Phosphorus Policy Advisory Committee

Final Report

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Prepared for
The Michigan Department of Environmental Quality

Prepared on behalf of
The Phosphorus Policy Advisory Committee

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INTRODUCTION

By letter dated June 27, 2006, Department of Environmental Quality (DEQ) Director Steven Chester requested the participation of a wide range of stakeholders on the DEQ's Phosphorus Policy Advisory Committee (Advisory Committee).

The charge to the Advisory Committee was to identify the major source categories of phosphorus loadings to Michigan's surface waters, and for each of these categories, to review and compile the voluntary and regulatory management approaches that are being or could be used to control phosphorus. Based on that review, the Advisory Committee was to develop findings and recommendations to help advance phosphorus management strategies protective of Michigan's surface waters, taking into consideration effectiveness, costs of implementation, feasibility, and the potential reductions associated with the various phosphorus control options.

The Advisory Committee held six meetings from August of 2006 through January of 2007. The meeting summaries are presented in Appendix A. Appendix B provides an overview of phosphorous initiatives in other states.

The findings and recommendation of the Advisory Committee are compiled in this final report.

PHOSPHORUS IN MICHIGAN'S WATERS

Phosphorus is a naturally occurring, essential plant, algal, and animal nutrient. Although phosphorus concentrations in healthy plants are relatively low, usually ranging from 0.1 percent to 0.8 percent of dry mass, phosphorus is essential because it is a structural component of nucleic acids, several essential coenzymes, phospholipids, and the phosphate-rich molecules that help store energy in living organisms.

Phosphorus is present in the environment in both soluble (dissolved) and insoluble (particulate) forms. The soluble form of phosphorus can be present in either the inorganic (not associated with carbon) or the organic (associated with carbon) state. Dissolved inorganic phosphorus (DIP) or orthophosphate (PO_4^{3-}) is the most bioavailable form of phosphorus for plants. Dissolved organic phosphorus (DOP) also can be used by algae, although most studies indicate that DIP is preferred over DOP. Particulate phosphorus is not usually considered a direct source of phosphorus to plants and algae, although as it is mineralized, it can release dissolved phosphorus, which can then be utilized by these organisms. Total phosphorus reflects the total amount of phosphorus in the system, including both particulate and dissolved forms, and is often used as a metric to assess the trophic status of a water body. Total phosphorus is the parameter recommended by the United States Environmental Protection Agency (USEPA) for use by states to develop nutrient criteria for phosphorus in the nation's water bodies.

Phosphorus moves through a series of cycles from soil to plant to animal. The phosphorus cycle consists of a complex relationship of chemical and biological reactions that control the availability of phosphorus. Phosphorus in soil originates from the weathering of minerals and from additions of phosphorus in the form of fertilizers, animal manure, plant residues, and other biosolids, such as wastewater treatment plant

sludges. Phosphorus is tightly held by soil particles. Practically all soluble phosphorus from fertilizer or manure is converted to soil-bound, water-insoluble phosphorus within a few hours of application. The majority of soil phosphorus is located in the topsoil as a complex mixture of mineral and organic materials, so phosphorus moving from soils into water is usually a result of soil erosion.

Eutrophication is the natural aging of lakes. This process can be accelerated by nutrient addition, which is referred to as cultural eutrophication. Elevated levels of phosphorus can lead to abnormally high growth of algae and aquatic vegetation in lakes and streams resulting in reduced aesthetic and recreational value of the waters. There is generally a progressive degradation of ecological systems with increasing phosphorus concentrations.

The four trophic states of lakes are oligotrophic (low nutrients), mesotrophic (moderate nutrients), eutrophic (high nutrients), and hypereutrophic (excessive nutrients). As phosphorus levels increase, the trophic state of a lake increases, and the quality of the lake decreases. High-quality lakes (oligotrophic and mesotrophic) are very sensitive to increased phosphorus loadings. Once the trophic state of a lake changes, it is extremely difficult to reduce nutrient levels because nutrients accumulate in sediments and release back to water. For this reason, it is extremely rare for a lake to move from a higher to a lower eutrophic state.

The determination of a lake's trophic status involves an assessment of several parameters including two important plant nutrients, phosphorus and nitrogen, in the water column. Aquatic plant and algal growth in Michigan waters is generally phosphorus-limited. As the amount of phosphorus in the water column increases, the algal and/or aquatic vegetation growth may also increase, possibly causing nuisance conditions that impair designated uses.

Michigan does not currently have numerical water quality standards for phosphorus in surface waters, but utilizes a narrative standard that limits nutrients in waters as necessary to prevent injurious levels of plant growth. Waters are considered to be in "non-attainment" when nuisance weed/algae conditions exist. Most Michigan waters meet Michigan's narrative water quality standard for nutrients. See the DEQ's *Water Quality and Pollution Control in Michigan: 2006 Sections 303(d, 305(b), and 314 Integrated Report, http://www.deq.state.mi.us/documents/deq-wb-swqas-2006integratedreport.pdf).*

Great Lakes

Reductions in phosphorus loadings to the Great Lakes through point and nonpoint source controls have substantially contributed to improved water quality. The National Pollutant Discharge Elimination System (NPDES) permitting program has been the principal mechanism for substantially reducing point source phosphorus loadings to Michigan's surface waters. Improvements in Michigan's water quality are attributable, in part, to nutrient limits applied at municipal sewage treatment plants and industrial discharges. In the early 1970's, in response to international concerns for the health of the Great Lakes, Michigan's Water Quality Standards were modified to specify a maximum monthly average discharge limit on point source discharges of total phosphorus of 1 milligram per liter (mg/l). Legislation passed in 1977 reducing the allowable phosphorus content in

cleaning agents and water conditioner products sold in Michigan to less than 0.5 percent phosphorus by weight also contributed to the reduction of phosphorus discharged from point sources. The current trophic status of each of Michigan's Great Lakes is presented in Exhibit 1.

