Flying Blind

Water Quality Monitoring and Assessment in the Great Lakes States

March 2004

ENVIRONMENTAL INTEGRITY PROJECT

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THE ENVIRONMENTAL INTEGRITY PROJECT (EIP) is a non-profit, non-partisan organization dedicated to more effective enforcement of existing federal and state environmental laws and to the prevention of political interference with those laws. EIP's research and reports sheds light on how enforcement and rulemaking affect the public health. EIP also works closely with local communities seeking the enforcement of environmental laws.

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Water Quality Monitoring and Assessment in the Great Lakes States

The Environmental Integrity Project (EIP), with the support of the Joyce Foundation, analyzed the water quality monitoring and assessment reports of six Great Lakes states (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin, or EPA's Region 5). In general, EIP found that drawing comparisons and discerning trends in water quality is no small task, due to widely disparate assessment methodologies, inconsistent standards, and significant data gaps.

These problems are not new. They have been highlighted in the past in government-funded studies, including the U.S. General Accounting Office, *Inconsistent State Approaches Complicate Nation's Efforts to Identify Its Most Polluted Waters*, January 2002 (GAO-02-186 Water Quality), and *Key EPA Decisions Limited by Inconsistent and Incomplete Data*, March 2000 (GAO/RCED-00-54 Water Quality); National Academy of Public Administration, *Understanding What States Need to Protect Water Quality*, December 2002; and National Research Council, *Assessing the TMDL Approach to Water Quality Management*, National Academy Press, Washington, D.C., 2001.

In April 2002, the Michigan Environmental Council (MEC) published *Greening the Governments*, a comprehensive analysis of environmental conditions and performance of the Great Lakes states. We wish to acknowledge these prior works, which provide a foundation for this report. These studies prompted EIP to take a closer look into several key aspects of the states' programs, in the hope of developing a deeper understanding of water quality in the Great Lakes states and identifying new opportunities for the states and EPA to move closer to the goal of comprehensive monitoring and assessment.

We wish to thank Beth Wentzel at Prairie Rivers Network in Illinois, Rae Schnapp at Hoosier Environmental Council in Indiana, and Keith Dimoff at Ohio Environmental Council, for their helpful reviews of this report. In addition, EIP wishes to acknowledge the help and cooperation of EPA Region 5 as well as the managers and staff of the state environmental agencies for their courteous assistance.

Finally, we are grateful for the support of the Joyce Foundation, without which this report would not have been possible.

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We risk flying blind if we aren't able to get dramatic improvements in water quality monitoring and data to support wise management decisions.

— G. TRACY MEHAN,
EPA Assistant Administrator for Water,
(***EPA WaterNews***) June 24, 2003

Today, the majority of the nation's waters remain unmonitored and unassessed.

— ROBERT WAYLAND,
Director, EPA Office of Wetlands,
Oceans, and Watersheds,
November 19, 2001

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Executive Summary

The primary goal of the Clean Water Act is to make sure the nation's waters are "fishable and swimmable." To determine whether an individual lake or stream meets this goal, the U.S. Environmental Protection Agency (EPA) and states determine whether specific "designated uses" have been achieved, for example, whether a water body supports aquatic life, fish consumption, or recreational uses.

The Environmental Integrity Project (EIP) analyzed the water quality monitoring and assessment programs of six Great Lakes states (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin, or EPA's Region 5). EIP conducted detailed reviews of the states' water quality assessment reports, which are submitted biennially to EPA. In addition, we compared state Water Quality Standards—the rules by which each state determines the quality of its waters—to develop a deeper understanding of the states' assessment methodologies and programs.

This report does not delve into all the components of the state and national water quality reports, such as the states' ground water assessments. We do not analyze in detail the causes and sources of impairments, an important component of the states' reports to EPA.

In general, EIP found that the states are far from achieving comprehensive, accurate, and reliable water monitoring and assessment. The end result is that national and regional "pictures" of water quality are overstated and often misleading.

More than thirty years after passage of the Clean Water Act, we *still* do not know enough about what's in our water. The public and Congress expect the states and EPA to present a clear picture of water quality—an honest assessment, especially when it comes to matters affecting human health. The public would benefit from a clear understanding of what we do *not* know as much as what we do know.

EIP found both positive aspects as well as opportunities for improvement as we delved into three specific programmatic components. First, because millions of anglers enjoy the world-class fishing along the states' many rivers, streams, lakes, and ponds, we compared the Great Lakes states' use of fish consumption advisories for PCBs and mercury, two toxic pollutants. Next, because EPA has long recognized the importance of biological indicators as a way to assess the overall health of aquatic ecosystems, we compared the states' biocriteria program elements to determine how well the states assess aquatic life use. Lastly, because during the summer months, Midwesterners flock to the Great Lakes' shores, we compared pathogen monitoring at Great Lakes beaches.

Are we using the same yardsticks to measure water quality?

Findings:

- EPA gives Congress and the public a view of water quality based on whether desired uses for a given water body have been attained. Yet, states neither agree on basic definitions, nor do they report on a consistent set of "designated uses." For example, Wisconsin measures only aquatic life use in rivers and streams, while all other states and EPA measure a broader array of water uses (e.g. drinking water, contact recreation, fish consumption). These disparate approaches and varying Water Quality Standards create challenges in drawing region-wide comparisons and assessing trends.

- State water officials are often forced to rely on loose narrative statements to determine whether a water body is clean or dirty. Numeric criteria—the hard and fast numbers which indicate the quality of a water body—make individual state assessments more reliable, but they, too, vary considerably between states, making comparisons difficult. For example, while Minnesota, Ohio, and Wisconsin have adopted some standards to begin measuring wetland health, no states have adopted objective numeric criteria for wetlands.

Recommendations:

- EPA should require states to adopt consistent Water Quality Standards, particularly where states have failed to adopt their own standards or where states have made little progress measuring water quality. Unless states move toward greater consistency, inconsistent standards will perpetuate the incomplete and often inaccurate picture of water quality that EPA presents to Congress and the public.

- EPA should require states to establish consistent and objective Water Quality Standards for wetlands. Deadlines set by EPA for the states to develop wetland standards have come and gone. Water Quality Standards for wetlands are necessary to ensure that, under the provisions of the Clean Water Act, wetlands are afforded the same level of protection as rivers and lakes. The time has come for EPA to hold states accountable and require them to adopt objective numeric wetland standards. EPA should impose federal wetland standards for states that fail to make reasonable progress.

How much have we measured and how do we know whether goals are being met?

Findings:

- Basic Clean Water Act reporting requirements on the number and percentage of assessed rivers, streams, lakes, ponds, estuaries, and wetlands are not being adequately met. While

together EPA and the states have made some headway—submitting data electronically and presenting information to the public in accessible formats—major discrepancies exist between what the individual states report and EPA's National Water Quality Inventory, the so called national "picture."

- While admitting that most of the nation's waters are unassessed, EPA presents state and regional assessments that lead many in Congress and the public to believe that our waters are being adequately monitored and, further, that most of our waters are clean. While the Great Lakes states work hard to monitor as many waterways as limited resources allow, the fact remains that the states have monitored a fraction of lakes and streams, and practically no wetlands.

Recommendations:

- EPA should explain inaccuracies in its national assessment when presenting it to Congress and the public. EPA's role in presenting a national assessment goes beyond aggregating state reports. The agency has a statutory mandate to analyze the data before putting the federal government's stamp of approval on it and presenting it to the public as the so-called "national picture." If EPA cannot assure the quality and accuracy of the information it presents, due to disparate state reporting methods, then it should divulge the Inventory's shortcomings when it presents it for public consumption. Full disclosure of problems in water quality data will only strengthen the case for decision makers to provide the needed resources states need to fill data gaps.

- EPA should appoint a scientific panel to grade state reports. A scientific advisory panel should devise a methodology to "grade" each state's submittal, based on the quality and reliability of the data. While not a complete fix, this mechanism would be a useful first step, and will help EPA fulfill its statutory mandate to analyze state water quality reports instead of simply compiling them.

- Great Lakes states should adequately fund their water quality monitoring programs. State environmental agency officials should conduct fee audits to determine whether fees should be increased to allow the state to fulfill the Clean Water Act requirement for comprehensive assessment. State water program officials should build a case to make their resource needs a priority, both within their agencies and at state legislatures. State legislators should take a critical look at all available funding mechanisms, including water discharge permit fees, which should be set at levels to adequately support the programs. Great Lakes states should pay special attention in the coming years to pathogen monitoring conducted at the local county level, which is in danger of falling further behind as local governments are usually hit hardest by budget shortfalls.

Are our waters fishable?

Findings:

- Fish consumption provides the greatest potential for human exposure to toxic substances in the Great Lakes states. Fish consumption advisories—warnings by public health officials that some species are unfit to eat and others should be eaten only occasionally—are in effect throughout the Great Lakes shorelines, and for most rivers, streams and inland lakes.

- Anglers get different fish consumption advice depending on where they live. State health departments issue risk-

based fish advisories to limit human consumption of toxics like PCBs, dioxins, and mercury. However, fish consumption advisories are inconsistent from state to state, so that anglers on the same body of water are told that it is safe to eat a fish under one state's standards, while they are warned not to eat that same fish under the neighboring state's standards.

- Some states fail to report that their waters are "unfishable" even though public health officials have issued blanket fish consumption warnings. Fish consumption is a key component of state water quality reports and a direct measure of the Clean Water Act's primary goal; waters are "fishable" when fish are safe to eat. All the Great Lakes states have, to varying degrees, established statewide mercury fish consumption advisories. Yet, in 2002, only two states (Michigan and Wisconsin) used their statewide mercury advisory as a basis for determining that state waters are "unfishable;" two states (Illinois and Indiana) used site specific fish advisories, but not their statewide mercury advisory, in their assessments; and two states (Minnesota and Ohio) did not use fish advisories at all as a basis for determining whether their waters are "fishable."

Recommendations:

- Great Lakes states should reduce the levels of mercury in their waters. Mercury contamination has long been a source of concern in the Great Lakes region, and does not appear to be getting any better. Recent Clean Air Act rollbacks provide even greater impetus for the states to take action to limit the amount of mercury entering their waterways. The Great Lakes states should use all the available tools to aggressively address this public health and environmental threat, including establishing total maximum daily loads for mercury impaired waters and requiring facilities that emit mercury into the air to obtain Clean Water Act permits.

- There is no reason for people who may eat the same fish from the same body of water to get different advice based on where they live. Therefore, the health departments of the Great Lakes states should adopt uniform fish consumption advisories. State health departments should ensure that anybody who eats fish caught locally or regionally receive the consumption advice, and make special efforts to inform the public and residents of low income and environmental justice communities of the health risks associated with fish consumption.

- Waters should not be rated as "fishable" when fish are unsafe to eat. Illinois, Minnesota, and Ohio should list fish consumption as a designated use, and all the states should adopt specific criteria to measure fish consumption attainment based on fish advisories. For many fish species (especially bottom feeders), meeting a "fishable" standard will not be achievable for many years to come, due to the high levels of historic pollution in sediments coupled with today's unregulated mercury emissions. Accordingly, EPA and the states should set interim standards that provide a realistic measure of progress.

Do our waters support aquatic life?

Finding:

- Biological criteria provide a good indication of overall ecosystem health. While most of the Great Lakes states use some form of bio-criteria to measure the quality of their waters, only one state, Ohio, has set

numeric biological standards in rule. Not coincidentally, when Ohio applies these stringent numeric criteria, its waters do not make the grade, while the states that apply loose subjective standards report that their waters are just fine. If all the Great Lakes states adopted objective biological criteria, it would likely double the number of waters identified as failing to support aquatic life use.

Recommendation:

- States should adopt numeric biological criteria to measure aquatic life use and ecosystem health. In Ohio, biological monitoring plays a prominent role in the state water monitoring program. For the other Great Lakes states, biological monitoring should be more fully integrated into the assessment program to measure aquatic life designated use, and to provide a more complete picture of overall ecosystem health.

Are our waters swimmable?

Findings:

- Some states do not report that their waters are "unswimmable" even where public health authorities have closed beaches due to high pathogen counts. In 2002, Illinois and Indiana reported that contact recreation was impaired at pathogen-contaminated Great Lakes beaches. Wisconsin, on the other hand, made no swimming assessment for any of its 1,017 miles of shoreline, despite having closed beaches due to high pathogen counts. Minnesota and Ohio, although they conducted regular monitoring in 2002, did not report whether their shorelines are swimmable.
- Pathogen monitoring is inconsistent, and some states still rely on fecal coliform testing even though *E. coli* is widely recognized as a more accurate indicator for risk to human health. Only three of six Great Lakes states have made the transition from testing for fecal coliform to *E. coli*. In states such as Illinois and Wisconsin, some local health agencies have adopted their own *E. coli* standards, despite the fact that the state environmental agency has not included it as part of the Water Quality Standards.

Recommendations:

- Waters should not be rated as "swimmable" where swimming is prohibited due to high levels of contamination. EPA should require the states to make pathogen monitoring results, swimming advisories, and beach closures a part of their contact recreation use attainment determinations. Whether state or local agencies use fecal coliform, *E. coli*, or any other method to make beach contamination decisions, no state should say that waters are swimmable when beaches have been closed due to contamination.

