ILLINOIS INTEGRATED WATER QUALITY REPORT AND SECTION 303(d) LIST - 2010

Clean Water Act Sections 303(d), 305(b) and 314

Water Resource Assessment Information and Listing of Impaired Waters

Volume I: Surface Water

December 2011

Illinois Environmental Protection Agency
Bureau of Water

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VOLUME I APPENDICES:

****Appendix A-5 was not available at the time of submission.**

EXECUTIVE SUMMARY

This 2010 Integrated Report continues the reporting format first adopted in the 2006 reporting cycle. However, for the 2010 cycle the Integrated Report is being divided into two volumes: Volume I covering surface water and Volume II covering groundwater. Prior to 2006, assessment information was reported separately in the Illinois Water Quality [Section 305(b)] Report and Illinois Section 303(d) List. The Integrated Report format is based on federal guidance for meeting the requirements of Sections 305(b), 303(d) and 314 of the Clean Water Act.

The basic purpose of this report (Volume I) is to provide information to the federal government and the citizens of Illinois on the condition of surface water in the state. This information is provided in detail in the appendices and is summarized in Section C-3.

Streams

For the 2010 cycle, Illinois EPA upgraded the basis for measuring stream miles in the state. Formerly, Illinois used the medium resolution National Hydrography Dataset (NHD) (1:100,000 scale) for this purpose. However, for 2010, this was upgraded to the high resolution NHD (1:24,000 scale). This resulted in a significant increase in the total stream miles considered in this report (from 71,394 to 119,244 stream miles) due to the inclusion of many small first and second order streams found in the high resolution NHD which are not included in the medium resolution NHD. This also reduced the overall percent of Illinois waters considered assessed. In addition, the length of each stream segment was recalculated using this more accurate basis resulting in a change of length for most segments. Unfortunately, this affects the comparison of the 2010 assessment results with results from previous years. The reader should be aware that differences between the percent of assessed stream miles in 2010 compared to percentages from previous years, may be partially an artifact of this change in methods.

For 2010, 17,010 stream miles, or 14.3 percent of the total 119,244 stream miles in Illinois have been assessed for attainment of at least one designated use. Overall, the percent of stream miles assessed has remained relatively consistent over the last 5 cycles – about 13 to 14 percent.

The degree of support (attainment) of a designated use in a particular stream segment is determined by an analysis of various types of information, including biological, physicochemical, physical habitat, and toxicity data. When sufficient data are available, each applicable designated use in each segment is assessed as Fully Supporting (good), Not Supporting (fair), or Not Supporting (poor). Waters in which at least one applicable use is not fully supported are called "impaired." For Illinois streams, the major potential causes of impairment, based on number of miles affected, are fecal coliform bacteria impairing swimming (*primary contact*) use, mercury and polychlorinated biphenyls (PCBs) in fish tissue impairing *fish consumption* use, and low dissolved oxygen, high nutrients, excessive siltation, physical-habitat alterations, and high suspended solids which impair *aquatic life* use (Table C-31). The major potential sources of impairment are atmospheric deposition of toxics, agriculture, hydromodification, municipal point sources, urban runoff/storm sewers, surface mining, and impacts from hydrostructure flow regulation/modification (Table C-32).

The percent of stream miles rated Fully Supporting (good) for *aquatic life* use increased slightly to 63.2 percent in 2010, compared to 61.0 percent in the 2008 reporting cycle. The percent of stream miles assessed as good, fair and poor for each use for 2008 and 2010 are shown below. Slight differences in assessment numbers may be attributable to random change or differences in how and where *aquatic life* use assessments were performed between the 2008 and 2010. For example, given that many *aquatic life* use assessments in streams are updated on a five-year cycle, it is possible that statewide comparisons at any shorter time period (e.g., between each consecutive reporting cycle) actually reflect the regional subset of waters most recently updated rather than a statewide pattern. Also, it is possible that improvements in assessment information, methods or stream mile calculations contribute to year-to-year differences.

Percent of Illinois Stream Miles Assessed as Good, Fair and Poor in 2010 and 2008

Designated Use	Miles Assessed	Percent Assessed	Percent Fully Supporting (Good) [2]		Percent Not Supporting (Fair) [2]		Percent Not Supporting (Poor) [2]		Percent Not Assessed	
Year:	2010	2010	2010	2008	2010	2008	2010	2008	2010	2008
Aquatic Life	16,753	14.1	63.2	61.1	30.6	34.8	6.2	4.1	85.9	78.5
Fish Consumption	3,930	3.3	0.0	0.0	92.1	91.9	7.9	8.1	96.7	94.6
Indigenous Aquatic Life	93	100.0	36.4	38.2	57.5	55.1	6.1	6.7	0.0	0.0
Primary Contact	4,009	3.4	18.6	18.9	34.3	36.2	47.1	44.9	96.6	94.5
Public and Food Processing Water Supply	1,157	100.0	9.5	9.0	90.5	91.0	0.0	0.0	0.0	0.0
Secondary Contact[1]	733	0.6	100.0	100.0	--		--		99.4	99.0
Aesthetic Quality[1]	--	--	--	---	--		--		100.0	100.0

Note: Numbers and percentages may not add up due to slight rounding errors.

1. Assessment guidelines are not yet fully developed; see section C-2 Assessment Methodology.
2. Percentages of Good, Fair and Poor indicate the percent of miles assessed.

2.By definition, Secondary Contact Use is "Fully Supporting" in all waters in which Primary Contact Use is "Fully Supporting.

Inland Lakes

For this 2010 report, a total of 148,014 lake acres were assessed for at least one designated use. This represents 46.5 percent of total lake and pond acreage (318,477) in the state. Overall, the percent of lake acres assessed has remained relatively consistent over the last 5 cycles – about 46 to 49 percent.

As with streams, each lake is assessed as Fully Supporting (good), Not Supporting (fair), or Not Supporting (poor), for each applicable designated use. Of the 142,571 lake acres assessed for *aquatic life* use in 2010, 91.3 percent were rated as Fully Supporting as compared to 69.4 percent Fully Supporting in 2008 and 53.6 percent Fully Supporting in the 2006 reporting cycle. This increase in the percent of fully supported lake acres may be due in part to a change in the assessment status of a relatively few large lakes from not assessed to fully supporting. The

percent of lakes (acres and numbers) assessed as good, fair and poor for each use are shown below.

Percent of Illinois Lakes Assessed as Good, Fair and Poor in 2010

Designated Use	Acres Assessed	Percent of Statewide Acres Assessed	Percent of Assessed Acres as Fully Supporting (Good)		Percent of Assessed Acres as Not Supporting (Fair)		Percent of Assessed Acres as Not Supporting (Poor)		Percent of Statewide Acres Not Assessed		Percent of Statewide Acres as Insufficient Information	
Year:	**2010**	**2010**	**2010**	**2008**	**2010**	**2008**	**2010**	**2008**	**2010**	**2008**	**2010**	**2008**
Aesthetic Quality	142,553	45.0	9.8	6.8	82.6	66.9	7.6	26.3	52.4	52.5	2.6	2.7
Aquatic Life	142,571	45.0	91.3	69.4	8.7	30.6	0.0	0.00	52.4	52.5	2.6	2.7
Fish Consumption	92,280	29.0	7.4	7.9	92.0	92.1	0.6	0.0	71.0	72.7	0.0	0.0
Indigenous Aquatic Life	1,600	100.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Primary Contact	1,814	0.6	60.2	60.2	39.8	39.8	0.0	0.0	99.4	99.4	0.0	0.0
Public and Food Processing Water Supply	75,655	99.7	20.5	6.3	79.3	93.7	0.0	0.0	0.3	0.2	0.0	0.0
Secondary Contact	1,092	0.3	100.0	100.0	0.0	0.0	0.0	0.0	99.7	99.7	0.0	0.0

Designated Use	Number of Lakes Assessed	Percent of Statewide Lakes Assessed[1]	Percent of Assessed Lakes Fully Supporting (Good)		Percent of Assessed Lakes Not Supporting (Fair)		Percent of Assessed Lakes Not Supporting (Poor)		Percent of Statewide Lakes Not Assessed		Percent of Statewide Lakes as Insufficient Information	
Year:	**2010**	**2010**	**2010**	**2008**	**2010**	**2008**	**2010**	**2008**	**2010**	**2008**	**2010**	**2008**
Aesthetic Quality	352	0.4	13.4	13.3	74.7	72.5	11.9	14.2	99.6	99.5	0.1	0.1
Aquatic Life	353	0.4	90.4	89.0	9.3	10.7	0.3	0.3	99.6	99.5	0.1	0.1
Fish Consumption	124	0.1	1.6	2.1	96.8	96.8	1.6	1.1	99.9	99.9	0.0	0.0
Indigenous Aquatic Life	1	100.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Primary Contact	15	0.02	46.7	46.7	53.3	53.3	0.0	0.0	99.98	99.98	0.0	0.0
Public and Food Processing Water Supply	74	93.7	24.3	23.7	75.7	76.3	0.0	0.0	6.3	5.0	0.0	0.0
Secondary Contact[2]	7	0.01	100.0		0.0		0.0		99.99	99.99	0.0	0.0

Note: Numbers and percentages may not add up due to slight rounding errors.

1. Statewide, in the time period covered by this summary, Illinois had 91,456 lakes and ponds designated for general uses, one lake designated for Indigenous Aquatic Life Use, and 79 lakes designated for Public and Food Processing Water Supply Use.
2. By definition, Secondary Contact Use is "Fully Supporting" in all waters in which Primary Contact Use is "Fully Supporting."

The major potential causes of impairment based on number of lake acres affected are total suspended solids, phosphorus (total) and aquatic algae, impairing *aquatic life* and *aesthetic quality* uses, and, mercury and polychlorinated biphenyls (PCBs) in fish tissue impairing *fish consumption* use (Table C-34). The major potential sources of impairment are crop production (crop land or dry land), atmospheric deposition of toxics, littoral/shore area modifications (nonriverine), other recreational pollution sources, runoff from forest/grassland/parkland, contaminated sediments, urban runoff/storm sewers, municipal point source discharges, and on-site treatment systems (septic systems and similar decencentralized systems)(Table C-35).

Lake Michigan

Lake Michigan is monitored annually through a cooperative agreement between the city of Chicago Department of Water and Illinois EPA Bureau of Water. The State of Illinois has jurisdiction over approximately 1,526 square miles of open water and 63 shoreline miles of Lake Michigan bordering Cook and Lake counties in the northeastern corner of the state. At least one use was assessed in 151 square miles of Lake Michigan.

Assessments of *aquatic life* use were unchanged from the 2008 reporting cycle. About ten percent of the total Lake Michigan waters in Illinois were assessed, and all were rated as Fully Supporting for the following uses: *aquatic life* use, *primary contact* (swimming) use, *secondary contact* use, and *public and food processing water supply* use. However, *fish consumption* use in the Illinois portion of Lake Michigan is assessed as Not Supporting (Poor) due to contamination from polychlorinated biphenyls (PCBs) and mercury. In addition, all Lake Michigan beaches in Illinois were assessed as Not Supporting (poor) for *primary contact* use due to bacterial contamination from *Escherichia coli* bacteria. The individual use-support summary for all Lake Michigan-basin waters is shown below.

Statewide Individual Use-Support Summary for Lake Michigan-Basin Waters

Lake Michigan Bays and Harbors; Units: Square Miles

Designated Use	Total Size	Total Assessed		Size Fully Supporting (Good)	Size Not Supporting (Fair)	Size Not Supporting (Poor)	Size Not Assessed
		Size	%				
Aesthetic Quality[1]	2.5	0	0	0	0	0	2.5
Aquatic Life	2.5	2.46	98.3	2.40	0	0.06	0.05
Fish Consumption	2.5	2.46	98.3	0	0	2.46	0.05
Primary Contact	2.5	0	0	0	0	0	2.5
Secondary Contact[1]	2.5	0	0	0	0	0	2.5

Lake Michigan Open Water; Units: Square Miles

Designated Use	Total Size	Total Assessed		Size Fully Supporting (Good)	Size Not Supporting (Fair)	Size Not Supporting (Poor)	Size Not Assessed
		Size	%				
Aesthetic Quality[1]	1,526	0	0.0	0	0	0	1,526
Aquatic Life	1,526	151	9.9	151	0	0	1,375
Fish Consumption	1,526	151	9.9	0.0	0	151	1,375
Primary Contact	1,526	151	9.9	151	0	0	1,375
Public and Food Processing Water Supplies	151	151	100	151	0	0	0
Secondary Contact[1]	1,526	151[2]	9.9[2]	151[2]	0[2]	0[2]	1,375

Lake Michigan Shoreline; Units: Miles

Designated Use	Total Size	Total Assessed		Size Fully Supporting (Good)	Size Not Supporting (Fair)	Size Not Supporting (Poor)	Size Not Assessed
		Size	%				
Aesthetic Quality[1]	63	0	0.0	0	0	0	63
Aquatic Life	63	0	0.0	0	0	0	63
Fish Consumption	63	63	100	0	0	63	0
Primary Contact	63	63	100	0	0	63	0
Secondary Contact[1]	63	0	0.0	0	0	0	63

1. Assessment guidelines are not yet fully developed; see section C-2 Assessment Methodology.
2. By definition, Secondary Contact Use is "Fully Supporting" in all waters in which Primary Contact Use is "Fully Supporting"; otherwise, assessment guidelines are not yet developed for determining the level of use attainment.

PART A: INTRODUCTION

A-1. Reporting Requirements

The 2010 Integrated Report is based on guidance from USEPA which is intended to satisfy the requirements of sections 305(b), 303(d) and 314 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) and subsequent amendments (hereafter, collectively called the "Clean Water Act" or "CWA") in a single combined report. For this reporting cycle the Integrated Report is being divided into two volumes: Volume I covering surface water and Volume II covering groundwater.

According to Section 305(b) of the Clean Water Act, each state, territory, tribe, and interstate commission (hereafter collectively called "state") must submit to USEPA "a report which shall include—

(A) a description of the water quality of all navigable waters in such State during the preceding year,…

(B) an analysis of the extent to which all navigable waters of such State provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water;

(C) an analysis of the extent to which the elimination of the discharge of pollutants and a level of water quality which provides for the protection and propagation of a balanced population of shellfish, fish, and wildlife and allows recreational activities in and on the water, have been or will be achieved by the requirements of this Act, together with recommendations as to additional action necessary to achieve such objectives and for what waters such additional action is necessary;

(D) an estimate of (i) the environmental impact, (ii) the economic and social costs necessary to achieve the objective of this Act in such State, (iii) the economic and social benefits of such achievement, and (iv) an estimate of the date of such achievement; and

(E) a description of the nature and extent of nonpoint sources of pollutants, and recommendations as to the programs which must be undertaken to control each category of such sources, including an estimate of the costs of implementing such programs."

Illinois reports the resource quality of its waters in terms of the degree to which the beneficial uses[1] of those waters are attained and the reasons (causes and sources) beneficial uses may not be attained. In addition, states are required to provide an assessment of the water quality of all publicly owned lakes, including the status and trends of such water quality as specified in Section 314(a)(1) of the Clean Water Act.

[1] Beneficial uses, also called designated uses, are discussed in more detail in Section B-2 Water Pollution Control Program, Illinois Surface Water Quality Standards.

Section 303(d) of the Clean Water Act and corresponding regulations in Title 40 of the Code of Federal Regulations, require states to

- Identify water quality-limited waters where effluent limitations and other pollution control requirements are not sufficient to implement any water quality standard,
- Identify pollutants causing or expected to cause water quality standards violations in those waters,
- Establish a priority ranking for the development of Total Maximum Daily Load[2] (TMDL) calculations including waters targeted for TMDL development within the next two years, and,
- Establish TMDLs for all pollutants preventing or expected to prevent the attainment of water quality standards.

This list of water quality limited waters is often called the 303(d) List.

The Integrated Report process has two major phases corresponding to the requirements noted above. In the first phase use attainment assessments are conducted for all waters and all designated uses for which data are available to make assessments. As part of that process all potential causes (both "pollutant" and "nonpollutant" causes) and sources of impairment are identified. These assessment results, which include all use attainment assessments and all potential causes and sources of use impairment for all assessed waters, are shown in Appendix B. The next phase involves categorizing waters based on whether any uses are impaired, whether pollutant or nonpollutant causes are identified and whether or not a TMDL is required. A subset of all assessed waters and causes of impairment is identified as the 303(d) List (Appendix A). It includes only those waters which have uses that are impaired by pollutants and which require a TMDL. Each entry on the 303(d) List is a unique combination of a water body segment (also known as an assessment unit[3]) and pollutant cause of impairment that requires a separate loading calculation. Also, as part of this second phase, each segment-pollutant combination on the 303(d) List is prioritized for TMDL development and a two-year schedule for TMDL development is created. TMDLs are only conducted for causes of impairment which are classified as pollutants such as metals or pesticides. Nonpollutant causes of impairment such as habitat degradation are not a component of Illinois' 303(d) List submission.

The distinction between pollutant and nonpollutant is critical in this process. Section 502(6) of the Clean Water Act, defines a pollutant as *"dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water."* In general, pollutants are substances, chemicals, materials or wastes and their components that are discharged into the water. Pollution, as defined by the Clean Water Act Section 502(19), is *''the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of a water body.''* This is a broad term that encompasses many types of changes to a water body, including

[2] Total Maximum Daily Load calculations determine the amount of a pollutant a water body can assimilate without exceeding the state's water quality standards or impairing the water body's designated uses.
[3] A lake, a stream segment, or an open-water area, harbor or shoreline segment of Lake Michigan for which a use attainment assessment is made.

alterations that do not result from the introduction of a specific pollutant or the presence of pollutants at a level that causes impairment. In other words, all waters impaired by human intervention suffer from some form of pollution. In some cases, the pollution is caused by the presence of a pollutant, and a TMDL is required. For assessment purposes, Illinois EPA classifies almost all causes of impairment as pollutants. The classification of each cause of impairment is shown in the guidelines for identifying potential causes of impairment related to each use (Tables C-5, C-8, C-10 and C-12). Some nonpollutant causes such as (excessive) aquatic algae or (low) dissolved oxygen may in turn be caused by pollutants. Whenever nonpollutant causes are identified we attempt to determine if pollutants are ultimately responsible for the impairment, and what those pollutants are.

While pollutant causes of impairment are addressed by the Agency's TMDL program, nonpollutant causes are addressed by other agency programs such as 319 grants for nonpoint source pollution control activities and other grant programs.

