CHAPTER THIRTEEN

Water

In the late 1960s, cities and towns were routinely discharging untreated human waste into the Hudson River in New York, robbing the water of needed oxygen. The river's sediments and water were loaded with toxic wastes. The fish were diseased, inedible, and rapidly declining in number. A 1966 headline in *The New York Times* read: "Life Abandoning Polluted Hudson."

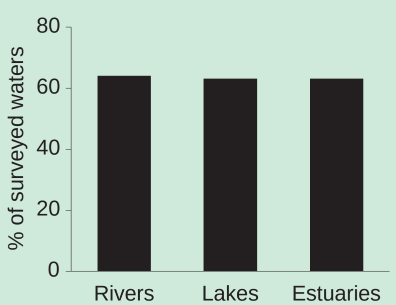
Three decades later, the Hudson is alive again. According to a recent count, 206 species of fish now live in or visit the river. Blue crabs have become common in the lower river, and fish-eating raptors such as bald eagles are back.

Much of the credit belongs to the Clean Water Act, which established a body of law and regulations backed by federal financial support that gradually led to a significant reduction in discharges of sewage and toxic chemicals in the Hudson and across the nation generally.

Yet the effort to improve water quality, in the Hudson and elsewhere, remains unfinished. Clean water, in short, is a resource still at risk:

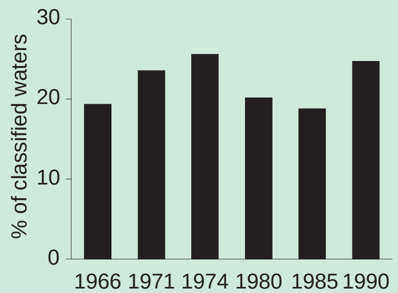
- Our rivers, lakes, and coastal waters are cleaner today than 25 years ago, yet nearly 40 percent are still too polluted to support all their designated uses (Figure 13.1).
- Contaminated fish advisories or bans were issued in 1995 for more than 1,700 water bodies—a 14 percent increase over the previous year—to protect the public from eating chemically- or disease-contaminated fish.
- One of every four shellfishing beds was closed for harvest in 1990 because of pollution (Figure 13.2).
- More than 4,000 beaches were closed in 1995 to protect the public from harmful bacteria and other pollutants found in the water.
- Our drinking water supply is one of the safest in the world, but one of every five people receive water from a facility violating a national safety requirement.

Figure 13.1 U.S. Surface Waters with Good Water Quality, 1994



Source: See Part III, Table 38.
Note: Data are the sum of fully supporting and threatened categories in Table 38.

Figure 13.2 Harvest-Limited U.S. Shellfish Waters, 1966-1990



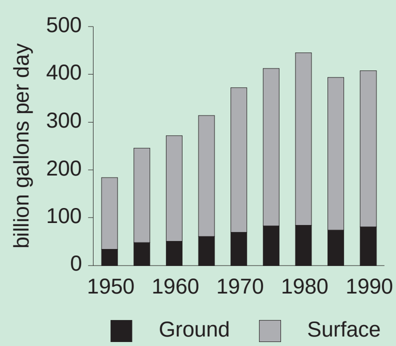
Source: NOAA, National Shellfish Register.
Note: Harvest-limited=shellfish growing waters that are not available for direct marketing all of the time.

Polychlorinated biphenyls (PCBs), a toxic chemical used until the 1970s, still linger in the sediments of the Hudson and in fish such as striped bass. Controlling nonpoint runoff from farms continues to be a difficult challenge. Many older cities depend on combined sanitary and storm water sewer systems, which can become overloaded during heavy rainfall and discharge a mix of raw sewage and storm water into surface waters.

Many federal agencies—the Environmental Protection Agency, Department of the Interior, Agriculture Department, Army Corps of Engineers, and Department of Commerce, among others—manage a wide variety of programs to manage and protect the nation's water resources. For example:

- EPA has the main responsibility for water quality and pollution issues.
- The Commerce Department's National Oceanic and Atmospheric Administration (NOAA) monitors coastal and marine resources.
- The Army Corps of Engineers has nationwide responsibility for building flood protection, river engineering, and coastal protection works and also administers the Clean Water Act Section 404 dredge-and-fill permit program.
- The Department of the Interior has several agencies with water-related responsibilities. The Bureau of Reclamation, which for many decades carried out water development projects west of the Mississippi, is now charged primarily with water resource management in these areas. The U.S. Geological Survey carries out water quantity and quality monitoring on nationally important rivers and aquifers. The Fish and Wildlife Service is responsible for freshwater ecosystems.
- The Department of Agriculture manages a wide variety of water resource conservation and water quality programs, focusing particularly on farm-related resource management and conservation issues.

Figure 13.3 U.S. Water Use by Source, 1950-1990



Source: See Part III, Table 37.