- EPA should require the states to move toward consistent *E. coli* monitoring. The patchwork of pathogen standards is a recipe for confusion, and adds yet one more layer of inconsistency among the Great Lakes states' water quality programs. The states should adopt EPA's recommended *E. coli* standards, so that water quality can be measured consistently from state to state, and swimmers are adequately protected from water-borne illness.

FLYING BLIND: STATE SUMMARIES

State	Comprehensive list of designated uses in state standards	Water Quality Standards for wetlands	Fish advisory used as a basis for determining fish consumption use attainment	Numeric biological criteria in Water Quality Standards	Uses *E. coli* to assess Great Lakes swimming beaches
IL			✓		*
IN	✓		✓		✓
MI	✓		✓		✓
MN		✓			†
OH		✓		✓	✓
WI		✓	✓		*

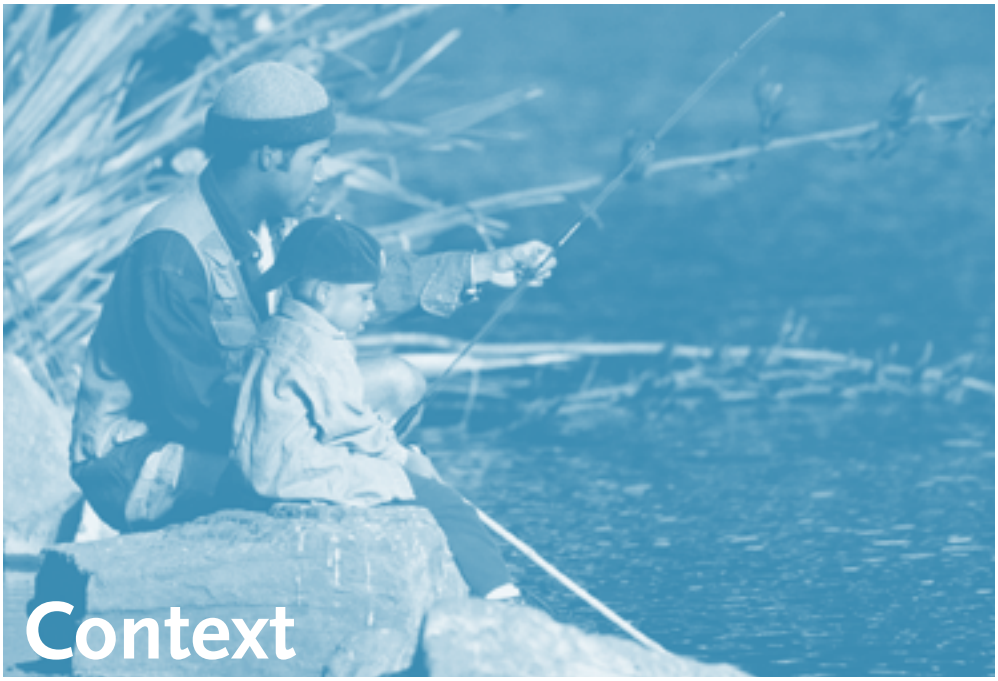
* State has adopted a fecal coliform standard, although some local health agencies use EPA recommended *E. coli* standards. Wisconsin DNR reports that it will transition to E. coli standard in 2004.

† State has adopted a fecal coliform standard and is considering transitioning to *E. coli*.

TABLE 1. GREAT LAKES SHORELINE ASSESSMENTS, 2002

State (Total Shoreline Miles)	Uses Assessed	% Good	% Threatened/Impaired
IL (63)	Aquatic Life	100%	0%
	Fish Consumption	0%	100%
	Swimming	22%	68% (10% not assessed)
	Drinking Water Supply	0%	100%
IN (59)	Aquatic Life	98%	2%
	Fish Consumption	0%	100%
	Swimming	2%	98%
	Drinking Water Supply (33 miles)	100%	0%
MI (3,250)	Aquatic Life	100%	0%
	Fish Consumption	0%	100%
	Swimming	99.8%	0.2% (8 miles)
	Secondary Contact Recreation	100%	0%
	Drinking Water Supply	97.5%	2.5% (80 miles)
	Navigation	100%	0%
MN (272)	none	–	–
OH (312)	Aquatic Life:		
	Western basin	17%	83%
	Central basin	32%	68%
	Lake Erie Islands	46%	54%
WI (1,017)	Fish Consumption	0%	100%

SOURCE: 2002 state water quality (305b) reports[1]



Context

The Federal Water Pollution Control Act of 1972, commonly called the Clean Water Act, establishes a process to measure the quality of the nation's waters. By law, each state is required to develop a program to monitor and assess its waters and report the results to the United States Environmental Protection Agency (EPA).[2] EPA, in turn, is required to compile and analyze the state reports, and transmit its analysis to Congress. The process of identifying polluted waters is the first step towards cleaning them up. In addition, the reporting process is the principal way that the public knows whether the lakes and streams in which they swim and fish meet water quality standards.

Measuring environmental progress is a challenging endeavor. In the late 1990's EPA and the states established a set of so-called Core Performance Measures to "paint a picture" of the nation's progress in protecting public health and the environment. Among several measures of water quality is the following:

What Does it Mean to "Assess" Waters?

Assess means to determine whether, and to what extent, a given water body, such as a stream segment, is fishable or swimmable. An assessment is based on a wide variety of information, which all falls into two categories: "monitored" data and "evaluated" data.

Monitor means to conduct site specific sampling or surveying, such as collecting fish tissue or sediment samples, or counting the number of a certain species in a given area. Monitored data is usually up-to-date and reliable, but is it also time consuming and costly for states to acquire.

Evaluate is a catch-all term for all the types of information, other than monitored data, that can be used to assess a water body. Evaluated data includes desktop models, local knowledge, and also "monitored" data more than five years old.

- Number and percent of assessed river miles, lake acres, and estuary square miles that have water quality supporting beneficial uses, including,

where applicable, fish and shellfish consumption; recreation; aquatic life support; and drinking water supply.

While monitoring and assessment activities are ongoing functions of state water programs, the states submit their water quality reports to EPA every two years. These documents are often called *305b reports*, after the section of the Clean Water Act that requires their submittal. Increasingly, states submit *integrated reports*, combining the 305b report with the list of impaired waters required to be submitted under Section 303d of the Act. Therefore, we use various terms—*state assessment, water quality report, integrated report, 305b report*—interchangeably, to refer to the biennial water quality reports which the states submit to EPA.

When a state's submittal has been approved and summarized by EPA, it is presented to Congress and the public as part of EPA's "national assessment." The most current national water quality assessment is EPA's *2002 National Water Quality Inventory*. Throughout this report, we make every effort to clearly identify facts and figures obtained from EPA's national water quality assessment and those obtained from the states' reports. The numbers often do not match. While it is not our intent to confuse the reader, we do not attempt to square all the discrepancies.

EPA numbers and states' numbers rarely match up.

Many aspects of a state's water quality program have highly subjective components which rest heavily on the professional judgment of water program officials. Each state faces decisions about what types of samples to use and how often to take them. In addition, state water program officials must decide how large an individual assessment unit should be. (Does a single monitoring site tell us about water quality along a one mile stream segment? Five miles? Twenty-five miles?). Each state answers these questions differently, making it extremely difficult to compare water quality among states.

EPA and the states are aware of the problems associated with disparate standards and approaches to water quality monitoring.[3] In recent years, several studies have detailed problems with states' and EPA's water quality reporting and assessment processes. The U.S. General Accounting Office, for example, has conducted at least two reviews and found that EPA's national "picture" is unreliable and incomplete, due in large part to gaps and inconsistencies among state programs. See generally, *Inconsistent State Approaches Complicate Nation's Efforts to Identify Its Most Polluted Waters*, January 2002 (GAO-02-186 Water Quality), and *Key EPA Decisions Limited by Inconsistent and Incomplete Data*, March 2000 (GAO/RCED-00-54 Water Quality). These and other government funded studies have made numerous recommendations to EPA and the states to work together to overcome these documented problems.[4]

In April 2002, the Michigan Environmental Council (MEC) published *Greening the Governments*, a comprehensive analysis of environmental conditions and performance of the Great Lakes states. In that report, MEC noted the "troubling lack of reliable, comparable environmental data concerning water pollution."[5]

In this report, we build on these past studies and take them a step further. Specifically, this report takes a detailed look at key elements of states' water quality monitoring and assessment programs in and around the nation's most important freshwater system, the Great Lakes. The report will, to the extent possible, measure progress and draw comparisons among the EPA Region 5 states (Indiana, Illinois, Michigan, Minnesota, Ohio, and Wisconsin). Although New York and Pennsylvania border Great Lakes, they are not within EPA Region 5, and their programs were not analyzed for this report.

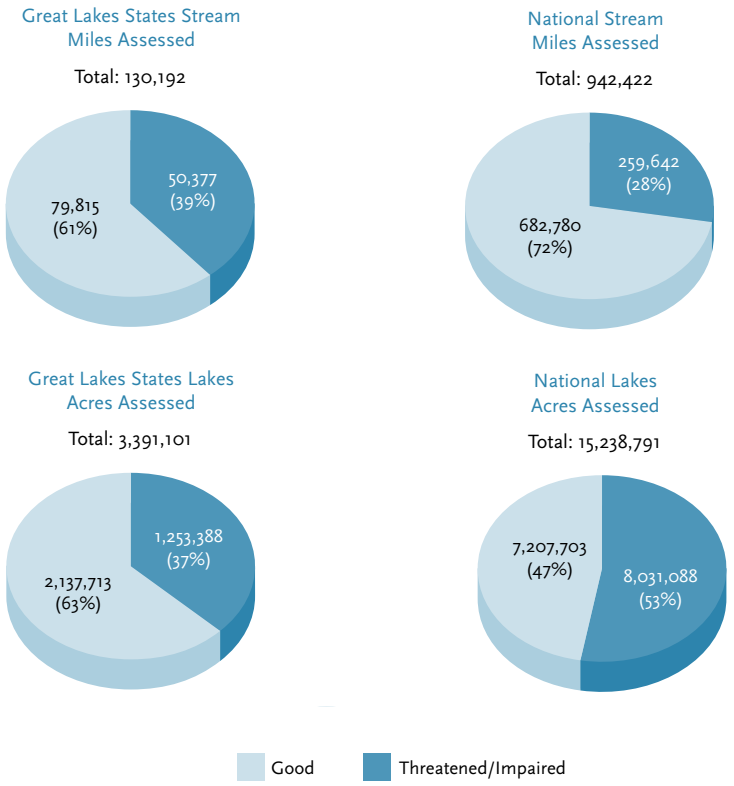
EPA's National and Great Lakes "Pictures"

The most recent data on water quality in the Great Lakes states shows that most of the assessed streams, creeks, and rivers ("stream miles") as well as most of the assessed lakes, reservoirs and ponds ("lake acres") are considered to be good, by EPA standards.

While this snapshot may appear clear on the surface, this report will reveal the regional water quality picture of the Great Lakes states to be blurred by wildly disparate state approaches, different standards, and inconsistent definitions. Because states "assess" their waters so differently, EPA's presentation of regional data, such as in the table below, is highly questionable.

EPA's presentation of cumulative data raises several questions. Did Michigan submit a 2002 report, as it is required to do by law? Indeed, Michigan did submit its report, but the format in which the state supplied the data does not

COMPARISON OF GREAT LAKES STATES' WATER QUALITY TO NATIONAL WATER QUALITY, AS REPORTED BY EPA, 2002*



SOURCE: 2002 EPA *National Water Quality Inventory*, available at http://oaspub.epa.gov/waters/w305b_report.nation (last visited on January 7, 2004).

* Great Lakes States Lake Acres includes only inland lake acres.

TABLE 2. ASSESSED WATERS OF REGION 5 BY STATE, AS REPORTED BY EPA, 2002*

	Rivers, Streams, Creeks (Miles)	Lakes, Ponds, Reservoir (Acres)	Coastal Waters (Miles)	Wetlands (Acres)
IL	19,401	365,798	0	0
IN	7,548	17,342	0	0
MI	0	0	0	0
MN	17,522	2,591,796	0	0
OH	14,380	238,119	391	0
WI	15,054	312,688	0	0

* From US EPA, Website, Water Quality Inventory for Region 5, http://oaspub.epa.gov/waters/w305b_report.region?p_region=5#url (last visited on January 7, 2004).

readily transfer into EPA's Assessment Database. Is Ohio the only Great Lake state with "coastal" waters? Under certain federal laws, Great Lakes shoreline is considered "coastal," and Ohio's use of this definition, coupled with data entry problems resulted in this inconsistency.

Some overt irregularities in EPA's national assessment have straightforward explanations, such as the agency's inability to analyze, and sometimes even to accept, the various forms of data that states provide electronically. Yet, despite the reasons for these irregularities, the "picture" that EPA presents would surely confuse a member of the public who simply wants to know how her state is doing.

Findings

Are we using the same yardsticks to measure water quality?