To the extent possible, this 2010 Illinois Integrated Report is based on USEPA's *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* issued July 29, 2005 and additional guidance contained in USEPA memorandums from the Office of Wetlands, Oceans and Watersheds regarding Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions.

Illinois EPA submitted its 2008 Integrated Report to USEPA for approval on June 30, 2008. On October 22, 2008 USEPA issued a decision partially disapproving Illinois' Section 303(d) List which was contained in the 2008 Integrated Report. Illinois EPA objected to the partial disapproval and sent a letter to USEPA on February 11, 2009 explaining in detail the reasons for those objections. USEPA responded to the arguments outlined in Illinois EPA's letter, however, several issues remain unresolved.

The three main unresolved issues are: 1) Illinois' removal of total nitrogen from its 303(d) List as a cause of aquatic life use impairment; 2) a change in one of the guidelines Illinois uses to identify sedimentation/siltation as a cause of aquatic life use impairment which resulted in the removal of some listings of sedimentation/siltation; and, 3) the reclassification of dissolved oxygen as a nonpollutant cause of impairment and the subsequent removal of this cause from Illinois' 303 (d) List. Illinois EPA's 2008 Integrated Report, USEPA's decision document and Illinois EPA's detailed comments and legal analysis regarding USEPA's partial disapproval of the 2008 303(d) list and proposal to list additional waters are available on the Agency's website at http://www.epa.state.il.us/water/tmdl/303d-list.html.

A-2. Major Changes from the 2008 Report Methodology and Format

1. As stated above, the 2010 Integrated Report was divided into two volumes: Volume I covering surface water and Volume II covering groundwater. This was done to accommodate the increased size of the integrated report, which has been greatly expanded to include more water quality information. This two volume format also improves the

organizational structure of the report and makes it easier for the reader to find the specific information that may be of concern.

2. Illinois EPA uses the U.S. Geological Survey's National Hydrography Dataset (NHD) as the basis for mapping streams in the state. For the 2010 cycle, we upgraded the base layer used for this purpose from the medium resolution NHD (1:100,000 scale) to the high resolution NHD (1:24,000 scale). This resulted in a significant increase in the total stream miles considered in this report due to the inclusion of many small first and second order streams found in the high resolution NHD which are not included in the medium resolution NHD. This also reduced the overall percent of Illinois waters considered assessed. In addition, the length of each stream segment was recalculated using this more accurate basis resulting in a change of length for most stream segments.

In all other aspects Illinois EPA is using the same methodology in 2010 as in 2008 with no significant changes.

A-3. Primary Data Sources, Data Quality and Time Periods Covered

Data Used for This Assessment Cycle

In general, data that became readily available since the 2008 Integrated Report were considered, and we updated relevant assessments as appropriate. Because water-resource data take time to gather and process, each assessment cycle reflects up to a two-year data lag. Surface water assessments in this 2010 report are based primarily on biological, water, sediment, physical habitat, and fish-tissue information collected through 2008 from various monitoring programs (Illinois EPA 2007). These programs include: the Ambient Water Quality Monitoring Network, Intensive Basin Surveys, Facility-Related Stream Surveys, the Fish Contaminant Monitoring Program, the Ambient Lake Monitoring Program, the Illinois Clean Lakes Monitoring Program, the Volunteer Lake Monitoring Program, the Lake Michigan Monitoring Program, TMDL monitoring and other outside sources. Use attainment was updated for all surface waters where sufficient new information became available since the last report (i.e., 2008 report, based mostly on data through September 2005). Other assessments in the 2008 report were updated using the most recent data available and applying the most recent applicable standards and use attainment methodologies. In addition, assessments were updated when errors were discovered in previous assessments. Older assessments are based on the most recent data available, which, in some cases, may be over 15 years old. Although the Intensive Basin Monitoring program generally revisits each major basin in the state on a five year basis, limited state resources make it impossible to monitor all water bodies in each basin every five years.

In 2010, stream assessments of *aquatic life* use, which rely primarily on data from Intensive Basin Surveys, were updated for stream segments in these basins: Calumet River, Lake Michigan tributaries, Kishwaukee River, Chicago/Little Calumet rivers, Middle and Lower Wabash River tributaries, Embarras River, Skillet Fork, Little Vermillion River (Wabash basin), Vermillion River (Wabash basin), Middle and Lower Illinois River, Macoupin Creek, Pecatonica River, Sugar River, Upper and Lower Fox River, Little Wabash River, Shoal Creek, Kaskaskia

River, La Moine River, Rock River, Des Plaines River, Big Muddy River, Upper and Lower Sangamon River, South Fork Sangamon River, and Salt Creek. These basins were sampled in 2006, 2007 or 2008. In a few cases, where other data were available for waters outside these basins, we used that data to update assessments as well. Water chemistry data from the Ambient Water Quality Monitoring Network from 2004 through 2008 were also used in some of those assessments. Some assessments of aquatic life use in streams were updated based on Facility-Related Stream Survey data from 2006, 2007 and 2008.

All use attainment assessments on Lake Michigan were updated with Lake Michigan Monitoring Program data from 2005 through 2007.

Assessments of *indigenous aquatic life* use in streams were not updated in this cycle because proposed comprehensive changes to the Secondary Contact and Indigenous Aquatic Life Standards (see Section B-2) have not yet been approved by the Illinois Pollution Control Board. *Indigenous aquatic life* use was not updated this cycle for Lake Calumet because no new data were available.

Assessments of *primary contact* use and *secondary contact* use in streams were updated with Ambient Water Quality Monitoring Network data from 2004 through 2008. Because there were no new fecal coliform samples collected in lakes since the last report, no new assessments of *primary contact* use or *secondary contact* use were made for inland lakes.

Assessments of *fish consumption* use were generally updated with Fish Contaminant Monitoring Program data from 2007 and 2008. In some cases older data may also have been used.

Aquatic life use and *aesthetic quality* use in lakes were updated with Ambient Lake Monitoring Program and Illinois Clean Lakes Monitoring Program data from 2006 through 2008.

Public and food processing water supply use in streams was updated from a variety of data sources covering a period of 2001 through 2008. The same is true for inland lakes except that some updates may involve data as old as 1999.

Non-agency data sources such as the Lake County Health Department, the City of Chicago, the Metropolitan Water Reclamation District of Greater Chicago, the U.S. Geological Survey, TMDL contractors and others were also used for the assessment of various uses and water bodies.

Solicitation of Information

For assessing Illinois surface waters, Illinois EPA routinely considers data from three outside sources, including: 1. biological data (from streams) collected by the Illinois Department of Natural Resources as part of the Cooperative Intensive Basin Survey program described in Section C-1; 2. physicochemical water data provided by the city of Chicago for Lake Michigan (data from the city of Chicago were not received for this cycle); and,
3. physicochemical water data provided by the Lake County Public Health Department (Inland Lake data). We also retrieve data from the United States Geological Survey's Long Term

Resource Monitoring Program (*http://www.umesc.usgs.gov*) that focuses on the Upper Mississippi River and from the Survey's National Stream Water Quality Network monitoring program (*http://nwis.waterdata.usgs.gov*) for use in assessments.

In August, 2009, Illinois EPA updated the "*Guidance for Submittal of Surface Water Data For Consideration in Preparing the 2010 Integrated Report on Illinois Water Quality, including the List of Clean Water Act Section 303(d) Impaired Waters*" and associated data-solicitation information on the Illinois Environmental Protection Agency website (*www.epa.state.il.us/water/water-quality/guidance.html*). The guidance describes the required format for data packages and associated quality assurance documentation and provides instructions on how and when (by October 15, 2009) to submit data for consideration for assessments in this report. Postcards requesting water quality monitoring data with reference to the submittal guidance on the web site were sent to over 400 individuals and organizations representing watershed groups, wastewater facilities, environmental consultants, universities, environmental groups, governmental organizations, participants on various Illinois EPA workgroups, and people who commented on previous 303(d) Lists.

Data sets and other information were received from nine external organizations by October 15, 2009: the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), the Conservation Foundation, the Illinois Natural History Survey, the Rock River Water Reclamation District, the United States Environmental Protection (USEPA) Agency Region 5, the North Shore Sanitary District, the Alliance for the Great Lakes, the Lake County Health Department, the Fox Metro Water Reclamation District, and the Fox River Study Group. None of the above organizations submitted data in the requested format and in many cases additional data/information was needed. Subsequent follow up with several of these organizations resulted in revised data formats and/or additional information. Because of the length in time between the original data submittals, the re-submittals and the deadline for completion of assessments some of this data was not used.

Information and data that met Illinois EPA Quality Assurance/Quality Control requirements were evaluated and considered for assessments in this report. Information or data sets submitted by the following organizations were not used in this report.

- Alliance for the Great Lakes: Data and anecdotal information for Lake Michigan beaches collected by volunteers using field bacteria screening kits and litmus paper. This information has limited value for assessing primary contact use for 303(d)/TMDL purposes, especially since all public beaches along the Illinois Lake Michigan shore are monitored daily by local health departments using Standard Methods. This information can be found on U. S. EPA webpage BEACON (Beach Advisory and Closing On-line Notification).
- Illinois Natural History Survey: Information submitted consisted of a list of reports. No data was submitted.
- Fox River Metro: Original data was not submitted in the requested format. Revised format was submitted but there was insufficient time to review and use this data.
- Conservation Foundation/DuPage River-Salt Creek Workgroup/Midwest Biodiversity Institute (The Conservation Foundation is a member of the DuPage River-Salt Creek

Workgroup. The Dupage River-Salt Creek Workgroup is the owner of the data and the Midwest Biodiversity Institute is the contractor.): This data was not submitted on time and was not in the requested format. A review of biological and habitat data revealed some inconsistencies and possible problems. Revised data/information was not received in time to include all of the data in the assessment process.

On October 15, 2009, USEPA Region 5 submitted a document to Illinois EPA titled "Evaluation of Illinois EPA's removal of nitrogen as a cause of impairment for waters listed as impaired under CWA 303(d)." The cover letter indicated that this technical memorandum was being submitted "so that Illinois can consider this information in compiling its 2010 list." Unlike other information submitted to the Agency during the submission period, the technical memorandum and attachment did not contain any new raw data from Illinois waters that had not been previously submitted and evaluated for inclusion in this Integrated Report.

The submission by Region 5 provided comments on the Agency's assessment methodology and also provided information and data from other states and published studies that might prove useful in development of statewide nitrogen water quality standards. The Agency declines to use its Integrated Report methodology as a means to implement a new statewide water quality standard for total nitrogen which has not been established by State or federal law. Only the Pollution Control Board and U.S. EPA have authority to set statewide water quality standards in Illinois.

As Illinois EPA made a determination not to make any additional changes to its assessment methodology in the 2010 cycle until the 2008 303(d) list has been finalized, the Agency did not make the revisions suggested by USEPA or any other revisions to the methodology. Illinois EPA's detailed comments and legal analysis regarding USEPA's partial disapproval of the 2008 303(d) list and proposal to list additional waters (dated February 11, 2009) are available on the Agency's website at http://www.epa.state.il.us/water/tmdl/303d-list.html.

Quality Assurance Issues

Results of ammonia analysis performed by the Illinois EPA Champaign laboratory from 01/01/1997 through 06/30/2006 were not used because the results failed to meet quality control criteria or failed to meet data quality objectives.

PART B: BACKGROUND INFORMATION

B-1. Total Surface Waters

Illinois EPA uses the U.S. Geological Survey's National Hydrography Dataset (NHD) as the basis for mapping streams in the state. For the 2010 cycle, we upgraded the base layer used for this purpose from the medium resolution NHD (1:100,000 scale) to the high resolution NHD (1:24,000 scale). This resulted in a significant increase in the total stream miles considered in this report (from 71,394 to 119,244 stream miles) due to the inclusion of many small first and second order streams found in the high resolution NHD which are not included in the medium resolution NHD.

Illinois has abundant water resources (Table B-1). The U. S. Geological Survey's National Hydrography Dataset (NHD 1:24,000 scale) shows approximately 119,244 miles of streams within the state's borders, including major rivers such as the Big Muddy, Cache, Des Plaines, Embarras, Fox, Illinois, Kankakee, Kaskaskia, Little Wabash, Rock, Sangamon, and Vermilion rivers. In addition, the NHD shows 911 miles of large rivers forming the state's western (Mississippi River), eastern (in part, Wabash River), and southern (Ohio River) borders. Throughout this document, streams and rivers are collectively referred to as streams.

More than 91,400 inland lakes and ponds exist in Illinois, 3,256 of which have a surface area of six acres or more (Illinois Department of Natural Resources, 1999). About three-fourths of Illinois' inland lakes are man-made, including dammed stream and side-channel impoundments, strip-mine lakes, borrow pits, and other excavated lakes. Natural lakes include glacial lakes in the northeastern counties, sinkhole ponds in the southwest, and oxbow and backwater lakes along major rivers.

Illinois is bordered by one of the Great Lakes, Lake Michigan. The state has jurisdiction over approximately 1,526 square miles of open water and 63 miles of Lake Michigan shoreline, bordering Cook and Lake counties in the northeastern corner of the state. Lake Michigan is the third largest of the Great Lakes and is the largest body of fresh water located entirely within the boundaries of the United States. With the exception of the polar ice caps, the Great Lakes form the largest freshwater system on earth.

Table B-1. Illinois Atlas.

Topic	Value	Scale	Source
State Population in year 2000	12,419,293		US Census Bureau
State Surface Area (sq. mi.)	56,250		
Major Watersheds	33		USGS
Total Stream Miles	119,244	1:100,000	NHD
Interior Stream Miles	118,333	1:24,000	NHD
Perennial Streams	25,019	1:24,000	NHD
Intermittent Streams	78,245	1:24,000	NHD
Ditches and Canals	3676	1:24,000	NHD
Other	11,393	1:24,000	NHD
Border Stream Miles	911	1:24,000	NHD
Mississippi River	582	1:24,000	NHD
Ohio River	131	1:24,000	NHD
Wabash River	198	1:24,000	NHD
Inland Lakes and Ponds	91,456	(1)	(1)
Total Acreage	318,477	(1)	(1)
Total Inland Lakes (6 acres and more)	3,256	(1)	(1)
Total Inland Lake Acreage (6 acres and more)	253,224	(1)	(1)
Publicly-Owned Inland Lakes	1,279	(1)	(1)
Publicly-Owned Lake Acreage	154,333	(1)	(1)
Inland Lakes over 5,000 Acres	4	(1)	(1)
Acreage of Inland Lakes over 5,000 Acres	61,545	(1)	(1)
Lake Michigan		(1)	(1)
Illinois Shoreline Miles	63	(1)	(1)
Illinois Square Miles	1,526	(1)	(1)
Total Shallow Water Wetlands Acreage	720,000	(1)	(1)

NHD = National Hydrography Dataset

1. 1999 Inventory of Illinois Surface Water Resources, Illinois Department of Natural Resources, Division of Fisheries, April 2000

B-2. Surface Water Pollution Control Program

Illinois Surface Water Quality Standards[4]

Water pollution control programs are designed to protect the beneficial uses of the water resources of the state. Each state has the responsibility to set water quality standards that protect these beneficial uses, also called "designated uses." Illinois waters are designated for various uses including aquatic life, wildlife, agricultural use, primary contact (e.g., swimming, water skiing), secondary contact (e.g., boating, fishing), industrial use, drinking water, food-processing water supply and aesthetic quality. Illinois' water quality standards provide the basis for assessing whether the beneficial uses of the state's waters are being attained.

The Illinois Pollution Control Board is responsible for setting water quality standards to protect designated uses. The Illinois EPA is responsible for developing scientifically based water quality standards and proposing them to the Illinois Pollution Control Board for adoption into state rules and regulations. The federal Clean Water Act requires the states to review and update water quality standards every three years. Illinois EPA, in conjunction with USEPA, identifies and prioritizes those standards to be developed or revised during this three-year period.

The Illinois Pollution Control Board has established four primary sets (or categories) of narrative and numeric water quality standards for surface waters (Tables B-2 through B-4). Each set of standards is intended to help protect various designated uses established for each category (Table B-5).

- *General Use Standards* (35 Ill. Adm. Code Part 302, Subpart B) - These standards apply to almost all waters of the state and are intended to protect aquatic life, wildlife, agricultural, primary contact, secondary contact, and most industrial uses. *Primary contact* use is defined as "*any recreational or other water use in which there is prolonged and intimate contact with the water* [where the physical configuration of the water body permits it] *involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard, such as swimming and water skiing*" (35 Ill. Adm. Code 301.355). Secondary contact is "*any recreational or other water use in which contact with the water is either incidental or accidental and in which the probability of ingesting appreciable quantities of water is minimal, such as fishing, commercial and recreational boating, and any limited contact incident to shoreline activity*" (35 Ill. Adm. Code 301. 380). These General Use standards are also designed to ensure the aesthetic quality of the state's aquatic environment and to protect human health from disease or other harmful effects that could occur from ingesting aquatic organisms taken from surface waters of the state. Tables B-2 and B-3 summarize General Use standards.

- *Public and Food Processing Water Supply Standards* (35 Ill. Adm. Code Part 302, Subpart C) - These standards protect surface waters of the state for human

[4] Illinois' Groundwater Quality Standards are discussed in Volume II.

consumption or for processing of food products intended for human consumption. These standards apply at any point at which water is withdrawn for treatment and distribution as a potable water supply or for food processing. See Table B-2 for these standards.

- *Secondary Contact and Indigenous Aquatic Life Standards* (35 Ill. Adm. Code 302, Subpart D) - These standards are intended to protect limited uses of those waters not suited for general use activities but are nonetheless suited for *secondary contact* uses and capable of supporting *indigenous aquatic life* limited only by the physical configuration of the body of water, characteristics, and origin of the water and the presence of contaminants in amounts that do not exceed these water quality standards. Secondary Contact and Indigenous Aquatic Life standards apply only to waters in which the General Use standards and the Public and Food Processing Water Supply standards do not apply: about 86 miles of canals, channels and modified streams and Lake Calumet (Figure B-1), in northeastern Illinois (35 Ill. Adm. Code 303.441). These include:

    a) The Chicago Sanitary and Ship Canal;
    b) The Calumet-Sag Channel;
    c) The Little Calumet River from its junction with the Grand Calumet River to the Calumet-Sag Channel;
    d) The Grand Calumet River;
    e) The Calumet River, except the 6.8 mile segment extending from the O'Brien Locks and Dam to Lake Michigan;
    f) Lake Calumet;
    g) The South Branch of the Chicago River;
    h) The North Branch of the Chicago River from its confluence with the North Shore Channel to its confluence with the South Branch;
    i) The Des Plaines River from its confluence with the Chicago Sanitary and Ship Canal to the Interstate 55 bridge; and
    j) The North Shore Channel, excluding the segment extending from the North Side Sewage Treatment Works to Lake Michigan.