CONDITIONS AND TRENDS

Trends in Water Resources

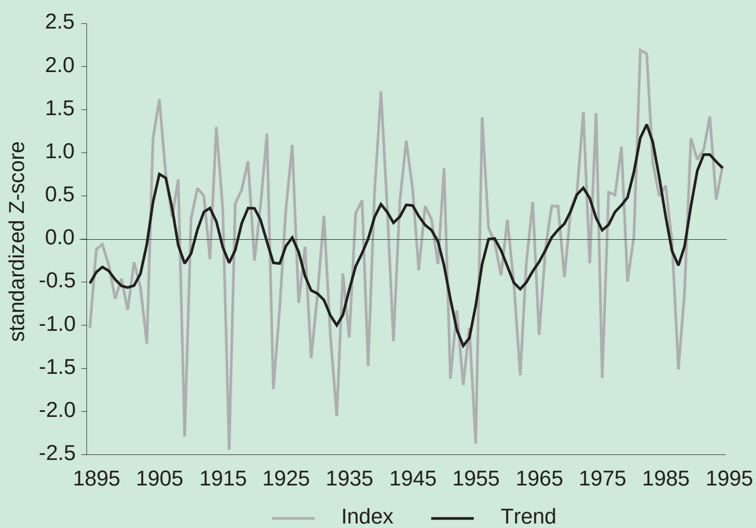
The United States is a water-rich nation, blessed with 3.5 million miles of rivers and streams, 41 million acres of lakes, 34,000 square miles of estuaries (excluding Alaska), and 33,000 trillion gallons of groundwater.

There is significant geographic and seasonal variation in precipitation. For example, the area east of the Mississippi River typically receives more than twice as much annual rainfall as the area west of the Rocky Mountains.

Surface waters provide about three fourths of overall freshwater requirements and groundwater one fourth (Figure 13.3). Groundwater is the source of drinking water for about half the general population and nearly all the rural population. The renewable water supply is more than 4 times the amount withdrawn and almost 15 times the amount consumed. But some parts of the country, especially the West and Southwest, are beginning to approach the physical limits of their water resources. Continued growth will require some combination of importing more water and/or managing water more efficiently.

For the nation as a whole, precipitation trends have been generally above normal during the 1970–95 period (Figure 13.4). During 1994, about 6.9 percent of the area in the lower 48 states was characterized by severe to extreme drought, while about 14.8 percent was characterized by severe to extreme wetness. In 1995, only 1.6 percent was drought-stricken, while 24.9 percent of

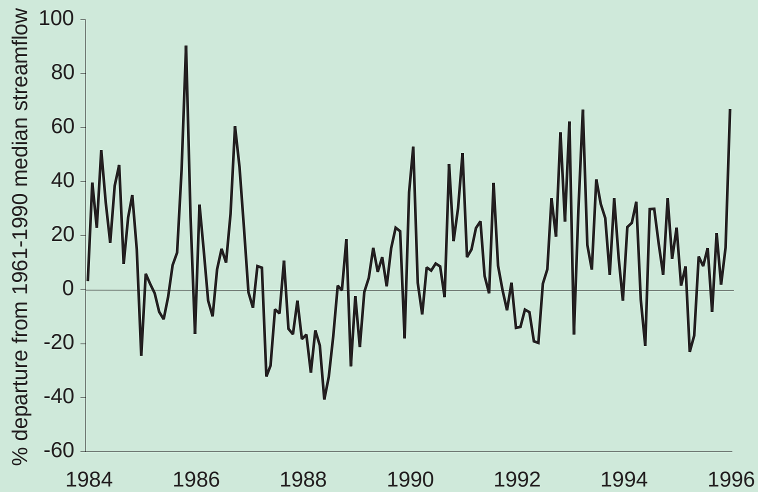
Figure 13.4 U.S. Precipitation Trends, 1895-1995



Source: See Part III, Table 35.

Note: The standardized z-score is derived from precipitation records. See Table 35 for explanation.

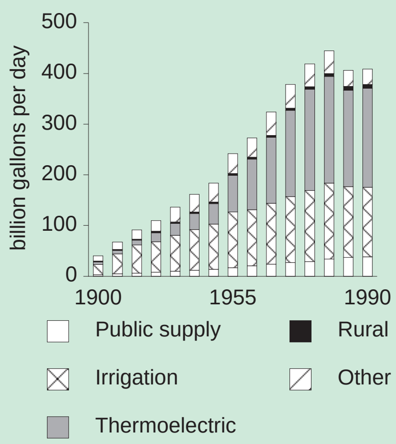
Figure 13.5 Monthly Departure of Actual Streamflow (January 1984-January 1996) from Median Streamflow (1984-1995)



Source: U.S. Department of the Interior, Geological Survey.
Note: Data represent the streamflow of 12 major river basins in the United States and southern Canada.

the nation was characterized by severe to extreme wetness (Part III, Table 36).

Figure 13.6 U.S. Water Use by Sector, 1900-1990

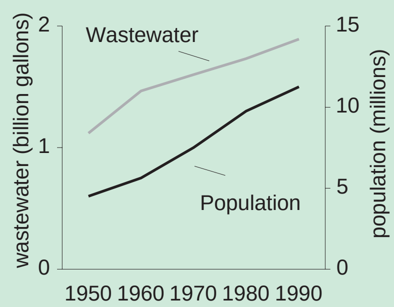


Source: See Part III, Table 37.

The United States has been struck repeatedly by natural disasters in the past few years. For example, throughout July and August 1993, devastating floods hit the lower Missouri River, the upper Mississippi River, the Illinois River, and many of their tributaries. Thirty-eight lives were lost, and estimated damages were between $10 billion and $16 billion. Over the 1979–89 period, flood-related damages cost the nation an average of about $14 billion annually.

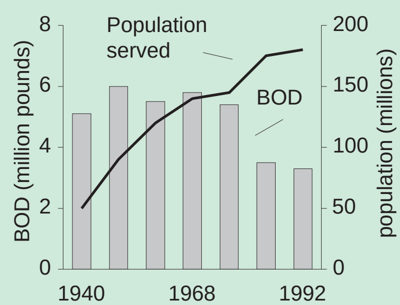
With the exception of 1992, streamflow for the nation as a whole has been generally above normal since 1991 (Figure 13.5). Regional streamflow totals have seen some unusual fluctuations in recent years. Since 1991, streamflow has been generally below normal in the three major Western basins—the Columbia

Figure 13.7 Chesapeake Bay Watershed Trends, 1950-1990



Source: Environmental Protection Agency.