Great Lakes States' Water Quality Standards Are Inconsistent

Water Quality Standards include a use appropriate to the water body, called a *designated use*, and *criteria* to measure whether the desired use is being achieved. A state's water quality assessment is a determination of whether, and to what extent, its water bodies meet designated beneficial uses. A "designated use" is a desirable use that a lake, stream, or wetland should support. For example, a lake may be designated to be used as a public water supply, for contact recreation, and/or aquatic life.

The goal of the Clean Water Act is to restore and protect the integrity of the nation's waters to allow for protection and propagation of fish, shellfish, and wildlife, and provide for recreation in and on the water.[6] More specifically, states are required to specify appropriate uses to be achieved and protected, taking into account the use of water for "public water supplies, protection and propagation of fish, shellfish, and wildlife, recreation in and on the water, agricultural, industrial, and other purposes, including navigation,"[7] thus allowing EPA to present a national picture of water quality to Congress based on the following use categories:[8]

Great Lakes states lack consistent standards to describe uses appropriate to their water bodies.

Key Terms

Designated Use describes the desired endpoint for the water body (e.g. swimming, fishing, drinking water), while **Criteria** and **Parameters** tell us whether those uses are attained.

- Aquatic Life: Is the water quality good enough to support a healthy, balanced community of fish, plants, insects, and algae?
- Fish Consumption: Can people safely eat fish caught in the river, stream, lake, or pond?
- Primary Contact Recreation: Can people swim in the water without risk to their health?
- Secondary Contact Recreation: Is there a public health risk from activities on the water, such as boating?
- Drinking Water Supply: Does the water body provide a safe drinking water supply after it has been adequately treated?

Each state is required to detail the degree of use support (i.e. do the state's waters support the designated uses), and then, for waters that do not meet their designated uses, list the causes (pollutants) and sources of impairments. A water body may be determined to be fully supporting, fully supporting but threatened, partially supporting, or not supporting a particular use.

According to EPA Guidance, water quality in a given water body is considered to be attained if all designated uses and associated criteria are met as determined in accordance with a state's assessment and listing methodology. Water quality is considered to be threatened if the standard is being met but non-attainment is predicted by the time the next report is due. Water quality is considered to be not attained, or impaired, if the standard is not met in accordance with a state's assessment and listing methodology.[9]

As shown below in the chart, Designated Uses, the Great Lakes states have yet to adopt consistent standards to describe uses appropriate to their water bodies.

How does a state decide whether a designated use has been achieved?

Assessing the quality of a water body means analyzing biological, physical,

DESIGNATED USES

Illinois	Aquatic Life, Wildlife, Agricultural, Primary Contact (e.g., swimming, water skiing), Secondary Contact (e.g., boating, fishing), Industrial, Drinking Water, and Food-processing Water Supply
Indiana	Aquatic Life, Fish Consumption, Drinking Water, Recreational Use
Michigan	Fisheries (warm and coldwater), Other Aquatic Life and Wildlife, Agricultural, Industrial, Municipal Water Supply, Navigation, Contact Recreation (partial and full)
Minnesota	Drinking Water, Aquatic Life and Recreation (swimming), Industrial Use and Cooling, Agricultural: irrigation, Agricultural: livestock and wildlife watering, Aesthetics and Navigation, Other Uses, Limited Resource Value Waters (not fully protected for aquatic life due to lack of water, lack of habitat or extensive physical alterations)
Ohio	Aquatic Life Habitat, Water Supply, Recreation (Bathing, Primary Contact, or Secondary Contact), State Resources Waters
Wisconsin	For rivers and streams: Aquatic Life For lakes: Aquatic Life, Fish Consumption, Secondary Contact Recreation

SOURCE: State 2002 305b Reports

chemical, toxicity and other available information to determine if it meets its designated use. To make these determinations, states adopt water quality "criteria" with specific "parameters" intended to be protective of designated uses.

Whereas designated use describes the desired endpoint for the water body, criteria indicate whether the use is attained. Criteria are the descriptions that allow a state to make designated use support determinations. Criteria may be specific pollutants or they may be other reasonable surrogates used to measure water quality.

Criteria can be either narrative or numeric. A numeric water quality standard is relatively straightforward: if a numeric limit is not exceeded, then the use is considered to be protected. A narrative standard is a statement that prohibits unacceptable conditions in or on the water.

Narrative standards are not quantitative. Instead, a determination that a narrative standard has been exceeded requires an element of professional judgment. For example, in Wisconsin, wetland water quality is measured using several criteria such as the following:

> Floating or submerged debris, oil, or other material may not be present in amounts which may interfere with public rights or interest or which may cause significant adverse impact to wetlands.[10]

In addition to narrative and numeric chemical-specific criteria, other types of water quality criteria include biological criteria (a description of the desired aquatic community, for example, based on the amount and types of organisms expected to be present), nutrient criteria, and sediment criteria.

States are not required to adopt the same criteria. Although they may adopt the criteria that EPA publishes under Section 304(a) of the Clean Water Act, states typically modify or adopt their criteria to reflect site-specific conditions. So, even before a drop of water is sampled, the cards are stacked in favor of inconsistency among the states, due in large part to differences in criteria.[11]

How much have we measured and how do we know whether goals are being met?

EPA's National and Regional Assessments Compare Apples to Oranges

EPA's national water quality assessment is little more than a compilation of states' submittals, with no meaningful attempt to standardize—let alone analyze—wildly disparate state approaches. In short, EPA presents "apples and oranges" state data to the public and Congress, rendering a true national or regional water quality assessment nearly impossible.

Table 3, *Assessed Waters of Region 5 by State, As Reported by States, 2002*, shows the amount of assessed rivers, lakes and wetlands reported by the states in their most recent 305(b) reports submitted to EPA. The discrepancies between what the states report and what EPA presents to the public are glaring. Some states (e.g. Indiana, Michigan, and Wisconsin) claim they have assessed a lot more than EPA gives them credit for, while other states (e.g. Illinois) say they have assessed fewer water bodies than EPA claims.

The only EPA/State numbers which seem to be in line is how many wetland acres have been assessed. There, everyone agrees on the number zero.

According to EPA, much of the disparity between what EPA and states report for stream miles and lake acres assessed is caused by different methods of counting "water bodies." EPA uses the National Hydrologic Dataset (NHD) to describe stream segments and portions of lakes.

The only EPA/State numbers which seem to be in line is how many wetland acres have been assessed. There, everyone agrees on the number zero.

TABLE 3. ASSESSED WATERS OF REGION 5 BY STATE, AS REPORTED BY STATES, 2002

State	Stream Miles	Stream Miles Assessed	Inland Lake Acres	Lake Acres Assessed	Wetland Acres	Wetland Acres Assessed
IL	87,110	10,510 monitored 4,981 evaluated	309,340	Inland lakes: 95,419 monitored 52,715 evaluated	920,000	0 reported
IN	35,673	15,920 monitored 19,510 evaluated	106,205 public owned	45,135 monitored	813,000	0 reported
MI	49,141	21,890 assessed	889,000 inland	502,989 assessed 260,457 monitored	6.24 M	690
MN	91,944	5,670 monitored	3.3 M	694,625 evaluated 1,885,582 monitored	10.6 M	0 reported
OH	57,936	41,308 assessed	118,963 public owned	81,928	1 M	121 wetlands (acreage not reported)
WI	57,698	9,199 monitored 15,222 evaluated	944,000 inland	758,782 monitored 33,519 evaluated	5.3 M	0 reported
Total	379,502	144,210 (38%)	5.67 M	4.41 M (78%)	24.87 M	0%

SOURCE: state 2002 305(b) reports

The NHD tracks perennial and intermittent streams, while some states only count perennial streams in their assessment reports. Other discrepancies can be explained on a case-by-case basis. For example, EPA does not currently show water bodies that have been assessed using probability-based models (described below). Indiana, which has aggressively used modeling to assess a large portion of its waters, appears to be lagging behind other states in EPA's snapshot, when in reality Indiana reported that it assessed almost all of its water bodies.

Although discrepancies between EPA's assessments and those presented by the states can usually be explained, members of the public are unlikely to delve into these nuances. They expect the pictures presented to them by the experts to be accurate, and they have every reason to rely on the data reported by their state and federal officials.

Great Lakes states are far from achieving a comprehensive water quality assessment. According to a top EPA water official, "Today, the majority of the nation's waters remain unmonitored and unassessed."[12] This statement is equally true for the current situation in the Great Lakes states. The fact is that more than thirty years after passage of the Clean Water Act, we know very little about the quality of most water resources.

Notably, hardly anything is known about the quality of the states' wetlands, other than the fact that overall wetland acreage is dwindling. The main reason for the paucity of wetland quality information is that there are no meaningful water quality standards for states to rate wetland quality. Three states (Minnesota, Ohio, and Wisconsin) have established some standards to measure wetland quality, and wetland standards have been under development in Indiana for several

years. Yet, no state has established numeric criteria with which to objectively measure the health of their wetlands.

To understand how water quality assessments are made, it is important to understand the various types of information that go into these determinations. States make determinations about water quality based not only on current, site specific ambient *monitored* data, but also on more subjective and qualitative information, which EPA calls *evaluated* data.

Examples of monitored data include in-the-field physical and chemical monitoring, and fish tissue analysis. Examples of evaluated data include land use information and outputs from predictive models. Evaluated data also includes monitored data which is more than five years old. EPA's complete menu of the type of data which states may use to assess their waters is included in Appendix A.

Decisions by state program officials as to which types of data to use to assess the state's waters are driven by a number of factors, not the least of which are staff and budgetary constraints. Nonetheless, the fact that assessment decisions are based on state-specific, qualitative, and often subjective factors, adds to the level of inconsistency among states' programs.

EPA encourages states to use probability-based monitoring, a predictive modeling tool for randomly selecting a sampling location which allows statistically valid inferences to be drawn about a much bigger area (watershed, basin, state, etc.). This approach is intended to eliminate the potential for sampling bias towards waters with known problems and to allow extrapolation from a relatively small sample of monitored sites to the entire population of water body types covered by the design. In short, probability-based monitoring is a way for states to assess a much greater portion of their waters than they could by conducting resource-intensive site-specific monitoring.

In its 1997 Guidance, EPA says:

> No State has sufficient monitoring resources to sample all its waters. With probability-based monitoring, a State can report assessment results for the target resource as a whole (e.g., all headwater streams) not just those waters that have been monitored. These assessment results are unbiased and include confidence limits. Several States including … Indiana are incorporating this approach."[13]

Using probability-based monitoring, Indiana has shown a dramatic increase in the amount of stream miles it has been able to assess, culminating in its most recent assessment of almost all of its 35,673 stream miles.

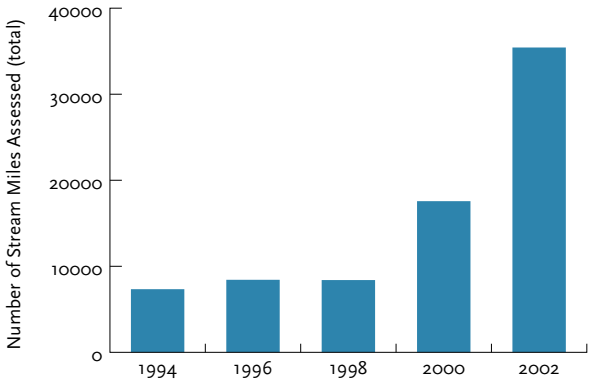
The fact is that more than thirty years after passage of the Clean Water Act, we know very little about the quality of most water resources.

Probability-based monitoring allows Indiana to assess vast watersheds without actual monitoring or testing at most sites. Neighboring Illinois, on the other hand, extrapolates site specific monitored data upstream or downstream 10 miles or 25 miles (depending on whether the stream is considered "wadable" or "non-wadable") to arrive at assessments for water bodies which lack site-specific monitored data. It is too early to tell whether individual state efforts to increase assessments through predictive models without increasing actual monitoring will improve or simply blur the overall water quality picture.

A Framework for Coordination Exists

Great Lakes states share the unique responsibility to protect one of the world's most valuable freshwater resources. This shared responsibility has provided the framework for coordination on a number of common water quality issues. For example, all the states must comply with federal rules called Water

INDIANA STREAM MILES ASSESSED



SOURCE: Indiana 305b Reports: 1994-2002
(35,673 Total Stream Miles)

Report Year	1994	1996*	1998	2000	2002
# Stream Miles Assessed	7,339 5,863 m 1,476 e	8,431	8,400 8,400 m 0 e	17,570 11,400 m 6,170 e	35,430 15,920 m 19,510 e
% Stream Miles Assessed	20.6%	23.6%	23.5%	49.3%	99.3%

m = monitored; e = evaluated

* State 305(b) report unavailable; SOURCE: http://www.epa.gov/owow/305b/96report/in.pdf

Quality Guidance for the Great Lakes System, also known as the Great Lakes Initiative. These rules establish uniform standards for the discharge of 29 toxic pollutants into Great Lakes waters. Binational efforts, such as the 1972 Great Lakes Water Quality Agreement between the United States and Canada, which emphasized reduction of phosphorus entering the lakes, have also played a major role in increasing awareness about pollution problems in and around the Great Lakes.