    See Table B-2 for these standards.

- *Lake Michigan Basin Water Quality Standards* (35 Ill. Adm. Code 302, Subpart E) - These standards protect the beneficial uses of the open waters, the harbors and waters within breakwaters, and the waters within Illinois jurisdiction tributary to Lake Michigan, except for the Chicago River, North Shore Channel, and Calumet River. See Table B-4 for these standards.

Figure B-1. Waters in which "Secondary Contact and Indigenous Aquatic Life Water Quality Standards" apply.

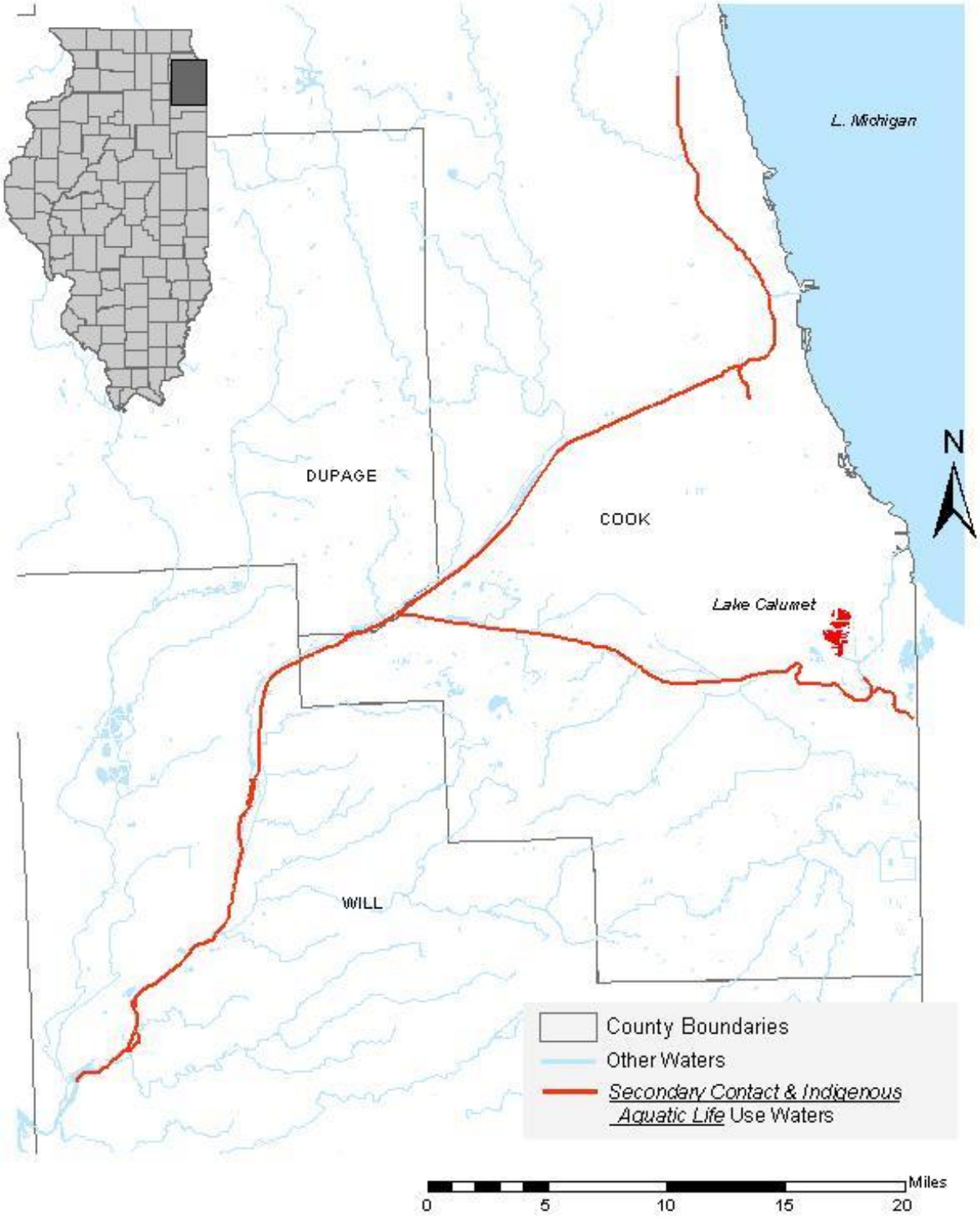


Table B-2. Illinois Surface Water Quality Standards[1].

PARAMETER	UNITS	GENERAL USE	PUBLIC AND FOOD PROCESSING WATER SUPPLY	SECONDARY CONTACT AND INDIGENOUS AQUATIC LIFE
pH	SU	6.5 minimum 9.0 maximum	---	6.0 minimum 9.0 maximum
Dissolved Oxygen	mg/L	**For most waters[2]:** March-July ≥ 5.0 min. & ≥ 6.0 7-day mean[2] Aug.-Feb ≥ 3.5 min, ≥ 4.0 7-day mean[2], & ≥ 5.5 30-day mean[2]. **For waters with enhanced protection [2]:** March-July ≥ 5.0 min & ≥ 6.25 7-day mean[2] Aug.-Feb ≥ 4.0 min, ≥ 4.5 7-day mean[2], & ≥ 6.0 30-day mean.[2]	---	4.0 minimum [3]
Arsenic	µg/L	[4]	50	1000
Barium	µg/L	5000	1000	5000
Boron	µg/L	1000	---	---
Cadmium	µg/L	[4]	10	150
Chloride	mg/L	500	250	---
Chromium (Total)	µg/L	---	50	---
Chromium (Trivalent)	µg/L	[4]	---	1000
Chromium (Hexavalent)	µg/L	[4]	---	300
Copper	µg/L	[4]	---	1000
Cyanide	mg/L	[4]	---	0.1
Fluoride	mg/L	1.4	---	15.0
Iron (Total)	µg/L	---	---	2000
Iron (Dissolved)	µg/L	1000	300	500
Lead (Total)	µg/L	---	50	100
Lead (dissolved)	µg/L	[4]	---	---
Manganese	µg/L	1000	150	1000
Mercury	µg/L	[4]	---	0.5
Nickel	µg/L	[4]	---	1000
Phenols	µg/L	100	1.0	300
Selenium	µg/L	1000	10	1000
Silver	µg/L	5.0	---	100
Sulfate	mg/L	2000[5]	250	---
Total Dissolved Solids	mg/L	---	500	1500
Total Residual Chlorine	µg/L	[4]	---	---
Zinc	µg/L	[4]	---	1000
Fecal Coliform Bacteria				
May-Oct.	count/100 ml	200[6], 400[7]	2000[6]	---
Nov.-April	count/100 ml	---	2000[6]	---

PARAMETER	UNITS	GENERAL USE	PUBLIC AND FOOD PROCESSING WATER SUPPLY	SECONDARY CONTACT AND INDIGENOUS AQUATIC LIFE
Total Ammonia Nitrogen	mg/L	15[4]	---	---
Un-ionized Ammonia Nitrogen	mg/L	---	---	0.1
Nitrate Nitrogen	mg/L	---	10	---
Oil and Grease	mg/L	---	0.1	15.0
Total Phosphorus	mg/L	0.05 [8]	---	---
Temperature	°C	2.8° maximum rise in water temperature[9]		37.8° max.& shall not exceed 34°more than 5% of time
Aldrin	µg/L	---	1	---
Dieldrin	µg/L	---	1	---
Endrin	µg/L	---	0.2	---
Total DDT	µg/L	---	50	---
Total Chlordane	µg/L	---	3	---
Methoxychlor	µg/L	---	100	---
Toxaphene	µg/L	---	5	---
Heptachlor	µg/L	---	0.1	---
Heptachlor epoxide	µg/L	---	0.1	---
Lindane	µg/L	---	4	---
Parathion	µg/L	---	100	---
2,4-D	µg/L	---	100	---
Silvex	µg/L	---	10	---
Benzene	µg/L	(4)	---	---
Ethylbenzene	µg/L	(4)	---	---
Toluene	µg/L	(4)	---	---
Xylene(s) (total)	µg/L	(4)	---	---

mg/L = milligrams per liter µg/L = micrograms per liter (---) Means no numeric standard specified.

1. 35 Ill. Adm. Code 302.
2. Applies to the dissolved oxygen concentration in the main body of all streams, in the water above the thermocline of thermally stratified lakes and reservoirs, and in the entire water column of unstratified lakes and reservoirs. Additional dissolved oxygen criteria are found in 35 Ill Adm. Code 302.206, including the list of waters with enhanced dissolved oxygen protection (Appendix D) and methods for assessing attainment of dissolved oxygen minimum and mean values.
3. Excluding the Calumet-Sag Channel, which shall not be less than 3.0 mg/L at any time.
4. Acute and Chronic Standards (see Table B-3).
5. At any point where water is withdrawn or accessed for purposes of livestock watering, the average of sulfate concentrations must not exceed 2,000 mg/L when measured at a representative frequency over a 30 day period, otherwise the sulfate standard is based on hardness and chloride values as explained in the table below:

Hardness (mg/L)	And/ Or	Chloride (mg/L)	Sulfate Standard
≥ 100 but ≤ 500	and	≥ 25 but ≤ 500	C = [1276.7 + 5.508 (hardness) – 1.457 (chloride)] * 0.65
≥ 100 but ≤ 500	and	≥ 5 but < 25	C = [-57.478 + 5.79 (hardness) + 54.163 (chloride)] * 0.65
< 100	or	<5	The sulfate standard is 500 mg/L
>500	and	≥ 5 and ≤ 500	The sulfate standard is 2000 mg/L

Where, C = sulfate concentration

6. Geometric mean based on a minimum of 5 samples taken over not more than a 30-day period.
7. Not to be exceeded by more than 10% of samples in any 30-day period.
8. Standard applies in any reservoir or lake $\geq$20 surface acres and in streams at the point of entry into these lakes or reservoirs.
9. In addition, the water temperature at representative locations in the main river shall not exceed maximum limits in the following table during more than one percent of the hours in the 12-month period ending with any month. Moreover, at no time shall the water temperature at such locations exceed the maximum limits in the following table by more than 1.7^{o} C (3^{o} F).

Month	**^{o} C**	**^{o} F**	**Month**	**^{o} C**	**^{o} F**
JAN.	16	60	**JUL.**	32	90
FEB.	16	60	**AUG.**	32	90
MAR.	16	60	**SEPT.**	32	90
APR.	32	90	**OCT.**	32	90
MAY	32	90	**NOV.**	32	90
JUNE	32	90	**DEC.**	16	60

Table B-3. Illinois Acute and Chronic General Use Water Quality Standards[1].

Constituent	Acute Standard[2]	Chronic Standard[3], [7]
Arsenic (trivalent, dissolved) (µg/L)	360 X 1.0*=360	190 X 1.0*=190
Cadmium (dissolved) (µg/L)	exp[A+Bln(H)] X {1.138672-[(lnH) X (0.041838)]}*, where A=-2.918 and B=1.128	exp[A+Bln(H)] X {1.101672-[(lnH) X (0.041838)]}*, where A=-3.490 and B=0.7852
Chromium (hexavalent, total) (µg/L)	16	11
Chromium (trivalent, dissolved) (µg/L)	exp[A+Bln(H)] X 0.316*, where A=3.688 and B=0.8190	exp[A+Bln(H)] X 0.860*, where A=1.561 and B=0.8190
Copper (dissolved) (µg/L)	exp[A+Bln(H)] X 0.960*, where A=-1.464 and B=0.9422	exp[A+Bln(H)] X 0.960*. where A=-1.465 and B=0.8545
Cyanide[4] (µg/L)	22	5.2
Lead (dissolved) (µg/L)	exp[A+Bln(H)] X {1.46203-[(lnH) X (0.145712)]}*, where A=-1.301 and B=1.273	exp[A+Bln(H)] X {1.46203-[(lnH) X (0.145712)]}*, where A=-2.863 and B=1.273
Mercury[5] (dissolved) (µg/L)	2.6 X 0.85*=2.2	1.3 X 0.85*=1.1
Nickel (dissolved) (µg/L)	exp[A+Bln(H)] X 0.998*, where A=0.5173 and B=0.8460	exp[A+Bln(H)] X 0.997*, where A=-2.286 and B=0.8460
Total Residual Chlorine (µg/L)	19	11
Zinc (dissolved) (µg/L)	exp[A+Bln(H)] X 0.978*, where A=0.9035 and B=0.8473	Exp[A+Bln(H)] X 0.986*, where A=-0.8165 and B=0.8473
Benzene[6] (µg/L)	4200	860
Ethylbenzene (µg/L)	150	14
Toluene (µg/L)	2000	600
Xylene(s) (µg/L)	920	360
Total Ammonia Nitrogen (Early Life Stage Present Period: March through October[8]) (mg/L)	$\frac{0.411}{1 + 10^{7.204-pH}} + \frac{58.4}{1 + 10^{pH-7.204}}$	When water temperature $\leq 14.51^{\circ}C$ $\left\{\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right\}(2.85)$ When water temperature $>14.51^{\circ}C$ $\left\{\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right\}(1.45*10^{0.028*(25-T)})$ Where T = Water Temperature, degrees Celsius
Total Ammonia Nitrogen (Early Life Stage Absent Period: November through February[8]) (mg/L)	$\frac{0.411}{1 + 10^{7.204-pH}} + \frac{58.4}{1 + 10^{pH-7.204}}$	When water temperature $\leq 7^{\circ}C$ $\left\{\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right\}(1.45*10^{0.504})$ When water temperature $>7^{\circ}C$ $\left\{\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right\}(1.45*10^{0.028(25-T)})$ Where T = Water Temperature, degrees Celsius
Total Ammonia Nitrogen (mg/L)	Total ammonia nitrogen must in no case exceed 15 mg/L	The subchronic standard = 2.5 times the chronic standard.

Footnotes for Table B-3

Where: Exp(x) = base of natural logarithms raised to x power and
ln(H) = natural logarithm of hardness of the receiving water in mg/L
* = conversion factor multiplier for dissolved metals

1. 35 Ill. Adm. Code 302.
2. Not to be exceeded except where a zone of initial dilution is granted.
3. Except for Total Ammonia Nitrogen, not to be exceeded by the average of at least four consecutive samples collected over any period of at least four days except where a mixing zone is granted.
4. STORET No. 718. Available cyanide is determined using USEPA Method OIA 1677.
5. Human health standard is 0.012 µg/L. The human health standard must be met on an annual average basis, 35 Ill Adm. Code 302.208 c, f.
6. Human health standard is 310 µg/L. The human health standard must be met on an annual average basis, 35 Ill Adm. Code 302.208 c, f.
7. For Total Ammonia Nitrogen, the 30-day average concentration of total ammonia nitrogen (in mg/L) must not exceed the chronic standard (CS) by an average of at least four samples collected at weekly intervals or at other sampling intervals that statistically represent a 30-day sampling period. The 4-day average concentration of total ammonia nitrogen (in mg/L) must not exceed the subchronic standard by averaging daily sample results collected over a period of four consecutive days within the 30-day averaging period.
8. The Early Life Stage Present period occurs from March through October. In addition, during any other period when early life stages are present, and where the water quality standard does not provide adequate protection for these organisms, the water body must meet the Early Life Stage Present water quality standard. All other periods are subject to the Early Life Stage Absent period.

Table B-4. Lake Michigan Basin Water Quality Standards.

Parameter	Unit	*Aquatic Life* Use [1]			Human Health Standard [5]	Water Quality or HHS[6] Standard for "Open Waters" only[6]	Water Quality Standard for other uses[7]	Wildlife Standard [8]
		AS [2]	CS [3]	Other [4]				
Arsenic (trivalent, dissolved)	µg/L	340	148	NA[9]	NA	NA	NA	NA
Arsenic (total)	µg/L	NA	NA	NA	NA	50.0	NA	NA
Cadmium (dissolved)	µg/L	exp[A+Bln(H)]X{1.138672–[(lnH)X∗0.041838)]}, where A = -3.6867 B = 1.128	exp[A+Bln(H)]X{1.138672–[(lnH)X∗0.041838)]}, where A = -2.715 B = 0.7852	NA	NA	NA	NA	NA
Chromium (hexavalent, total)	µg/L	16	11	NA	NA	NA	NA	NA
Chromium (trivalent, dissolved)	µg/L	exp[A+Bln(H)] X 0.316, where A = 3.7256 B = 0.819	exp[A+Bln(H)] X 0.860, where A = 0.6848 B = 0.819	NA	NA	NA	NA	NA
Copper (dissolved)	µg/L	exp[A+Bln(H)] X 0.960, where A = -1.700 B = 0.9422	exp[A+Bln(H)] X 0.960, where A = -1.702 B = 0.8545	NA	NA	NA	NA	NA
Cyanide (weak acid dissociable)	µg/L	22	5.2	NA	NA	NA	NA	NA
Lead (dissolved)	µg/L	exp[A+Bln(H)] X {1.46203-[(lnH)∗0.145712)]}, where A = -1.055 B = 1.273	exp[A+Bln(H)] X {1.46203-[(lnH)∗0.145712)]}, where A = -4.003 B = 1.273	NA	NA	NA	NA	NA
Lead (total)	µg/L	NA	NA	NA	NA	50.0	NA	NA
Nickel (dissolved)	µg/L	exp[A+Bln(H)] X 0.998, where A = 2.255 B = 0.846	exp[A+Bln(H)] X 0.997, where A = 0.0584 B = 0.846	NA	NA	NA	NA	NA
Selenium (dissolved)	µg/L	NA	5.0	NA	NA	NA	NA	NA
Selenium (total)	µg/L	NA	NA	NA	NA	10.0	NA	NA
Total Residual Chlorine	µg/l	19	11	NA	NA	NA	NA	NA
Zinc (dissolved)	µg/L	exp[A+Bln(H)] X 0.978, where A = 0.884 B = 0.8473	exp[A+B ln(H)] X 0.986, where A = 0.884 B = 0.8473	NA	NA	NA	NA	NA
Benzene	µg/L	3900	800	NA	310	HHS: 12.0	NA	NA
Chlorobenzene	mg/L	NA	NA	NA	3.2	HHS: 0.470	NA	NA
2,4 – Dinitrophenol	mg/L	NA	NA	NA	2.8	HHS: 0.0550	NA	NA
Endrin	µg/L	0.086	0.036	NA	NA	NA	NA	NA
Hexachloroethane	µg/L	NA	NA	NA	6.7	HHS: 5.30	NA	NA
Methylene Chloride	mg/L	NA	NA	NA	2.6	HHS: 0.0470	NA	NA
Parathion	µg/L	0.065	0.013	NA	NA	NA	NA	NA
Pentachlorophenol	µg/L	exp B([pH] + A), where A = -4.869 B = 1.005	exp B([pH] + A), where A = -5.134 B = 1.005	NA	NA	NA	NA	NA
Ethylbenzene	µg/L	150	14	NA	NA	NA	NA	NA
Toluene	mg/L	2000	610	NA	51.0	HHS: 5.60	NA	NA