Figure 13.8 U.S. Population and Sewage Discharge Trends, 1940-1992



Source: U.S. Environmental Protection Agency.
Note: BOD=biochemical oxygen demand.

River, Pacific Slope, and Great Basin in Nevada. Streamflow in the rest of the nation has been generally above normal, notably after great floods in the upper Mississippi River basin in 1993 and in parts of the Southeast in 1994.

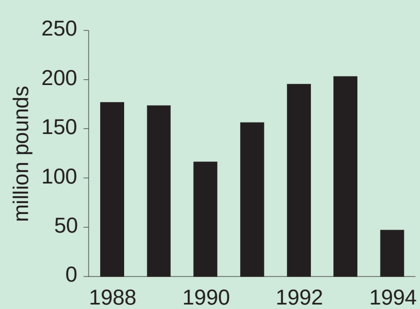
The bulk of national water use is for irrigation and the thermoelectric utility industry. In 1990, irrigation accounted for about 33 percent of water use and electric utilities for about 47 percent of use (Figure 13.6 and Part III, Table 37).

Trends in Water Quality

Since passage of the Clean Water Act in 1972, most of the conspicuous water pollution of the late 1960s and 1970s has been eliminated. During the 1972–92 period, the amount of sewage treated at wastewater treatment plants and U.S. population each rose about 30 percent (e.g., see Figure 13.7 for the Chesapeake Bay watershed), yet biochemical oxygen demand (BOD) from treatment plants declined by 36 percent (Figure 13.8). Direct discharges of toxic pollutants are down dramatically since 1988 (Figure 13.9). Water pollution controls on industry prevent about 1 billion pounds of toxic pollutants from entering our waters every year.

According to the 1994 EPA National Water Quality Inventory survey (Table 13.1), about 57 percent of surveyed rivers and streams showed good water quality and supported their designated use and 7 percent were in good condition but

Figure 13.9 Toxic Discharges to U.S. Surface Waters, 1988-1994



Source: See Part III, Table 72.

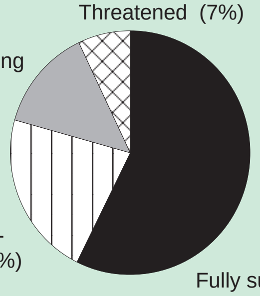
Table 13.1 Levels of Use Support

Use Support Level	Water Quality Condition	Definition
Fully Supporting	Good	Water quality meets designated use criteria.
Threatened	Good	Water quality supports beneficial uses now but may not in the future unless action is taken.
Partially Supporting	Fair (impaired)	Water quality fails to meet designated use criteria at times.
Not Supporting	Poor (impaired)	Water quality frequently fails to meet designated use criteria.
Not Attainable	Poor	The State, Tribe, or other jurisdiction has performed a use-attainability analysis and demonstrated that use support is not attainable due to one of six biological, chemical, physical, or economical/social conditions specified in the *Code of Federal Regulations.*

threatened. About 22 percent were in fair condition, partially supporting their designated uses. Another 14 percent showed poor quality. In less than 1 percent, designated uses were not attainable (Figure 13.10). Bacteria and siltation were the pollutants most often found in surveyed rivers and streams, each affecting 34 percent of all impaired river miles. Agricultural activities were the most widespread source of pollution, generating pollutants that degraded aquatic life or interfered with public use in 60 percent of the impaired river miles.

In the same survey, about 50 percent of the surveyed lake acres were in good condition and met designated use standards, 13 percent were in good condition but threatened by future degradation, 28 percent partially met the standards, and 9 percent had poor quality (Figure 13.11). Leading pollutants included nutrients, which were found in 43 percent of all impaired lake acres, followed by siltation

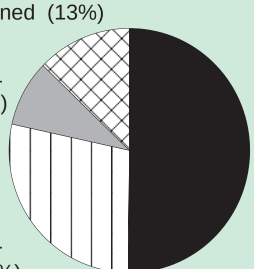
Figure 13.10 Overall Use Support in U.S. Rivers and Streams, 1994



Source: See Part III, Table 38.

Note: Based on an assessment of 17% of U.S. river and stream miles. Designated uses are not attainable in less than 1% of assessed waters.

Figure 13.11 Overall Use Support in U.S. Lakes, Ponds and Reservoirs, 1994



Source: See Part III, Table 38.

Note: Based on an assessment of 42% of U.S. lakes, ponds and reservoirs. Designated uses are not attainable in less than 1% of assessed waters.

(28 percent), oxygen-depleting substances (24 percent), and metals (21 percent).

Of the nation's total estuarine area, the EPA survey found that 57 percent of the surveyed square miles were in good condition and met designated use standards, 6 percent were in good condition but threatened, 27 percent partially met the standards, and 9 percent had poor quality (Figure 13.12). Nutrients and bacteria were the pollutants most often found in impaired estuaries.

Fish consumption advisories provide another indication of water quality. In 1995, the number of consumer advisories to limit or restrict consumption of certain fish species rose by 14 percent over the previous year. The study found that advisories were issued in 1995 for 1,740 water bodies in 47 states, an increase of 209 warnings from the previous year.