In 1994, the U.S. and Canada convened the first State of the Lakes Ecosystem Conference (SOLEC) to further the purpose of the Great Lakes Water Quality Agreement. Papers prepared for this, and subsequent conferences are summarized in a report called *State of the Great Lakes*. The conferences and reports focus on the status of the Great Lakes' shores and the effects of land-use practices on shoreland and nearshore ecosystems.[14]

Years of federal and binational attention to the Great Lakes basins have yielded a wealth of knowledge on the Lakes' water quality. EPA's Great Lakes National Program Office is a repository for much of this information.

Yet, even with federal and binational attention to the Great Lakes, gaps exist in basic reporting by the states. See Table 4, below. Even with most states reporting 100 percent shoreline assessment, inconsistencies among the states remain significant, since each state assesses its shoreline for different uses. For a detailed

breakdown of each state's 2002 shoreline assessments, refer to Table 1, *Great Lakes Shoreline Assessments, 2002*, in the Executive Summary.

A complete survey of Water Quality Standards of each of the Great Lakes states would be a monumental task, and is beyond the scope of this report. Indeed, one need not pick apart each state's physical, chemical, and biological criteria to reach the conclusion that drawing comparisons and tracking trends is difficult. EPA is well aware of the need to increase consistency in order to facilitate informed regional water quality decisions. Instead of echoing previous reports' calls for EPA to increase consistency among the states' Water Quality Standards, we focused on three specific program areas.

We chose three components of the state programs to find out how inconsistencies hamper the reporting process. Each component provides an important window into the states' programs, not only because they deal with important indicators, but also because they directly touch people's lives. First, because millions of anglers enjoy the world-class fishing along the states' rivers, streams, lakes, and ponds, we compare the states' implementation of fish consumption advisories for PCBs and mercury, two toxic pollutants. Next, because EPA has long recognized the importance of biological indicators as a way to assess the overall health of aquatic ecosystems, we compare the states' biocriteria program elements to determine how well the states assess aquatic life use. Lastly, because during the summer months Midwesterners flock to the Great Lakes' shores, we compare pathogen monitoring at Great Lakes beaches.

For many people in lower income communities, fishing is more than just recreation; it is a way to help keep a family's grocery bill down.

Are Our Waters Fishable?

Anglers Get Different Fish Consumption Advice Depending on Where They Live

Toxic pollutants include human-made organic chemicals and heavy metals that can be dangerous in small amounts. More than any other activities, such as drinking water or swimming, it is widely believed that fish consumption provides the

TABLE 4. PERCENT OF GREAT LAKES SHORELINE MILES ASSESSED 1998–2002

State (Miles)	1998 Report*	2000 Report**	2002 Report***
IL (63)	100%	100%	100%
IN (59)	100%	100%	100%
MI (3,250)	100%	100%	100%
MN (272)	Not reported	0%	0%
OH (236)	Not reported	100%	100%
WI (1,017)	100%	100%	100%

* SOURCE: http://www.epa.gov/305b/98report/il.pdf (substitute state abbreviations)
** SOURCE: EPA 2000 National Water Quality Inventory, Appendix F-1
***SOURCE: State 305b reports

greatest potential for human exposure to toxic substances in the Great Lakes.

Residents of the Great Lakes states as well as tourists enjoy world renowned angling along the region's countless lakes and streams. For many people in lower income communities, fishing is a source of protein and a way to help keep a family's grocery bill down.

Fish consumption advisories in the Great Lakes basin are relatively consistent, but gaps still exist. Discrepancies are more evident beyond the Great Lakes basins, in tributaries and inland lakes. In addition, there is inconsistency among the states in how they use fish consumption advisories as part of their water quality assessments.

Michigan was the first state to issue a fish consumption advisory in 1970, after high levels of mercury were found in Lake St. Clair fish. Since then, all the Great Lakes states have issued fish consumption advice, not only for the Great Lakes basins, but also for inland lakes, rivers, streams, and wetlands. Historically, polychlorinated biphenyls (PCBs) have been the most frequent concern in Great Lakes waters, but dioxins, DDT, and pesticides like chlordane are also of concern. PCBs continue to be a serious problem in sediments in and near heavily industrialized areas, but levels in Great Lakes fish have declined steadily since use of the chemical was banned in the U.S. in 1976.[15]

Mercury is of particular concern because, unlike PCBs, it remains largely unregulated. A recent study by Environmental Defense, based on draft EPA mercury deposition modeling, shows Indiana, Michigan and Illinois among the nation's top mercury "hot spots."[16] Mercury bioaccumulates as it passes up the food chain in the aquatic ecosystem, so even when concentrations are low in the water column, biomagnification through the food chain makes levels in predator fish, such as large trout and salmon, significant. Biomagnification also occurs in people who eat fish.

Each state is responsible for providing the public advice on eating the fish they catch. For all the Great Lakes states, this responsibility falls on the state health departments which make decisions based on their interpretation of studies of health effects from exposure to contaminants.

Because fish advisories must account for numerous water bodies, different fish species and varying sizes, and also because consumption advice differs for men, women, and children, a fish advisory, even on a single water body, can be complicated. The states have made progress presenting useable fish consumption advice to anglers. See, for example, Appendix B, *2003 Michigan Family Fish Consumption Guide* (Excerpt). Pamphlets

The Slow Road Toward Consistent Advice for Great Lakes Anglers

In the early 1980's, the four states bordering Lake Michigan (Illinois, Indiana, Michigan and Wisconsin) decided to address the problem of inconsistent fish advisories. In 1985, after settling on maximum acceptable levels for PCBs, the states released the first uniform fish consumption advisory for particular fish species in Lake Michigan. The following year, as part of the Great Lakes Toxic Substance Agreement, the Great Lakes Governors agreed to enact uniform fish consumption advisories for PCBs in each of the Great Lakes.

In 1993, the Great Lakes Fish Consumption Advisory Task Force established five consumption categories, based on a *health protection value* for daily intake of PCBs: unrestricted consumption, one meal per week, one meal per month, six meals per year and no consumption.

Instead of immediately implementing the Task Force's recommendation, the Council of Great Lakes Governors opted for further study and appointed a scientific panel to review the Task Force's health protection value.

In September 1995, ten years after the Governors promised to reach uniform fish consumption advisories for the Great Lakes, the scientific panel concluded that the Task Force's health protection value was appropriate for women of child-bearing age and children.

TABLE 5a. SAME RIVER, SAME FISH, DIFFERENT ADVICE

Wabash River 2003 State Advisories: Carp

State	Contaminant	Consumption Advice	Specific Advice for "At Risk" Groups
Indiana	PCBs, mercury	15–20 inches: 1 meal/month 20–25 inches: 6 meals/year > 25 inches: Do Not Eat	Do Not Eat
Illinois	PCBs	All sizes: 1 meal/week	none

SOURCE:
Angling Indiana — 2003 Fish Consumption Advisory, available at http://fn.cfs.purdue.edu/anglingindiana/
Illinois Fish Advisory 2003, available at http://www.idph.state.il.us/envhealth/fishadv/fishadvisory03.htm

are usually given to anglers when they purchase fishing licenses, and advisories are typically listed by water body and/or county on state and local health department websites.

While progress has been made on efforts to coordinate advisories for Great Lakes anglers, the states still have significant room for improvement. For example, a person fishing along portions of the Wabash and Ohio Rivers, which form the border between Illinois and Indiana, will receive different fish consumption advice depending on which side of the river they fish. Indiana lists advisories for 11 species, while Illinois lists advisories for four species. The table, *Same River, Same Fish, Different Advice*, presents the two state's advisories for carp—an example of a fairly typical and widespread inconsistency in Great Lakes state's fish consumption advice.

TABLE 5b. LAKE ERIE, SAME FISH, DIFFERENT ADVICE

Lake Erie 2003 State Advisories: Carp, Catfish, and Whitefish

State	Contaminant	Consumption Advice	Specific Advice for "At Risk" Groups
Michigan	PCBs, dioxins	Carp, Catfish all sizes: Do Not Eat Whitefish < 22 inches: 1 meal/week Whitefish > 22 inches: Do Not Eat	Women/Children: Do Not Eat
Ohio	PCBs	Carp all sizes: 1 meal/month Catfish < 16 inches: 6 meals/year Catfish > 16 inches: Do Not Eat Whitefish all sizes: 1 meal/month	none

SOURCE:
2003 Michigan Family Fish Consumption Guide, available at http://www.michigan.gov/documents/FishAdvisory03_67354_7.pdf
Ohio Sport Fish Consumption Advisory — Limit Meals, available at http://www.epa.state.oh.us/dsw/fishadvisory/

TABLE 5c. LAKE MICHIGAN, SAME FISH, DIFFERENT ADVICE

Green Bay 2003 State Advisories: Rainbow Trout, Yellow Perch, Whitefish

State	Contaminant	Consumption Advice	Specific Advice for "At Risk" Groups
Michigan	PCBs	Rainbow Trout all sizes: unlimited consumption	Women/Children: 1 meal/month
	PCBs	Yellow Perch all sizes: unlimited consumption	Women/Children: 1 meal/week
	PCBs, dioxins	Whitefish < 22 inches: 1 meal/week Whitefish > 22 inches: Do Not Eat	Women/Children: Do Not Eat
Wisconsin	PCBs	Rainbow Trout all sizes: 1 meal/month	none
		Yellow Perch all sizes: 1 meal/week	
		Whitefish all sizes: 6 meals/year	

SOURCE:
2003 Michigan Family Fish Consumption Guide, available at http://www.michigan.gov/documents/FishAdvisory03_67354_7.pdf
Choose Wisely 2003 (Wisconsin), available at http://www.dnr.state.wi.us/org/water/fhp/fish/advisories/Tables.pdf

Advisories for fish caught in the Great Lakes are somewhat more consistent than those for inland lakes and rivers. Yet, widespread discrepancies still persist. States issue warnings for most of the fish species anglers might find in Great Lakes waters—that can mean 15 or more separate advisories to keep track of. One state may list an advisory for a certain fish, while a neighboring state does not.

Roughly 10 percent of American women carry mercury concentrations at levels considered to put a fetus at risk to neurological damage.

Tables 5b and 5c show examples of inconsistent fish advisories on Great Lakes waters, first for Ohio and Michigan anglers who share Lake Erie waters, and then for Wisconsin and Michigan anglers in Lake Michigan's Green Bay.

Little is known about the effectiveness of fish consumption advisories. In lower income and environmental justice communities, many people may lack access to the Internet, which is where the states post most of their fish consumption information.

Potential gaps between the states' *having* fish advisories and people actually *using* them is a concern in light of recent findings by the Centers for Disease Control (CDC). In 2003, the CDC released its *National Report on Human Exposure to Environmental Chemicals*.[17] One of the startling findings in that report is that roughly 10 percent of American women carry mercury concentrations at levels considered to put a fetus at risk to neurological damage. This trend is more disturbing given recent Clean Air Act rollbacks that will likely result in even more mercury finding its way into our waters and into the fish we eat.

Some States Fail to Report That Their Waters Are "Unfishable" Even Though Many Fish Are Unsafe to Eat

Historically, the Great Lakes states have taken very disparate approaches to using fish consumption advisories as part of their water quality assessments. Where some states have directly tied fish advisories to their water quality assessments, others have not.

TABLE 6. 2002 FISH CONSUMPTION ADVISORY INFORMATION BY STATE

State	Statewide Mercury Advisory	Fish Consumption Specified as a Designated Use	Fish Advisory Used as Basis for Determining Use Attainment	Numeric Standards to Determine Use Attainment
IL	All rivers and lakes	No	Yes, but site-specific advisories only, not statewide advisory	No
IN	All rivers	Yes	Yes, but site-specific advisories only, not statewide advisory	No
MI	All lakes	Considered as part of Aquatic Life Use	Yes	Yes*
MN	All lakes	No	No	No
OH	All rivers and lakes	No	No	No
WI	All rivers and lakes	Yes. Specified for lakes. Considered as part of Aquatic Life Use for rivers.	Yes. All waters listed as impaired due to statewide fish consumption advisory.	No

SOURCE: state 2002 305(b) reports
* According to Michigan's 2002 water quality report, inland lakes with fish tissue levels averaging greater than 0.3 mg/kg for mercury, are listed as "Mercury Lakes" (i.e. nonattainment).

In its 2002 critique of the states' approaches to identifying polluted waters, the U.S. General Accounting Office noted:

> Wisconsin issued 447 fish consumption advisories for individual waters in 1998 and listed 307 waters as impaired for a fish consumption advisory in their 1998 [impaired waters] list. On the other hand, Minnesota issued 825 fish consumption advisories for individual waters in 1998 but listed no waters as impaired for a fish consumption advisory in their 1998 [impaired waters] list.[18]

Ohio does not include fish consumption among its codified designated uses and has no criteria to measure attainment status for fish consumption. The lack of standards means that water quality decisions relating to fish consumption use are highly subjective. For example, whereas in the past all of Ohio's waters were listed as impaired for mercury, the state did an about face in 2002 and listed none of its waters as impaired for fish consumption, despite a statewide mercury fish consumption advisory.[19] Wisconsin, on the other hand, previously made lake-by-lake determinations of fish consumption use attainment, but, in 2002, decided to list all lakes as impaired for fish consumption due to its statewide mercury advisory. Similarly, in Michigan, water bodies with fish consumption advisories are placed on the state's non–attainment list.