Parameter	Unit	*Aquatic Life* Use [1]			Human Health Standard [5]	Water Quality or HHS[6] Standard for "Open Waters" only[6]	Water Quality Standard for other uses[7]	Wildlife Standard [8]
		AS [2]	CS [3]	Other [4]				
Xylene(s) (total)	µg/l	1200	490	NA	NA	NA	NA	NA
Trichloroethylene	µg/L	NA	NA	NA	370	HHS: 29.0	NA	NA
Barium (total)	mg/L	NA	NA	5.0	NA	1.0	NA	NA
Boron (total)	mg/L	NA	NA	NA	NA	NA	1.0	NA
Chloride	mg/L	NA	NA	500	NA	12.0	NA	NA
Fluoride	mg/L	NA	NA	NA	NA	NA	1.4	NA
Iron (dissolved)	mg/L	NA	NA	1.0	NA	0.30	NA	NA
Manganese (total)	mg/L	NA	NA	1.0	NA	0.15	NA	NA
Phenols	µg/l	NA	NA	NA	NA	1.0	100	NA
Sulfate	mg/L	NA	NA	NA	NA	24.0	500	NA
Total Dissolved Solids	mg/L	NA	NA	1000	NA	180.0	NA	NA
Nitrate-Nitrogen	mg/L	NA	NA	NA	NA	10.0	NA	NA
Phosphorus	µg/L	NA	NA	NA	NA	7.0	NA	NA
Lindane	µg/L	0.95	NA	NA	0.5	HHS: 0.47	NA	NA
Un-ionized ammonia:								
April-October	mg/L	0.33 [10]	0.057 [10]	NA	NA	NA	NA	NA
November-March	mg/L	0.14 [10]	0.025 [10]	NA	NA	NA	NA	NA
Total Ammonia-Nitrogen	mg/L	NA	NA	15	NA	0.02	NA	NA
Fecal coliform bacteria	#/100 ml	NA	NA	NA	NA	20[11]	200/400[12]	NA
pH minimum	SU	NA	NA	6.5	NA	7.0	NA	NA
pH maximum	SU	NA	NA	9.0	NA	9.0	NA	NA
Dissolved Oxygen	mg/L	NA	NA	– [13]	NA	NA	NA	NA
Mercury (total)	ng/L	1700	910	NA	3.1	NA	NA	1.3
Chlordane	ng/L	NA	NA	NA	0.25	NA	NA	NA
DDT and metabolites	pg/L	NA	NA	NA	150	NA	NA	11.0
Dieldrin	ng/L	240	56	NA	0.0065	NA	NA	NA
Hexachlorobenzene	ng/L	NA	NA	NA	0.45	NA	NA	NA
PCBs (class)	pg/L	NA	NA	NA	26	NA	NA	120
2,3,7,8-TCDD	fg/L	NA	NA	NA	8.6	NA	NA	3.1
Toxaphene	pg/L	NA	NA	NA	68	NA	NA	NA
2,4-Dimethylphenol	mg/L	NA	NA	NA	8.7	HHS: 0.450	NA	NA
Oil (hexane solubles or equivalent)	mg/L	NA	NA	NA	NA	0.10	NA	NA
Temperature	(Refer to 35 Ill. Adm. Code 302.506, 302.507, 302.508, 302.509)							

Where:
mg/L = milligrams per liter (10^{-3} grams per liter)
µg/L = micrograms per liter (10^{-6} grams per liter)
ng/L = nanograms per liter (10^{-9} grams per liter)
pg/L = picograms per liter (10^{-12} grams per liter)
NA = Criterion currently not available or not applicable
Exp (x) = base of natural logarithms raised to the x-power
ln(H) = natural logarithm of Hardness
fg/L – femtograms per liter (10^{-15} grams per liter)

Footnotes for Table B-4

1 35 Ill. Adm. Code 302
2 Acute standard – not to be exceeded at any time (35 Ill. Adm. Code 302.504 a, e). These criteria apply in all waters of the Lake Michigan Basin.
3 Chronic standard – not to be exceeded by the arithmetic average of at least four consecutive samples over a period of at least four days (35 Ill. Adm. Code 302.504 a, e). These criteria apply in all waters of the Lake Michigan Basin.
4 Other water quality standards applicable to *aquatic life* use (35 Ill. Adm. Code 302.502, 302.503, 302.504 b). These criteria apply in all waters of the Lake Michigan Basin unless an open waters water quality standard is specified. In these cases, the criterion in the *aquatic life* use column applies to all waters of the Lake Michigan Basin other than the open waters.
5 Human health standard – not to be exceeded by the arithmetic average of at least four consecutive samples over a period of at least four days (35 Ill. Adm. Code 302.504 a, d, e). For each parameter, the criterion applies in all waters of the Lake Michigan Basin unless an open waters human health standard is specified. In these cases, the standard in the "Human Health Standards" column applies to all waters of the Lake Michigan Basin other than the open waters.
6 Water quality standards or human health standards, specified as "HHS," apply only in the open waters of the Lake Michigan Basin (35 Ill. Adm. Code 302.504 c, d; 302.502; 302.503; 302.505; 302.535).
7 Water quality standards applicable to uses other than *aquatic life* use. These do not include Public and Food Processing Water Supply Standards applicable at some locations in the waters of the Lake Michigan Basin; for these standards see Table B-2.
8 Wildlife standard – not to be exceeded by the arithmetic average of at least four consecutive samples over a period of at least four days (35 Ill. Adm. Code 302.504 e). These criteria apply in all waters of the Lake Michigan Basin.
9 "NA" means that a numeric criterion currently is not available, but may be derived in the future as per 35 Ill. Adm. Code 302.540.
10 Acute standard and chronic standard for un-ionized ammonia computed as per 35 Ill. Adm. Code 302.535 c.
11 Based on a minimum of five samples taken over not more than a 30-day period.
12 For Lake Michigan-basin waters other than open waters, fecal coliform bacteria must not exceed a geometric mean of 200 per 100 ml, nor shall more than 10% of the samples during any 30-day period exceed 400 per 100 ml, based on a minimum of five samples taken over not more than a 30-day period.
13 Dissolved oxygen must not be less than 90% of saturation, except due to natural causes, in the open waters of the Lake Michigan Basin (as defined at 35 Ill. Adm. Code 302.501). The other waters of the Lake Michigan Basin (i.e., tributaries, harbors and areas within breakwaters of Lake Michigan) must not be less than 6.0 mg/L during at least 16 hours of any 24 hour period, nor less than 5.0 mg/L at any time.

Table B-5. Illinois Designated Uses and Applicable Water Quality Standards.

Illinois EPA Designated Uses Assessed in 2010	Illinois Waters in which the Designated Use and Standards Apply[1]	Applicable Illinois Water Quality Standards
Aquatic Life	Streams, Inland Lakes	General Use Standards
	Lake Michigan-basin waters	Lake Michigan Basin Standards
Aesthetic Quality	Streams, Inland Lakes	General Use Standards
	Lake Michigan-basin waters	Lake Michigan Basin Standards
Indigenous Aquatic Life	Specific Chicago Area Waters (Figure B-1)	Secondary Contact and Indigenous Aquatic Life Standards
Primary Contact (Swimming)	Streams, Inland Lakes	General Use Standards
	Lake Michigan-basin waters	Lake Michigan Basin Standards
Secondary Contact	Streams, Inland Lakes	General Use Standards
	Lake Michigan-basin waters	Lake Michigan Basin Standards
	Specific Chicago Area Waters (Figure B-1)	Secondary Contact and Indigenous Aquatic Life Standards
Public and Food Processing Water Supply	Streams, Inland Lakes, Lake Michigan-basin waters	Public and Food Processing Water Supply Standards
Fish Consumption	Streams, Inland Lakes	General Use Standards (Human Health)
	Lake Michigan-basin waters	Lake Michigan Basin Standards (Human Health)
	Specific Chicago Area Waters (Figure B-1)	Secondary Contact and Indigenous Aquatic Life Standards

1. As defined in 35 Ill. Adm. Code 302.201 and 303.

Narrative Standards and Antidegradation Regulations

Water quality standards generally consist of three components: designated uses, a set of numeric and narrative criteria to protect those uses, and an antidegradation statement. In Illinois, the antidegradation statement (35 Ill. Adm. Code 302.105) is separate and covers all designated uses. This component of Illinois' water quality standards describes regulations which protect "*existing uses of all waters of the State of Illinois, maintain the quality of waters with quality that is better than water quality standards, and prevent unnecessary deterioration of waters of the State*."

While the majority of Illinois' water quality standards are in the form of numeric criteria as shown in Tables B-2, B-3, and B-4, several aspects of the standards have narrative elements. The standard for water temperature in both the General Use Standards (35 Ill. Adm. Code 302.211) and the Lake Michigan Basin Standards (35 Ill. Adm. Code 302.507) has a narrative element which prohibits "*abnormal temperature changes that may affect aquatic life*" and any disruptions in the "*normal daily and seasonal temperature fluctuations that existed before the addition of heat*." Narrative language in the General Use and Lake Michigan Basin standards (35 Ill. Adm. Code 302.210, 302.540) also protects waters from any toxic substances "*harmful to human health, or to animal, plant or aquatic life.*" In addition, the Public and Food Processing Water Supply Standards also contain narrative elements (35 Ill. Adm. Code 302.303, 302.305) that prohibit concentrations of contaminants hazardous to human health in waters used for human consumption. Furthermore, "*Offensive Conditions*" such as "*sludge or bottom deposits, floating debris, visible oil, odor, plant or algal growth, color or turbidity of other than natural origin*" are prohibited in all waters of the state (35 Ill. Adm. Code 302.203, 302.403, 302.515).

Derived Water Quality Criteria

The narrative standards in Title 35 of the Illinois Administrative Code, Section 302.210 and in Subpart F for General Use Waters and at 302.540 and elsewhere in Subpart E allow the Illinois EPA to derive numeric water quality criteria values for any substance that does not already have a numeric standard in the Illinois Pollution Control Board regulations. These criteria serve to protect aquatic life, human health or wildlife, although wildlife based criteria have not yet been derived. Illinois EPA derived criteria can be found at following the web site: http://www.epa.state.il.us/water/water-quality-standards/water-quality-criteria.html.

Proposed Revisions to the Secondary Contact and Indigenous Aquatic Life Standards

These standards currently apply to portions of the Chicago, Calumet and Lower Des Plaines River drainages which were altered, in various stages during the mid 1800s into the mid 1900s, to promote commercial navigation and to eliminate untreated sewage from flowing into Lake Michigan. These waters were greatly impacted by hydromodification, alteration in flow, and storm water and waste water discharges from the urban development of the Chicago metropolitan area. At the time of standards development it was believed these waters could not meet the interim goal of the Clean Water Act. The Secondary Contact and Indigenous Aquatic Life Standards were intended to provide some level of protection for these highly modified waters which were not suited for General Use activities.

Since the implementation of the standards in the 1970s water quality improved and questions arose as to the potential of these waters and what level of protection they should receive. Two separate Use Attainability Analyses (UAA) were conducted; one on the lower Des Plaines River (AquaNova International, Ltd. and Hey & Associates, Inc., 2003), and one on the Chicago Area Waterway System (Camp, Dresser and McKee, 2007). The main purpose of the UAAs was to determine if the Secondary Contact and Indigenous Aquatic Life Use waters could meet the aquatic life and recreational goals of the Clean Water Act or, if these goals could not be met, what beneficial uses could be attained in those waters.

Illinois EPA used the two UAAs to form a single rulemaking proposal and on October 26, 2007 filed a rulemaking notice with the Illinois Pollution Control Board. The result is an exhaustive and detailed rulemaking proposal which includes changes in definitions, use designations and the subdivision of the segments of the UAA waters into the new Use Designation Categories. The proposal also includes changes to Part 302, Subparts A and D which replace the existing narrative and numerical water quality standards necessary to protect the Secondary Contact and Indigenous Aquatic Life Uses with new standards designed to protect newly defined uses. Finally, changes are proposed to Part 304 that address effluent limitations for bacteria discharges. The complete proposal can be found on the Illinois Pollution Control Board website at http://www.ipcb.state.il.us/documents/dsweb/Get/Document-59147/.

Water Pollution Control Programs for Surface Water

The Illinois Environmental Protection Act of 1970 established a statewide program for environmental protection and assigned authority to implement purposes of the Act to three entities. The Illinois Pollution Control Board was assigned the responsibility of establishing the basic regulations and standards necessary for the preservation of the environment. The Act also created and established the Illinois EPA as the principal state agency for implementation of environmental programs. This includes activities such as monitoring, watershed planning, permitting, financial assistance administration, compliance assurance, and program management conducted to prevent, control and abate water pollution in Illinois. The Illinois EPA is responsible for the maintenance and updating of the state Water Quality Management Plan that identifies the state's goals and objectives pertaining to water quality activities.

The Act further established the Illinois Institute for Environmental Quality as the research and education arm of the state's environmental protection apparatus. These responsibilities were subsequently assumed by the Illinois Department of Energy and Natural Resources that, in July 1995, became part of the Illinois Department of Natural Resources.

Water resource management activities involving interstate waters are also coordinated with various interstate committees and commissions. The Illinois EPA participates in water-resource management activities of the Association of State and Interstate Water Pollution Control Administrators, International Joint Commission of the Great Lakes Water Quality Board, Ohio River Valley Water Sanitation Commission, Upper Mississippi River Conservation Committee, Upper Mississippi River Basin Association, Council of Great Lakes Governors, and other interstate committees and commissions.

Point Source Pollution Control

Discharges that enter surface waters through a pipe, ditch or other well-defined point of discharge are broadly referred to as "point sources." Common point source discharges include wastewater treatment facilities serving municipalities, industries, residential developments, retail and commercial complexes, schools, mobile home parks, military installations, state parks, resorts/campgrounds, prisons, and individual residences. Other wastewater point source discharges can come from municipal combined sewer overflows (CSOs), concentrated animal feeding operations, mines, groundwater remediation projects, and water treatment plants.

The most significant contaminants of concern from domestic point sources (non-industrial) and CSOs include nutrients, deoxygenating wastes and dissolved solids. Bacterial contamination can also be a concern from CSOs. Contaminants from industrial dischargers vary by source.

The National Pollutant Discharge Elimination System (NPDES) was established by the Clean Water Act in 1972 and has been administered by the Illinois EPA since 1973. The program requires permits for the discharge of treated municipal effluent, treated industrial effluent, storm water and other dischargers. The permits establish the conditions under which the discharge may occur and establish monitoring and reporting requirements.

In all areas except pretreatment, the state of Illinois has been delegated NPDES permitting authority pursuant to Sections 402 and 303(e) of the CWA, and has the responsibility for issuance, reissuance, modification and enforcement of NPDES Permits. The procedures for the issuance of permits are established by a memorandum of agreement with the USEPA, the regulations under 40 Code of Federal Regulations 122, 123, 124 and 125, and the Illinois Administrative Code, Title 35, Environmental Protection. The priorities for permit issuance are established based on the economic needs of the state, guidance from USEPA, and the needs of the Illinois EPA in implementing the construction grants/loans program.

The Clean Water Act Amendments of 1987 established the NPDES storm water program. Municipalities located in urban areas as defined by the Census Bureau are required to obtain NPDES permit coverage for discharges from their municipal separate storm sewer systems. Construction sites that disturb one acre or more are required to have coverage under the NPDES general permit for storm water discharges from construction site activities.

Nonpoint Source Pollution Control

Precipitation moving over and through the ground picks up pollutants from farms, cities, mined lands, and other landscapes and carries these pollutants into rivers, lakes, wetlands, and groundwater. This is type of pollution is called nonpoint source pollution (NPS), and major sources in Illinois include agriculture, construction erosion, urban runoff, hydrologic modifications, and resource extraction activities. Under Section 319(h) of the Clean Water Act, the Illinois EPA receives federal funds to implement nonpoint source pollution control projects in cooperation with local units of government and other organizations. The program emphasizes funding for implementing corrective and preventative best management practices (BMPs) on a

watershed scale; demonstration of new and innovative BMPs on a nonwatershed scale; and the development of information/education NPS pollution control programs.

303(d)/Total Maximum Daily Load Program

As stated earlier, section 303(d) of the federal Clean Water Act requires states to identify waters that do not meet applicable water quality standards. States are required to submit a prioritized list of impaired waters, known as the 303(d) List, to the USEPA for review and approval (Appendix A).

The CWA also requires that a Total Maximum Daily Load (TMDL) be developed for each pollutant of an impaired water body. The establishment of a TMDL sets the pollutant reduction goal necessary to improve impaired waters. It determines the load (i.e., quantity) of any given pollutant that can be allowed in a particular water body. A TMDL must consider all potential sources of pollutants, whether point or nonpoint. It also takes into account a margin of safety, which reflects scientific uncertainty, as well as the effects of seasonal variation.

After the reduced pollutant loads have been determined, an implementation plan is developed for the watershed spelling out the actions necessary to achieve the goals. The plan specifies limits for point source discharges and recommends best management practices for nonpoint sources. It also estimates associated costs and lays out a schedule for implementation. Commitment to the implementation plan by the citizens who live and work in the watershed is essential to success in reducing the pollutant loads and improving water quality. The status of all TMDLs in the state is discussed in Section C-3.

Watershed Management Program

The Illinois EPA Bureau of Water implements a Watershed Management Program to protect and restore natural resources. This initiative incorporates common sense approaches that emphasize involvement from citizens and the regulated community. In recent years, there has been an increased awareness among natural resource managers regarding the interdependence of natural systems. As a result, a more comprehensive approach to natural resource management has emerged, using watersheds as the basic management unit. Water quality standards define the water quality goals for all water bodies in a watershed and are the driving force behind this initiative. The Watershed Management Program looks holistically at the range of problems that affect a given watershed, taking into account that most watersheds are not experiencing a single problem, but are faced with an array of interrelated concerns.

