine if their discharges comply with permit limits. If dischargers are not in compliance, enforcement action is taken.

In 1990, EPA promulgated permit application requirements for municipal sewers that carry storm water separately from other wastes and serve populations of 100,000 or more and for storm water discharges associated with some industrial activities. The EPA is developing regulations to establish a comprehensive program to regulate storm sewers, including requirements for State storm water management programs.

Grants - The EPA provides States with financial assistance to help support many of their pollution control programs. These programs include the State Revolving Fund program for construction and upgrading of municipal sewage treatment plants; water quality monitoring, permitting, and enforcement; and developing and implementing nonpoint source pollution controls, combined sewer and storm water controls, ground water strategies, lake assessment, protection, and restoration activities, estuary and near coastal management programs, and wetlands protection activities.

Nonpoint source control - The EPA provides program guidance, technical support, and funding to help the States control nonpoint source pollution. The States are responsible for analyzing the extent and severity of their nonpoint source pollution problems and developing and

implementing needed water quality management actions.

Control of combined sewer overflows - Under the National Combined Sewer Overflow Control Strategy of 1989, States develop and implement measures to reduce pollution discharges from combined storm and sanitary sewers. The EPA works with the States to implement the national strategy.

The Watershed Protection Approach (WPA) Inset

The CWA also established pollution control and prevention programs for specific waterbody categories, such as the Clean Lakes Program. Other statutes that also guide the development of water quality protection programs include:

- The Safe Drinking Water Act, under which States establish standards for drinking water quality, monitor wells and local water supply systems, implement drinking water protection programs, and implement Underground Injection Control (UIC) programs.
- The Resource Conservation and Recovery Act, which establishes State and EPA programs for ground water and surface water protection and cleanup and emphasizes prevention of releases through management standards in addition to other waste management activities.
- The Comprehensive Environmental Response, Compensation, and Liability Act (Superfund Program), which provides EPA with the authority to clean up contaminated waters during remediation at contaminated sites.
- The Pollution Prevention Act of 1990, which requires EPA to promote pollutant source reduction rather than focus on controlling pollutants after they enter the environment.

The Clean Lakes Program

EPA's Clean Lakes Program provides Federal funds to help States carry out diagnostic studies of lake problems, determine necessary protection and restoration measures, implement those measures, and monitor the long-term impacts and effectiveness of those measures. The Clean Lakes Program provides grants for four types of cooperative agreements:

Lake Water Quality Assessments strengthen State lake management programs and improve water quality information.

Phase I Diagnostic/Feasibility Studies investigate the causes of water quality decline in a publicly owned lake and determine the most feasible procedures for controlling pollutants and restoring the lake.

Phase II Projects implement the restoration and pollution control methods identified in a Phase I study.

Phase III Postrestoration Monitoring Projects sponsor long-term monitoring to verify the longevity and effectiveness of restoration and control measures implemented during a Phase II project.

Managing lake quality often requires a combination of in-lake restoration measures and pollution controls, including watershed management measures:

Restoration measures are implemented to reduce existing pollution problems. Examples of in-lake restoration measures include harvesting aquatic weeds, dredging sediment, and adding chemicals to precipitate nutrients out of the water column. Restoration measures focus on restoring uses of a lake and may not address the source of the pollution.

Pollution control measures deal with the sources of pollutants degrading lake water quality or threatening to impair lake water quality. Control measures include planning activities, regulatory actions, and implementation of BMPs to reduce nonpoint sources of pollutants.

During the 1980s, most States implemented chemical and mechanical in-lake restoration measures to control aquatic weeds and algae. In their 1992 Section 305(b) reports, the States report a shift toward watershed planning techniques and nonpoint source controls to reduce pollutant loads responsible for aquatic weed growth and algal blooms. Watershed management plans simultaneously address multiple sources of pollutants, such as runoff from urbanized areas, agricultural activities, and failing septic systems along the lake shore. Although the States reported that they still use in-lake treatments, the States recognize that source controls are needed in addition to in-lake treatments to restore lake water quality.

