Water Quality

BACKGROUND

Water covers approximately 40 percent of Michigan's nearly 97,000 square miles of surface area and includes more than 35,000 lakes and ponds, 36,000 miles of rivers and streams, and nearly 25 million acres in the four Great Lakes (Erie, Huron, Michigan, Superior) bordering the state. Because of its unique geographic configuration—two large peninsulas—all rivers and streams in the state eventually flow into one of the four Great Lakes or their connecting waters (St. Marie's River, St. Clair River, Detroit River, or Lake St. Clair).

Michigan protects both surface water and groundwater from pollution that would impair certain uses of the water. These "protected" uses are defined by state law and include (1) recreation, (2) support of fish, wildlife, and aquatic organisms, and (3) domestic, agricultural, and industrial water withdrawals. Under state law and delegated federal authority, Michigan's primary regulatory mechanism is a permit system that limits waste that may be discharged into Michigan waters. The state law is Public Act 451 of 1994, the Michigan Natural Resources and Environmental Protection Act (NREPA), and the federal authority is derived from the U.S. Environmental Protection Agency (EPA) under the federal Clean Water Act.

Traditionally, water-pollution control has focused on regulating *point*, or discrete, sources of discharges, such as those from municipal and industrial waste-treatment systems. Over the last 30 years such regulation significantly improved water quality in Michigan, but in the last decade it has become evident that additional pollution sources need to be controlled. For example, stormwater runoff has been found to be a major point source of pollution, particularly in urban areas, and recent federal court decisions require delegated-authority states, such as Michigan, to regulate, under the pollution-control permit system, certain municipal and private stormwater-management systems.

Certain *nonpoint*, or diffuse, sources also can significantly impair water quality. These include runoff from urban and agricultural lands, contaminated rain/snow, and leachate from contaminated land and water-bottom sediments. Control and remediation (cleanup) of these nonpoint sources often fall outside of the permit system, necessitating alternative approaches, such as preventing pollution by use of "best management practices" and, in some cases, removing or containing the source or the contaminants.

Surface Water

Michigan's surface-water quality improvements over the last three decades are due in large measure to the investment of billions of public and private funds for treating and/or properly disposing of industrial and sanitary waste that once polluted state waters. In general, the water quality in lakes and streams in the northern two-thirds of the state is high, with the few exceptions being in and around highly urbanized areas or adjacent to old mining or industrial sites. In the southern third, a number of rivers, streams, and lakes, while improving, still do not meet water-quality standards; this is due to agricultural, industrial, commercial, and residential land uses and the resulting point and nonpoint pollution.

GLOSSARY

Animal feedlot operation (AFO)
An operation where farm animals are held in a confined space for an extended period, creating the need for waste management so as to prevent water pollution. A concentrated animal feeding operation (CAFO), as defined by the EPA, must have a water-discharge permit.

Combined sewer overflow (CSO)
Occurs when the capacity of a combined sewer, which carries storm water, domestic sewage, and industrial waste to a wastewater treatment facility in a single pipe, is exceeded (usually during wet weather); such systems originally were designed to discharge the excess untreated waste into the nearest water body (that is, to overflow into it).

Generally accepted agricultural and management practices (GAAMPs)
Pollution-prevention practices recognized and/or established by the Michigan Department of Agriculture under the Right to Farm Act.

Groundwater
Water found underground in (1) shallow silt, sand, and gravel deposits or (2) deep, fractured, or porous rock.

Nonpoint-source pollution
A diffuse discharge containing pollutants that does not have a single point of discharge; examples are rain, runoff from adjacent lands, or air deposition.

Many inland lakes and streams still have pollution problems caused by the presence of such persistent toxic chemicals as polychlorinated biphenyls (PCBs), certain pesticides, and heavy metals, such as mercury, that increase in concentration as they move through the food chain (that is, they *bioaccumulate*). Mercury is the most pervasive toxic substance found in fish in Michigan, and the Michigan Department of Community Health's annual fish-consumption advisories (warnings) due to high mercury levels apply virtually throughout the state for many species.