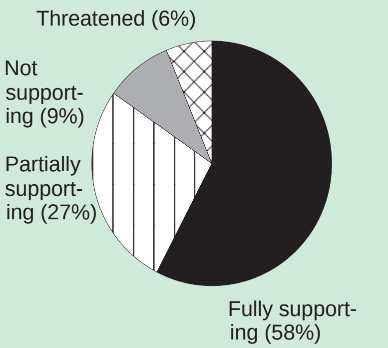
Mercury accounted for 1,308 advisories, up from 899 the previous year. Warnings for PCBs rose 37 percent, and for chlordane, 16 percent. Warnings for DDT, which has been banned in the United States since 1972, were up 3 percent. (DDT has not been banned in Mexico, which shares several bodies of water with the United States.)

These increases are attributed primarily to more surveys being done by the states, and do not necessarily indicate that conditions are worsening nationwide. Advisories do, however, show where local water quality problems exist.

Trends in the Great Lakes

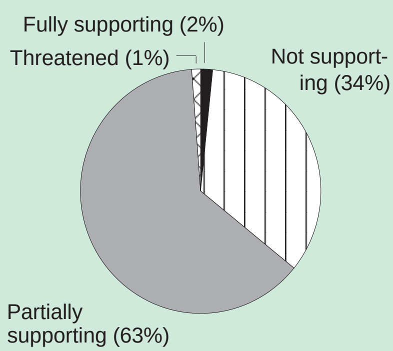
Despite dramatic declines in the occurrence of algal blooms, fish kills, and localized "dead" zones depleted of oxygen, less visible problems continue to degrade the Great Lakes.

Figure 13.12 Overall Use Support in U.S. Estuaries, 1994



Source: See Part III, Table 38.
Note: Based on an assessment of 78% of U.S. estuary square miles.

Figure 13.13 Overall Use Support in the Great Lakes, 1994



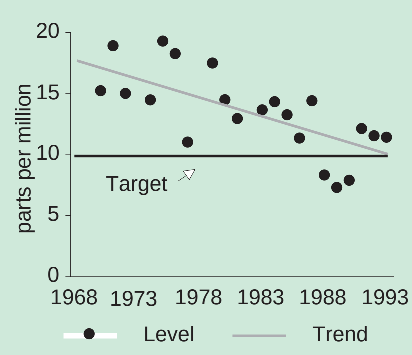
Source: See Source for Part III, Table 38.
Note: Based on an assessment of 94% of Great Lakes shoreline miles.

According to EPA's National Water Quality Inventory, most of the Great Lakes nearshore waters were found to be safe for swimming and other recreational activities and for use as a source of drinking water with normal treatment. However, only 2 percent of the surveyed nearshore waters fully supported designated uses, while 34 percent partially supported designated uses (Figure 13.13). About 63 percent were not supporting their designated uses, largely because fish consumption advisories are posted throughout the nearshore waters of the Great Lakes and water quality conditions are not favorable for aquatic life in many cases. Aquatic life impacts are caused by persistent toxic pollutant burdens, habitat degradation and destruction, and competition from and predation by nonnative species such as the zebra mussel and the sea lamprey. Toxic organic chemicals—primarily PCBs—are present in 98 percent of the impaired shoreline miles.

According to the 1995 *State of the Great Lakes* report, water quality in the Great Lakes is generally improving:

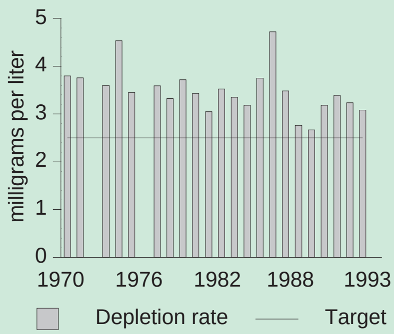
- Overall, there has been a general decrease in concentrations of toxic chemicals over the last 20 years, but the rate of decrease has slowed.
- Nutrient levels have decreased

Figure 13.14 Spring Phosphorus Levels in Lake Erie, 1968-1993



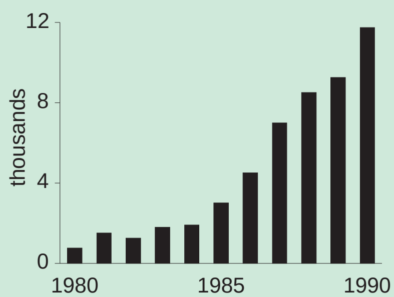
Source: P. Beltran, EPA Great Lakes Program Office.

Figure 13.15 DO Depletion Rate in Lake Erie, 1970-1993



Source: P. Beltram, EPA Great Lakes Program Office.
Note: DO=dissolved oxygen in lake bottom waters.

Figure 13.16 Double-crested Cormorant Nests, 1980-1990

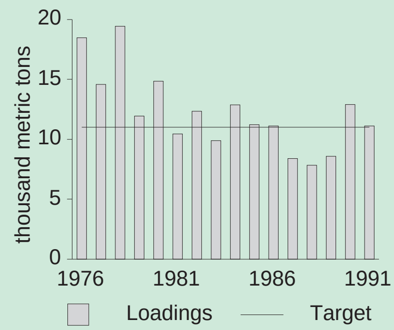


Source: Environment Canada.
Note: Data refer to Great Lakes-wide populations.

(Figure 13.14), and dissolved oxygen levels have improved (Figure 13.15), but chloride and nitrogen levels appear to be increasing. (The primary source of chloride seems to be municipal wastewater discharges and the use of salt in road deicing.)