The disconnect between state health departments' fish consumption advisories and the state environmental agencies' water quality assessment process is troubling in light of the fact that fish consumption use is one of the most direct measures of the Clean Water Act's goal to achieve "fishable" waters.

If all the Great Lakes states followed the common sense approach adopted by Wisconsin for its 2002 report, which

TABLE 7. COMPARISON OF STATES' STREAM ASSESSMENTS AND BIOCRITERIA PROGRAM ELEMENTS

State	Total perennial stream miles	Total miles assessed for biology*	Stream Miles partially or non-Supporting (Aquatic Life Use)	# of sites sampled	# of miles assessed per sampling site	Narrative criteria in Water Quality Standards	Numeric criteria in Water Quality Standards
IL	30,246	15,304	5,806	115	Site specific	Under development	None
IN	21,094	35,430	12,430	<200	Site specific	Under development	None
MI	27,873	21,469	6,000	3,500	Unknown	None	None
MN	32,985	2,047	472	100	Varies, depending on segment length	In guidance document, but not in state WQS	None
OH	29,113	9,535	4,331	1,100	2.5	In state rules	In state rules
WI	32,000	24,442	12,028	600	5	"Acute" and "chronic"	None

SOURCE: *Summary of Biological Assessment Programs and Biocriteria Development for States, Tribes, Territories and Interstate Commissions: Streams and Wadeable Rivers* (EPA-822-R-02-048, December 2002), available at: http://www.epa.gov/bio-indicators/html/table_contents.html (last visited on January 8, 2004)

* Uses of bioassessment within overall water quality program includes, but is not limited to, aquatic life use determinations.

is simply to say that a water body is not fishable if there is a fish consumption advisory in effect, then practically no water bodies in the Great Lakes states would achieve the level of supporting fish consumption use.

Do Our Waters Support Aquatic Life?

If All the Great Lakes States Adopted Objective Biological Criteria, It Could Double the Number of Waters Identified as Failing to Support Aquatic Life Use

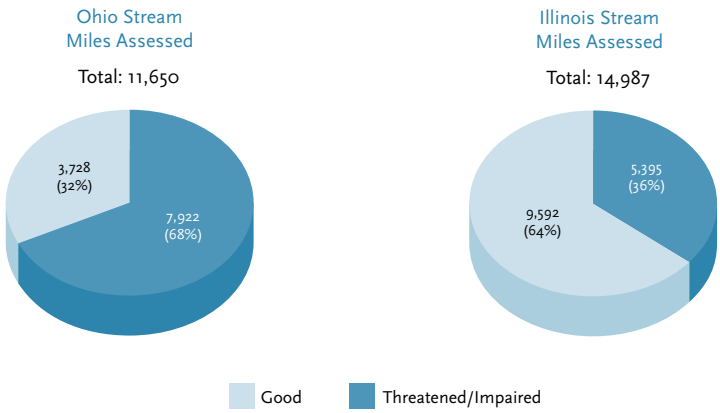
Biological criteria—for example, the number of fish or insects in a given area—reveal whether the whole ecosystem is functioning properly. While pathogen monitoring, sediment sampling, fish tissue analysis, and a host of other tools provide important details about water quality, biological indicators are crucial for assessing the overall health of a lake or stream.[20] Table 7 shows widespread disparity in the extent to which the Great Lakes states have implemented meaningful biological criteria.

Ohio's water quality monitoring and assessment program is viewed as a national leader in the area of biological criteria.[21] Studies conducted in Ohio in 1995 and 1998 found that half of the state's water bodies determined to be not impaired based on chemical tests were actually impaired based on subsequent biological surveys.[22]

Not coincidentally, Ohio's leadership in this regard makes many of its waters appear worse off than other region 5 states. Like Ohio, the state of Illinois

COMPARISON OF OHIO AND ILLINOIS STREAM ASSESSMENTS FOR AQUATIC LIFE, 2002

	Ohio	Illinois
Stream miles assessed:	11,650 mi.	14,987 mi.
Good:	31.76 %	63.35 %
Threatened or Impaired:	67.58%	36.35 %



SOURCE: EPA, National Water Quality Inventory, 2002

relies primarily on biological monitoring instead of physical and chemical monitoring.[23] Yet, unlike Ohio, Illinois lacks numeric biological criteria. A comparison of Ohio's and Illinois' 2002 stream assessments for aquatic life use, according to EPA's 2002 *Water Quality Inventory* shows that Ohio streams appear to be worse off.

Ohio's streams get failing grades only because the state has an objective grading system. If all the states adopted numeric biological criteria similar to those established by Ohio, the picture of the region's water quality would appear quite different, and, very likely, not quite as rosy.

Are Our Waters Swimmable?

Some States Do Not Assess Their Waters as "Unswimmable" Despite Beach Closures and High Pathogen Counts

Great Lakes states, primarily through local county health departments, have implemented standards to monitor popular swimming beaches during the warmer months. However, not all states have made the transition from testing for fecal coliform to testing for *E. coli*, which is considered to be a better indicator. In 1986, EPA established criteria for *E. coli,* stating that it is more reliable than fecal coliform at providing a correlation between swimming and gastrointestinal illness.[24]

Although EPA has adopted an *E. coli* standard, the states are not required to use it. The states, in turn, do not require local health agencies, which are primarily responsible for testing beach waters and making decisions about beach closures, to adopt consistent standards. The result is a patchwork of state and local standards with no uniform criteria to guide decisions about posting

The result is a patchwork of state and local standards with no uniform criteria to guide decisions about posting advisories or closing beaches.

TABLE 8. ASSESSMENT OF GREAT LAKES FOR SWIMMING

State	Great Lakes shoreline miles	Parameter	Testing	Standards	Shoreline miles not fully supporting swimming (primary contact recreation)
IL	63 miles	Fecal coliform or *E. coli* (local agencies)	Local agencies test swimming beaches daily during summer	Fecal coliform: May-Oct 200/100 ml No state standard for *E. coli*	43
IN	59 miles	*E. coli*	State and local	Mean shall not exceed 125/100 ml. based on at least 5 samples equally spaced over 30 days, or 235/100 ml. in any one sample.	58
MI	3,250 miles	*E. coli*	County Health Department	Minimum of three samples per monitoring event. Daily mean must be below 300/100 ml. Monthly (30-day) mean (minimum of five sampling events) must be below 130/100 ml	8
MN	272 miles	Fecal coliform, but considering transitioning to *E. coli*	State and local Standards applicable during swimming season only.	Fecal coliform: geometric mean based on not less than five samples within a 30-day period shall not exceed 200/100 ml; and Content shall not exceed 400/100 ml in more than ten percent of all samples taken during any 30-day period. *E. coli*: geometric mean based on not less than five samples within a 30-day period shall not exceed 126/100 ml; and Content shall not exceed 235/100 ml.	Not assessed
OH	297 (plus 15 miles Lake Erie Islands)	*E. coli*	State and local	*E. coli*: Mean content (no less than five samples within a thirty-day period) shall not exceed 126/100 ml, and content shall not exceed 235/100 ml in more than ten per cent of the samples taken during any thirty-day period.	Not assessed In 1998, Ohio's Lake Erie Commission *State of the Lake Report* found approximately 229 miles not supporting recreational use. Lake Erie is designated Bathing Waters. Less restrictive standards apply to waters designated for Primary Contact and waters designated for Secondary Contact.
WI	1,017 mile	Fecal coliform *E. coli*	Local government	Fecal: mean may not exceed 200/100 ml based on at least 5 samples per month, nor exceed 400/100 ml in more than 10% of all samples during any month. No standard for *E. coli*.	Not assessed

SOURCE: state 2002 305(b) reports

advisories or closing beaches. *See*, Table 8, *Assessment of Great Lakes for Swimming*.

Every year, the Natural Resources Defense Council (NRDC) publishes a comprehensive study of beach closings and beach monitoring activities in coastal and Great Lakes states. The most recent report, *Testing the Waters 2003*, provides in-depth state-by-state data on beach monitoring and beach closures among all the Great Lakes states, including activities undertaken by local health agencies.[25] Among NRDC's major findings is that the more we monitor, the more we find serious water pollution at popular beaches. In addition, NRDC found that while many states, including all the Great Lakes states, conduct regular monitoring, the standards and criteria which states and local agencies use to make beach closure decisions are inconsistent.

EPA understands the need to maintain states' progress in pathogen monitoring and beach closure reporting. The agency's Great Lakes National Program Office, for example, compiles useful information and makes it available to the public. See, Appendix C, *2002 High Priority Beaches*. In addition, Indiana reports that a recent EPA grant has allowed the state to contract out some *E. coli* testing, and purchase a cargo van equipped as a mobile laboratory. Prior to these efforts, "[h]istorically, if persons were utilizing a given lake, it was considered to be supporting that use—despite any knowledge (or lack thereof) of its bacteriological component."[26]

Despite these strides, EPA and the states continue to provide an inconsistent picture of "swimmability" along many miles of Great Lakes shoreline. For example, in its 2002 report, Wisconsin does not assess contact recreation (swimming) along any of its 1,017 miles of shoreline, despite significant evidence of beach closures, including five Wisconsin beaches making it onto EPA's 2002 High Priority Beaches list. Michigan, which boasts by far the greatest amount of Great Lakes shoreline of any state, allows people to swim in waters with *E. coli* counts well above EPA's recommended standards. If these two states implemented EPA's recommended *E. coli* standards, they would likely see significant "new" impairment when they assess whether their waters are swimmable.

Michigan, which boasts by far the greatest amount of Great Lakes shoreline of any state, allows people to swim in waters with E. coli *counts well above EPA's recommended standards.*

Recommendations

1. Federal Water Quality Standards Should be Imposed Where States Have Failed to Act

Water Quality assessments necessarily contain elements of subjectivity and professional judgment, and it is unrealistic to expect totally uniform state approaches. However, it is well known that inconsistent Water Quality Standards are largely to blame for the incomplete and often inaccurate picture of water quality that EPA presents to Congress and the public. See, e.g., *Inconsistent State Approaches Complicate Nation's Efforts to Identify Its Most Polluted Waters*, January 2002 (GAO-02-186 Water Quality) ("Variation among states is primarily caused by different states focusing on different pollutants, mainly because of differences in water quality criteria."); and *Key EPA Decisions Limited by Inconsistent and Incomplete Data*, March 2000 (GAO/RCED-00-54 Water Quality).

Despite widespread acceptance of this problem, few have ventured a recommendation to standardize disparate state standards. Imposing federal standards on the states is an unpopular stance. Still, there is ample room to foster greater consistency among the states without impinging on state autonomy or hampering efforts to address unique situations. For example, federal standards should be applied where states have failed to adopt their own standards or in cases where states have made little progress on measuring water quality. Wetlands and biological criteria (Recommendations 2 and 8, respectively) are two such examples where strong federal oversight would help push along nascent state efforts.

Another area where EPA should require consistency is in states' reporting on designated use categories. States should be required to report on a consistent set of designated uses—those that most directly measure whether a water

body is fishable and swimmable. For example, EPA should require all states to measure and report on fish consumption use, and ensure that fish advisories are a part of that assessment (Recommendation 7). In addition, EPA should require all states to measure and report on contact recreation use, and ensure that appropriate pathogen monitoring standards are a part of that assessment (Recommendations 9 and 10).

2. EPA Should Enforce Objective Water Quality Standards for Wetlands

Water Quality Standards for wetlands are necessary to ensure that, under the provisions of the Clean Water Act, wetlands are afforded the same level of protection as rivers and lakes.

More than ten years ago, EPA published guidance on what it expected states to achieve in the development of wetland Water Quality Standards. By the end of fiscal year 1999, EPA expected states to designate uses and adopt narrative criteria for wetlands.[27] EPA has not held the Great Lakes states to these expectations.

Currently, Minnesota, Ohio, and Wisconsin have developed some wetland-specific standards, but these are narrative standards, which are inherently subjective and rely on a great deal of professional judgment. In 2002, Michigan reported that it assessed a small amount of wetland acreage, even though the state lacks standards by which to measure wetlands. Of all the Great Lakes states, Illinois is furthest behind in addressing wetland water quality.

On a regional basis, the Great Lakes states have assessed almost no wetlands. This shortcoming has a "silver lining" because wetlands provide a perfect opportunity for the states to adopt consistent and objective standards, so that real comparisons can be made and trends measured as the data comes in.

EPA should require states to set a timeline for completing numeric wetland Water Quality Standards and then hold them to it. To avoid the long-standing problem of inconsistency among the states, wetland standards should be adopted with the goal being a comprehensive regional assessment of the Great Lakes states' wetlands. In the short-term, EPA should require states to list designated uses for wetlands and describe efforts to develop narrative and numeric biological criteria.

Alternatively, for the states that fail to adopt standards, EPA should promulgate and impose federal wetland standards.

3. EPA Should Clearly Explain Inaccuracies in its National Water Quality Assessment When Presenting it to Congress and the Public

EPA should be commended for its effort to present the *National Water Quality Inventory* in easily accessible formats, such as the charts available on its website. However, the agency has failed to accurately depict Great Lakes states' and regional water quality, due in large part to its inability to compile the data submitted by the states.