The federal Clean Water Act (section 305[b] of the federal Water Pollution Control Act) requires that each state with delegated pollution-control authority biennially report to the EPA. This so-called section 305(b) report, among its other elements, must (1) identify lakes and river segments where pollution-control efforts have not attained state standards and (2) under certain circumstances, establish the limit for various pollutants that cannot be exceeded (the total maximum daily load [TMDL]) if attainment with water-quality standards is to be achieved.

On-site disposal system (OSDS)
A system designed to treat and discharge waste near its source; commonly, a septic tank and drain field.

Point-source pollution
A single, identifiable source of pollutants; examples are discharges from wastewater-treatment facilities or storm-water pipes.

Protected water uses
Purposes (e.g., domestic consumption, fish habitat, recreation) for which water is protected under state and federal law.

Sanitary sewer overflow (SSO)
Unplanned discharge, when pipe capacity is exceeded, of untreated waste from separate sanitary sewers into a water body.

Surface water
Water found above ground, in lakes, streams, rivers, bogs, wetlands, and other visible water bodies.

Total maximum daily load (TMDL)
A regulatory term describing the limit imposed, to achieve water-quality standards, on the combined discharges of a particular pollutant into a river segment or lake.

The Michigan Department of Environmental Quality (MDEQ) has TMDLs established or planned in numerous locations for a variety of pollutants, including phosphorus, a nutrient responsible for nuisance algal growths and other negative affects resulting from excessive enrichment, and *Escherichia coli (E. coli),* a bacteria indicative of the presence of untreated human waste, which is a threat to public health. For *E. coli* alone, the MDEQ is developing TMDLs on 69 lakes and river segments.

In 2001 the MDEQ and the Michigan Department of Natural Resources jointly published *State of Michigan's Environment 2001—First Biennial Report* under a 1999 statute requiring the departments to biennially prepare a comprehensive status report on the state's environment. The report tracks various physical, biological, and chemical indicators of environmental quality, describes monitoring programs, and presents information on water-quality measures (including indices for measuring the quality of the Great Lakes). The departments acknowledge that there are gaps in the data and analysis in the 2001 report but expect that over time, the reports will be an important tool in tracking the performance of programs addressing water quality and other environmental issues.

Combined Sewer Overflow (CSO)

Historically, older urban areas built sewers in which so-called sanitary waste (domestic sewage), industrial waste, and stormwater are combined and carried in a single pipe. Under normal conditions, all the wastewater goes to, and is treated at, a municipal wastewater facility before being discharged to lakes or rivers. But when there is a storm (or excessive snowmelt), and flow exceeds pipe capacity, a problem arises because the combined systems were designed to overflow and discharge the untreated waste directly into surface waters. Because more than 50 cities still have combined systems, CSOs are a serious water-quality problem in many areas of Michigan. In the last decade, local governments have expended approximately $1.0 billion to build CSO holding/treatment basins or new, separated sanitary sewers. This has helped to substantially reduce the number of untreated CSOs, but an estimated $1.7 billion more is needed over the next 10 years to address remaining problems.

Sanitary Sewer Overflow (SSO)

Even when the sanitary sewer system is separate from the stormwater system, overflows (sanitary sewer overflows, or SSOs) may occur. Although there are various causes, persistent SSOs usually result from stormwater entering the separate sanitary sewer from a pipe failure, from infiltration through pipe connections, or from roof drains and basement footing drains that are connected directly to the sanitary system. SSOs also occur,

usually following a major storm, if a local government responds to basement sewage backups by using a relief pump to temporarily discharge the excess wastewater, which is untreated, into the nearest lake or stream. Although this violates the law, the MDEQ has exercised enforcement discretion in such instances.

Recently, the EPA has targeted SSOs, and, in 2000, the MDEQ adopted new SSO reporting requirements that have been incorporated into state law. The number of SSOs reported under the new state requirement is expected to exceed several hundred. Completely eliminating SSOs may be impractical given the design and capacity of sewers already in place, but many communities already have corrected or have plans underway to address SSO problems. Correction of SSOs statewide will be very costly and could take years.