EXHIBIT 1
Trophic Status of the Great Lakes

Lake	Trophic Status (nutrient level)
Superior	Oligotrophic (low)
Huron	Oligotrophic (low)
Huron – Saginaw Bay	Meso/eutrophic (high)
Michigan	Oligotrophic (low)
Erie	Oligo/mesotrophic (moderate)
Erie – Western Basin	Eutrophic (moderate)

SOURCE: USEPA, Great Lakes National Program Office.

The Great Lakes waters of Lake Superior, Lake Huron (except for Saginaw Bay), and Lake Michigan have a trophic status of oligotrophic. Saginaw Bay is mesotrophic/eutrophic and the Western Basin of Lake Erie is eutrophic, with a high level of nutrients.

Inland Lakes

Michigan has11,000 inland lakes greater than five acres, and 750 significant public lakes, the majority of which are greater than 50 acres. Sixty-seven percent of Michigan's significant public lakes are considered high-quality lakes, with moderate (mesotrophic) to low (oligotrophic) nutrient levels. The trophic status of Michigan's public access lakes is summarized in Exhibit 2.

EXHIBIT 2
Trophic Status Summary of Michigan's Public Acess Lakes

Trophic Status	Number and percentage of lakes	Acres
Oligotrophic (low nutrients)	118 (16%)	164,595 (33%)
Mesotrophic (moderate nutrients)	386 (53%)	200,651 (40%)
Eutrophic (high nutrients)	196 (27%)	121,046 (24%)
Hypereutrophic (excessive nutrients)	30 (4%)	16,697 (3%)
Total Assessed	730	502,989

SOURCE: DEQ's *Water Quality and Pollution Control in Michigan: 2006 Sections 303(d, 305(b), and 314 Integrated Report*

Many lakes with moderate to high nutrient levels are located in the southern Lower Peninsula where large population centers and fertile soils exist. Many lakes with low

nutrient levels are located in the northern part of Michigan's Lower Peninsula where the population density is lower, soils are less fertile, and lakes tend to be larger and deeper.

As nonpoint sources of pollution (i.e., diffuse sources such as runoff from agriculture, residential areas, and impervious surfaces) continue to increase, inland lakes become more threatened by their impacts. Best management practices and smart growth strategies have been shown to be effective in minimizing this external source of pollution. However, many lakes are also impacted by internal nutrient loading. This internal source comes from nutrient-rich sediments, which can release phosphorus to the water column under the appropriate environmental conditions. Many studies have shown that reductions in external loadings, to levels where water quality improvement should be detected, do not have the expected benefit because of the counteracting release of phosphorus from the internal source of phosphorus in the sediments.

Michigan has supported citizen volunteer monitoring activities since 1974 for measuring water clarity in lakes. Formerly known as the Self-Help Program, the Cooperative Lakes Monitoring Program is an enhanced and expanded volunteer monitoring network in terms of number of lakes enrolled and water quality parameters monitored. The volunteer-based monitoring focuses on the primary trophic status indicators, including Secchi disk transparency, total phosphorus, and chlorophyll *a*. Water column dissolved oxygen and temperature monitoring have been added recently and other biological indicators are being evaluated. The Cooperative Lakes Monitoring Program is jointly administered by the DEQ and the nonprofit, citizen-based Michigan Lake and Stream Associations Inc.

The Cooperative Lakes Monitoring Program provides sampling protocols and equipment, training workshops, technical assistance, quality control, and laboratory support to the volunteer monitors. This is a cost-effective process used to increase baseline lake water quality information, establish a more frequent data record for evaluating water quality changes and trends, and foster public awareness, stewardship, and surveillance of Michigan's inland lakes.

Rivers and Streams

There are approximately 33,850 perennial river miles in Michigan. Non-attainment of designated uses in rivers due to nutrient concerns is not prevalent. Of the assessed rivers, only 212 miles were designated to be in non-attainment due to nutrients.

Nutrients enter streams from many of the same sources as lakes. Some nutrients originate from natural processes, such as weathering of soils, but human activities often load much larger quantities of nutrients into stream waters than naturally occur. Municipal wastewater treatment plants often discharge directly to streams. Nonpoint sources of nutrients are also important. The nutrient concentrations that naturally occur in streams are usually so low that they constrain algal and plant growth. High nutrient concentrations in streams can cause excessive amounts of plants and algae in streams, which physically and chemically alter habitats for many designated uses, such as aquatic life and recreation. Excess plants and algae clog habitats, reduced dissolved oxygen concentration, and may harbor bacteria that may threaten public health.