The objective of the Watershed Management Program is to develop an integrated, holistic process to effectively and efficiently protect, enhance and restore the physical, chemical, and biological integrity of our water resources within a defined hydrologic area. This comprehensive approach focuses on the total spectrum of water resource issues, including the following:

1. Integration of water pollution control and drinking-water issues. The environmental goals of this program were chosen to reflect statewide progress in areas of water quality, safety of drinking water provided to Illinois citizens, and overall reduction in water related pollutant

loading. The interrelationship of water pollution control and drinking water provides an opportunity to address requirements of both the Clean Water Act and the Safe Drinking Water Act in a holistic manner.

2. Integration of regulatory and nonregulatory programs. Regulatory programs are currently in place to deal with point sources of pollution. These regulatory programs have been very effective in improving water quality conditions nation wide. However, to address the challenges we now face in controlling nonpoint sources of pollution, the key to success lies in a combination of voluntary approaches (regarding issues for which we currently have no regulatory authority), while maintaining strong and effective regulatory controls through both compliance assistance and enforcement when necessary.

3. Addressing surface and groundwater-resource issues. Where surface and groundwater issues are linked within a watershed, program approaches compliment the resolution of both concerns in a manner that improves or protects both resources. This is accomplished through such activities as targeting of noncompliance discharges within a watershed, and expansion of wellhead and recharge zone protection areas.

B-3. Cost/Benefit Assessment

Section 305(b) requires the state to report on the economic and social costs and benefits necessary to achieve Clean Water Act objectives. Information on costs associated with water quality improvements is complex, and not readily available for developing a complete cost/benefit assessment. The individual program costs of pollution control activities in Illinois, the general surface water quality improvements made, and the average groundwater protection program costs follow.

Cost of Pollution Control and Water Protection Activities

The Illinois EPA Bureau of Water distributed a total of $121.0 million in loans during 2008 for construction of municipal wastewater treatment facilities. Other Water Pollution Control program and Groundwater/Source Water Protection costs for Bureau of Water activities conducted in 2008 are summarized in Table B-6.

Table B-6. Water Pollution Control Program Costs for the Illinois Environmental Protection Agency's Bureau of Water, 2008.

Activity	Total
Monitoring	$5,277,300
Planning	$1,517,400
Point Source Control Programs	$14,011,000
Nonpoint Source Control Programs	$9,469,000
Groundwater/Source-Water Protection	$2,102,400
Total	$32,377,100

General Surface Water Quality Improvements

Economic benefits of water quality improvements, while difficult to quantify, include increased opportunities for water-based recreational activities, enhanced commercial and sport fisheries, recovery of damaged aquatic environments, and reduced costs of water treatment to various municipal and industrial users. While assessment methods have improved over time making comparisons with previous years' assessments difficult to interpret, the summary of attainment of *aquatic life* use in streams and inland lakes indicates improvement in these waters. The number of assessed stream miles reported in good condition has improved from 34.7 percent in 1972 to 63.2 percent in 2010, while during that same period, the miles reported in poor condition declined from 11.3 percent to 6.2 percent. The lake acreage assessed in good condition for aquatic life use has also improved from 17.8 percent in 1972 to 91.3 percent in 2010. During the same time period, the lake acreage assessed in poor condition has declined from 27.8% in 1972 to 0.0 percent in 2010.

PART C: SURFACE WATER MONITORING AND ASSESSMENT

C-1. Monitoring Program

Illinois EPA's "Surface Water Monitoring Strategy" (Illinois EPA 2007) provides a detailed discussion of all agency monitoring programs. Field, laboratory, and data-management procedures are explained in the Illinois EPA Bureau of Water's "Quality Assurance Project Plan" (Illinois EPA 1994). Specific programs that contribute data to the assessment process are briefly described below.

Streams

Ambient Water Quality Monitoring Network

The Ambient Water Quality Monitoring Network (AWQMN) consists of 146 fixed stations. At each station water samples are collected once every six-weeks and analyzed for a minimum of 55 universal parameters including field pH, temperature, specific conductance, dissolved oxygen, suspended solids, nutrients, fecal coliform bacteria, and total and dissolved metals. Additional parameters specific to the station, watershed, or subnetwork within the ambient network are also analyzed.

Pesticide Monitoring Subnetwork

The Illinois EPA has been routinely monitoring pesticides in water column samples at a subset of 30 ambient stations since October 1985. Analytes include common herbicides and insecticides currently in use. In addition the samples are also analyzed for organochlorine pesticides, such as DDT, along with polychlorinated biphenyls (PCBs). The program has under gone a number of modifications over the years.

Sampling frequency was reduced from the initial five times per year to three times year in 1991. The new sampling was based on one pre-application sample, typically in March, and two post-application samples during mid-April through July. In 1996, site selection for pesticide monitoring at ambient stations was modified to correspond with other monitoring programs based on a 5-year basin rotation. In 2002, six of the original pesticide monitoring stations were re-established with a sampling frequency of 9 times per year. The remaining 24 stations continued to be allocated within the 5-year basin rotation at three times per year.

In 2006, the total number of sites was reduced to 20 and reflected a new emphasis on monitoring pesticides at ambient stations near public water supply intakes along with continued monitoring at some of the original stations for long term trends. Sampling frequency reflected the routine ambient schedule, typically nine times per year. Currently those sites include: Lusk Creek (AK-02), Salt Fork Vermilion River (BPJ-03), Skillet Fork (CA-05), Illinois River (D-23 and D-30), Vermilion River (DS-06), Sangamon River (E-06 and E-18), Kankakee River (F-16), Des

Plaines River (G-15), Bear Creek (KI-02), Mississippi River (I-05, J-98, K-17, K-22, M-02), Kaskaskia River (O-07, O-08, O-30) and Shoal Creek (OI-08).

Facility-Related Stream Surveys

Illinois EPA conducts Facility-Related Stream Surveys that collect macroinvertebrate, water chemistry, stream flow, and habitat data upstream and incrementally downstream of discharges from municipal and industrial wastewater treatment facilities. Information is used to evaluate water quality impacts and the need for additional wastewater treatment controls. Data are also used to characterize the existing and potential resource quality of the receiving stream, to determine biological impacts on the receiving stream, and to support the Bureau of Water's National Pollutant Discharge Elimination System permitting activities.

Intensive Basin Surveys

Illinois EPA conducts Intensive Basin Surveys in cooperation with the Illinois Department of Natural Resources. These surveys are a major source of information for assessments of *aquatic life* use. Sampling is organized by drainage basin on a five-year schedule (Figure C-1): in any single year, a subset of basins is sampled so that statewide coverage is achieved once every five years. Sampling locations are selected based on where data are currently lacking or historical data needs updating. Water chemistry and biological information (fish and macroinvertebrate assemblages) plus qualitative and quantitative instream-habitat information (including stream discharge) are collected to characterize stream segments, to identify resource conditions, and to assess attainment of *aquatic life* use. Samples of fish tissue (see below) and sediment are also collected to screen for the accumulation of toxic substances.

Fish Contaminant Monitoring Program

The Illinois Fish Contaminant Monitoring Program (FCMP) is responsible for determining the levels of contaminants in Illinois sport fish and issuing consumption advisories for species found to be contaminated above specified levels. The FCMP operates under a Memorandum of Agreement (MOA), last renewed in 1989, that spells out many details of the responsibilities of the participating agencies (Depts. of Agriculture, Natural Resources, Nuclear Safety, Public Health and Environmental Protection Agency). However, certain procedures and criteria for the determination and issuance of consumption advisories are now outdated or not specified in the MOA, leaving these elements to the discretion of the agencies. To address this, the FCMP now closely follows the procedures recommended in the *Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory* (Anderson et al. 1993), and has adopted as policy over the years certain other procedures that replace outdated procedures in the MOA, or are not specifically addressed by the MOA for the determination of advisories. Key elements of the procedures and policies for issuing the advisories include:

- The MOA lays out various tasks for the member agencies that allow the FCMP to collect, process, analyze, and preserve for possible future analysis sufficient numbers and sizes of

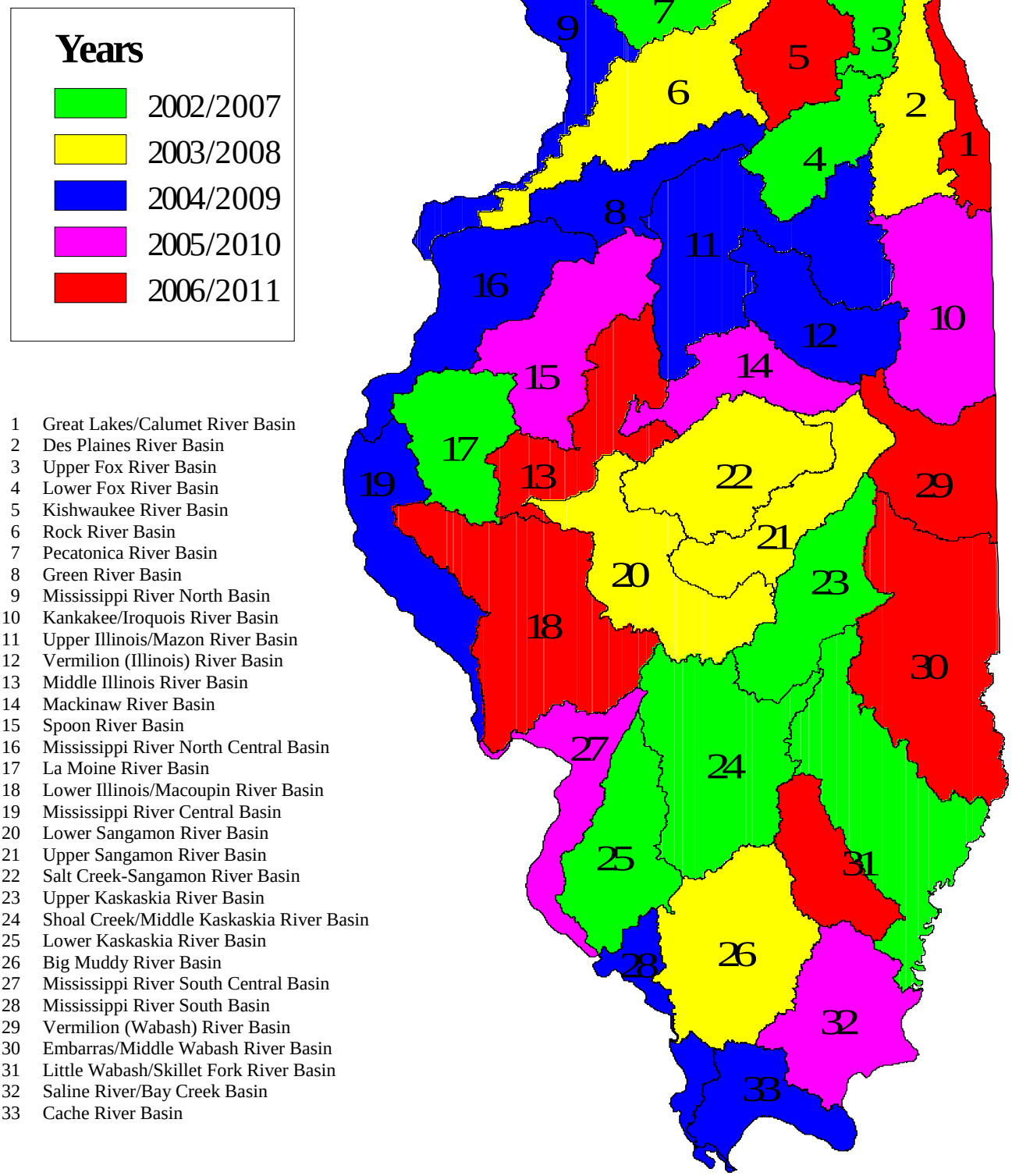
sport fish samples from across the state to evaluate levels of contaminants in most bodies of water accessible to anglers. The goal of the FCMP is to sample most accessible waters every five to ten years, except for waters already under an advisory. In these cases, more frequent sampling is used to assess whether changes in the advisory are needed.

- The MOA specifies the collection of filet and whole fish samples from a network of 73 permanent stations for annual or biennial monitoring of trends in contaminant levels over time, plus additional samples from across the state to evaluate important sport-fishing waters. However, the funding source for trend-monitoring has since been lost, and the existing funding at this time is dedicated to the analysis of filet samples for advisory purposes. Therefore, since 1993 only filet samples are analyzed and the permanent monitoring stations are sampled at the same frequency as similar stations across the state.

- The MOA specifies collection of a core set of samples from each body of water to be evaluated. These samples are to be composites of filets from three to five fish of similar size, and are to include two different sizes of bottom feeders (preferably carp), one sample of an omnivorous species (preferably channel catfish), and one sample of a predatory species (preferably largemouth or smallmouth bass). These samples are analyzed for a suite of 14 bioaccumulative organic chemicals and mercury. If a sample is found to contain one or more of the analytes above a criterion, the FCMP has adopted a policy of requiring a second set of samples from the water, which should include two bottom feeders, two omnivores, two predators, and one or more additional species of local importance to confirm the original findings and provide sufficient data for the issuance of advisories if needed.

- The Protocol stresses the benefits of fish consumption. Language relaying this message is included with all consumption advisories issued.

Figure C-1. IEPA/IDNR Intensive Basin Schedule, 2002-2011.



1 Great Lakes/Calumet River Basin
2 Des Plaines River Basin
3 Upper Fox River Basin
4 Lower Fox River Basin
5 Kishwaukee River Basin
6 Rock River Basin
7 Pecatonica River Basin
8 Green River Basin
9 Mississippi River North Basin
10 Kankakee/Iroquois River Basin
11 Upper Illinois/Mazon River Basin
12 Vermilion (Illinois) River Basin
13 Middle Illinois River Basin
14 Mackinaw River Basin
15 Spoon River Basin
16 Mississippi River North Central Basin
17 La Moine River Basin
18 Lower Illinois/Macoupin River Basin
19 Mississippi River Central Basin
20 Lower Sangamon River Basin
21 Upper Sangamon River Basin
22 Salt Creek-Sangamon River Basin
23 Upper Kaskaskia River Basin
24 Shoal Creek/Middle Kaskaskia River Basin
25 Lower Kaskaskia River Basin
26 Big Muddy River Basin
27 Mississippi River South Central Basin
28 Mississippi River South Basin
29 Vermilion (Wabash) River Basin
30 Embarras/Middle Wabash River Basin
31 Little Wabash/Skillet Fork River Basin
32 Saline River/Bay Creek Basin
33 Cache River Basin

Inland Lakes

The Illinois EPA conducts and supports several inland-lake-monitoring programs. Collectively, chemical, physical or biological data have been collected from nearly 2,000 lake stations since 1977. Lake monitoring programs are described briefly below.

Ambient Lake Monitoring Program

Illinois EPA conducts an Ambient Lake Monitoring Program (ALMP) at approximately 50 inland lakes annually. Lakes are selected on a rotating basis so that all significant publicly-owned lakes are monitored at least once every five years. Furthermore, approximately one-half of the 50 inland lakes sampled each year are monitored on a three-year rotating schedule to enhance Illinois EPA's ability to assess lake trends. There are 78 inland lakes included in this trends monitoring program. These lakes are known as the Ambient "Core" Lakes. Data collected through the ALMP are primarily used for assessment of *aquatic life*, *aesthetic quality*, and *public and food processing water supply* uses and to identify potential causes of use impairment. However, data are also used to encourage development of management plans and to evaluate the effectiveness of programs implemented.

The Ambient Lake Monitoring Program involves the collection of physical data (e.g. temperature/dissolved oxygen profiles, Secchi Disk transparency, and water color), water and sediment chemical data, and field observations, including weather conditions and the presence of algae and macrophytes. Lakes in the ALMP are sampled five times during the year: once during the spring runoff and turnover period (April or May), three times during the summer (June, July, and August), and once during fall turnover (October). Data are routinely collected from three distinct lake sites, with water samples collected from one foot below the surface at all sites, and two feet above the bottom (and at intake depth for lakes with a public water supply intake) at the deepest site. Chemical analyses include: total ammonia, nitrate-nitrite nitrogen, total and dissolved phosphorus, total Kjeldahl nitrogen, and total and volatile suspended solids. Integrated water samples are also collected for analysis of chlorophyll *a*, chlorophyll b, chlorophyll c, and pheophytin. Additional parameters specific to public and food processing water supply use are also analyzed.

Clean Lakes Program Intensives

The Illinois Clean Lakes Program is a two-part program consisting of Phase 1 diagnostic-feasibility studies and Phase 2 implementation projects. Intensive lake-specific monitoring is conducted under both phases of the Illinois Clean Lakes Program and includes water sampling twice per month from April-October and monthly from November-March for a one-year period. Water quality samples are collected from one foot below the surface, intake-depth (for lakes with a public water supply intake), and two feet above the bottom at the deepest site. Surface samples (one foot below the surface) are also typically collected at two other lake sites. Physical (dissolved oxygen, temperature, pH, and Secchi transparency depth), chemical (alkalinity, total ammonia, nitrate-nitrite nitrogen, total and dissolved phosphorus, total Kjeldahl nitrogen, and total and volatile suspended solids), and biological (phytoplankton, fish, macrophytes) information is collected. In addition, for Phase 1 studies only, flow and chemical data are

collected at major inflows and outflows for development of hydrologic, nutrient and sediment budgets. Additional Phase I activities include: bathymetric mapping; sedimentation surveys, fish contaminant monitoring conducted pursuant to the Fish Contaminant Monitoring Program; and analysis of sediment samples.

Volunteer Lake Monitoring Program

The Volunteer Lake Monitoring Program (VLMP) has been administered by the Illinois EPA since 1981 and relies on the time and talents of citizen volunteers. The VLMP is an educational program for Illinois citizens to learn about lake ecosystems, as well as a cost-effective method of gathering fundamental information about inland lakes.