Basement flooding associated with SSOs has prompted numerous homeowner lawsuits to recover damages from their local government. A lower court ruled in 2000 that local governments cannot assert government immunity in the case of SSOs and, under a strict liability standard, could be held liable for economic as well as noneconomic damages. Local governments fear that being held to a strict liability standard will result in very high judgments and, in response, the legislature enacted P.A. 222 of 2001, which limits local government liability in such instances. At this writing, a consolidated basement-flood-damage case, involving the cities of Farmington Hills and Allen Park, is before the Michigan Supreme Court. The decision could result in substantially different compensation between those with basements flooded before and those flooded after the effective date of this new state law.

Stormwater Management

The federal Clean Water Act requires that stormwater discharges be regulated, and the EPA established a phased approach. Phase I regulations mandate that all municipalities having a separated sewer system serving a population of 100,000 or more must obtain a permit to discharge their stormwater into surface waters, Michigan, using its delegated authority (see above), promulgated general stormwater-discharge regulations in 1995. Phase I affects five Michigan cities: Ann Arbor, Flint, Grand Rapids, Lansing, and Warren. The costs of complying vary, but the average expenditure just to meet the application requirements was estimated to be $600,000. The costs of implementing the stormwater plan will be in addition.

Phase II regulations require virtually all public agencies (i.e., cities, townships, villages, counties, the Michigan Department of Transportation, and colleges and universities) in the urbanized areas of southern Michigan that have stormwater facilities to obtain a stormwater-discharge permit by 2003. In 1997 the MDEQ established a voluntary, alternative, *watershed*-based general permit. Forty-three communities and cooperating public agencies in the Rouge River watershed, in southeast Michigan, volunteered to be trailblazers for this innovative approach. They have developed seven subwatershed plans that lay the foundation on which each public agency has prepared its stormwater pollution-prevention initiative. Based on the success in the Rouge River watershed and with the MDEQ's encouragement, several other areas are considering the watershed alternative, which now has received EPA approval for meeting Phase II requirements.

Cost of Needed Infrastructure

A statewide assessment of Michigan's sewer infrastructure needs (*Managing the Cost of Clean Water—An Assessment of Michigan's Sewer Infrastructure Needs*) was completed in 2000 by Clean Water Michigan, a coalition of representatives of local government, county drain commissioners, local health agencies, regional governments, environment groups, and business organizations. This assessment determined that it may cost as much as $6 billion in the next 20 years for locals to correct combined-sewer problems, replace/repair/expand existing sanitary sewers, and/or improve existing wastewater treatment plants. In 2001 the Southeast Michigan Council of Governments produced a more comprehensive evaluation of new sewer infrastructure and maintenance costs, estimating that an additional $14–26 billion will be needed by 2030 in just that seven-county area.

The high costs projected for meeting the sewer infrastructure needs of the state relate in part to the relatively new requirements for CSO and SSO remediation, but the major costs arise from the fact that 60–70 percent of the existing sanitary sewer systems and treatment plants were built more than 30 years ago and need or soon will need major repair or replacement. Many of these facilities were built with federal and state grant dollars that no longer are available. The Michigan State Revolving Loan Fund (SRF) currently is the largest source of financial help to local governments that must improve their sewer infrastructure. Annually, about $200 million is available, but it is estimated that over the next five years, $350 million a year will be needed to meet the demand for these state-subsidized loans. The older urban areas are the most likely to have CSOs, SSOs, and aging wastewater-treatment plants and sewers. In most, the population and tax base are decreasing, and, in many, the average household income is below the statewide average, which increases the financial burden on the residents.

To address this need, a measure recently enacted (P.A. 220 of 2001) will increase state capitalization of the SRF. The new law authorizes a transfer from the Budget Stabilization Fund (providing that its balance exceeds $250 million) of up to $25 million a year for the next five years to match any increase in federal dollars. While not providing immediate new dollars for loans to local communities, the authorization does bolster growing support in Congress for increasing the federal allocation for such programs nationwide.