SOURCES OF PHOSPHORUS IN MICHIGAN'S WATERS

The Advisory Committee identified and discussed the following sources of phosphorus loadings to Michigan waters:

- Point source discharges
  - Municipal waste water treatment plants(WWTP)
  - Combined sewer overflows (CSOs); sanitary sewer overflows (SSOs)
  - Permitted municipal storm sewers
  - Industrial point sources (direct discharges and indirect discharges to WWTPs)
- Septic tank-tile fields and other on-site sewage treatment
- Un-permitted urban stormwater runoff
- Non-agriculture rural runoff
- Other nonpoint sources
- Stream bank erosion
- Atmospheric deposition
  - Interstate transport
  - Wind erosion
- Release from sediments (internal loading)
- Agricultural
  - Soil erosion
  - Cropland and pasture runoff
  - Tile drained fields
  - Concentrated animal feeding operations
  - Greenhouses

CURRENT REGULATORY AND NON-REGULATORY INITIATIVES

The Advisory Committee identified and reviewed the following regulatory and non-regulatory programs and initiatives:

Regulatory Programs

- Point Source Discharges
  - NPDES Permits
  - CSOs/SSOs
  - Stormwater
  - Total maximum daily load (TMDL) allocations
- Nonpoint source discharges
  - Part 31 prohibition against injurious discharges
- Land application
  - Septage
  - Biosolids

- On-site sewage disposal systems
- Laundry detergent phosphorus restrictions
- Soil erosion and sedimentation control
- Agriculture regulatory programs
  - Concentrated animal feeding operations (CAFOs)
  - Part 31 prohibition against injurious discharges

Non-regulatory Programs

- Nonpoint source discharges
  - Incentive programs for best management practices (BMPs)
  - Grants (Clean Water Act, Section 319, Clean Michigan Initiative (CMI)
  - Educational and outreach programs and initiatives
- Incentive based stewardship programs
- Watershed initiatives

Standards and Criteria

- Michigan's water quality standards for phosphorus

Agriculture Programs

- Right-to-Farm—generally accepted agriculture management practices (GAAMPs)
- Michigan Department of Agriculture (MDA), United States Department of Agriculture (USDA), and Natural Resources Conservation Service (NRCS) programs
- Conservation Reserve Enhancement Program (CREP)
- Environmental Quality Incentives Program (EQIP) and other Farm Bill programs to encourage BMPs (filter strips, conservation tillage, others)
- Farm*A*Syst, Greenhouse*A*Syst and others agricultural *A*Syst programs
- Partnership programs such as the Michigan Turfgrass Environmental Stewardship Program
- State incentive programs (Michigan Agriculture Environmental Assurance Program (MAEAP))

Education and Outreach

- Michigan State University Extension (MSU Extension)
- South East Michigan Council of Governments' (SEMCOG) "Our Water-Our Future" Project
- Watershed initiatives

Monitoring and Data Collection Programs

- The DEQ's comprehensive monitoring strategy
- Voluntary monitoring programs
- Lake associations monitoring

- Comprehensive research
- MSU Extension at Kellogg Biological Station—Kalamazoo River Watershed
- Annis Water Resources Institute Grand Valley State University—Spring Lake, Ottawa County

FINDINGS AND RECOMMENDATIONS

The following findings and recommendations address various source categories that were discussed by the committee, including information from various presentations, and relate these to existing regulatory and non-regulatory programs.

Education and Technical Assistance

Agriculture

Finding 1: Environmentally sound agriculture practices significantly reduce phosphorus losses from agriculture fields. Outreach and education programs are effective in enabling producers to adopt these practices. A careful review of current agriculture outreach and education programs is needed to assure that sufficient focus is provided to enhance agriculture practices to reduce phosphorus loadings to the environment.

> **Recommendation 1:** The DEQ should work with MDA, MSU Extension, USDA, NRCS, and others to evaluate and enhance outreach and education efforts that minimize phosphorus losses. Current outreach and education programs should be evaluated, looking for gaps and areas to improve/expand these programs relative to phosphorus management and control.

Finding 2: Drainage tiles used in agriculture fields can be conduits by which phosphorus reaches surface waters. Also, improperly engineered tile outlets can produce hydraulic conditions that exacerbate stream bank erosion, which was estimated to be 11 percent of the total phosphorus contribution to Minnesota surface waters in a report (Minnesota study) conducted for the Minnesota Pollution Control Agency.[1] It should be noted that well-drained fields that follow GAAMPs with well-designed outlets can reduce phosphorus loadings compared to fields that flood and result in overland runoff.

> **Recommendation 2:** Technical assistance providers and educators should specifically target agriculture outreach and education efforts to producers in tiled areas of the state to further promote BMPs to reduce phosphorus losses.

Finding 3: Wind erosion leads to airborne phosphorus loadings. The Minnesota study estimated that atmospheric deposition represented 13 percent of the total phosphorus contribution. The loss of phosphorus to wind erosion can be significantly reduced

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[1] Barr Engineering Company, *Detailed Assessment of Phosphorous Sources to Minnesota Watersheds, Volume 1: Executive Summary and Report* (Minneapolis, Minn.: Barr Engineering Company, February 2004). [Online, accessed 3/19/07.] Available: *http://www.pca.state.mn.us/publications/reports/pstudy-covertoc.pdf.*

through the use of BMPs, GAAMPs, and practices such as installing cover crops, wind rows and buffer strips.