The VLMP Basic Program includes training volunteers to measure water clarity (transparency) using a Secchi disk. Secchi-transparency measurements are useful for tracking changes in lake water transparency within a single year and for tracking trends over many years. Monitoring is conducted twice a month from May-October, typically at three sites per lake. The basic program also emphasizes education and monitoring of aquatic invasive species. Aquatic invasive species, also known as exotic species, include zebra mussels, eurasian water-milfoil, bighead and silver carp, rusty crayfish, and others. The main focus of this program is to establish a network of individuals at the local level that can assist Illinois EPA in their effort to control the spread of exotic species. Volunteers are educated on how to identify exotic species through the use of Illinois-Indiana Sea Grant "Watch ID Cards," signs, and other educational materials. With their help, Illinois EPA can be notified of new infestations shortly after they are discovered.

The VLMP Advanced Program includes Basic Program monitoring plus the collection of water samples from one foot below the water's surface at one to three lake sites. Water samples are shipped to an accredited laboratory for analysis of the following parameters: total ammonia, nitrate-nitrite nitrogen, total phosphorus, total Kjeldahl nitrogen, and total and volatile suspended solids. Integrated water samples are also collected for analysis of chlorophyll pigments. These samples are collected at a depth equal to twice the Secchi transparency depth, then filtered and sent to a laboratory for analysis of chlorophyll *a*, chlorophyll b, chlorophyll c and pheophytin. Chlorophyll *a*, Secchi transparency depth, and total phosphorus data are used to calculate the lake's trophic state index which is used for determining the lake's resource quality.

The primary purpose of the VLMP is to promote education on lake issues and evaluate lake resource quality as good, fair and poor. While the VLMP is conducted according to an approved QAPP and does meet the QA/QC requirements for these purposes, the data do not have the degree of reliability that Illinois EPA deems necessary for placing a water on the 303(d) List. Volunteer Lake Monitoring Program data are considered insufficient for making use-support determinations and 303(d) listings.

Lake Michigan

Lake Michigan water quality is monitored through a cooperative agreement between Illinois EPA and the city of Chicago (updated August 1, 2001). The Lake Michigan Monitoring Program is conducted by the city of Chicago's Water Quality Surveillance Section and consists of 77 sites assessed in five monitoring surveys: 14 on the Lake Michigan Open Water Survey, eight on the North Shore Survey, 10 on the South Shore Survey, 23 on the Jardine Water Purification Plant Radial Lake Survey, and 22 on the South Water Purification Plant Radial Lake Survey. Water surveys are conducted from January through December each year providing there are no weather-related problems. The city's Water Purification Division Laboratory performs general water chemistry analyses with additional analyses performed by Illinois EPA laboratories.

Chemical and fecal coliform bacteria data are collected to characterize overall water quality conditions and evaluate designated uses. Fish contaminant sampling is conducted in cooperation with the Illinois Department of Natural Resources to screen for the accumulation of toxic substances. The fish contaminant data provide essential information to the general public relative to contaminant concentrations in fish tissue, species affected, and risks associated with fish consumption. Fecal coliform and *Escherichia coli* bacteria data provide the basis for protecting *primary contact* use (swimming). Chemical parameters, including arsenic, cadmium, chromium, copper, cyanide, lead, mercury and others are used to assess *aquatic life* use.

C-2. Assessment Methodology

This section explains how Illinois EPA uses various criteria (including, but not limited to, Illinois water quality standards) to assess the level of support (attainment) of each applicable designated use in the waters of the state. Designated uses assessed in Illinois waters include *aquatic life*, *indigenous aquatic life*, *fish consumption*, *primary contact*, *secondary contact*, *public and food processing water supply* and *aesthetic quality*. Assessments of designated uses are based on water-body-specific monitoring data believed to accurately represent existing resource conditions. The methodology for the assessment of use attainment and causes of impairment is explained below for each use and each water body type. At the end of Section C-2, we explain guidelines for identifying potential sources of impairment.

Water Body Segments

Illinois EPA uses the National Hydrography Dataset (1:24,000 scale) as the basis for mapping and calculating the length of streams. Mapping and area calculations of inland lakes and Lake Michigan are based on Illinois data (see Table B-1). While assessments of designated uses are based on data from individual monitoring stations, the data are extrapolated to represent larger water body segments (i.e., a stream segment, an inland lake, an open water area in Lake Michigan), also called assessment units. Assessment units delineated for *aquatic life* use are typically used as the basis for all other assessed uses.

For streams, monitoring data are extrapolated to linear segments depending on the size of the

stream (USEPA, 1997). Assessments of *aquatic life* use typically apply approximately 10 miles upstream and downstream from the sampling site for wadable streams, about 25 miles upstream and downstream for unwadable streams (i.e., generally $\geq 7^{th}$ order, $\geq$ 3.5 ft. average depth and fish sampled with an electrofishing boat) and approximately 50 miles upstream and downstream for large rivers, i.e., Illinois and Wabash rivers. However, the final extent of any particular segment is determined by considering significant influences such as point or nonpoint source inputs; changes in watershed characteristics such as land use; changes in riparian vegetation, stream banks, slope or channel morphology; stream confluence or diversions; or hydrologic modifications such as channelization or dams. This process can result in segments that are either longer or shorter than the general numeric guidelines above. On the Mississippi River, the segments mostly reflect a September 2003 interstate memorandum of understanding between five states (Illinois, Iowa, Minnesota, Missouri and Wisconsin) designed to improve the assessment process on the Mississippi River (UMRBA 2003). http://www.umrba.org/wq.htm). On the Ohio River, segmentation is based on Ohio River Sanitation Commission assessments.

In the case of lakes, monitoring data are typically used to assign an assessment to the entire lake acreage as a single assessment unit.

Assessments of *fish consumption* use are generally extrapolated to include the entire named water body.

Changes to some 2008 assessment units were made and some new assessment units were added for the 2010 cycle. These are described in Appendix D.

Levels of Use Attainment

The Illinois EPA determines the resource quality of each assessment unit by determining the level of support (i.e., attainment) of each applicable designated use. For each assessment unit and for each designated use applicable to that assessment unit, an Illinois EPA assessment concludes one of two possible use-support levels: "Fully Supporting" or "Not Supporting." Fully Supporting means that the designated use is attained; Not Supporting means the use is not attained. To facilitate communicating these results, Illinois EPA also refers to Fully Supporting status (for a use) as Good resource quality; Not Supporting status is called Fair or Poor resource quality, depending on the degree to which the use is not attained. Uses determined to be Not Supporting are called "impaired," and waters that have at least one use assessed as Not Supporting are also called impaired. For each impaired use in each assessment unit, Illinois EPA attempts to identify potential causes and sources of the impairment as explained below.

Aquatic Life - Streams

Aquatic life use assessments in streams are typically based on the interpretation of biological information, physicochemical water data and physical-habitat information from the Intensive Basin Survey, Ambient Water Quality Monitoring Network or Facility-Related Stream Survey programs as described previously. The primary biological measures used are the fish Index of Biotic Integrity (fIBI; Karr et al. 1986; Smogor 2000, 2005), the new macroinvertebrate Index of Biotic Integrity (mIBI; Tetra Tech, 2004) and the Macroinvertebrate Biotic Index (MBI; Illinois

EPA 1994). Physical-habitat information used in assessments includes quantitative or qualitative measures of stream-bottom composition and qualitative descriptors of channel and riparian conditions. Physicochemical water data used include measures of "conventional" parameters (e.g., dissolved oxygen, pH, temperature), priority pollutants, non-priority pollutants, and other pollutants (USEPA 2002 and www.epa.gov/waterscience/criteria/wqcriteria.html). In a minority of streams for which biological information is unavailable, *aquatic life* use assessments are based primarily on physicochemical water data. Physicochemical data (from water and sediment) and habitat information play primary roles in identifying potential causes and sources of *aquatic life* use impairment.

Table C-1 shows a decision matrix which illustrates how biological data (fIBI, mIBI, and MBI), physicochemical water data (i.e., water chemistry), and physical-habitat information are integrated and interpreted to guide the assessment of *aquatic life* use.

All biological indices are divided into three ranges: 1. a range which indicates no impairment; 2. a range which indicates moderate impairment, and, 3. a range which indicates severe impairment. (Table C-2). Water-chemistry data are also evaluated to determine whether the potential for impairment of *aquatic life* use is indicated (Table C-3). In addition, several conditions of physical habitat are used to indicate the potential for impairment of aquatic life use (Table C-4).

When all available data indicate no impairment, the stream segment is considered fully supporting *aquatic life* use. In general, when both fish and macroinvertebrate indicators are available for a site and each indicator shows a similar level of impairment, the attainment decision is based primarily on this concordant information. If either biological indicator shows severe impairment, the attainment decision is based primarily on a worst case emphasis.

For assessing attainment of *aquatic life* use in streams, direct reliance on information-rich biological indicators over indirect and sometimes simplistic comparisons of physicochemical water quality criteria is a useful and widely recommended approach (Karr and Dudley 1981; Yoder and Rankin 1995; Karr 1991; Yoder and Rankin 1998; Hall and Giddings 2000; National Research Council 2001). Much more than physicochemical water data, biological indicators--such as a fish Index of Biotic Integrity--provide direct, reliable measures of aquatic-community health and facilitate detection of cumulative impacts on aquatic life from multiple stressors (e.g., Norton et al. 2000). By relying more on biological indicators than on less-reliable surrogates (e.g., water chemistry), our assessments of *aquatic life* use achieve their primary purpose: to determine the degree to which a water body provides for the protection and propagation of fish, shellfish, and wildlife (i.e., the Clean Water Act's interim aquatic life goal). In these terms, an Illinois EPA assessment conclusion of Full Support for *aquatic life* use indicates conditions that meet the Clean Water Act's interim aquatic life goal.

Water chemistry and habitat data are used to help determine the attainment status: 1) where only one biological assemblage is available, 2) where two biological assemblages may indicate different levels of impairment, or 3) occasionally, when no biological data are available. Water-chemistry data (Table C-3) and habitat data (Table C-4) are used as corroborating evidence when one biological assemblage indicates fully supporting but another indicates moderate impairment.

When only one biological assemblage (mIBI or fIBI) is available which indicates full support, an indication of severe water chemistry impairment overrides this single biological indicator. A limited amount of water chemistry data which indicates the potential for impairment may be used to determine non support of ***aquatic life*** use, but when biological data is unavailable, a conclusion of full support requires an amount of water chemistry data which represents a long period of time and a large suite of parameters. The dataset collected at the typical Ambient Water Quality Monitoring Network station is considered adequate for concluding full support.

When interpreting water chemistry data for assessing attainment of ***aquatic life*** use, we do not consider a single exceedance of a water quality criterion as indicative of impairment. Such an event does not account for at least two other aspects critical for determining how physicochemical conditions in water affect aquatic life: the frequency and duration of the exceedances (Barnett and O'Hagan 1997; National Research Council 2001). Illinois EPA uses "frequency of exceedance" guidelines (Table C-3) that better represent the true risk of impairment to aquatic life than do single-exceedance guidelines.

Illinois EPA's approach for assessing attainment of ***aquatic life*** use achieves a reasonable balance in minimizing the two possible types of assessment mistakes: incorrectly concluding that a use is being fully supported or incorrectly concluding that it is not. Inherent uncertainty exists in using water-monitoring information to assess the condition of water resources (Ward et al. 1990). Designing an assessment protocol exclusively to minimize the potential for making one of these mistakes necessarily results in a counteractive, increased vulnerability to the other type of mistake. Therefore, short of incorporating an in-depth analysis of the relative costs and benefits of decision mistakes—some of which are very difficult to quantify—the most reasonable and practical assessment approach is one that results in an acceptably low and equal number of each type of mistake. In assessing attainment of ***aquatic life*** use, Illinois EPA tries to achieve this balance by recognizing and accommodating the greater information value of biological indicators over less informative, surrogate water-chemistry data or habitat data. Illinois EPA interprets water-chemistry data and habitat data as indicators of the potential for aquatic-life impairment, not as direct evidence of such. Consistent with this approach, we typically conclude *Fully Supporting* for situations in which two biological indicators indicate lack of impairment, despite any contraindication from surrogate data (see cells 1A and 4A in Table C-1).

However, Illinois EPA does recognize and accommodate uncertainty in our biological indicators by allowing for situations in which the potential for impairment, as indicated by water-chemistry or habitat data, is sufficient to conclude *Not Supporting* despite contraindication from a biological indicator. Specifically, if one biological indicator indicates *Fully Supporting* and the other indicates *Not Supporting*, the potential for impairment, as indicated by water-chemistry or habitat data, typically results in a decision of *Not Supporting* (see cells 1B, 2A, and 5A in Table C-1). In such situations, we judge that the combined information value of one biological indicator indicating impairment, plus corroborating water-chemistry or habitat data, provides sufficient evidence of actual impairment.

For situations in which one biological indicator indicates *Fully Supporting*, but no other biological indicator is available (see cells 1D, 4D, and 7A in Table C-1), we typically conclude *Fully Supporting*, unless sufficient contraindication is provided by surrogate data. In such

situations, although our decision of *Fully Supporting* is based on less information than those in which we have two biological indicators, it nonetheless relies primarily on the superior information value of the single biological indicator relative to the surrogate data. Specifically, if a fish or macroinvertebrate IBI is the only available biological indicator and it indicates *Fully Supporting*, then typically we diverge from this conclusion only if water-chemistry data indicate a potential for severe impairment. If an MBI is the only available biological indicator and it indicates lack of impairment, we diverge from this conclusion if water-chemistry data indicate at least a potential for moderate impairment. We incorporate this distinction because, unlike an IBI score, an MBI score is designed to be sensitive only to a specific type of water-chemistry impact: organic pollution.

The last stage of the assessment process is a final review of the assessment conclusion (Table C-1, cell 8). In this review, Illinois EPA biologists carefully examine all available biological, water-chemistry and habitat data and also use their site-specific knowledge and other information about the environmental setting of the stream segment. This additional information includes field notes and observations, knowledge of the nature of the stream and its biological potential, the existence of potential sources of pollution, and riparian or watershed information. Based on this review, the biologist may modify the use-attainment decision indicated in any cell in Table C-1. For example, conflicting biological information may require case-specific interpretation, including analysis of possible error or ambiguity in an IBI score, especially when scores are near the threshold values in Table C-2. Also, physicochemical, physical-habitat and other information are examined for corroborating or refuting evidence of ***aquatic life*** use attainment. In some cases, after careful review, it may be determined that the current data are not adequate to make a new assessment. In these cases, the previous assessment status remains unchanged. Illinois EPA believes that this final review helps improve the accuracy of our ***aquatic life*** use assessments.

Table C-1. Decision Table for Assessing Attainment of Aquatic Life Use in Streams. Each table cell shows the preliminary assessment conclusions based primarily on biological data: fish Index of Biotic Integrity (fIBI), macroinvertebrate Index of Biotic Integrity (mIBI), and Macroinvertebrate Biotic Index (MBI). See Table C-2 for how to interpret these biological indicators. See Tables C-3 and C-4 for how to interpret surrogate water-chemistry data or habitat data. The final review in table cell 8 applies to every preliminary assessment conclusion.

Biological Indicator Indicates:	**A. fIBI Indicates No Impairment fIBI ≥ 41**	**B. fIBI Indicates Moderate Impairment fIBI < 41 and > 20**	**C. fIBI Indicates Severe Impairment fIBI ≤ 20**	**D. fIBI is Unavailable**
1. mIBI Indicates No Impairment mIBI ≥ 41.8	*Fully Supporting (Good)* (Water chemistry and other data are considered during final review) (See cell 8 below.)	If water-chemistry data or habitat data indicate a potential for impairment, then *Not Supporting (Fair)*. Otherwise, *Fully Supporting (Good)*.	*Not Supporting (Poor)*	If water-chemistry data indicate a potential for severe impairment, then *Not Supporting (Fair)* Otherwise, *Fully Supporting (Good)*.
2. mIBI Indicates Moderate Impairment mIBI < 41.8 and > 20.9	If water-chemistry data or habitat data indicate a potential for impairment, then *Not Supporting (Fair)* Otherwise, *Fully Supporting (Good)*.	*Not Supporting (Fair)*	*Not Supporting (Poor)*	*Not Supporting (Fair)*
3. mIBI Indicates Severe Impairment mIBI ≤ 20.9	*Not Supporting (Poor)*	*Not Supporting (Poor)*	*Not Supporting (Poor)*	*Not Supporting (Poor)*
4. mIBI is Unavailable and MBI Indicates No Impairment MBI ≤ 5.9	*Fully Supporting (Good)*	*Not Supporting (Fair)*	*Not Supporting (Poor)*	If water-chemistry data indicate a potential for moderate impairment, then *Not Supporting (Fair)*. If water-chemistry data and sufficient habitat data [1] indicate no impairment, then *Fully Supporting (Good).* Otherwise, no assessment is made [2].

Biological Indicator Indicates:	A. fIBI Indicates No Impairment fIBI ≥ 41	B. fIBI Indicates Moderate Impairment fIBI < 41 and > 20	C. fIBI Indicates Severe Impairment fIBI ≤ 20	D. fIBI is Unavailable
5. mIBI is Unavailable and MBI Indicates Moderate Impairment MBI > 5.9 and ≤ 8.9	If water-chemistry data or habitat data indicate a potential for impairment, then *Not Supporting (Fair)*. Otherwise, *Fully Supporting (Good)*.	*Not Supporting (Fair)*	*Not Supporting (Poor)*	*Not Supporting (Fair)*
6. mIBI is Unavailable and MBI Indicates Severe Impairment MBI > 8.9	*Not Supporting (Poor)*	*Not Supporting (Poor)*	*Not Supporting (Poor)*	*Not Supporting (Poor)*
7. mIBI and MBI are Unavailable	If water-chemistry data indicate a potential for severe impairment, then *Not Supporting (Fair)* Otherwise, *Fully Supporting (Good)*.	*Not Supporting (Fair)*	*Not Supporting (Poor)*	If water-chemistry data indicate a potential for moderate impairment, then *Not Supporting (Fair)*. If water-chemistry data indicate a potential for severe impairment, then *Not Supporting (Poor)*. If sufficient water-chemistry data [3] and sufficient habitat data [1] indicate no impairment, then *Fully Supporting (Good)*. Otherwise, no assessment is made[2].
8. Final review using site-specific knowledge and considering all available biological, water-chemistry, habitat and other information. This review considers factors such as the extent to which biological-indicator scores exceed or fall short of impairment thresholds, the type and degree of water quality standard exceedances, the type and degree of habitat degradation, and the presence or absence of pollution sources. Based on this review, the biologist may modify the preliminary use-attainment decision. In some cases, after careful review, it may be determined that current data are not adequate to make a new assessment. In these cases the previous assessment status remains unchanged.				