- Fisheries have generally improved. Contaminant levels in fish have decreased, but the rate of decrease has slowed.

Figure 13.17 Phosphorus Loadings to Lake Erie, 1976-1991



Source: See Part III, Table 41.

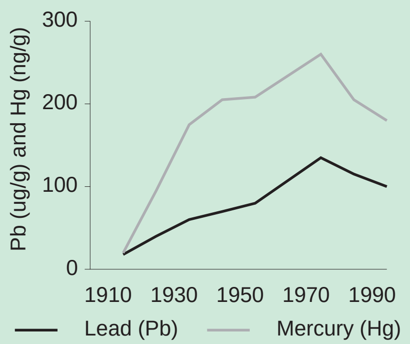
- Populations of fish-eating birds have increased (Figure 13.16).
- Habitat destruction and exotic species remain serious concerns.

Lake Erie has shown the greatest improvement. Average annual concentrations of conventional contaminants have been reduced by approximately 50 percent over the last 15 years (Figure 13.17).

Metal concentrations rose steadily from about 1915 to the mid-1970s but have been generally declining since then (Figure 13.18). PCB levels in herring gull eggs have declined significantly since 1974 (Figure 13.19). Toxic concentrations of DDE (a derivative of DDT) in bald eagle eggs on the north shore of Lake Erie show a significant downward trend (Figure 13.20). Nesting pairs of eagles have increased from an estimated 83 pairs in Michigan in 1973 to 227 pairs in 1993.

In Lake Erie, water clarity has increased dramatically from the combined effects of lower phosphorus levels

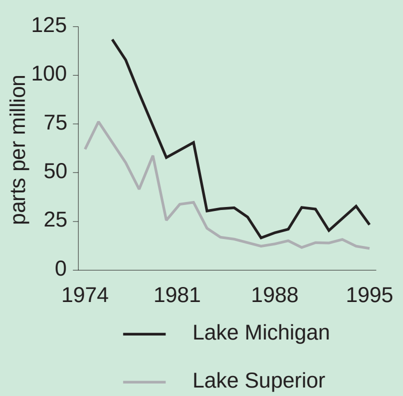
Figure 13.18 Lead and Mercury in Lake Sediment, 1910-1990



Source: Michigan Department of Environmental Quality, *State of the Great Lakes: Annual Report for 1995* (DEQ, Lansing, MI, 1996).
Note: Data are from Lake Michigan sediment cores. ug/g=micrograms per gram. ng/g=nanograms per gram.

due to pollution control and zebra mussel filter feeding. The improvement in clarity has resulted in an increased abundance of aquatic rooted plants. As the lake ecosystem has changed, some fish species—notably lake whitefish, smallmouth bass, and walleye in the western and central basins—are prospering. The change may also be a positive sign for bottom-feeding fish such as yellow perch. Populations of open-water species such as smelt, which feed on plant and animal plankton, have been reduced.

Figure 13.19 PCB Levels in Herring Gull Eggs, 1974-1995



Source: See Part III, Table 74.
Note: PCB=polychlorinated biphenyls.

U.S. members of the joint U.S./Canadian Lake Erie Committee recommended an increase in allowable harvests of walleye in the western and central basins of Lake Erie from 9 million fish in 1995 to 11 million fish in 1996. Consistent stocks of yellow perch also warrant increases in allowable harvests in those areas.

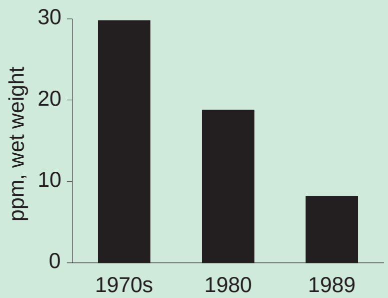
Program Overview

The two principal federal laws governing water quality are the Clean Water Act of 1972 (amended in 1977, 1981, and 1987) and the 1974 Safe Drinking Water Act (amended in 1986 and 1996). Nonpoint pollution protection programs, which are authorized by the Clean Water Act and other laws, are discussed separately.

The Clean Water Act. The Clean Water Act provides a comprehensive framework of pollution control standards, technical tools, and financial assistance to address the many stressors that can cause water pollution and adversely affect water quality.

The National Pollution Discharge Elimination System (NPDES) provides a permitting mechanism to limit the amount of pollution that can be discharged into receiving waters from indus-

Figure 13.20 DDE in Bald Eagle Eggs in the 1970s and 1980s



Source: Ontario Ministry of Natural Resources.
Note: DDE=Derivative of DDT. ppm=parts per million.
Data are from populations on Lake Erie's north shore.

tries and sewage treatment plants as well as other sources that can affect water quality. Industrial facilities, for example, are required to comply with technology-based effluent limitations that are based on the demonstrated performance of a reasonable level of treatment that is within the economic means of the specific categories of industrial facilities. These technology-based controls, defined as effluent limitation guidelines, have been specified for over 50 kinds of industries. Collectively, they reduce pollution loadings by about 90 percent. Similarly, municipal sewage treatment plants are required in most areas to provide at least secondary treatment to assure that 85 percent of conventional pollutants, such as organic waste and sediment, are removed. NPDES permits to control water pollution have been issued for about 48,000 industrial facilities and about 15,000 municipal facilities nationwide, and today, most facilities are in compliance with their permit conditions. General permits control wastewater discharges from an additional 160,000 sources, including storm water discharges.