The States reported that they most frequently rely on their NPDES permit programs and their Section 319 nonpoint source (NPS) management programs to control pollutants entering lakes. Through the State NPDES permit programs, States often impose stricter nutrient limits for effluents discharged into lakes than into rivers and streams. Seven States reported that phosphorus detergent restrictions enhanced sewage treatment plant compliance with NPDES nutrient limits. Twenty-two States reported that they use their Section 319 NPS programs to implement BMPs in watersheds surrounding impaired or threatened lakes.

Successful lake programs require strong commitment from local citizens and cooperation from natural resource agencies at the local, State, and Federal levels. Forty-nine States, Puerto Rico, and 18 American Indian Tribes have established cooperative frameworks for managing lakes under the Clean Lakes Program.

The National Estuary Program

Section 320 of the Clean Water Act (as amended by the Water Quality Act of 1987) established the National Estuary Program (NEP) to protect and restore water quality and living resources in estuaries. The NEP adopts a geographic or watershed approach by planning and implementing pollution abatement activities for the estuary and its surrounding land area as a whole.

Through the NEP, States nominate estuaries of national signifi-cance that are threatened or impaired by pollution, development, or overuse. EPA evaluates the nominations and selects those that show evidence of a committed citizenry, political support, a range of government involvement (State, Federal, regional, and local), and available scientific and technical expertise to tackle the problem. The EPA convenes management conferences with representatives from all interested groups (e.g., industry, agriculture, conservation organizations, and State agencies) to more fully characterize the problems and seek solutions.

The NEP is also a national demonstration program. There are more than 150 estuaries in the United States and only a small fraction can be targeted for action through the NEP. It is therefore important that the lessons learned through the NEP be communicated to estuarine water quality managers throughout the country. As of June 1993, 21 estuaries are included in the NEP.

Protecting Wetlands

Section 404 of the CWA remains the primary Federal vehicle for protecting wetlands. Section 404 regulates the discharge of dredged or fill material into waters of the United States, including wetlands. EPA continues to promote other mechanisms to protect wetlands including:

- Incorporating wetlands considerations into traditional water programs and other EPA programs
- Working with other Federal agencies
- Helping to build State and local government programs to protect wetlands
- Improving wetlands science
- Promoting outreach and education
- Developing voluntary partnerships with landowners
- Coordinating international wetlands protection.

In addition, EPA has awarded wetlands grants since 1990 to support the development of State and Tribal wetlands protection programs. States and Tribes have used these grants to develop water quality standards, monitor trends in wetlands loss, coordinate State and local planning agencies, and disseminate educational materials on wetlands.

Overall, States reported that they are making considerable progress in protecting the quantity and quality of their wetlands through regulatory and nonregula-tory approaches. States were asked to report on several key areas, including the application of Section 401 certification authority to protect wetlands, their progress in developing water quality standards for wetlands, and efforts to incorporate wetlands considerations into other programs. In addition, 18 States and one Territory reported on efforts to inventory the physical acreage of their wetlands.

According to State-reported information, no State is currently operating a statewide wetlands monitoring program. However, five States did describe water quality and habitat monitoring efforts for some portion of their wetlands.

EPA recognizes that the development of biological monitoring and assessment methods for wetlands is a critical need for State wetlands managers so that they

can begin to monitor their wetlands. To this end, EPA is developing assessment protocols for freshwater emergent wetlands as part of its 5-year research plan. However, more research on other wetlands systems is needed on both the Federal and State levels.

State monitoring programs are critical for determining whether wetlands are meeting their designated and existing uses as well as for prioritizing restoration once impairment is identified. Wetlands monitoring information is also important for making Section 401 certification decisions, determining mitigation success for Section 404, and supporting other management decisions.

Protecting the Great Lakes

The Great Lakes are cooperatively managed by the United States and Canada under the Great Lakes Water Quality Agreement of 1978 (as amended in 1987). The International Joint Commission, established by the 1909 Boundary Waters Treaty, is responsible for identifying actions to protect the Great Lakes. Representatives from State and Federal agencies and universities work together on the Commission's two boards to identify problem areas, plan programs to reduce pollution, and publish findings and issue papers.

Since 1973, 43 Areas of Concern have been identified in the Great Lakes basin where environmental quality is substantially degraded. Most Areas of Concern are harbors, bays, and river mouths. Remedial Action Plans are being developed for each Area of Concern. These plans identify impaired uses and examine management options to restore the areas.