EPA's role in presenting a national assessment goes beyond aggregating state reports. The agency has a statutory mandate to *analyze* the data before putting the federal government's stamp of approval on it and presenting it to the public as the so-called "national picture."

Because the public and policymakers rely on EPA as the national expert, the agency should ramp up efforts to present accurate and complete information.

If EPA can not assure the quality and accuracy of the information it presents, due to disparate state reporting methods, then it should divulge the Inventory's shortcomings when it presents it for public consumption. Further, EPA should

inform Congress and the public *what we do not know* in terms of monitoring and assessment data.

Recommendations to EPA to more adequately explain the shortcomings of the national water quality assessment are not new. In 2002, the U.S. General Accounting Office suggested that:

> "[U]ntil EPA's Office of Water resolves problems relating to inaccurate and/or misleading data contained on its WATERS database, we recommend that the Administrator direct that office to explain clearly and visibly to users of its impaired waters Web site the potential misinterpretations that may arise from its current presentation of these data."[28]

We clearly have a long way to go before meeting the basic goal of assessing all waters, and until we achieve that goal, EPA should shoot straight about what is known and unknown and, especially, about potential inaccuracies or misinterpretations in the reports. Full disclosure of problems and inconsistencies in water quality data will only strengthen the case for decision makers, at the state and federal levels, to provide the resources which are needed to fill these gaps.

4. EPA Should Appoint a Scientific Panel to Develop a Grading System for State Water Quality Reports

State water quality reports—the "305b" or "integrated" reports—purport to give the public a picture of the overall water quality of rivers and streams, lakes, ponds, wetlands, and estuaries. Yet, even though some aspects of states' water monitoring programs are exemplary, the assessments are at best incomplete and wildly inconsistent between states, and at worst, unreliable.

State and federal officials rely on water quality assessments to make regulatory decisions; the reports are the first in the impaired waters listing process and subsequent regulatory processes under the Clean Water Act. In order to clean up polluted waters, state and federal decision-makers need clear and accurate information.

EPA should appoint a scientific advisory panel to devise a methodology to "grade" the quality of each state's submittal, based on the quality and reliability of the data. Assigning a "grade" would give the public a tool to help compare disparate reports. Although this mechanism will not solve all the problems caused by the many subjective aspects of water quality assessment and the widespread inconsistencies in state standards, this recommendation is a practical first step. A "grading system" will allow EPA to fulfill its statutory mandate to analyze state water quality reports instead of simply compiling them.

A scientific advisory panel should devise a system that takes into account the fact that a state program may be exemplary in one aspect, but lacking in another. For example, Ohio would likely receive high marks for its use of objective numeric biological criteria to assess aquatic life use, while it may not make the grade on other aspects of its program which have been overlooked, such as its lack of fish consumption criteria.

"Grading" state reports would also add an important measure of quality control as the states feel added pressure to achieve comprehensive assessment of all of their waters. As states move toward probability-based monitoring (as Indiana has done), or similar predictive models, the public would benefit by knowing whether the assessment reports are accurate and reliable portrayals of state water quality.

5. Great Lakes States Should Increase Funding of Their Water Quality Monitoring Programs

In its 2002 report, *Greening the Governments*, the Michigan Environmental Council urged state legislators to "hold the line" on funding for core environmental monitoring during this time of widespread budget cuts. MEC's recommendation is grounded in the fact that the states are already falling behind with respect to basic information needed to make decisions about human health and the environment. Further budget cuts will only make matters worse.

Holding the line is the very least the Great Lakes states can do for their water quality monitoring programs, which have yet to achieve the fundamental Clean Water Act requirement for comprehensive assessment. Large gaps exist in understanding water quality in rivers and lakes, and the states have assessed practically zero wetlands.

State environmental agency officials should conduct fee audits in order to determine whether fees should be increased to fulfill the Clean Water Act requirement for comprehensive assessment. State water program officials should build a case to make their resource needs a priority, both within their agencies and state legislature.

In its 2002 report, *Understanding What States Need to Protect Water Quality*, the National Academy of Public Administration estimated the national "resource gap" (what states need to fully implement their water quality programs) to be between $0.7 billion and $1 billion, and urged states to use the estimates from its Resource Analysis project "without hesitation."[29] The model is available as a tool for states to use to estimate their particular budgetary needs, and can help build a strong case for legislatures to appropriate additional money.

State legislators should take a critical look at all available funding mechanisms, including water discharge permit fees, which should be set at levels to adequately support the programs. States typically have a sliding scale fee based on the amount of discharge. Michigan, however, has no annual fee associated with NPDES permits for industrial sources.

Finally, the Great Lakes states should pay special attention in the coming years to pathogen monitoring conducted at the local county level, which is in danger of falling further behind as local governments are usually hit hardest by budget shortfalls.

6. Great Lakes States Should Act to Reduce the Levels of Mercury Entering Their Waters

Mercury has long been a source of concern in the Great Lakes region. The Great Lakes Water Quality Agreement between the U.S. and Canada calls for the elimination of mercury from the Great Lakes watershed. Unfortunately, until EPA adopts national standards to control mercury emissions from power plants, the states will continue to see mercury deposition in lakes and streams, and levels of mercury in sport fish will continue to pose a threat to public health.

Recent Clean Air Act rollbacks provide even greater impetus for the states to take action to limit the amount of mercury entering their waterways. The time has come for the Great Lakes states, especially those with mercury "hot spots"[30] to use all the tools available to aggressively address this public health and environmental threat, including considering the following options:

- *Set total maximum daily loads for all mercury impaired waters.*

Mercury from power plant emissions is often thought of in terms of air pollution, but the long term health effects are associated with fish consumption. The Clean Water Act provides an appropriate regulatory mechanism to deal with

widespread mercury pollution: the total maximum daily load (TMDL) process. Therefore, Great Lakes states' water pollution control programs should take the responsibility to address this issue head on by setting TMDLs for all mercury impaired water bodies.

- *Require facilities that emit mercury into the air to obtain discharge permits.*

The states should consider requiring air polluters to comply with the national pollutant discharge elimination system (NPDES) permitting scheme if mercury from these sources enters state waters. Power plants and other sources have been discharging mercury into Great Lakes states' waters, using the air as a "mixing zone." These sources have escaped the rigorous permitting requirements that all other direct dischargers have faced for years, causing mercury to become a major public health concern.

7. Great Lakes States Should Address the Inconsistencies in Fish Consumption Advisories and Make Fish Consumption a Meaningful Part of Their Water Quality Assessments

All the Great Lakes states have statewide fish consumption advisories. Mercury and PCBs are by far the primary contaminants of concern. Although the states have made progress, opportunities exist to develop a greater degree of regional consistency in fish consumption advice. There is no reason for people to get different advice about what is safe to eat based on where they live.

- *The Governors of the Great Lakes states should make consistent fish consumption advice a top priority.*

Great Lakes governors must first bring their health officials together for the purpose of adopting a uniform set of risk-based fish consumption advisories. In addition, because little is known on the effectiveness of fish advisories, and because recent studies show that many Americans already have dangerous levels of mercury, state health departments must ensure not only that anglers receive the information, but that anybody who eats fish caught locally or regionally receives the consumption advice as well.

To adequately assess health risks, states need reliable data on who eats sport fish and how often. Until we know whether fish advisories are truly being heeded, states should take additional steps to inform the consuming public, especially in lower income and environmental justice communities, of the health risks associated with eating contaminated fish.

States should ensure that a direct link exists between the state health departments' fish advisories and the environmental agencies' designated use attainment decisions. All Great Lakes states should make the health-based fish advisories a factor in assessing fish consumption use.

- *Illinois, Minnesota, and Ohio should list fish consumption as a designated use, and all the states should adopt specific numeric criteria to measure fish consumption attainment.*

Although all the Great Lakes states—to varying degrees—report to EPA on fish consumption use, their water quality reports indicate that fish consumption attainment decisions are loosely tied to aquatic life use. Illinois, Minnesota, and Ohio do not list fish consumption as a designated use, while Michigan and Wisconsin consider it a subset of aquatic life use. However, fish consumption is not the same as aquatic life use; it is a separate and distinct category based on *human* health.

- *Water program officials should adopt objective numeric standards to make reliable assessments for fish consumption use.*

The states make highly subjective determinations about fish consumption use attainment based loosely, if at all, on fish advisories. Only one state, Michigan, has numeric standards using fish advisory information to determine whether a water body meets fish consumption use. Other Great Lakes states have made fish consumption assessment decisions based on fish advisories, but these have been inconsistent and ill-defined.

The states should not say that a water body is "fishable" if there is a fish consumption advisory in effect. The Great Lakes states should establish a set of consistent and objective standards to make fish consumption use attainment decisions based on fish advisories. Due to widespread contamination, it is likely that fish consumption advisories will be in effect for many years to come, especially for larger fish and bottom-feeders. Therefore, states should not stop their assessments after saying that all waters are impaired. Instead, the states and EPA should develop a set of markers, perhaps tied to the number of fish moving off the "do not eat" list, as a way to measure progress over time as waters move closer to attainment status.

8. States Should Adopt Numeric Biological Criteria to Measure Aquatic Life Use and Overall Ecosystem Health

Biological monitoring should play a more prominent role in state programs. EPA advisory groups, including the Intergovernmental Task Force on Monitoring Water Quality and 305(b) Consistency Workgroup, say that greater emphasis on biological assessment tools will result in better reporting of use attainment in the national water quality report to Congress.[31] In its 2001 report, the National Research Council found that biological criteria are more closely related to designated uses than are physical and chemical criteria, and recommended that biological criteria be used in conjunction with these other measures.[32]

Biological monitoring is a good way to assess aquatic life designated use, and, if integrated into existing state programs, would provide a more complete picture than most states currently have. Specific numeric bio-criteria will give the states an important tool to measure water quality.

Because Ohio has concentrated its monitoring and assessment efforts on biological monitoring to assess aquatic life uses, Great Lakes states should follow Ohio's lead in this regard. However, states should keep in mind that biological monitoring complements, but does not replace, physical, chemical, and sediment monitoring to assess attainment of designated uses such as drinking water, fish consumption, and recreation.

9. Waters Should be Assessed as Unswimmable Where Swimming is Restricted Due to High Levels of Contamination

Among the major findings in NRDC's *Testing the Waters 2003*, is that the more we monitor, the more we find serious water pollution at popular beaches. This finding holds true for the Great Lakes shorelines. The states conduct regular monitoring of popular bathing beaches during warmer months, and beaches are generally safe for swimming. Yet, pathogen levels at many beaches are above the safe-swimming level, leading state and local health agencies to close these beaches to swimmers during the summer.

Illinois and Indiana make the link between beach closures and swimmability; in 2002, these states had pathogen-contaminated beaches, and, therefore, found

contact recreation use (i.e. swimming) to be impaired. Wisconsin, on the other hand, despite having closed beaches due to contamination, made no assessment for any of its 1,017 miles of shoreline for contact recreation. Other states, although they conduct regular monitoring, have not reported in any publicly accessible way whether their shorelines are considered swimmable. For example, Ohio's watershed approach makes it difficult for EPA to tease out shoreline data, and Minnesota did not assess Lake Superior shoreline at all for its 2002 report.

EPA should require the states to adequately tie pathogen monitoring results and swimming advisories/closure information to contact recreation use attainment determinations. Whether state or local agencies use fecal coliform, *E. coli*, or any other method to make beach contamination decisions, no state should say that waters are swimmable when beaches have been closed due to contamination.

10. EPA Should Require the States to Move Toward Consistent *E. coli* Monitoring

According to NRDC's *Testing the Waters 2003*, the standards and criteria which states and local agencies use to make beach closure decisions are inconsistent. This finding holds true for the Great Lakes states, which all conduct regular beach monitoring during summer months.

E. coli is a more reliable indicator of contamination than fecal coliform, and it is EPA's preferred parameter for monitoring swimming waters. Yet, only three of six Great Lakes states have made the transition from testing for fecal coliform to *E. coli.* In states such as Illinois and Wisconsin, some local health agencies have adopted their own *E. coli* standards, despite the fact that the state environmental agency has not included it as part of the Water Quality Standards.

This patchwork of pathogen standards is a recipe for confusion, adding yet another layer of inconsistency among the Great Lakes states water quality reports. EPA should require states to adopt the EPA recommended *E. coli* standards, so that water quality can be measured consistently from state to state, and swimmers are adequately protected from water-borne illness.

NOTES

[1] *Flying Blind* draws heavily from biennial state water quality reports, often called "305b reports." These include:

Illinois Water Quality Report, 2002 (IEPA/BOW/02-006) available at http://www.epa.state.il.us/water/water-quality/report-2002/305b-2002.pdf;

Indiana Integrated Water Monitoring and Assessment Report, 2002 (IDEM/34/02/004/2002) available at http://www.in.gov/idem/water/planbr/wqs/quality.html;

Water Quality and Pollution Control in Michigan, 2002 Section 305(b) Report (MI/DEQ/SWQ-02/024) available at http://www.michigan.gov/deq/0,1607,7-135-3313_3686_3728-12711--,00.html; 2002

Minnesota Water Quality available at http://www.pca.state.mn.us/publications/reports/305b-finalreport-2002.pdf;

Ohio 2002 Integrated Water Quality Monitoring and Assessment Report, available at http://www.epa.state.oh.us/dsw/tmdl/2002IntReport/Ohio2002IntegratedReport_100102.pdf; and

Wisconsin Water Quality Assessment Report to Congress 2002 (PUB-WT-254 2003) available at http://www.dnr.state.wi.us/org/water/wm/watersummary/final305b_2002.htm.