Recommendation 3: Technical assistance providers and educators should specifically target outreach and education to reduce wind erosion of phosphorus, and encourage such practices as cover crops, wind rows, and buffer strips.

Community Education Initiatives

Finding 4: Education of Michigan residents is critical for a successful phosphorus reduction program. Michigan residents, especially homeowners and renters, need to understand the important role they play in reducing phosphorus loadings to surface waters. An example of an effective education and outreach effort is the one being conducted by SEMCOG. Other examples include commercial enterprises, such as the turf grass industry, watershed initiatives, such as the Middle Huron River Watershed project and the Kalamazoo River Watershed Phosphorus Reduction program, and some lake associations. Also, K–12 education offers opportunities to prepare future citizens. MSU Extension is by far the largest outreach/adult education/research institution in Michigan. However, there are many other organizations also doing good outreach work. The efficacy and impact of outreach and education efforts could be enhanced significantly if done in collaboration.

Recommendation 4a: The DEQ should:

Work with SEMCOG, MSU Extension, and other organizations to expand the use and distribution of educational material targeting residents and homeowners and renters.

Identify and compile examples of effective community education initiatives.

Establish a website and clearinghouse for local units of government, watershed councils, businesses, and others to access effective educational approaches for use throughout the state.

Recommendation 4b: The DEQ should maintain and enhance its assistance to K–12 educators.

Recommendation 4c: The DEQ and MSU Extension should take the lead in establishing a coalition of organizations to improve the collective outreach efforts to control and manage phosphorus, particularly regarding community/property owner voluntarily applied BMPs. This would serve to help various organizations work more collaboratively educating communities, agricultural producers, and riparian property owners regarding on strategies to reduce phosphorus impacts upon state waters.

Finding 5: Lake associations can also play an important role in public education.

Recommendations 5: The DEQ should work closely with lake associations assisting them in developing effective educational materials and consistent messages.

Finding 6: There are approximately ten million people and four million households in the state of Michigan. Much of this population and most of these households are in urbanized areas experiencing water quality problems. The sources of many of

these water quality problems, including contributors to phosphorus loadings, are often very complex with little quantitative data. Nonetheless, various day-to-day activities at these households, such as maintenance of lawns and gardens, can contribute to urban phosphorus loadings. These day-to-day activities represent an opportunity for improving water quality through more widespread participation in low-cost best practices by homeowners and renters. Thus, public education of homeowners and renters is a key component of a comprehensive state approach to reducing water quality impacts from phosphorus. Education efforts are very effective when targeted at a particular issue, such as lawn maintenance.

Recommendation 6a: The DEQ should work with local units of government, watershed councils, commercial applicators, trade associations, non government organizations, and others to develop and deliver a consistent, coordinated statewide message to residents and commercial applicators focusing on environmentally sound landscaping management, such as soil testing and the proper application of the appropriate phosphorus-content fertilizer.

Recommendation 6b: As part of this effort, the DEQ should facilitate the launch of the Michigan Turfgrass Stewardship Initiative as proposed by MSU Extension, the Michigan Turfgrass Foundation, and others.

Recommendation 6c: A point-of-sale educational program for lawn fertilizer should be initiated that provides effective information to customers on the connection between phosphorus and water quality, the option of low- or zero-phosphorus fertilizer, and the importance of soil testing and proper application.

Recommendation 6d: Effective educational materials and programs are needed for other household practices that contribute phosphorus, as well. These include proper handling and disposal of pet waste and yard debris, such as grass clippings and leaves.

Incentives and Voluntary Programs

Conservation Reserve Enhancement Program (CREP)

Finding 7: CREP is a financial incentive program that provides incentives and technical assistance to agriculture producers. The MDA reports that CREP practices reduce phosphorus losses by 75 percent by providing filter strips, riparian buffers and other best management practices. Recognizing the value of this program, Michigan has dedicated $33 million to this program since 2000, leveraging $134 million in federal funds.

Under the current agreement with the federal government, Michigan can enroll up to 80,000 acres in CREP. Currently, 65,000 acres are in the program, which is limited to three watershed basins: River Raisin, Saginaw Bay, and Lake Macatawa-Black River.

Michigan is currently pursuing an increase in its agreement level to 90,000 acres, which would leverage $40 million of additional federal funds. However, Michigan currently has limited technical assistance capability, hindering the program's ability to go beyond the

current 65,000 acres. To increase the program to 90,000 acres, $440,000/year increased state funding is needed to enhance Michigan's technical assistance capability.

To expand the current program to new watersheds such as the Grand River, Kalamazoo River, and St. Joseph River, additional state funding is needed. An increase in state match of $30 million over five years would allow an additional 100,000 acres of CREP program coverage, the minimum program expansion under current federal procedures. This would leverage over $193 million in additional federal funds, allowing Michigan to expand the program into these additional watersheds.