In 1989, the EPA launched the Great Lakes Initiative to provide a framework for Federal assistance in pursuing the goal of whole-system restoration based on an ecosystem perspective. The Initiative emphasizes areas in which EPA can provide State governments and other stakeholders with technical support. The Initiative envisions EPA making the following technical contributions:

- Develop guidance for identifying toxic hot spots
- Develop guidance for tracking the relative contributions of toxic and acidic pollutants from surface water and atmospheric sources
- Develop guidance for determining the relative roles of point and nonpoint source contributions to conventional and toxic pollutant burdens

- Suggest innovative approaches for the protection of critical habitat areas
- Support the development of special wildlife standards.

To help implement the goals of the Great Lakes Initiative, EPA Region 5 and the EPA Great Lakes National Program Office coordinate a Steering Committee, Technical Workgroup, and Public Participation Group. The States have played an active role in the development of draft criteria and policies.

By late 1992, EPA had reviewed a draft of the Great Lakes Initiative Guidance. When issued in final form, this major guidance document will assist in updating the Great Lakes Strategy, which provides the framework for implementing the Great Lakes Water Quality Agreement. Specific policies under the Great Lakes Initiative will help integrate the development of Remedial Action Plans for designated Areas of Concern with the more holistic goals of Lakewide Management Plans and pollution prevention strategies for the Great Lakes as a whole.

The Chesapeake Bay Program

In 1975, the Chesapeake Bay became the Nation's first estuary targeted for protection and restoration when Congress directed EPA to study the causes of environmental declines in the Bay. Section 117(a) of the 1987 CWA amendments required that the EPA Administrator continue the Chesapeake Bay Program to:

- Collect and distribute information about the Bay's environmental quality . Coordinate Federal and State efforts to improve the Bay's water quality
- Determine impacts from environmental changes such as inputs of nutrients, chlorine, oxygen- demanding substances, toxic pollutants, and acid precipitation.

A system of committees, subcommittees, work groups, and task forces have evolved under the Chesapeake Executive Council, which consists of the Governors of Maryland, Virginia, and Pennsylvania, the Administrator of EPA, the Mayor of the District of Columbia, and the Chairman of the Chesapeake Bay Commission. The Council coordinates program implementation, establishes policy directions, and provides oversight for the restoration and protection of the Bay and its living resources. On August 6, 1991, the Chesapeake Executive

Council adopted four action steps, building on the 1987 Chesapeake Bay Agreement to reduce nitrogen and phosphorus loads entering the Bay by 40%. The four action steps commit the Council to:

- Reevaluating and accelerating the nutrient reduction program
- Adopting pollution prevention
- Restoring and enhancing living resources and their habitats, such as submerged aquatic vegetation beds
- Broadening participation in the Bay Program.

The Chesapeake Bay Program has implemented programs to reduce impacts from nutrients, oxygen-demanding substances, and pathogens. To date, three elements of the Chesapeake Bay Program's point source control strategy are responsible for reductions in nutrient loadings:

- Upgrading wastewater treatment plants
- Improving compliance with discharge and pretreatment permits
- Pollution prevention actions such as prohibiting the sale of detergents containing phosphorus.

As a result of these measures, annual discharges of phosphorus into the Bay dropped by 40% (4.7 million pounds) between 1985 and 1991.

The Chesapeake Bay Program's nonpoint source program emphasizes controls for runoff generated by agricultural activities, paved surfaces, and construction in urban areas. The program includes nutrient management for applying animal wastes and fertilizers to cropland in amounts calculated to meet crop requirements without contaminating ground and surface waters. Overall, water quality monitoring data confirm significant progress in reducing phosphorus loads into Chesapeake Bay. Total phosphorus concentrations in the Bay decreased by 16% between 1984 and 1992. However, total nitrogen concentrations have remained stable in the mainstem of the Bay and increased in some tributaries, indicating a need for additional progress in reducing nitrogen loadings.

The Gulf of Mexico Program

In 1988, the Gulf of Mexico Program (GMP) was established with EPA as the

lead Federal agency to develop and help implement a strategy to protect, restore, and maintain the health and productivity of the Gulf. The GMP is a grass roots program that serves as a catalyst to promote sharing of information, pooling of resources, and coordination of efforts to restore and reclaim wetlands and wildlife habitat, clean up existing pollution, and prevent future contamination and destruction of the Gulf. The GMP mobilizes State, Federal, and local government; business and industry; academia; and the community at large through public awareness and information dissemination programs, forum discussions, citizen committees, and technology applications.