Hereinafter, referenced as *state 2002 305(b) reports*. Above websites last visited on February 22, 2004.

[2] The general requirements for this process are found in Clean Water Act Sections 106(e) and 204(a)(linking federal grants to the states' water quality programs); 303(d)(requiring states to identify waters not meeting water quality standards, and implement total maximum daily loads for the problem-causing pollutants); 305(b) and 314(a) (requiring states to submit detailed biennial reports on the quality of their waters).

[3] *See, e.g.,* Statement of G. Tracy Mehan, III Assistant Administrator for Water, U.S. EPA, before the Subcommittee on Fisheries, Wildlife, and Water of the Committee on Environment and Public Works, United States Senate (September 16, 2003).

[4] *See,* National Academy of Public Administration, *Understanding What States Need to Protect Water Quality*, December 2002; National Research Council, *Assessing the TMDL Approach to Water Quality Management*, National Academy Press, Washington, D.C., 2001.

[5] Michigan Environmental Council, *Greening the Governments: Assessing the Environmental Conditions and Performance of the Great Lakes States*, (Lansing, Michigan) April 2002, at p. 26.

[6] Clean Water Act Section 101(a)(2).

[7] 40 CFR 131.10(a).

[8] *See EPA guidance documents, e.g.*, EPA, Office of Wetlands, Oceans, and Watersheds, *Elements of a State Monitoring and Assessment Program*, March 2003 (EPA 841-B-03-003), at p. 8; *Consolidated Assessment and Listing Methodology: Toward a Compendium of Best Practices*, Part A, Chapter 3 (*Overview of Process to Assess WQS Attainment and Identify Impaired Waters*), First Edition—July 2002. See also, generally, EPA National Water Quality Inventories.

[9] *2002 Integrated Water Quality Monitoring and Assessment Report Guidance*, available at http://www.epa.gov/owow/tmdl/2002wqma.pdf.

[10] Wisc. Admin. Code, NR 103.03(2)(b).

[11] GAO-02-186 (Water Quality). 'Variation among states is primarily caused by different states focusing on different pollutants, mainly because of differences in water quality criteria.'

[12] Memo from Robert Wayland, Director, EPA OWOW, to Regional and State Directors, re: 2002 Integrated Water Quality Monitoring and Assessment Report Guidance, November 19, 2001, p.2.

[13] U.S. EPA, Office of Water, *Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates: Report Contents,* September 1997, p. 1–10; available at http://www.epa.gov/owow/monitoring/305bguide/v1ch1.pdf (last visited on January 26, 2004).

[14] *See,* http://www.on.ec.gc.ca/solec/nearshore-water/paper/intro.html#TOC.

[15] Hesselberg, Robert J. and John E. Gannon, *Contaminant Trends in Great Lakes Fish*, by LaRoe, E.T., G.S. Farris, C.E. Puckett, P.D. Doran, and M.J. Mac, eds. 1995. *Our living resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems.* U.S. Department of the Interior, National Biological Service, Washington, DC. p. 242; available at http://biology.usgs.gov/s+t/pdf/Aquatic.pdf.

[16] Environmental Defense, *Out of Control and Close to Home: Mercury Pollution from Power Plants*, by Michael Shore, December 2003; available at www.environmental defense.org/go/mercurypowerplants.

[17] *Second National Report on Human Exposure to Environmental Chemicals*, Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Environmental Health, Division of Laboratory Sciences, Atlanta, Georgia, NCEH Pub. No. 02-0716, January 2003; available at http://www.cdc.gov/exposurereport/.

[18] *Inconsistent State Approaches Complicate Nation's Efforts to Identify Its Most Polluted Waters*, U.S. General Accounting Office, Washington, D.C., January 2002, (GAO-02-186 Water Quality), at p. 14.

[19] It is worth noting that Ohio water program officials developed a methodology to make fish advisories a part of use attainment decisions for the state's 2004 integrated report.

[20] *Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates: Report Contents*, EPA, September 1997; available at http://www.epa.gov/owow/monitoring/305bguide/v1ch1.pdf (last visited on January 8, 2004).

[21] *See, e.g.*, EPA Office of Inspector General, Audit Report, *(Water) Ohio Water Quality Program*, Report No. 99P00210, June 30, 1999.

[22] *Id* at p. ii, and at p. 10 (citing Chris Yoder and Edward T. Rankin, "The Role of Biological Indicators in a State Water Quality Management Process," *Environmental Monitoring and Assessment*, vol. 51 (1998), pp. 61–68.)

[23] *Id* at p. 10.

[24] EPA, *Ambient Water Quality Criteria for Bacteria*—1986; available at http://www.epa.gov/ost/pc/ambientwqc/bacteria1986.pdf (last visited on January 26, 2004).

[25] *See,* http://www.nrdc.org/water/oceans/ttw/titinx.asp.

[26] *Indiana Integrated Water Monitoring and Assessment Report, 2002* (2002 305b report), Indiana Department of Environmental Management (Report No. IDEM/34/02/004/2002) at p. 33.

[27] *Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates: Report Contents*, EPA, September 1997, at p. 4–36; available at http://www.epa.gov/owow/monitoring/305bguide/v1ch4.pdf (last visited on January 8, 2004).

[28] *Inconsistent State Approaches Complicate Nation's Efforts to Identify Its Most Polluted Waters*, at p. 30.

[29] *Understanding What States Need to Protect Water Quality*, National Academy of Public Administration, December 2002, at pp. 1–2.

[30] In *Out of Control and Close to Home: Mercury Pollution from Power Plants* (December 2003; available at www.environmental defense.org/go/mercurypowerplants), Environmental Defense recommends that states with mercury hot spots pursue their own standards to protect water bodies and also press for national standards.

[31] *Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates: Report Contents*, EPA, September 1997, at p.1–19.

[32] National Research Council, *Assessing the TMDL Approach to Water Quality Management*, National Academy Press, Washington, D.C., 2001.

Appendices

APPENDIX A

EPA Assessment Type Codes

From 1997 EPA Guidance (Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates: Report Contents) http://www.epa.gov/owow/monitoring/305bguide/v2ch1.pdf

100 Qualitative (evaluated) assessment—unspecified[a]
110 Information from local residents
120 Surveys of fish and game biologists/other professionals
130 Land use information and location of sources
140 Incidence of spills, fish kills, or abnormalities
150 Monitoring data that are more than 5 years old
175 Occurrence of conditions judged to cause impairment (e.g., channelization, dredging, severe bank erosion)
180 Screening models (desktop models; models are not calibrated or verified)
190 Biological/habitat data extrapolated from upstream or downstream water body
191 Physical/chemical data extrapolated from upstream or downstream water body

200 Physical/chemical monitoring[b]
210 Fixed-station physical/chemical monitoring, conventional pollutants only
211 Highest quality fixed-station physical/chemical monitoring, conventional pollutants; frequency and coverage sufficient to capture acute and chronic events, key periods, high and low flows
220 Non-fixed-station physical/chemical monitoring, conventional pollutants only
222 Non-fixed-station monitoring, conventional, during key seasons and flows
230 Fixed-station physical/chemical monitoring, conventional plus toxic pollutants
231 Highest quality fixed-station physical/chemical monitoring, conventional plus toxicants; frequency and coverage sufficient to capture acute and chronic events, key periods, high and low flows
240 Non-fixed-station physical/chemical monitoring, conventional plus toxic pollutants
242 Non-fixed-station physical/chemical monitoring, conventional plus toxicants, during key seasons and flows
250 Chemical monitoring of sediments
260 Fish tissue analysis
270 Community water supply chemical monitoring (ambient water)
275 Community water supply chemical monitoring (finished water)

300 Biological monitoring[b]
310 Ecological/habitat surveys
315 Regional reference site approach
320 Benthic macroinvertebrate surveys
321 RBP III or equivalent benthos surveys
322 RBP I or II or equivalent benthos surveys
330 Fish surveys
331 RBP V or equivalent fish surveys
340 Primary producer surveys (phytoplankton, periphyton, and/or macrophyton)
350 Fixed-station biological monitoring

360 Habitat assessment
365 Visual observation, usually at road crossings; professional not required
370 Visual observation, use of land use maps, reference conditions, professional not required
375 Visual observation, may quantify some parameters; single season typically; by professional
380 Quantitative measurements of instream parameters, channel morphology, floodplain; one or two seasons; by professional

400 Pathogen monitoring[b]
410 Shellfish surveys
420 Water column surveys (e.g., fecal coliform)
430 Sediment analysis
440 Community water supply pathogen monitoring (ambient water)
450 Community water supply pathogen monitoring (finished water)

500 Toxicity testing[b]
510 Effluent toxicity testing, acute
520 Effluent toxicity testing, chronic
530 Ambient toxicity testing, acute
540 Ambient toxicity testing, chronic
550 Toxicity testing of sediments

600 Modeling[c]
610 Calibrated models (calibration data are less than five years old)

700 Integrated intensive survey[b] (field work exceeds one 24-hour period and multiple media are sampled)
710 Combined sampling of water column, sediment, and biota for chemical analysis
720 Biosurveys of multiple taxonomic groups (e.g., fish, invertebrates, algae)

Assessments Based on Data from Other Sources
800 Assessments based on data from other sources[c]
810 Chemical/physical monitoring data by quality-assured volunteer program
820 Benthic macroinvertebrate surveys by quality-assured volunteer program
830 Bacteriological water column sampling by quality-assured volunteer program
840 Discharger self-monitoring data (effluent)
850 Discharger self-monitoring data (ambient)
860 Monitoring data collected by other agencies or organizations (use the assessment comment field to list other agencies)
870 Drinking water supply closures or advisories (source-water quality based)

Discrepancy in Aquatic Life Assessment Results[d]
900 Discrepancy in Aquatic Life Assessment Results
910 Discrepancy among different data types; aquatic life assessment is based on physical/chemical data
920 Discrepancy among different data types; aquatic life assessment is based on biological data
925 Discrepancy among different data types; aquatic life assessment is based on habitat data
930 Discrepancy among different data types; aquatic life assessment is based on toxicity testing data
940 Discrepancy among different data types; aquatic life assessment is based on qualitative (evaluated) assessment data

[a] Generally considered to be evaluated assessment types.

[b] Generally considered to be monitored assessment types.

[c] Considered to be monitored or evaluated assessment types depending on data quality and State assessment protocols.

[d] States are requested to use these codes to identify cases when biological, habitat, toxicity, and/or physical/chemical data show different assessment results.

APPENDIX B

Michigan Fish Advisory (Excerpt)

Michigan Department of Community Health

MDCH

Jennifer M. Granholm, Governor
Janet Olszewski, Director

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Project F.I.S.H

Project F.I.S.H. is a Michigan youth sportfishing education program. It is designed to involve children in long-term, mentor-based, community-supported, sportfishing and aquatic resource education.
Call 517-432-2700 for more information, or visit: www.projectfish.org

WHAT WOMEN OF CHILDBEARING AGE SHOULD KNOW ABOUT EATING FISH

General Fish Consumption Advice

The Michigan Department of Community Health advises extra caution about eating Michigan fish for women of childbearing age and children under 15.

Certain kinds and sizes of fish from the Great Lakes and from some of Michigan's lakes and streams contain levels of toxic chemicals that may be harmful if those fish are eaten too often.

The amounts of chemicals found in Michigan fish are not known to cause immediate sickness. But chemicals can collect in the body over time. It may take months or years of regularly eating contaminated fish to build up amounts that are a health concern. Chemicals may eventually affect your health or that of your children. Mothers who eat highly contaminated fish before birth may have children who are slower to develop and learn. A pregnant woman may pass these chemicals to her unborn child and to the new baby through breast milk.

What Can I Do to Reduce My Health Risks from Chemicals in Fish?

- Choose smaller fish. Generally, panfish and fish just over the legal size will have fewer chemicals.
- Choose lean fish. Panfish, brook trout and brown trout that live in streams and rivers tend to be low in fat. Small walleye, northern pike and bass, especially those that are just legal size, also tend to have fewer chemicals. Carp and catfish are higher in fat and usually have more chemicals.
- Choose fish that don't eat other fish. Large predator fish, especially large walleye, northern pike, muskie, bass and lake trout tend to have more chemicals.

For a guide to how often you may eat sport fish and still avoid potential health risks from chemicals, see the charts of specific advisories for the Great Lakes watersheds. The charts start on page 8. They show specific locations, kinds, and sizes of fish, and how often you may eat them.

Trim and cook fish properly to reduce risk. This can remove more than 50 percent of the remaining contaminants in fish. See the separate section on trimming and cooking on page 3.

Advisory on Mercury in Inland Lakes

The Michigan Department of Community Health has issued a special advisory for all inland lakes in Michigan due to mercury. This is a widespread problem throughout the north central United States and Canada.