When these technologies are not sufficient to meet water quality standards, the act provides for progressively more stringent limits to ensure that conditions are improved. Water quality standards are set by the states for every waterbody and approved by EPA. They include a designated use for the waterbody, such as drinking water or recreation, and specific criteria to protect those uses. This water quality-based approach provides an additional safeguard, triggering more stringent pollution control, if and when more needs to be done.

Protecting valuable aquatic habitat, such as wetlands, is another important component of this law. Filling wetlands with dredged or fill material can destroy or degrade these important areas and have a profound impact on water quality. To minimize these impacts, the law establishes a permitting program to ensure that these types of activities are conducted in an environmentally sound manner.

The law also provides funding to help states and local governments protect and improve water quality. In addition to providing funding to implement state programs, the act has been a major source of funding for building wastewater infrastructure projects. The original 1972 act established a construction grants program, in which the federal government agreed to pay up to 75 percent (later reduced to 55 percent) of the construction and design cost for municipal treatment plants. From 1972 to 1990, the program provided nearly $60 billion in federal assistance; state and local governments contributed over $20 billion.

Amendments to the act in 1987 began a transition from grants to loans through state revolving funds. Localities now must repay the cost of construction financing. Federal contributions (83 percent) to the funds are matched by states (17 percent of total capitalization). In addition to municipal wastewater treatment, loans may also be used for storm water outfalls and projects that reduce agricultural and urban runoff.

The transition from grants to loans has meant a substantial increase in the share of wastewater treatment expenditures borne by local governments. The program has also been an effective way to leverage limited dollars. Over a 20-year period, an initial federal investment can result in the construction of up to four times as many projects as a one-time federal grant. With new streamlined requirements, state revolving fund projects are completed about 30 percent faster than those funded with grants. The typical cost of a state revolving fund loan is about 30 to 50 percent less than the cost of the same project funded through the commercial bond market.

The Clean Water Act also has provided substantial federal support for nonpoint source pollution control projects. Under the act's section 319, EPA has provided over $470 million in grants to nonpoint source projects through fiscal year 1996.

The Safe Drinking Water Act. The 1974 Safe Drinking Water Act required EPA to establish national primary drinking water regulations that incorporate enforceable maximum contaminant levels or treatment techniques, underground injection control regulations to protect underground sources of drinking water, and groundwater protection grant programs for the administration of state wellhead protection area programs. States are permitted to implement these activities.

The 1986 amendments required EPA to issue final regulations for 83 drinking water contaminants by June 1989 and for 25 additional contaminants every 3 years thereafter. Thus far, EPA has issued regulations for 84 contaminants. The 1986 amendments also require extensive monitoring of public water supplies to ensure that safety standards are being met.

As discussed in the Recent Developments section, the act was substantially amended again in mid-1996.

EPA and the states regulate approximately 200,000 public drinking water systems that serve over 240 million people. About 60,000 of these systems are community drinking water systems, which provide water to the same population year-round. In 1994, 81 percent of the population served by community systems had no reported violations, 9 percent were served by systems with surface water treatment violations, 8 percent with total coliform violations, 1 percent with lead and copper treatment violations, and 1 percent with chemical/radiological contamination violations.

Drinking water systems supplied by surface waters can sometimes withdraw water that contains harmful levels of disease-causing microbiological contaminants, such as *Giardia lamblia, Legionel-*

la, and viruses. Under the Surface Water Treatment Rule, EPA and the states require all inadequately protected drinking water systems using surface water sources to disinfect and install filtration treatment to remove any microbiological contaminants. In 1993, over 12 million people were provided drinking water from more than 1,000 unfiltered community water systems not in compliance with the rule. By the end of fiscal 1995, the number of systems not complying was reduced to 400 and the population at risk had dropped to 9.9 million.

The Administration will take strong enforcement action against violations, which threaten the health of our families and communities.

EPA also is working with states and tribes to protect sources of drinking water, particularly groundwater used for drinking. The Wellhead Protection Program covers four areas: (1) delineating a wellhead protection area; (2) identifying potential sources of contamination; (3) developing a contingency plan in case of a threat to the drinking water source; and (4) developing a source management plan to control potential sources of contamination. Of the 60,000 community systems, by 1993 about 18,700 systems (31 percent) had initiated the program and 3,800 systems (6 percent) were covered by all four parts of the groundwater protection program.

Nonpoint Pollution Protection. Nonpoint pollution sources include cropland, livestock, urban runoff, storm sewers, construction sites, mining and logging, and drainage from waste disposal sites.

For example, cropland erosion delivers sediments, nutrients, and pesticides to receiving waters. As a result of a wide variety of federal programs, sediment loadings from cropland has declined substantially, from an estimated 1.93 billion tons annually in 1977 to about 1.18 billion tons in 1992.

In fiscal 1995, the Department of Agriculture spent an estimated $3.5 billion on voluntary resource conservation and other environmental programs and activities, many of which address water quality.

Under the Agricultural Conservation Program (ACP), cost-share expenditures on water-quality-related practices rose from $13.4 million in 1988 to $44.2 million in 1994. The most frequently cost-shared practices were conservation tillage, irrigation water management, and nutrient management. All have been shown to increase net returns in many parts of the country.

Since 1990, USDA also has managed (with EPA, Interior, and Commerce) a Water Quality Program, with annual expenditures ranging from $83 million to $116 million. Through 1993, nitrogen management practices (including cover and green manure crops) have been implemented on 1 million acres. Annual nitrogen reductions averaged almost 42 pounds per acre on land receiving treatments. Phosphorus management, implemented on about 850,000 acres by 1993, showed similar reductions of about 40 pounds per acre. The program also includes erosion and sediment control practices, which had been installed on about 1 million acres by 1993.