A Policy Review Board and a newly formed Management Committee determine the scope and focus of GMP activities. The program also receives input from a Technical Advisory Committee and a Citizen's Advisory Committee. The GMP Office and 10 Issue Committees coordinate the collection, integration, and reporting of pertinent data and information. The Issue Committees are responsible for documenting environmental problems and management goals, available resources, and potential solutions for a broad range of issues, including habitat degradation, public health, freshwater inflow, marine debris, shoreline erosion, nutrients, toxic pollutants, and living aquatic resources. The Issue Committees publish their findings in Action Agendas. Two additional committees provide operational support and information transfer activities for the entire GMP.

On December 10, 1992, the Governors of Alabama, Florida, Louisiana, Mississippi, and Texas; EPA; the Chair of the Citizen's Advisory Committee; and representatives of 10 other Federal agencies signed the Gulf of Mexico Program Partnership for Action agreement for protecting, restoring, and enhancing the Gulf of Mexico and adjacent lands. The agreement commits the signatory agencies to pledge their efforts, over the next 5 years, to obtain the knowledge and resources to:

- Significantly reduce the rate of loss of coastal wetlands
- Achieve an increase in Gulf Coast seagrass beds
- Enhance the sustainability of Gulf commercial and recreational fisheries . Protect human health and food supply by reducing input of nutrients, toxic substances, and pathogens to the Gulf
- Increase Gulf shellfish beds available for safe harvesting by 10%
- Ensure that all Gulf beaches are safe for swimming and recreational uses

- Reduce by at least 10% the amount of trash on beaches
- Improve and expand coastal habitats that support migratory birds, fish, and other living resources
- Expand public education/outreach tailored for each Gulf Coast county or parish.

During 1992, the GMP also launched Take-Action Projects in each of the five Gulf States to demonstrate that program strategies and methods could achieve rapid results. The Take-Action Projects primarily address inadequate sewage treatment, pollution prevention, and habitat protection and restoration. Several projects aim to demonstrate the effectiveness of innovative sewage treatment technologies to control pathogenic contamination of shellfish harvesting areas. Other projects aim to restore wetlands, sea grass beds, and oyster reefs. The Take-Action Projects are designed to have Gulf-wide application.

Comprehensive State Ground Water Protection Programs Inset

Ground Water Protection Programs

Numerous laws, regulations, and programs play a role in protecting ground water. The following Federal laws and programs enable, or provide incentives for, EPA and/or States to regulate or voluntarily manage and monitor sources of ground water pollution:

- The Resource Conservation and Recovery Act (RCRA) regulates solid and hazardous waste treatment, storage, and disposal as well as underground storage tanks, the source of ground water contamination most frequently cited by the States.
- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulates cleanup of abandoned waste sites, many of which contain contaminated ground water.
- The Safe Drinking Water Act (SDWA) regulates subsurface injection of fluids that can contaminate ground water. . The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) controls the use and disposal of pesticides, some of which have been detected in ground water wells in rural communities.
- The Toxic Substances Control Act (TSCA) controls the use and disposal of additional toxic substances, thereby minimizing their entry into ground

water. Other Federal laws establish State grants that may be used to protect ground water.

- Clean Water Act Sections 319(h) and (i) and 518 provide funds to State agencies to implement EPA-approved nonpoint source management programs that include ground water protection activities. Several States have developed programs that focus on ground water contamination resulting from agriculture and septic tanks.
- The Pollution Prevention Act of 1990 allows grants for research projects to demonstrate agricultural practices that emphasize ground water protection and reduce the excessive use of fertilizers and pesticides.

Comprehensive State Ground Water Protection Programs (CSGWPPs) will integrate all of the above efforts and emphasize contamination prevention. CSGWPPs will improve coordination of Federal, State, Tribal, and local ground water programs and enable distribution of resources to established priorities. Once EPA endorses a CSGWPP, the Agency will seek to provide more consistent deference to State priorities.

EPA's Pesticides and Ground Water Strategy emphasizes prevention and protection of the Nation's ground water resources and provides a flexible framework for tailoring State Management Plans for the management and control of pesticide use to the needs of each State. In addition, EPA has established a Restricted Use classification for pesticides, which is intended to reduce both the risks of point source causes of ground water contamination and nonpoint source causes of contamination.