1. "*Sufficient habitat data*" means a dataset at least as representative of physical-habitat conditions as the dataset that is typically available from an Intensive Basin Survey. For a relatively few waters, assessments of *aquatic life* use as *Fully Supporting* may not include consideration of habitat data because appropriate physical-habitat indicators have not yet been fully developed or conditions prevented comprehensive habitat measurements or observations. Typically, these are large-stream locations.
2. If a previous assessment exists, it remains unchanged.
3. "*Sufficient water chemistry data*" means a dataset at least as representative of water-chemistry conditions as the three-year dataset that is typically available from an Ambient Water Quality Monitoring Network station.

Table C-2. Guidelines for Using Biological Information in Table C-1 to Assess *Aquatic Life* Use Attainment in Streams.

	No Impairment	Moderate Impairment	Severe Impairment
Biological Indicator	**Fully Supporting *Aquatic Life* Use (Good Resource Quality)**	**Not Supporting *Aquatic Life* Use (Fair Resource Quality)**	**Not Supporting *Aquatic Life* Use (Poor Resource Quality)**
Fish Index of Biotic Integrity (fIBI,)	fIBI $\geq$ 41	fIBI < 41 and > 20	fIBI $\leq$ 20
Macroinvertebrate Index of Biotic Integrity (mIBI)	mIBI $\geq$ 41.8	mIBI < 41.8 and > 20.9	mIBI $\leq$ 20.9
Macroinvertebrate Biotic Index[1] (MBI)	MBI $\leq$ 5.9	MBI > 5.9 and $\leq$ 8.9	MBI > 8.9

1. When the mIBI is available, the MBI is not used independently to assess attainment of *aquatic life* use.

Table C-3. Guidelines for Using Water-Chemistry Data in Table C-1 to Indicate the Potential for Impairment of Aquatic Life Use in Streams.

Number of Observations [1]	Type of Parameter	Type of Water Quality Standard	Water Chemistry Condition Indicating Potential for Moderate Impairment of ***Aquatic Life*** Use [2]	Water Chemistry Condition Indicating Potential for Severe Impairment of ***Aquatic Life*** Use [2]
Ten or more observations are available for the applicable water-chemistry parameter	Toxic [3]	Acute	For any single parameter, two observations exceed the applicable standard [4].	For any single parameter, three or more observations exceed the applicable standard.
		Chronic	For any single parameter, there is one exceedances of the applicable standard [5].	For any single parameter, there are two or more independent exceedances of the applicable standard [5].
	Nontoxic [6]	Other	For any single parameter, more than 10% but no more than 25% of observations exceed the applicable standard; or, there is one exceedance of any standard that requires multiple observations to apply.	For any single parameter, more than 25% of observations exceed the applicable standard; or, there are two or more exceedances of any standard that requires multiple observations to apply.
Fewer than 10 observations are available for the applicable water-chemistry parameter	Toxic [3]	Acute	Among all parameters, one observation exceeds an applicable standard.	Among all parameters, two or more observations exceed an applicable standard.
		Chronic	Among all parameters, there is one exceedance of an applicable standard [5].	Among all parameters, there are two or more independent exceedances of an applicable standard [5].
	Nontoxic [6]	Other	Among all parameters, two observations exceed an applicable standard.	Among all parameters, three or more observations exceed an applicable standard.

1. The most recent consecutive three years of data are used. It is not necessary that observations be available for every parameter of each type; the assessment is based on available data. As used in Table C-1, "*sufficient water chemistry data*" means a dataset at least as representative of water-chemistry conditions as the three-year dataset that is typically available from an Ambient Water Quality Monitoring Network station.
2. If conditions in at least one table cell apply, then the potential for impairment is indicated.
3. Includes 2, 4-D, alachlor, atrazine, ammonia, arsenic, barium, benzene, cadmium, chloride, chlorine, chromium (hexavalent and trivalent), copper, cyanazine, cyanide, dicamba, endrin, ethylbenzene, fluoride, iron, lead, manganese, mercury, metolachlor, metribuzin, nickel, selenium, silver, sulfate, terbufos, toluene, xylenes, and zinc or any parameter with an acute or chronic aquatic life criteria derived under 35 IAC 302.210. If no specific chronic water quality standard applies, the standard is interpreted as an acute one.
4. Hereafter in this table, "*applicable standard*" refers to an Illinois General Use Water Quality Standard (see tables B-2 and B-3, 35 IAC 302.208, 302.212 and 303.444and 35 IAC 303.311 through 303.445) or an aquatic life criterion derived according to 35 IAC 302.210 (www.epa.state.il.us/water/water-quality-standards/water-quality-criteria.html.).
5. Chronic standards are applied consistent with 35 IAC 302.208, 302.210, 302.212, and 303.444 as follows. If the chronic standard is exceeded for one or more combinations of four consecutive observations, then the water chemistry condition indicates the potential for impairment of *aquatic life* use. If the chronic standard is exceeded for more than one *independent* set of four consecutive observations, then the water chemistry condition indicates the potential for severe impairment of *aquatic life* use. An *independent* set of four consecutive observations is one that does not share any observations with any other set of four consecutive observations.
6. Includes: water temperature, pH, and dissolved oxygen.

Table C-4. Guidelines for Using Habitat Information in Table C-1[(1)] to Assess Attainment of *Aquatic Life* Use in Streams.

Information Sources	Habitat Conditions Indicating the Potential for Impairment of *Aquatic Life* Use [(2)]
Illinois EPA field observations and notes	Moderate to severe habitat alteration by channelization and dredging activities, removal of riparian vegetation, bank failure or bank erosion, heavy sediment deposition, alteration of flow regime, fish passage barriers, alteration/reduction of hydrologic diversity, alteration/reduction of instream cover, alteration of wetland habitats, or excessive algae or plant growth (USEPA 1997).
Qualitative Habitat Evaluation Index (Rankin 1989) Metrics: Substrate, Instream Cover, Channel Morphology, Riparian Zone and Bank Erosion	Metric 1: "Silt heavy" is indicated, or Metric 2: instream cover is indicated as "nearly absent" (due to anthropogenic causes), or Metric 3: "recent channelization/no recovery," is indicated, or Metric 4: riparian width is indicated as "none" or bank erosion is indicated as "heavy/severe."
Illinois EPA Stream Assessment Form (Illinois EPA 1994)	Filamentous algae or macrophytes are abundant New channelization documented >50% of riparian vegetation denuded Documented site-specific knowledge of sludge, excessive siltation or unnatural bottom deposits.
Illinois EPA habitat-transect data or visual evaluation of substrate	≥75% silt/mud bottom substrate[(3)]

1. As used in Table C-1 "s*ufficient habitat data*" means a dataset at least as representative of physical-habitat conditions as the dataset that is typically available from an Intensive Basin Survey.
2. If any of the conditions exist, the potential for impairment is indicated.
3. Based on an 98th percentile value calculated from statewide data from sites having at least three habitat transects.

After a stream is assessed and determined to be impaired for a designated use, potential causes of impairment are identified. The next two paragraphs describe, in general, how Illinois EPA identifies potential causes of impairment of *aquatic life* use in streams.

When a stream segment is determined to be Not Supporting *aquatic life* use, generally, one exceedance of an applicable Illinois water quality standard (related to the protection of aquatic life) results in identifying the parameter as a potential cause of impairment (Table C-5). Additional guidelines used to determine potential causes of impairment include site-specific standards (35 Ill. Adm. Code 303, Subpart C), adjusted standards (published in the Illinois Pollution Control Board's *Environmental Register* at http://www.ipcb.state.il.us/Archive/dscgi/ds.py/View/Collection-11), or narrative standards (35 Ill. Adm. Code 302.203) intended to protect waters from "*…sludge or bottom deposits, floating debris, visible oil, odor, plant or algal growth, color or turbidity of other than natural origin.*"

For parameters that have no numeric water quality standards (e.g., nutrients, suspended solids, siltation, various features of stream habitat), a statistically derived numeric value or a field

observation may be used to identify potential causes of ***aquatic life*** use impairment. For example, for total phosphorus and suspended solids, a numeric threshold based on an 85th-percentile value is used as a cause guideline (Table C-5); this threshold value is derived from all available data from water years 1978 through 1996, at Ambient Water Quality Monitoring Network sites. Similarly, for siltation, a 98th-percentile threshold is based on stream-bottom composition data from Intensive Basin Survey sites sampled from 1982 through 1997. Measures of sediment chemistry are also used to identify potential causes of ***aquatic life*** use impairment. In general, sediment parameters found at highly elevated levels (Short 1997) are identified as potential causes. Examples of less-quantitative cause guidelines include scores for selected Qualitative Habitat Evaluation Index (Rankin 1989) metrics that reflect channel alteration, riparian zone disturbance, heavy siltation or streambank instability, as well as other related field observations.

In some cases, biological data may indicate that ***aquatic life*** use in streams is impaired but only nonpollutant causes, such as low dissolved oxygen, alteration in streamside or littoral vegetative covers, fish passage barriers, low flow alterations, or other flow regime alterations are identified. If only nonpollutant causes of impairment are identified, the assessor must determine if the segment should be placed in category 4C (see Section C-3, Five-Part Categorization of Surface Waters). The assessor will examine carefully all of the information related to the segment, including the amount of water chemistry data available, the nature of the stream, the degree of impairment, the existence of potential pollution sources, whether the elimination of riparian vegetation may also be increasing turbidity and sedimentation and other relevant watershed information. After reviewing this information, if the assessor thinks that the ***aquatic life*** use impairment is occurring because of nonpollutant causes then that water body segment may be placed in category 4C depending on the results of other use attainment assessments. If the assessor believes that an unidentified pollutant may also be contributing to the impairment, Cause Unknown will be listed as an additional cause and the segment will be placed in Category 5 (the 303(d) List).

Table C-5. Guidelines for Identifying Potential Causes of Impairment of *Aquatic Life* Use in Illinois Streams.

	Basis for Identifying Causes[1] [7]				
	Criteria based on Water Quality Standards [2]			Non-Standards-based Criteria[3]	
Potential Cause	**Acute Criteria**	**Chronic Criteria**	**Narrative Criteria**	**Sediment Criteria**	**Other Criteria**
Pesticides and other Organic Pollutants					
2,4-D	100 µg/L[4]	8 µg/L[4]	Toxic effects[9]		
Alachlor	1100 µg/L[4]	---	Toxic effects[9]	---	---
Aldrin	---	---	Toxic effects[9]	1.0 µg/kg	---
alpha-BHC	31 µg/L[4]	2.5 µg/L[4]	Toxic effects[9]	1.0 µg/kg	---
Atrazine	82 µg/L[4]	9 µg/L[4]	Toxic effects[9]	---	---
Benzene	4200 µg/L	860 µg/L	---	---	---
Chlordane	---	---	Toxic effects[9]	23 µg/kg	---
Cyanazine	370 µg/L[4]	30 µg/L[4]	Toxic effects[9]	---	---
DDT	---	---	Toxic effects[9]	34 µg/kg	---
Dicambra	1500 µg/L[4]	150 µg/L[4]	Toxic effects[9]	---	
Dieldrin	---	---	Toxic effects[9]	15 µg/kg	---
Endrin	160 µg/L[4]	33 µg/L[4]	Toxic effects[9]	1.0 µg/kg	---
Ethylbenzene	150 µg/L	14 µg/L	---	---	---
Heptachlor	---	---	Toxic effects[9]	1.0 µg/kg	---
Heptachlor epoxide	---	---	Toxic effects[9]	3.8 µg/kg	---
Hexachlorobenzene	---	---	Toxic effects[9]	1.0 µg/kg	---
Lindane (gamma BHC)	---	---	Toxic effects[9]	1.0 µg/kg	---
Methoxychlor	---	---	Toxic effects[9]	5.0 µg/kg	---
Metolachlor	380 µg/L[4]	30.4 µg/L[4]	Toxic effects[9]	---	---
Metribuzin	8.4 mg/L[4]	---	Toxic effects[9]	---	---
Polychlorinated biphenyls (PCBs)	---	---	Toxic effects[9]	180 µg/kg	---
Terbufos	0.024 µg/L[4]	---	Toxic effects[9]	---	---
Toluene	2000 µg/L	600 µg/L	---	---	---
Trifluralin	26 µg/L[4]	1.1 µg/L[4]	Toxic effects[9]	---	---
Xylenes (total mixed)	920 µg/L	360 µg/L	---	---	---
Metal Pollutants					
Arsenic	360 µg/L (dissolved)	190 µg/L (dissolved)	---	18 mg/kg	---
Barium	5000 µg/L	---	---	230 mg/kg	---
Cadmium	Table B-3[5]	Table B-3[5]	---	9.3 mg/kg	---
Copper	Table B-3[5]	Table B-3[5]	---	170 mg/kg	---
Chromium, hexavalent	16 µg/L	11 µg/L	---	---	---
Chromium, trivalent	Table B-3[5]	Table B-3[5]	---	---	---
Chromium (total)	---	---	Toxic effects[9]	110 mg/kg	---
Iron	1000 µg/L (dissolved)	---	---	53,000 mg/kg	---

Table C-5 (continued). Guidelines for Identifying Potential Causes of Impairment of *Aquatic Life* Use in Illinois Streams.

	Basis for Identifying Causes[1] [7]				
	Criteria based on Water Quality Standards [2]			Non-Standards-based Criteria[3]	
Potential Cause	**Acute Criteria**	**Chronic Criteria**	**Narrative Criteria**	**Sediment Criteria**	**Other Criteria**
Metals (cont.)					
Lead	Table B-3[5]	Table B-3[5]	---	245 mg/kg	---
Manganese	1000 µg/L	---	---	2300 mg/kg	---
Mercury	2.2 µg/L (dissolved)	1.1 µg/L (dissolved)	---	1.40 mg/kg	---
Nickel	Table B-3[5]	Table B-3[5]	---	45 mg/kg	---
Selenium	1000 µg/L	---	---	---	---
Silver	5 µg/L	---	---	5 mg/kg	---
Zinc	Table B-3[5]	Table B-3[5]	---	760 mg/kg	---
Other Pollutants					
(any pollutant with aquatic life criteria derived under 35 IAC 302.210)	<criterion>[4]	<criterion>[4]	---	---	---
Ammonia (Total)	Table B-3[5]	Table B-3[5]	---	---	---
Cause Unknown	[12].	[12].	---	---	[12].
Chlorides	500 mg/L	---	---	---	---
Chlorine[5]	19 µg/L	11 µg/L	---	---	---
Cyanide[5]	22 µg/L	5.2 µg/L	---	---	---
Fluoride	1.4 mg/L	---	---	---	---
Oil and Grease	---	---	unnatural sources[10]	---	Observed degradation from oil and grease [8]
pH	<6.5 or >9.0	---	---	---	---
Phosphorus (Total)	---	---	---	2800 mg/kg	0.61 mg/L
Sedimentation/Siltation (Bottom Deposits)	---	---	unnatural sources[10]	---	≥ 75% silt/mud substrate, or Observed degradation from siltation/sedimentation [6] [8]
Sludge	---	---	unnatural sources[10]	---	Observed degradation from sludge [6] [8]
Sulfate[5]	[5]	[5]	---	---	---
Temperature, Water[5] *(used only for thermal point sources)*	2.8°C maximum rise in water temperature[5]	[5]	unnatural temperature changes[11]	---	Observed degradation from unnatural temperature changes [8]
Total Suspended Solids	---	---	---	---	116 mg/L
Turbidity	---	---	unnatural sources[10]	---	Observed degradation from turbidity [8]

Table C-5 (continued). Guidelines for Identifying Potential Causes of Impairment of *Aquatic Life* Use in Illinois Streams.

	Basis for Identifying Causes[1] [7]				
	Criteria based on Water Quality Standards [2]			Non-Standards-based Criteria[3]	
Potential Cause	**Acute Criteria**	**Chronic Criteria**	**Narrative Criteria**	**Sediment Criteria**	**Other Criteria**
Nonpollutant Causes					
Alteration in stream-side or littoral vegetative covers[6]	---	---	---	---	Observed degradation from alteration in stream-side or littoral vegetative covers [6] [8]
Alteration in wetland habitats	---	---	---	---	Observed degradation from alteration in wetland habitats [8]
Aquatic Algae[6]	---	---	unnatural sources[10]	---	Observed degradation from aquatic algae [6] [8]
Aquatic Plants (Macrophytes)[6]	---	---	unnatural sources[10]	---	Observed degradation from aquatic plants [6] [8]
Changes in stream depth and velocity patterns					Observed degradation from alteration/reduction of hydrologic diversity [6] [8]
Fish Kills	---	---	Toxic effects[9]	---	Documented fish kill; IDNR or Ill. EPA Records[8]
Fish-Passage Barrier	---	---	---	---	Observed degradation from fish-passage barrier [8]
Loss of instream cover					Observed degradation from reductions in instream cover[6] [8]
Low flow alterations[6]	---	---	---	---	Observed degradation from low flow alterations [6] [8]
Non-Native Aquatic Plants	---	---	unnatural sources[10]	---	Observed degradation from non-native aquatic plants[6] [8]
Non-Native Fish, Shellfish, or Zooplankton[6]	---	---	---	---	Observed degradation from non-native fish, shellfish or zooplankton [6] [8]
Other flow alterations[6]	---	---	---	---	Observed degradation from other flow alterations [8]
Oxygen, Dissolved	[5]	[5]	---	---	---

1. Unless otherwise indicated, for numeric criteria serving as guidelines, a single exceedance indicates that the substance is a potential cause of impairment. For applying these guidelines, Illinois EPA typically uses data from our three primary stream-monitoring programs: Ambient Water Quality Monitoring Network (most recent three years), Intensive Basin Survey (most recent survey), Facility-Related Stream Survey (most recent survey).
2. General Use Water Quality Standards at 35 Ill. Adm. Code 302, Subpart B.
3. Non-standards based numeric criteria for substances in water are based on 85th-percentile values determined from a statewide set of observations from the Ambient Water Quality Monitoring Network, for water years 1978-1996. Criteria for substances in sediment represent the minimum threshold of "highly elevated" levels (Short 1997).
4. Criterion derived according to 35 Ill. Adm. Code 302.210. Derived water quality criteria are available at www.epa.state.il.us/water/water-quality-standards/water-quality-criteria.html. Any single value above the chronic criteria indicates a potential cause of impairment.
5. Numeric criteria used as cause guidelines are available in Tables B-2 and B-3 with further explanation.
6. Physical-habitat criteria are available in Table C-4 with further explanation.
7. All table entries of "---" indicate that a cause guideline is not applicable or is unavailable.
8. Site-specific observation, information, or knowledge.
9. 35 Ill. Adm. Code 302.210.
10. 35 Ill. Adm. Code 302.203.