The Conservation Reserve Program, which is discussed in the chapter on agriculture, also provides substantial water quality benefits. Erosion reductions for the 36.4 million acres enrolled in the program in 1995 are estimated to generate about $437 million annually in benefits to water users.

RECENT DEVELOPMENTS

In recent years, corporations and others among the regulated community have increasingly embraced the need for and value of environmental protection, while EPA and other regulatory institutions have increasingly appreciated the fact that creative alternatives can provide cleaner, cheaper, smarter pollution management. Occasionally, however, the legal requirements of federal environmental statutes create impediments to creative alternatives.

For example, in 1989 Amoco and EPA sponsored a voluntary effort to identify multimedia pollution prevention opportunities at Amoco's refinery in Yorktown, Virginia. Project staff developed an assessment of releases to air, water, and land. They then formulated reduction options. Finally, they compared their innovative solutions with those presecribed by statutes. In many cases, the creative approaches provided comparable or better pollution control at substantially less cost, yet EPA did not have the statutory flexibility to support such alternatives.

Finding Creative Alternatives

Despite these limitations, opportunities do exist to build greater flexibility and cost-effectiveness into water quality programs. A few examples follow:

Effluent Trading in Watersheds. Under an effluent trading program, an industry or sewage plant that can reduce water pollution discharges below the minimum level required to meet water quality standards can sell its excess pollution reductions to other facilities within the same watershed. Effluent trading can allow dischargers to take advantage of economies of scale and the treatment efficiencies that vary from facility to facility, and it could provide an economic incentive for dischargers to go beyond minimum pollution reductions. Trading programs also could be established for other sources of water pollution, including nonpoint sources (e.g., runoff from farms) and facilities whose wastewater is not directly discharged, but sent to a local municipal sewage treatment plant for treatment.

To get the process started, EPA is developing a framework promoting different types of effluent trading and providing technical analyses to determine an appropriate amount of pollution to allow in a given watershed.

Project XL. On a demonstration project basis, EPA is supporting company projects to replace existing regulatory requirements with alternative environmental management strategies if the company can promise better environmental results than would be expected under existing regulations. Of course, with flexibility must come accountability. In addition, such projects must be consistent with congressional mandates.

Ten companies and two state agencies are currently taking part in Project XL. For example, Lucent Technology will take an innovative approach to monitoring water pollution at its Allentown, Pennsylvania, facility by utilizing outside auditors. Weyerhauser will operate its Flint River, Georgia, plant as a "minimum impact mill," a comprehensive approach to minimize the overall impact of the mill on the environment.

Combined Sewer Overflows. Problems associated with combined sewer overflows (CSOs)—spills of raw sewage, untreated industrial wastewater, and street debris—can be a considerable public health menace. They are a leading cause of beach closures and shellfishing restrictions. Working closely with the states, affected cities, and environmental groups, EPA in 1994 developed a consensus policy to guide action on CSOs. It encourages cities to pursue certain minimum, low-cost controls and to develop a full understanding of local CSO occurrences and impacts before making longer-term investments in additional wastewater treatment, temporary storage capacity, and sewer rehabilitation.

Refocusing Programs

Many other opportunities exist to focus existing programs on the highest-priority risks.

For example, EPA is seeking to improve the performance of the drinking water program in three areas:

- Establishing priorities for rule making based on health risks. EPA is seeking a delay for all court schedules for drinking water rules and, based on a reassessment of health risks and consultation with stakeholders, will set new priorities and schedules for drinking water rule making.
- Encouraging voluntary treatment. EPA is working with public water suppliers and states to develop a voluntary drinking water treatment program that will reduce the occurrence of *Cryptosporidium* and other microbiological pathogens. These efforts will help reduce risks to the public while EPA completes the scientific work needed to develop an appropriate safety standard.
- Simplifying monitoring requirements. EPA is streamlining monitoring requirements for chemical contaminants in drinking water and allowing further "tailoring" of monitoring based on the existing quality of the drinking water source.

A similar approach is being taken to reduce unnecessary monitoring and reporting for industries, municipalities, and other entities that have permits to discharge wastewater into rivers and other receiving waters. Under the Clean Water Act NPDES program, EPA is now allowing permit holders to reduce their monitoring and reporting if they show and maintain a strong permit compliance record. This performance-based approach is expected to cut monitoring and reporting time by an estimated 4.5 million hours nationwide, and create incentives to further improve environmental quality.

The Safe Drinking Water Act Amendments of 1996. In mid-1996, Congress passed and President Clinton signed The Safe Drinking Water Act (SDWA) Amendments of 1996. The amendments establish a new emphasis on preventing contamination problems through source water protection and enhanced water system management. The amendments also set up a state revolving fund (SRF) system to provide money to communities to improve their drinking water facilities. The SRF is authorized at $1 billion for each of fiscal years 1994 to 2003. The states may use set asides from the SRF to pay for programs such as source water assessments; voluntary source water quality protection partnerships with public water systems, local governments, and private companies; and capacity development and implementation efforts.

Another significant provision of the 1996 amendments is the recognition of the importance of public involvement in addressing and preventing threats to drinking water quality in the years ahead. Within two years, EPA must issue regulations requiring all community water systems to prepare at least annually a report with information about the system's source water and the level of contaminants in the drinking water purveyed. Systems serving 10,000 or more people must mail these reports to their customers; smaller water systems are given other options for distributing this information.