> **Recommendation 7a**: The DEQ and the MDA should work with the Michigan Legislature to pursue necessary state funding for the technical assistance capability to enable CREP to expand to 90,000 acres, and qualify for $40 million in new federal money. The DEQ and the MDA should also develop a long-term funding proposal to secure state funding to enable expansion of the program into other basins and leverage available federal funds.
>
> **Recommendation 7b**: The DEQ and the MDA should also consider modifications to CREP to increase the time commitment for keeping specified land out of production and assuring critical areas near highly vulnerable waters stay out of production permanently.

Michigan Agriculture Environmental Assurance Program (MAEAP)

Finding 8: Agriculture producers participating in the MAEAP receive education and assistance and make a commitment to use environmentally sound agricultural practices that, among other things, minimize phosphorus losses. However, the incentives for participating in MAEAP are not as robust as they could be.

> **Recommendations 8:** The DEQ should partner with MDA and stakeholders to establish effective incentives that encourage more producers to participate in MAEAP. The goal should be 100 percent of Michigan producers environmentally assured under MAEAP. While moving toward this goal, the program should be managed to target producers that have the greatest potential for environmental impact or are in the most environmentally sensitive areas.

Michigan Turfgrass Environmental Stewardship Program

Finding 9: Several private-public partnership incentive programs are effectively driving sound environmental management. An example is the Michigan Turfgrass Environmental Stewardship Program, which works to advance the environmental stewardship of the turfgrass industry.

> **Recommendation 9:** The DEQ should look for opportunities to establish effective incentives that encourage more participation in voluntary programs such as the MTESP and facilitate the expansion of the Michigan Turfgrass Environmental Stewardship Program to segments of the turf industry beyond golf course management.

U.S. Farm Bill Programs

Finding 10: Financial assistance and incentives programs, such as the U.S. Farm Bill programs, are important drivers in accomplishing environmental sound agriculture practices that reduce phosphorus losses from agricultural fields. The following Farm Bill programs make millions of dollars of federal financial assistance available on an annual basis:

- EQIP ($15.1 million)
- Conservation Security Program ($30.9 million)
- Wetland Reserve ($8.0 million)
- The Wildlife Habitat Incentives Program and the Farm and Ranch Land Protection Program ($2.1 million)
- CREP ($134 million).

It should be noted, however, that adequate technical assistance is a limiting factor in the utilization of these funds for the application of conservation practices.

> **Recommendation 10:** These programs should be continued and strengthened as appropriate, and the DEQ should increase the utilization of these federal U.S. Department of Agriculture programs to enhance its watershed protection efforts. Innovative funding solutions should be sought to provide for technical assistance to maximize the effective utilization of the Federal Farm Bill financial program dollars. The MDA and the DEQ should work with Michigan's Congressional Delegation to assure Michigan receives its full share of federal Farm Bill financial and technical assistance funding and to continue to support these programs.

Funding Issues

Communities

Finding 11: Urban runoff is an important source of phosphorus. BMPs are effective in minimizing phosphorus loadings from stormwater runoff. However, communities lack the necessary financial resources to implement all necessary BMPs. State and federal financial assistance is needed. Low-interest loans for nonpoint source correction initiatives are available under the Michigan State Revolving Fund. Few communities, however, have taken advantage of this assistance. The Clean Water Act Section 319 funding is an important funding source for communities in developing and implanting BMPs. However, for communities regulated under Phase I and Phase II stormwater permits, certain federal restrictions may prevent these communities from being eligible for Section 319 funding.

> **Recommendation 11a:** The DEQ should:
>
> Clarify eligibility and streamline requirements for low interest loans for nonpoint source projects under the Michigan State Revolving Fund program.
>
> Review and clarify, if necessary, guidance for Phase I and II communities to assure eligible projects qualify for Section 319 funding.

Pursue changes in federal regulations that would authorize the use of Section 319 funds by municipalities to implement new stormwater requirements managed by Phase I and Phase II permits.

Provide Section 319 guidance applicable to smaller non-regulated communities with stormwater systems.

Recommendation 11b: Communities should pursue a variety of funding options, such as special assessment districts.

Finding 12: Many opportunities for reducing phosphorus loadings are in one way or another connected with stormwater management. Thus, effective stormwater management is a key component of reducing phosphorus loadings. Stormwater management is largely being implemented by local units of government through the federal and state stormwater discharge permitting program.

Communities need assistance in establishing financing/revenue mechanisms to accomplish stormwater correction projects. Fees may be an important part of the funding solution. However, the ability to finance stormwater management in Michigan using fees is in question due to a Michigan Supreme Court decision (Bolt vs. City of Lansing). Also, local government's ability to fund stormwater management from their general funds is severely limited due to constitutional limitations, cuts in state revenue sharing, and the struggling Michigan economy. Thus, the ability to use fees to pay for services related to stormwater management is crucial.

Recommendations 12: The DEQ and other interested parties should support the efforts of SEMCOG and the Michigan Water Environment Association (MWEA) to clarify through legislation the conditions under which fees could be used to support stormwater management.

Monitoring, Source Identification and Loadings Analysis

Water Quality Monitoring

Finding 13: A comprehensive statewide monitoring system is important for assuring that existing and potential phosphorus impacts are identified. The DEQ's current statewide monitoring strategy relies primarily on one-time Clean Michigan Initiative funding. Long-term funding (beyond 2014) for water quality monitoring has not been identified.