Groundwater

Nearly half of Michigan's population relies on groundwater for its domestic water. In addition, near-surface groundwater is the primary source of many of Michigan's rivers and lakes.

Protecting the Water Supply

In the last decade, the MDEQ has identified more than 10,000 sites where groundwater has been polluted, and it estimates that 560 water supplies were affected by polluted groundwater in 2001. Most of those problems relate to seepage into groundwater from old landfills, manufacturing spills, waste-disposal practices, mining operations, bulk-chemical storage, and underground oil- and gasoline-storage tanks. The latter problem was diminished considerably by a correction program and the requirement that substandard underground tanks be upgraded/replaced by December 1998; in 2001 there were fewer than 300 substandard storage tanks in use.

Much of the 1998 Michigan Environmental Bond monies were expended by the MDEQ to protect or replace public water supplies or restore other natural resources impaired by groundwater contamination. A portion of the $335 million Clean Michigan Initiative Fund also is being used to help clean up contaminated sites and assist local governments in addressing serious problems.

Despite the positive effect of new requirements for solid-waste disposal, new underground storage-tank standards, and a series of laws enacted in the past 20 years addressing the handling, storage, and disposal of hazardous materials, the legacy of past practices leaves the state with hundreds, if not thousands, of places where the groundwater no longer is suitable as a drinking water supply. The MDEQ Environmental Response Division maintains a catalog of contaminated sites (currently about 3,000) that are suspected to have polluted groundwater and also provides information on the status of cleanup and what is known about the source and extent of the contamination.

Septic Systems

Under Michigan law, disposing of any liquid waste from any source into the waters of the state, including groundwater, requires a permit. On-site disposal systems (OSDSs), frequently referred to as septic systems, that discharge waste into the ground are subject to MDEQ regulation. Under MDEQ rules, residential OSDSs are subject to review and approval by local (county, city, or district) health departments using state guidelines. If a septic system is designed, installed, and maintained properly, in a suitable location, it will provide cost-effective and environmentally safe waste disposal. But if any one of these essential factors is ignored, the system can fail and release harmful contaminants to the groundwater and, potentially, to surface waters.

There are more than 1.2 million septic systems in Michigan, serving approximately 3.7 million people, and the number is increasing by more than 10,000 a year. State law does not require that septic systems be properly maintained, and the local governments are responsible for addressing failures. Only seven counties (Benzie, Grand Traverse, Macomb, Ottawa, Shiawassee, Washtenaw, and Wayne) require that a septic system be inspected when a property is sold. Results from such inspections in Wayne and Washtenaw counties indicate that the failure rate for older systems is 20 percent or higher.

Pollution Prevention

Preventing water pollution at its source is much less expensive than having to remove it at a treatment facility or remediate environmental impairments resulting from inadequate treatment. The state has both regulatory programs and voluntary education programs intended to reduce or eliminate waste generation. Pre-treatment of waste, to remove or reduce certain chemicals, particularly toxics, is required of industries that discharge into municipal treatment systems. One of the major foci for stormwater and nonpoint-source water-pollution control is education that encourages homeowners, businesses, industry, and farmers to use "best management practices" in storing, handling, and using potentially polluting materials. For many of the more toxic, persistent, and bioaccumulative chemical compounds, the most effective form of pollution control is recycling and reuse, or, if less toxic substitutes are available, elimination. State and federal prohibitions on the use of certain pesticides (e.g., DDT) and industrial compounds (e.g., PCBs) and restrictions on the use of chemicals (e.g., mercury) have been effective in reducing the levels of these harmful chemicals in water, fish, and fish-eating animals.