A number of mechanisms have been developed to manage the ever-growing volume of information on the Nation's ground water resources. These include the development of standard elements for collecting ground water data called the Minimum Set of Data Elements (MSDE) for Ground Water Quality. The MSDE is intended to improve access to ground water data and to increase information- sharing capabilities by standardizing the elements used in databases that contain ground water data. Additional mechanisms include the development of a geographic information system (GIS) to integrate ground water data that have been collected under different programs, the development and management of two databases concerning pesticides and ground water, and the inclusion of ground water data in a modernized STORET (EPA's water database).

What You Can Do

Federal and State programs have helped clean up many waters and slow the degradation of others. But government alone cannot solve the entire problem, and water quality concerns persist. Nonpoint source pollution, in particular, is everybody's problem, and everybody needs to solve it.

Examine your everyday activities and think about how you are contributing to the pollution problem. Here are some suggestions on how you can make a difference.

Be Informed

You should learn about water quality issues that affect the communities in which you live and work. Become familiar with your local water resources. Where does your drinking water come from? What activities in your area might affect the water you drink or the rivers, lakes, beaches, or wetlands you use for recreation?

Learn about procedures for disposing of harmful household wastes so they do not end up in sewage treatment plants that cannot handle them or in landfills not designed to receive hazardous materials.

Be Responsible

In your yard, determine whether additional nutrients are needed before you apply fertilizers, and look for alternatives where fertilizers might run off into surface waters. Consider selecting plants and grasses that have low maintenance requirements. Water your lawn conservatively. Preserve existing trees and plant new trees and shrubs to help prevent erosion and promote infiltration of water into the soil. Restore bare patches in your lawn to prevent erosion. If you own or manage land through which a stream flows, you may wish to consult your local county extension office about methods of restoring stream banks in your area by planting buffer strips of native vegetation.

Around your house, keep litter, pet waste, leaves, and grass clippings out of gutters and storm drains. Use the minimum amount of water needed when you wash your car. Never dispose of any household, automotive, or gardening wastes in a storm drain. Keep your septic tank in good working order.

Within your home, fix any dripping faucets or leaky pipes and install water-saving devices in shower heads and toilets. Always follow directions on labels for use and disposal of household chemicals. Take used motor oil, paints, and other hazardous household materials to proper disposal sites such as approved service stations or designated landfills.

Be Involved

As a citizen and a voter there is much you can do at the community level to help preserve and protect our Nation's water resources. Look around. Is soil erosion being controlled at construction sites? Is the community sewage plant being operated efficiently and correctly? Is the community trash dump in or along a stream? Is road deicing salt being stored properly?

Become involved in your community election processes. Listen and respond to candidates' views on water quality and environmental issues. Many communities have recycling programs; find out about them, learn how to recycle, and volunteer to help out if you can. One of the most important things you can do is find out how your community protects water quality, and speak out if you see problems.

Volunteer Monitoring: You Can Become Part of the Solution

In many areas of the country, citizens are becoming personally involved in monitoring the quality of our Nation's water. As a volunteer monitor, you might be involved in taking ongoing water quality measurements, tracking the progress of protection and restoration projects, or reporting special events, such as fish kills and storm damage.

Volunteer monitoring can be of great benefit to State and local governments. Some States stretch their monitoring budgets by using data collected by volunteers, particularly in remote areas that otherwise might not be monitored at all. Because you are familiar with the water resources in your own

neighborhood, you are also more likely to spot unusual occurrences such as fish kills.

The benefits to you of becoming a volunteer are also great. You will learn about your local water resources and have the opportunity to become personally involved in a nationwide campaign to protect a vital, and mutually shared, resource. If you would like to find out more about organizing or joining volunteer monitoring programs in your State, contact your State department of environmental quality, or write to:

Alice Mayio
U.S. EPA
Volunteer Monitoring (4503F)
401 M St. SW
Washington, DC 20460
(202) 260-7018

For further information on water quality in your State, write to your State department of environmental quality. Additional water quality information may be obtained from the Regional offices of the U.S. Environmental Protection Agency (see inside front cover).

For Further Reading

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