Recommendation 13: The DEQ should work with the legislature to identify and secure adequate funding for water quality monitoring. The DEQ should review its long-term monitoring strategy with specific focus on developing the data needed to guide phosphorus management in Michigan. The DEQ monitoring strategy should be integrated with volunteer and local government monitoring, and the DEQ should provide technical assistance for these local efforts; the strategy should also prioritize critical monitoring needs.

Source Identification

Finding 14: The Minnesota study was helpful in guiding the Advisory Committee in its deliberations. However, there are some important differences between Michigan and Minnesota that would change the findings if that study were done in Michigan. As the Michigan DEQ moves forward with phosphorus management strategies, a Michigan based study of phosphorus sources and loadings would be of value. On-the-ground assessments of loadings on a watershed basis, with the involvement of watershed groups and related government agencies, are especially effective.

> **Recommendation 14:** The DEQ should develop and implement an overall strategy to systematically identify sources and quantify loadings of phosphorus to Michigan's waters, utilizing local governmental agencies, university researchers, watershed groups, and non-governmental organizations to the extent possible. Funding should be considered as part of the strategy.

Land Use Development

Stormwater Management

Finding 15: Land use and development patterns that create more impermeable surface area increase stormwater runoff, stream bank erosion and accompanying phosphorus loadings. The State of Minnesota has a statewide requirement that large developments must have wet retention basins to address stormwater generated from new impervious surfaces

> **Recommendation15:** The DEQ should work with MSU Extension and local units of government and developers to implement land use and development practices that assure sound stormwater management for new developments.

Phosphorus-containing Product Changes

Lawn Fertilizers

Finding 16: Urban lawns often do not need additional phosphorus to be applied for a healthy lawn. Yet, in some situations high-phosphorus fertilizer is applied to lawns, even when it is not needed. The misapplication of fertilizer can result in the runoff of phosphorus to surface waters or the leaching of phosphorus to groundwater, which may reach surface waters. Phosphorus-free fertilizer is not readily available at many retail outlets, and education initiatives are needed. Some local units of government have passed ordinances that prohibit the use of phosphorus-containing fertilizer without a soil test demonstrating that phosphorus is needed. The intent of these types of restrictions is to encourage increased soil testing, reduce unnecessary application of phosphorus to lawns, increase better practices, and eliminate phosphorus losses from misapplication. Various local ordinances around the state, however, are problematic for applicators, suppliers, and manufacturers as they have to meet varying requirements.

> **Recommendations 16:** The DEQ should continue to work with the legislature and interested parties to develop acceptable legislation that would reduce the potential for phosphorus loadings to surface waters from this source.

The DEQ should work with MSU Extension and others to evaluate existing homeowner soil test kits and provide recommendations on their continued use or the need to develop an alternative.

The DEQ should work with MSU Extension, local units of government, industry, watershed councils, Michigan Turfgrass Foundation and others to develop and implement effective lawn fertilizer education, including education/outreach at the point of sale. The State of Michigan should encourage the retail market to stock phosphorus-free fertilizer, which is commercially available.

Automatic Dishwasher Detergents

Finding 17: The Minnesota study estimated that automatic dishwasher detergent represented 13 percent of the non-ingested phosphorus loads to publicly owned wastewater treatment plants. A portion of this phosphorus passes through the plant and the balance is captured in the biosolids which are subsequently land applied where, if not utilized on the fields, can enter surface waters. A low-phosphorus substitute is under development, and is schedule to be available by 2010.

Recommendation17: The DEQ should work with the Soap and Detergent Association, the appliance manufacturers, and others to pursue appropriate legislation that, effective July 2010, would restrict the phosphorus content of household dishwasher detergent to 0.5 percent by weight.

Road Deicers

Finding 18: The Minnesota study reported that highway departments are moving away from salt and sand deicers to derived deicer substances which can have significant phosphorus concentrations.

Recommendation 18: The DEQ should review this matter with Michigan Department of Transportation and county road commission officials to assure that phosphorus impacts are considered in decisions to shift to phosphorus-containing road deicers in Michigan.

Sustainable Practices

Finding 19: Phosphorus enters municipal sewer systems from domestic, commercial, and industrial dischargers. A high percentage of this phosphorus load is removed at wastewater treatment plants under federal and state NPDES Permit requirements. This phosphorus is captured in the treatment plant sludge, or residual solids, for subsequent disposal as biosolids. The phosphorus collected and removed from municipal sewage then re-enters the environment via the facility's biosolids disposal practice(s) such as land application, landfill, composting, or incineration. While this phosphorus is being disposed of, more phosphorus continues to mined and brought to market for commercial and industrial use, increasing the total mass of available phosphorus in the environment.

Recommendation 19: The DEQ should work with industry, agriculture, and municipalities to develop sustainable strategies that reduce phosphorus use and encourage the re-use and recycle of phosphorus and phosphorus-containing products.