DISCUSSION

No one wants to be identified as advocating for polluted water, but the cost of maintaining clean water and the high price of correcting the remaining problems has engendered strong advocacy for less expensive approaches, fewer government mandates, more emphasis on risk-based remediation, and nonregulatory alternatives. On the other side, advocates for cleaner water, including those directly affected by potential and present pollution, urge stringent enforcement of existing requirements and full cleanup of the sources of water pollution. Compounding the debate is the fact that many of the remaining water-quality problems are more complex than those previously faced; in many cases, they also are much more expensive to correct and yield much lower direct benefit for every dollar spent. The arguments on both sides are well known and are not repeated here. The following pertains to pending water-quality actions and likely state or federal policy changes.

On-Site Disposal Systems (Septic Tanks and Tile Fields)

Legislation introduced in 2001 (SB 107) would establish standards for residential on-site disposal systems, require that they be inspected before a home may be sold, and mandate that local governments provide educational materials to OSDS owners. Local governments' concern about paying for such a program and developers' and real estate firms' concern about the effect on home sales have stalled the bill. The bill's supporters point to the success of programs in the seven counties that have time-of-sale inspection and the need to prevent significant surface and groundwater contamination from failing systems.

A related bill, SB 108, would (1) require monitoring to assess the effects on state waters of discharges of untreated or partially treated sanitary waste from CSOs, SSOs, and failing OSDSs and (2) provide Clean Water Fund grants to local agencies to assess such discharges and train local OSDS inspectors. The full fiscal implications of the bill are not known, and some argue that existing monitoring programs are adequate. Supporters argue that better information is needed to accurately assess the extent of the problem and the costs of responding.

Agriculture Practices

Michigan farm waste generally is regulated under nonpoint-pollution-prevention programs developed under the state Right to Farm Act. Animal feedlot operations (AFOs) that meet the EPA definition of a concentrated animal feeding operation (CAFO), generally those with more than 1,000 animals, are regulated through a point-source permit. Agricultural nonpoint-pollution-prevention programs in Michigan emphasize the use of the generally accepted agricultural and management practices (GAAMPs) identified by the Michigan Department of Agriculture and endorsed by the MDEQ in 1997 in a joint memorandum.

In early 2001 the EPA proposed to modify the federal regulations governing CAFO permits by requiring more agricultural operations to obtain such a permit and eliminating certain current exemptions. The rules are pending while the EPA considers comments and tries to resolve concerns expressed by the U.S. Department of Agriculture. Advocates of the proposed changes argue that the growing number of AFOs and their animal-waste management practices have generated water-pollution problems and should be regulated. Opponents argue that expanding the permit requirements to include more farming operations will be too costly and that current state pollution-prevention programs are adequate to address water-pollution concerns.

NOTE: In May, just before this edition went to print, the legislature voted to put a $1 billion general-obligation bond issue on the November ballot; the bonds' proceeds would be used to help finance sewer construction and renovation.

See also Air Quality; Great Lakes Concerns; Solid Waste and Recycling.

Research on this policy topic was made possible by a grant from the Frey Foundation.

FOR ADDITIONAL INFORMATION

CSO/SSO searchable data base
Michigan Department of Environmental Quality,
www.deq.state.mi.us/csosso

Investing in Southeast Michigan's Quality of Life: Sewer Infrastructure Needs
Southeast Michigan Council of Governments (2001),
www.semcog.org/products/pdfs/sewerneeds2.pdf

Managing the Cost of Clean Water—An Assessment of Michigan's Sewer Needs
Public Sector Consultants (2000), *www.pscinc.com/underground/index.html*

Michigan Fish Advisory
Michigan Department of Community Health (2002),
www.michigan.gov/mdch

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www.mecprotects.org

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(517) 371-1505 FAX
www.mucc.org

Michigan Water Quality Report (Year 2002 305[b] Report)
Michigan Department of Environmental Quality (2002),
www.michigan.gov/deq

Rouge River stormwater program
www.wcdoe.org/rougeriver/stormwater/status.html

State of Michigan's Environment 2001—First Biennial Report
Michigan Department of Environmental Quality (2001),
www.michigan.gov/deq

Stormwater rules
Michigan Department of Environmental Quality (2002),
www.michigan.gov/deq

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