No one should eat more than one meal a week of these kinds and sizes of fish from any of Michigan's inland lakes:

- Rock bass, perch, or crappie over 9 inches in length
- Any size largemouth bass, smallmouth bass, walleye, northern pike, or muskie

Women of childbearing age and children under age 15 should not eat more than one meal per month of these fish.

More than 200 inland bodies of water have been sampled. For specific advice about these lakes, see the summary of mercury in fish from inland lakes on page 6.

Commercial Fish

The fish you buy from your supermarket can also contain toxic chemicals. There are laws to limit them, but extra caution will help protect unborn and young children.

Women of child bearing age, particularly those who are pregnant or nursing, and children under 15 should not eat these fish due to mercury levels:

• Swordfish • Shark • King Mackerel • Tilefish

COOKING AND CLEANING FISH

Trim & Cook Fish Properly To Reduce Risk

Fish are nutritious and good to eat. When properly prepared, fish provide a diet high in protein and low in saturated fats. Many doctors suggest, based on scientific studies, that eating 2-3 fish meals a week is helpful in preventing heart disease.

Proper preparation reduces the concentration of organic chemicals like PCB even further. By trimming fatty areas before cooking and by cooking fish in ways that allow fat to drip away, more than 50 percent of the contaminants in fish can be eliminated. Methyl mercury is stored in fish flesh. Special trimming and cooking methods do not remove it.

DO

Trim fatty areas before cooking (see drawing). The belly, the top of the back, and the dark meat along the skin side of the fillet are often fatty.

Remove or puncture skin before cooking. This allows fats to drain off and helps remove or reduce fat under the skin.

Cook so fat drips away. Bake, broil or grill on a rack, or poach and do not use the liquid.

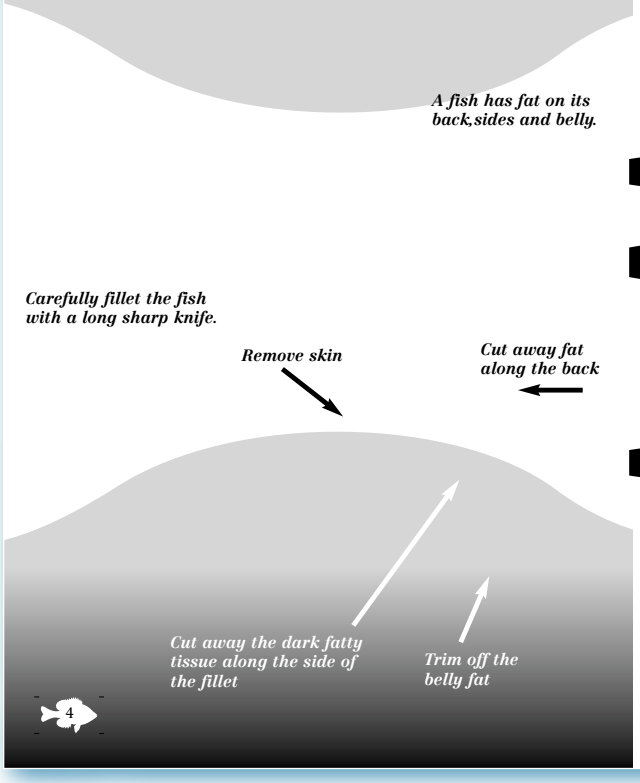
Deep-fry trimmed fillets in vegetable oil. After frying, drain and throw away the oil.

DON'T

Pan-fry in butter or animal fat, and don't make fish soups or chowders. These methods hold in juices that contain fat from the fish.

COOKING AND CLEANING FISH

Important reminders.



CHARTS OF SPECIFIC ADVISORIES

How to Use the Charts – Four Easy Steps

Step One:

In the first column, find the body of water in which you are fishing. The charts are divided into separate listings for each Great Lakes watershed. Within these sections, the Great Lake is listed first, then bays on the lake that have additional advisories, followed by an alphabetical listing of rivers that flow into the lake and inland lakes, reservoirs or impoundments in the watershed.

Step Two:

In the second column, find the kind of fish that you have caught.

Step Three:

Read across the top of the chart to the appropriate category and find the size range of the fish you have caught. The General Population category is for men, boys over the age of 15 and women who are beyond childbearing years. The Women & Children category is for women of childbearing age and children under 15.

Step Four:

Follow the size column down to the line for the species that you found in the previous steps. The symbol on the chart represents the consumption advice, according to the following key:

- ▲ Unlimited consumption. Eat as much of these fish as you wish.
- ▼ One meal per week.
- ● One meal per month.
- ■ Six meals per year.
- ◆ Do not eat these fish.

General Advice

If you are fishing in a river or stream that is not listed, keep in mind the following facts:

- Larger and older fish tend to collect more contaminants.
- Fish that eat other fish, such as muskie, northern pike, walleye and bass, tend to collect chemicals such as mercury.
- Fatty fish, such as carp, catfish, lake trout and large salmon, tend to collect PCBs and similar chemicals.
- For salmon and trout on their spawning run into streams, follow the advice for the Great Lake from which they are migrating.

Mercury in fish

Mercury is found in nature. It is also released by burning wastes and coal, and improper disposal of mercury containing products such as thermometers, batteries, and older thermostats. Small amounts can dissolve in water. Bacteria can change it into a more toxic form called methyl mercury.

Fish pick it up as they feed and absorb it from water as it passes over their gills. Larger predator fish accumulate more as they eat other fish. Methyl mercury is stored in fish flesh. Special trimming and cooking methods do not remove it.

Nearly all fish contain very small amounts of methyl mercury. Usually only large fish that eat other fish have levels too high for humans to eat.

Mercury in Michigan Sport Fish

In addition to Great Lakes advisories, these charts represent results of testing for mercury in fish from about 200 inland lakes in Michigan. Only a few kinds of fish were tested in each lake. The charts show only the mercury in the fish that were tested. Other fish in the same lake will probably have similar levels. Large fish such as bass and walleye may have higher levels. Panfish such as bluegill and sunfish may have lower levels. You can also get a copy of the full tables that show species and sizes tested in each lake. Contact the Michigan Department of Community Health Environmental & Occupational Epidemiology Division at 1-800-648-6942.

General Inland Lake Mercury Advisory

For lakes not in these lists, follow this general advisory. Even in the lakes tested that did not have fish consumption advisories due to mercury it is wise to limit meals of large fish.

- No one should eat more than one meal a week of rock bass, yellow perch, or crappie over nine inches in length and bass, walleye, northern pike or muskellunge of any size.
- Women of childbearing age and children under 15 should not eat more than one meal per month of these fish.

Spacing Meals of Sport Fish

It's important to leave enough space between meals of sport fish so you reduce the risks of chemicals in fish.

- If you eat fish that contain mercury, wait until the consumption period is over before having another meal of fish in the same category. For example, if you eat a fish that has a consumption advisory of one meal a month because of mercury contamination, don't eat any more fish that contain mercury for another month.
- It's different with fish that contain other chemicals such as PCBs. You can eat more meals of these fish over a shorter period of time as long as you don't go over the total number of meals you could have in a year. If most of the fish you eat are in the one-meal-a-week category, you could have a total of 52 meals a year. If most of the fish you eat are in the one-meal-a-month group, you could have 12 meals a year. Eating one meal of fish from the one-meal-a-month group is the same as eating four meals of fish from the one-meal-a-week group. If you eat most of your meals of sport fish in four or five months over the summer fishing season, that's okay — but don't eat more than the total number of meals you may have in a year.

Need More Information?

For further information or for the most up-to-date advice, contact the MDCH Environmental & Occupational Epidemiology Division at 1-800-648-6942. This advisory was updated in January, 2002. Determining safe levels of fish consumption is an ongoing process of scientific analysis. Updates may be issued as the Michigan Department of Community Health gets new information.

▲ Unlimited consumption.
● One meal per month.
▼ One meal per week.
■ Six meals per year.
◆ Do not eat these fish.

Water body	Species	Contaminant(s)	General Population Length (inches) 6-8	8-10	10-12	12-14	14-18	18-22	22-26	26-30	30 +	Women & Children Length (inches) 6-8	8-10	10-12	12-14	14-18	18-22	22-26	26-30	30 +
Lake Erie Watershed All other locations refer to general advice on page 6.																				
Lake Erie #	Carp, Catfish	PCBs, Dioxins	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	Chinook Salmon	PCBs			▲	▲	▲	▲	▲	▲	▲			●	●	●	●	●	●	●
	Coho Salmon	PCBs			▲	▲	▲	▲	▲	▲	▲			●	●	●	●	●	●	●
	Freshwater Drum	PCBs	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	▼	▼	▼	▼	▼	▼	▼	▼
	Lake Trout	PCBs			▲	▲	▲	▲	▲	▲	▲			■	■	■	■	■	■	■
	Rainbow Trout (Including Steelhead)	PCBs			▲	▲	▲	▲	▲	▲	▲			●	●	●	●	●	●	●
	Smallmouth Bass	PCBs					▲	▲	▲	▲						●	●	●	●	
	Walleye	PCBs				▲	▲	▲	▲	▲	▲				▼	▼	▼	●	●	●
	White Bass	PCBs	▲	▲	▲	▲	▲	▲				●	●	●	●	●	●			
	Whitefish	PCBs, Dioxins	▼	▼	▼	▼	▼	▼	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
	White Perch	PCBs	▲	▲	▲	▲						●	●	●	●					
	Yellow Perch	PCBs	▲	▲	▲	▲	▲					▼	▼	▼	▼	▼				
Barton Pond* (Huron R.)	Carp	PCBs	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	▼	▼	▼	▼	▼	▼	▼	▼
Belleville Lake* (Huron R.)	Carp	PCBs	▲	▲	▲	▲	▲	▲	▲	▲	▲	●	●	●	●	●	●	●	■	■
	Gizzard Shad	PCBs	▲	▲	▲	▲	▲	▲				●	●	●	●	●	●			
	Walleye	PCBs					▲	▲	▲	▲	▲					▼	●	●	●	●
	White Suckers	PCBs	▲	▲	▲	▲	▲	▲	▲	▲		●	●	●	●	●	●	●	●	
Black Creek (Lenawee Co.)	Carp	PCBs	▲	▲	▲	▲	▲	▲	▲	▲	▲	●	●	●	●	●	●	●	●	●
Black River (Sanilac Co.)	Carp	PCBs	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	▼	▼	▼	▼	▼	▼	▼	▼
Cass Lake* (Oakland Co.)	Smallmouth Bass	Mercury, PCBs					▼	▼	▼	▼						●	●	●	●	
	Walleye	Mercury, PCBs					▼	▼	▼	▼	▼					●	●	●	●	●
Clear Spring Lake* (Macomb Co.)	Largemouth Bass	Mercury, PCBs					▲	▼	▼	▼						▼	●	●	●	

Also applies to tributaries into which migratory species enter.

* For species not listed, see general inland lake mercury advisory on page 6.

An empty box in the chart means one of two things:

- On the small end of the size scale, fish in this size range are not of legal size.
- On the large end of the size scale, fish of this type generally do not grow to this size.

APPENDIX C

2002 High Priority Beaches:

Beaches posted for 10 days or more of the June, July August swimming season, identified by USEPA Region 5.

# Days Closed	Beach Name	County	State	Cause
13	Rosewood Beach	Lake	IL	Sanitary Sewer Overflow, Stormwater Runoff, Wildlife
15	Forest Park Beach	Lake	IL	Sanitary Sewer Overflow, Stormwater Runoff, Wildlife
18	Illinois Beach State Park South	Lake	IL	Stormwater Runoff, Wildlife
33	Waukegan North Beach Park	Lake	IL	Stormwater Runoff, Wildlife
46	Winthrop Harbor North Marina Beach	Lake	IL	Boat Discharge, Stormwater Runoff, Wildlife
56	Waukegan South Beach	Lake	IL	Stormwater Runoff, Wildlife
20	Edgewater State Park	Cuyahoga	OH	Combined Sewer Overflow, Sewage Treatment Plant, Boat Discharge, Stormwater Runoff, Unknown
26	Euclid State Park	Cuyahoga	OH	Combined Sewer Overflow, Sewage Treatment Plant, Boat Discharge, Stormwater Runoff, Unknown
28	Lake Shore Park	Ashtabula	OH	Combined Sewer Overflow, Sewage Treatment Plant, Boat Discharge, Stormwater Runoff, Unknown
30	Lakeview Beach	Lorain	OH	Stormwater Runoff
43	Villa Angela State Park	Cuyahoga	OH	Combined Sewer Overflow, Sewage Treatment Plant, Stormwater Runoff, Unknown
18	Bradford Beach	Milwaukee	WI	Combined Sewer Overflow, Boat Discharge, Stormwater Runoff, Unknown
20	Zoo Beach	Racine	WI	Stormwater Runoff, Wildlife
22	McKinley Beach (South)	Milwaukee	WI	Combined Sewer Overflow, Boat Discharge, Stormwater Runoff, Wildlife, Unknown
27	North Beach	Racine	WI	Boat Discharge, Stormwater Runoff, Wildlife

From EPA Great Lakes National Program Office Website: http://www.epa.gov/glnpo/glindicators/water/beachb.html (last visited on January 9, 2004)

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