Regulation

Point Source Discharges and Nonpoint Source Discharges

Finding 20: In the 1970's, concern with the health of Lake Erie led to an international agreement to impose a discharge limitation of 1.0 mg/l total phosphorus on large municipal discharges to Lake Erie. This led to the establishment of Michigan's NPDES permit requirements for phosphorus, which are among the most stringent in the nation. All point discharges are required to meet the discharge limitation of 1.0 mg/l total phosphorus, with limitations set below 0.5 mg/l total phosphorus being required in some situations.

Nevertheless, in some watersheds, phosphorus loadings from point source discharges are still a significant portion of the total phosphorus load. The Minnesota study estimates that point sources represent 31 percent of the total contribution, with commercial and industrial sources representing 12 percent of the total. Nonpoint sources, which are essentially non-regulated, represent 69 percent of the total.

> **Recommendation 20:** Before considering any further tightening of the 1.0mg/l standard, the DEQ should focus on reducing discharges from nonpoint sources. While tightening of site-specific point source discharge permit limitations may be necessary in some situations, it should be done as part of an overall strategy balancing point and nonpoint source discharges and looking at the cost impacts and technological feasibility of reducing the overall phosphorus loadings. This should be coordinated with the strategy developed pursuant to Recommendation 14. To help implement this recommendation, the DEQ should review its water quality trading rules for appropriate changes.

Finding 21: Point sources have a vested interest in the successful implementation of nonpoint source control measures to reduce phosphorus. Continuing water quality impairment will likely lead to increased regulatory action, which is likely to be focused on the point sources. Point source discharges can play an important role in developing and implementing strategies to address nonpoint source discharges. For example, utility billing represents an opportunity for contact and information sharing with consumers in broad geographic areas. Also, public utility personnel have a wealth of information that would be helpful to watershed groups and others developing strategies for dealing with nonpoint source loadings of phosphorus.

> **Recommendation 21:** The DEQ should look for opportunities to engage active involvement and support of point sources in developing and implementing nonpoint source control programs, particularly public education activities in the service area of publicly owned treatment works and in providing technical assistance to the effort.

Combined Sewer Overflows and Sanitary Sewer Overflows

Finding 22: Wastewater treatment plants typically remove more than 80 percent of the phosphorus in the influent. However, untreated combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs) receive no phosphorus treatment and the full concentration of phosphorus in the municipal and industrial wastes being transported is discharged to the open waters.

Recommendation 22: The DEQ should assess the status of its regulatory actions to assure adequate controls of CSOs and SSOs and take necessary enforcement action where necessary progress is not being achieved.

Water Quality Standards

Finding 23: Michigan does not currently have numerical ambient water quality standards for phosphorus in surface waters. The ambient water quality standard is a narrative standard that states that nutrients are to be limited to the extent necessary to prevent stimulation of aquatic plants injurious to designated uses. The narrative water quality standard is not met when nuisance weed/algae conditions exist. This criterion is inadequate, since a clear violation has not occurred until the damage has already been done. Pursuant to its authority under Section 304(a) of the Clean Water Act, the USEPA is requiring states to establish schedules to adopt numeric water quality standards for phosphorus. If the states do not adopt numeric water quality standards by the required date, the USEPA will establish a federal numeric standard for the states. The DEQ has been working with MSU and others to develop the scientific basis for numeric water quality standards.

Recommendation 23: The DEQ should initiate a stakeholder process to establish appropriate numeric ambient water quality standards for phosphorus to guide its regulatory program. In so doing, the DEQ should consider whether there should be different criteria for lakes than for rivers, and consider the trophic state of the lake in setting acceptable criteria.

Preserving High-quality Lakes

Finding 24: Oligotrophic (low nutrients) and mesotrophic (moderate nutrients) lakes are recognized as extremely valuable waters.

Recommendation 24: The DEQ should make special efforts to identify these lakes and implement regulatory and non-regulatory programs to assure these lakes are not allowed to be degraded to higher eutrophic states.

Septic Tank-Tile Field Systems

Finding 25: The use of septic tank-tile field on-site wastewater systems is increasing. It is estimated that 50 percent of Michigan's new housing development is relying on on-site treatment. In a properly sited and operated septic tank-tile field system, phosphorus is removed from the wastewater by adsorption onto soil particles. Systems that are not properly sited, operated or maintained, however, do not have the capacity to effectively remove phosphorus from the wastewater, and often result in phosphorus loadings to surface waters. Michigan is the only state in the Midwest that does not have a statewide sanitary code to assure consistent siting of septic tank-tile field systems. Further, Michigan lacks a consistent statewide regulatory structure to assure these systems are properly operated and maintained.

Recommendation 25: The DEQ should pursue enactment of a statewide sanitary code to assure adequate and consistent siting of septic tank-tile field systems.

The DEQ should establish statewide requirements for septic tank tile-field inspections at the time of sale of the property.

The DEQ, in consultation with the Michigan Department of Community Health (DCH), should require county health departments to establish the necessary regulatory structure to assure consistent statewide regulation of operation and maintenance of septic tank-tile field systems, without preempting local control.

On-Site Mechanical Wastewater Treatment Plants (Package Plants)

Finding 26: In many areas of the state, soils are not suitable for septic tank-tile field systems and public sewers are not available or feasible. Development pressure has led to the increased use of individual package plants with surface water discharges. Unlike septic tank-tile field systems, these systems, which are miniature sewage treatment plants, are technically complex and demand qualified personnel to operate and maintain them. The numbers of these are increasing and creating regulatory problems for responsible agencies.