In addition, the 1996 amendments repeal the current requirement that EPA promulgate standards for 25 additional contaminants every three years. These requirements, instituted by Congress as part of the 1986 SDWA amendments, have proved impossible to meet within the mandated time frames. Under the 1996 amendments, new standards must undergo a cost-benefit analysis.

Other provisions of the 1996 amendments include the establishment of a priority list of unregulated contaminants, a streamlining of the enforcement process and increases in penalties, and requirements that EPA promulgate rules on arsenic, enhanced surface water treatment incorporating standards for *Cryptosporidium*, and a radon standard using the new standard-setting authorities. EPA is also directed to conduct research on sensitive subpopulations that may experience greater adverse health effects from drinking water contaminants than the general population.

Building a New Consensus

Bringing all affected parties together to find solutions to difficult problems holds great promise. The San Francisco Bay/Delta accord and the Great Lakes agreement are two recently negotiated cooperative efforts.

San Francisco Bay/Delta Accord. After 2 years of intensive consultation with local interests, EPA published final water quality standards for the San Francisco Bay/Delta. The plan takes a comprehensive, ecosystem approach rather than single-pollutant, individual source approach. The Clinton Administration helped facilitate a solution that will protect endangered species and the ecosystem while ensuring reliability in federal water allocations to support farmers and urban water users.

Great Lakes Agreement. Working in partnership with eight Great Lakes states, EPA produced a comprehensive plan to reduce toxic chemicals from the Great Lakes basin. The final plan provides the Great Lakes states and tribes with community-based flexibility to tailor solutions to local conditions.

Building New Partnerships

Increasingly, EPA is establishing new partnerships to improve water quality through voluntary means. Through the Partners in Prevention program, EPA is working with agricultural groups to accelerate the voluntary adoption of modern, economical management practices that reduce polluted runoff while maintaining or even enhancing farming and livestock operations.

A new partnership to improve water quality has been established with the golf industry. In 1995, EPA, golf industry representatives, and environmental groups worked together to determine how golf courses could be built and maintained in a more environmentally sound manner. A consensus set of principles were developed to improve operations in a number of areas, including fertilizer and pesticide usage.

Under EPA's voluntary "Partnership for Safe Water," suppliers that use surface waters carefully survey their filtration systems, operating and maintenance procedures, and other management activities to determine whether action is needed to reduce the risk of *Cryptosporidium* and other microbial contaminants. This action is especially important given the resistance of these contaminants to normal disinfection processes. To date, 140 water companies have joined the program.

The Groundwater Guardian Program is another voluntary way to improve drinking water safety. With help from EPA, a nonprofit organization in the Midwest provides special recognition and technical assistance to help communities protect their groundwater from contamination. Since beginning in 1994, Groundwater Guardian programs have been established in nearly 100 communities in 31 states.

Improving National Water Quality Data

In order to make better use of water quality monitoring data, a national Intergovernmental Task Force on Monitoring Water Quality (ITFM) was established in January 1992. The mission of the ITFM is to develop and implement a national strategic plan to achieve effective collection, interpretation, and presentation of water quality data and to improve the availability of existing information for decison-making at all levels of government. Major products will include guidelines and support for comparable field and laboratory methods, quality assurance and control, data management and sharing, data interpretation techniques, and environmental indicators. These products will be available for use by agencies nationwide.

A major improvement in water quality assessment capabilities was made in 1996 when a set of water quality indicators were agreed upon and released for future use by multiple agencies, including state and tribal agencies. These indicators, which reflect various water quality and ecological parameters, provide for a more accurate characterization of how conditions are changing over time.

FUTURE CHALLENGES

In a time when nearly 40 percent of rivers and lakes surveyed are found to be unsafe for fishing, swimming and other uses, and when drinking water supplies are threatened by microbial and other contaminants, it is clear that the national commitment to protecting and improving water quality must remain strong.

In particular, federal investments are needed to help communities ensure safe drinking water and wastewater treatment. It is estimated that $137 billion will be needed over the next 20 years to replace aging infrastructure, deal with outdated sewage collection systems, and control polluted runoff. EPA is now gathering information to develop a similar cost estimate for national drinking water needs.

While important, continued improvements in water quality will require more than infrastructure investment. Better solutions are needed to control polluted runoff—now the leading source of pollution in rivers and lakes, to protect wetlands and other critical aquatic areas, and to further reduce toxic pollution. These challenges, along with the challenge of providing safe, reliable drinking water, point to the need for more tailored, comprehensive approaches that take into account the unique stressors and conditions in any given area. This need has been recognized, and there is growing interest in and use of watershed-based management approaches. Increasingly, public and private organizations, including EPA and many other federal agencies, are using watersheds as a basis for developing and implementing water resource protection and restoration activities. This approach provides greater opportunity for leveraging resources, for involving and gaining the support of local stakeholders, and most importantly, for finding the most effective solutions.

Opportunities to improve water quality are evolving in other areas.

- In many cases, old adversaries are now partners in trying to find creative ways to reduce water pollution.
- States and municipalities have built up expertise and gained experience in water management and are taking on a larger role.
- Pollution prevention measures may reduce the burden on treatment plants.
- Market-based incentives, such as effluent trading, can provide new impetus for pollution reduction.

These changes in approach and attitude, coupled with improving science and technology, offer promise for the future. Together, they suggest that despite many challenges, continued improvement in water quality can be achieved.

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