Recommendation 26: The DEQ needs to work with the DCH and county health departments to develop a regulatory structure to effectively regulate these facilities. Consideration should be given to prohibiting the use of these systems in vulnerable areas. The following should be considered:

Enforceable performance standards

Certified operator requirements

Defined role of local government in regulating these facilities

Adequate financial assurance to cover failure expenses

Compliance with local requirements being made a prerequisite for a discharge permit

Prohibition of these systems in vulnerable areas (around inland lakes, small watercourses, populated areas)

Heightened regulatory oversight of system monitoring and performance

Soil Erosion and Sedimentation Regulation

Finding 27: The Minnesota study estimated that a significant percentage of phosphorus loadings are from soil erosion. The same is likely to be true in Michigan. The principal sources of soil erosion include stormwater runoff, stream bank erosion, and water and wind erosion.

Recommendation 27: Soil Erosion and Sedimentation Control Act Administration

The DEQ should increase oversight of local soil erosion programs.

The DEQ should review and enhance as necessary its guidance on program administration.

The DEQ needs to work with counties and other local units of government to assure local authorities are adequately funded to effectively administer soil erosion and sedimentation control programs.

Stormwater regulation

Finding 28: Stormwater runoff is a significant source of phosphorus to Michigan's surface waters.

Recommendation 28: The DEQ should assess the overall adequacy of Phase I and Phase II stormwater permit programs, and develop a strategy to address shortfalls.

The DEQ should assess its stormwater permit oversight program to assure Phase I and Phase II programs are adequate and include: stormwater pollution prevention initiatives (SWPPI), public education, an illicit discharge program, a soil erosion control program, BMPs for post construction stormwater control, and buffer strips for all riparian owners.

The DEQ should evaluate the cost effectiveness of the six minimum measures.

The DEQ should assure compliance with stormwater discharge permits.

The DEQ and MSU Extension should develop an educational program aimed at communities not covered by Phase I and II, to assist them in meeting storm water management goals.

The DEQ should assess performance of community stormwater discharges not covered by Phase I and II, and bring them under regulation, where necessary to protect water resources.

Land Application of Phosphorus Bearing Materials

Finding 29: Adequate regulation of land application of phosphorus bearing materials is necessary to assure sound land application practices and to avoid loss of phosphorus to Michigan's surface waters.

Recommendation 29: The DEQ should:

Review its programs regulating land application of biosolids and septage to assure there is adequate oversight and that biosolids and septage are being applied at a rate and in a manner that allows adequate phosphorus utilization to take place on the fields.

Work with WWTPs to provide incentives to increase the availability of septage receiving stations at WWTPs and encourage innovations for treating septage.

Agricultural Practices

Finding 30: CAFOs have the potential to release significant loadings of phosphorus to the environment, and some large CAFOs are required to obtain NPDES permit coverage under state law. In most situations, non-CAFOs and other agricultural producers are not required to have an NPDES permit. However, state law prohibits any direct or indirect discharge that is or may become injurious to the designated uses of the waters of the state.

Recommendation 30: The DEQ should review its CAFO regulation program to assure all CAFOs that are required to have a permit are under permit and in compliance with the comprehensive nutrient management plan (CNMP) and other

state requirements. For non-CAFOs and other producers, the DEQ should work with MDA to assure producers are following GAAMPS under Right to Farm laws. The DEQ should take necessary and appropriate enforcement action where practices are causing injury to the designated uses of the waters of the state.

Finding 31: Most agricultural producers are good environmental stewards and manage their operations using environmentally sound practices. The small percentage of producers that fail to do this enjoy an unfair economic advantage over the others, and can cause environmental damage, including increased loadings of phosphorus to the waters of the state.

Recommendation 31: The DEQ in partnership with MDA should work with producers to maximize conformance with GAAMPS, and in the event poor practices result in injurious discharges to the waters of the state, assure that timely and appropriate enforcement action is taken.

Watershed Initiatives

Incentives

Finding 32: Watershed initiatives, such as those in the Huron River watershed and the Kalamazoo River watershed, are valuable collaborations in addressing phosphorus loadings to Michigan's waters.

Recommendation 32: The DEQ should continue and where possible enhance its assistance to watershed associations. The DEQ should look for ways to provide regulatory incentives to watershed initiatives, such as the stormwater program for municipal separate storm sewer systems (MS4) permit innovation used in the Rouge River Watershed.

NEXT STEPS

The findings and recommendations of this final report are presented to the DEQ for consideration and appropriate follow-up action. The Advisory Committee looks forward to a continuation of the collaborative process that led to the development of this report, and requests that the DEQ advise the members of its plans to implement the recommendations. The Advisory Committee recommends that the DEQ establish a link on its Website for this initiative, and use that site to keep the public informed of progress on implementation activities.

The members of the Advisory Committee appreciate the opportunity provide these recommendations to the DEQ and stand ready to assist in the DEQ's efforts to implement them.

Appendices

Appendix A: Advisory Committee Meeting Summaries (CD Enclosed)

Appendix B: Phosphorus Initiatives in Other States (CD Enclosed)