11. 35 Ill. Adm. Code 302.211b & c.
12. Cause Unknown is used if any of the following conditions apply:
    a. If Aquatic Algae or Aquatic Plants (Macrophytes) is identified as a cause of impairment but total phosphorus is not identified;
    b) If Fish Kills is identified as a cause of impairment, but the pollutant which caused the fish kill is not;
    c) If Non-Native Fish, Shellfish, or Zooplankton is identified as a cause of impairment, and those non-native species are contributing to an increase in the level of some pollutant, but that pollutant is not identified;
    d) If only nonpollutant causes are identified such as dissolved oxygen or habitat related causes, and there is reason to suspect that a pollutant impairment is likely, but the quantity and timing of water sampling is insufficient to detect it;
    e) If dissolved oxygen is identified as a cause and a pollutant is suspected of contributing to low DO, but that pollutant is not identified.
    f) If no causes of any type are identified.

Aquatic Life – Inland Lakes

The *Aquatic Life* Use Index (ALI) is the primary tool used for assessing *aquatic life* use in lakes (Tables C-6 and C-7). The Trophic State Index (TSI; Carlson 1977), the percent surface area macrophyte coverage during the peak growing season (June through August), and the median concentration of nonvolatile suspended solids (NVSS) are used to calculate the ALI score. Higher ALI scores indicate increased impairment.

Assessments of *aquatic life* use are based primarily on physical and chemical water quality data collected via the Ambient Lake Monitoring Program, the Illinois Clean Lakes Program, or by non-Illinois EPA persons under an approved quality assurance project plan. The physical and chemical data used for *aquatic life* use assessments include: Secchi-disk transparency, chlorophyll *a*, total phosphorus (epilimnetic samples only), nonvolatile suspended solids (epilimnetic samples only), and percent surface area macrophyte coverage. Data are collected a minimum of five times per year (April through October) from one or more established lake sites. Data are considered usable for assessments if meeting the following minimum requirements (Figure C-2): 1) at least four out of seven months (April through October) of data are available; 2) at least two of these months occur during the peak growing season of June through August (this requirement does not apply to NVSS); and 3) usable data are available from at least half of all lake sites within any given lake each month. As outlined in Figure C-2, a whole-lake TSI value is calculated for the median Secchi-disk transparency, median total phosphorus (epilemnetic sample depths only), and median chlorophyll *a* values. A minimum of two parameter-specific TSI values are required to calculate parameter-specific use support determinations. An assessment is then made based on the parameter-specific use support determinations. The 0.05 mg/L Illinois General Use Water Quality Standard for total phosphorus in lakes (35 Ill. Adm. Code 302.205) has been incorporated into the weighting criteria used to assign point values for the ALI.

Table C-6. Aquatic Life Use Index.

Evaluation Factor	Parameter	Weighting Criteria	Points
1. Trophic State Index (TSI)	For data collected April-October: Whole-lake TSI value calculated from median total phosphorus (epilimnetic sample only), median chlorophyll *a*, and median Secchi-disk transparency values	a. <60 b. ≥60<85 c. ≥85<90 d. ≥90	a. 40 b. 50 c. 60 d. 70
2. Macrophyte Coverage	Average percentage of lake surface area covered by macrophytes during peak growing season (June through August). Determined by: a. Macrophyte survey conducted during same water year as the chemical data used in the assessment; or b. Average value reported on the VLMP Secchi Monitoring Data form.	a. ≥15<40 b. ≥10<15, ≥40<50; c. ≥5<10, ≥50<70 d. <5, ≥70	a. 0 b. 5 c. 10 d. 15
3. Nonvolatile Suspended Solids (NVSS) Concentration	For data collected April-October: Median epilimnetic sample NVSS concentration (mg/L).	a. <12 b. ≥12<15 c. ≥15<20 d. ≥20	a. 0 b. 5 c. 10 d. 15

Figure C-2. Flow Chart for Assessing Attainment of *Aquatic Life* Use in Lakes.

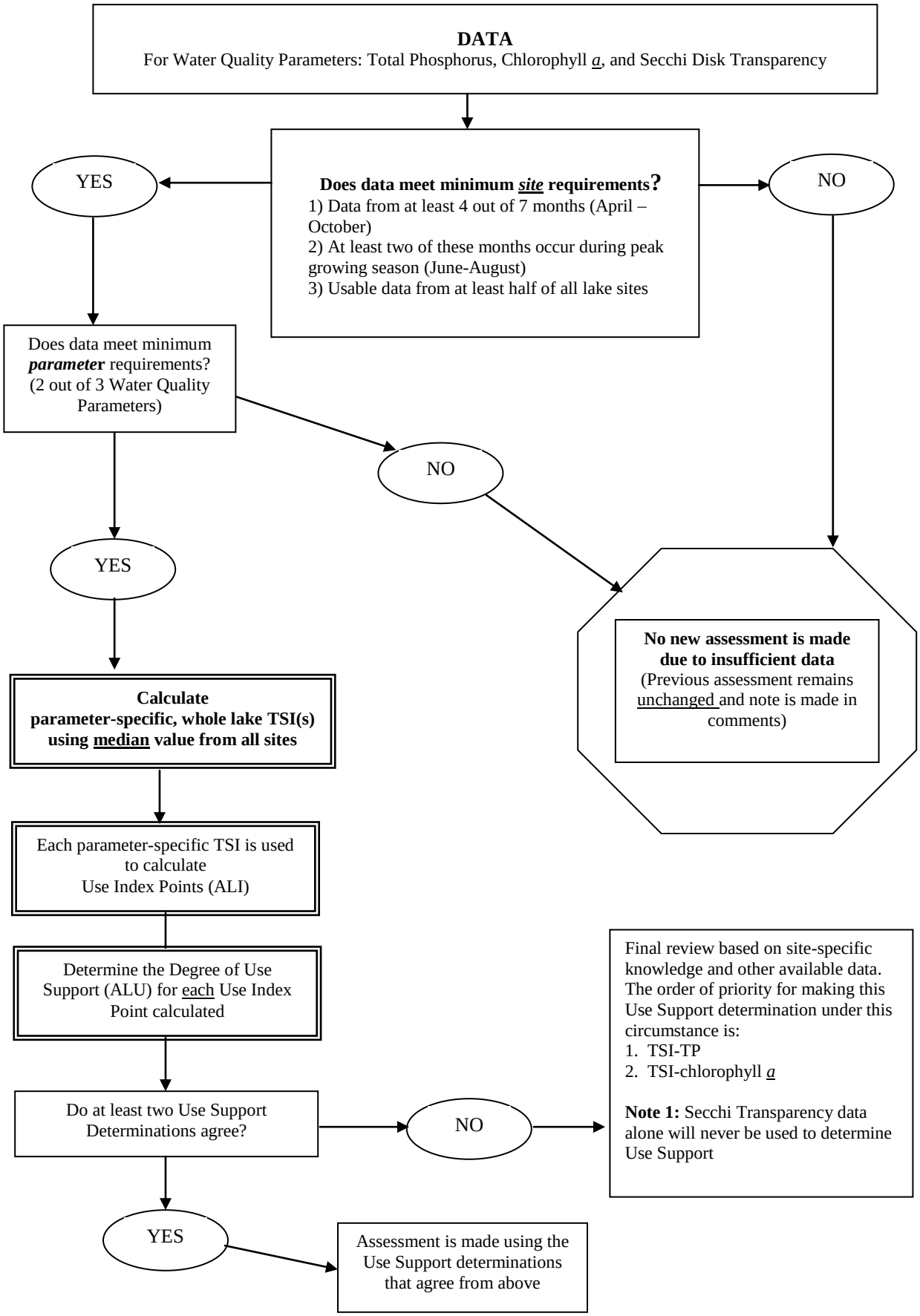


Table C-7. Guidelines for Assessing *Aquatic Life* Use in Illinois Inland Lakes.

Degree of Use Support	Guidelines
Fully Supporting (Good)	Total ALI points are <75
Not Supporting (Fair)	Total ALI points are ≥75<95
Not Supporting (Poor)	Total ALI points are ≥95

When an *aquatic life* use is found to be Not Supporting in a particular lake, potential causes of impairments are identified. Specific guidelines used to determine potential causes of impairment of *aquatic life* use in inland lakes are listed in Table C-8. Generally, one exceedance of an applicable Illinois water quality standard results in identifying the parameter as a potential cause of impairment. Additional guidelines used to determine potential causes of impairment include site-specific standards (35 Ill. Adm. Code 303.Subpart C), adjusted standards (published in the Illinois Pollution Control Board's *Environmental Register* at http://www.ipcb.state.il.us/Archive/dscgi/ds.py/View/Collection-11), or narrative standards (35 Ill. Adm. Code 302.203) intended to protect waters from "…sludge or bottom deposits, floating debris, visible oil, odor, plant or algal growth, color or turbidity of other than natural origin."

For parameters that have no numeric water quality standard (e.g., total suspended solids), a statistically-derived numeric value or a qualitative field observation may be used to identify potential causes of use impairment. For example, for total suspended solids, a numeric threshold based on an 85^{th}-percentile value is used as a cause guideline (Table C-8); this threshold value is derived from all available data from water years 1978 through 1998, at Ambient Lake Monitoring Program or Illinois Clean Lakes Program sites. Measures of sediment chemistry are also used to identify potential causes of use impairment. In general, sediment parameters found at highly elevated levels (Mitzelfelt 1996) are identified as potential causes of impairment.

Table C-8. Guidelines for Identifying Potential Causes of Impairment of *Aquatic Life* Use in Illinois Inland Lakes.

	Basis for Identifying Causes[1] [7]				
	Criteria based on Water Quality Standards [2]			Non-Standards-based Criteria[3]	
Potential Cause	**Acute Criteria**	**Chronic Criteria**	**Narrative Criteria**	**Sediment Criteria**	**Other Criteria**
Pesticides and other Organic Pollutants					
2,4-D	100 µg/L[4]	8 µg/L[4]	Toxic effects[9]		
Alachlor	1100 µg/L[4]	---	Toxic effects[9]	---	---
Aldrin	---	---	Toxic effects[9]	1.2 µg/kg	---
alpha-BHC	31 µg/L[4]	2.5 µg/L[4]	Toxic effects[9]	1.0 µg/kg	---
Atrazine	82 µg/L[4]	9 µg/L[4]	Toxic effects[9]	---	---
Benzene	4200 µg/L	860 µg/L	---	---	---
Chlordane	---	---	Toxic effects[9]	12 µg/kg	---
Cyanazine	370 µg/L[4]	30 µg/L[4]	Toxic effects[9]	---	---
DDT	---	---	Toxic effects[9]	180 µg/kg	---
Dicambra	1500 µg/L[4]	150 µg/L[4]			
Dieldrin	---	---	Toxic effects[9]	15 µg/kg	---
Endrin	160 µg/L[4]	33 µg/L[4]	Toxic effects[9]	1.0 µg/kg	---
Ethylbenzene	150 µg/L	14 µg/L	---	---	---
Heptachlor	---	---	Toxic effects[9]	1.0 µg/kg	---
Heptachlor epoxide	---	---	Toxic effects[9]	1.6 µg/kg	---
Hexachlorobenzene	---	---	Toxic effects[9]	1.0 µg/kg	---
Lindane (gamma BHC)	---	---	Toxic effects[9]	1.0 µg/kg	---
Methoxychlor	---	---	Toxic effects[9]	5.0 µg/kg	---
Metolachlor	380 µg/L[4]	30.4 µg/L[4]	Toxic effects[9]	---	---
Metribuzin	8.4 mg/L[4]	---	Toxic effects[9]	---	---
Polychlorinated biphenyls (PCBs)	---	---	Toxic effects[9]	89 µg/kg	---
Terbufos	0.024 µg/L[4]	---	Toxic effects[9]	---	---
Toluene	2000 µg/L	600 µg/L	---	---	---
Trifluralin	26 µg/L[4]	1.1 µg/L[4]	Toxic effects[9]	---	---
Xylenes (total mixed)	920 µg/L	360 µg/L	---	---	---
Metal Pollutants					
Arsenic	360 µg/L (dissolved)	190 µg/L (dissolved)	---	95.5 mg/kg	---
Barium	5000 µg/L	---	---	397 mg/kg	---
Cadmium	Table B-3[5]	Table B-3[5]	---	14 mg/kg	---
Copper	Table B-3[5]	Table B-3[5]	---	590 mg/kg	---
Chromium, hexavalent	16 µg/L	11 µg/L	---	---	---
Chromium, trivalent	Table B-3[5]	Table B-3[5]	---	---	---
Chromium (total)	---	---	Toxic effects[9]	49 mg/kg	---
Iron	1000 µg/L (dissolved)	---	---	56,000 mg/kg	---

Table C-8 (continued). Guidelines for Identifying Potential Causes of Impairment of *Aquatic Life* Use in Illinois Inland Lakes.

	Basis for Identifying Causes[1] [7]				
	Criteria based on Water Quality Standards [2]			Non-Standards-based Criteria[3]	
Potential Cause	**Acute Criteria**	**Chronic Criteria**	**Narrative Criteria**	**Sediment Criteria**	**Other Criteria**
Metals (cont.)					
Lead	Table B-3[5]	Table B-3[5]	---	339 mg/kg	---
Manganese	1000 µg/L	---	---	5500 mg/kg	---
Mercury	2.2 µg/L (dissolved)	1.1 µg/L (dissolved)	---	0.701 mg/kg	---
Nickel	Table B-3[5]	Table B-3[5]	---	43 mg/kg	---
Selenium	1000 µg/L	---	---	---	---
Silver	5 µg/L	---	---	1.0 mg/kg	---
Zinc	Table B-3[5]	Table B-3[5]	---	1100 mg/kg	---
Other Pollutants					
(any pollutant with aquatic life criteria derived under 35 IAC 302.210)	<criterion>[4]	<criterion>[4]	---	---	---
Ammonia (Total)	Table B-3[5]	Table B-3[5]	---	---	---
Cause Unknown	[12].	[12].	---	---	[12].
Chlorides	500 mg/L	---	---	---	---
Chlorine[5]	19 µg/L	11 µg/L	---	---	---
Cyanide[5]	22 µg/L	5.2 µg/L	---	---	---
Fluoride	1.4 mg/L	---	---	---	---
Oil and Grease	---	---	unnatural sources[10]	---	Observed degradation from oil and grease [8]
pH	≥6.5 & ≤9.0	---	---	---	---
Phosphorus (Total)	0.05 mg/L[6]			2179 mg/kg	0.05 mg/L[6]
Sedimentation/Siltation (Bottom Deposits)	---	---	unnatural sources[10]		Annual storage loss > 0.25%
Sulfate					(See proposed standard in Section B-2)
Sludge			unnatural sources[10]		Observed degradation from sludge [8]
Temperature, Water[5] *(used only for thermal point sources)*	2.8°C maximum rise in water temperature[5]	[5]	unnatural temperature changes[11]	---	Observed degradation from unnatural temperature changes [8]
Total Suspended Solids	---	---	---		Median Surface NVSS > 12 mg/L
Turbidity	---	---	unnatural sources[10]	---	Observed degradation from turbidity [8]

Table C-8 (continued). Guidelines for Identifying Potential Causes of Impairment of *Aquatic Life* Use in Illinois Inland Lakes.

	Basis for Identifying Causes[1] [7]				
	Criteria based on Water Quality Standards [2]			Non-Standards-based Criteria[3]	
Potential Cause	**Acute Criteria**	**Chronic Criteria**	**Narrative Criteria**	**Sediment Criteria**	**Other Criteria**
Nonpollutant Causes					
Alteration in stream-side or littoral vegetative covers	---	---	---	---	Observed degradation from alteration in stream-side or littoral vegetative covers [8]
Alteration in wetland habitats	---	---	---	---	Observed degradation from alteration in wetland habitats [8]
Aquatic Algae	---	---	unnatural sources[10]	---	Median chlorophyll a (corrected) > 20 µg/L [7]
Aquatic Plants (Macrophytes)	---	---	unnatural sources[10]	---	> 40% peak coverage (June-Aug.)
Fish Kills	---	---	Toxic effects[9]	---	Documented fish kill; IDNR or Ill. EPA Records[8]
Non-Native Aquatic Plants	---	---	unnatural sources[10]	---	Observed degradation from non-native aquatic plants [8]
Non-Native Fish, Shellfish, or Zooplankton	---	---	---	---	Observed degradation from non-native fish, shellfish or zooplankton [8]
Oxygen, Dissolved	[5]	[5]	---	---	---

1. In general, a single exceedance of the criteria results in listing the parameter as a potential cause of impairment. Determination of causes is normally based on the most recent year of data from the Ambient Lake Monitoring Program, Illinois Clean Lakes Program or Source Water Assessment Program.
2. General Use Water Quality Standards at 35 Ill. Adm. Code 302, Subpart B.
3. Non-standards based numeric criteria for substances in water are based on 85th-percentile values of statewide Ambient Lake Monitoring Program and Illinois Clean Lakes Program data for water years 1978-1998. Criteria for substances in sediment represent the minimum threshold of "highly elevated" levels (Mitzelfelt 1996).
4. Criterion derived according to 35 Ill. Adm. Code 302.210. Derived water quality criteria are available at www.epa.state.il.us/water/water-quality-standards/water-quality-criteria.html. Any single value above the chronic criteria indicates a potential cause of impairment.
5. Numeric criteria used as cause guidelines are available in Tables B-2 and B-3 with further explanation.
6. The total phosphorus standard applies to lakes of 20 acres or larger. However, an observation of total phosphorus greater than 0.05 mg/L in lakes under 20 acres in size is also used to indicate a cause of impairment.
7. All table entries of "---" indicate that a cause guideline is not applicable or is unavailable.
8. Site-specific observation, information, or knowledge.
9. 35 Ill. Adm. Code 302.210.
10. 35 Ill. Adm. Code 302.203.
11. 35 Ill. Adm. Code 302.211b & c.
12. Cause Unknown is used if any of the following conditions apply:
    a) if either Aquatic Algae or Aquatic Plants (Macrophytes) is identified as a cause of impairment, but total phosphorus is not identified;
    b) if fish kills is identified as a cause of impairment, but the pollutant which caused the fish kill is not;
    c) if Non-Native Fish, Shellfish, or Zooplankton is identified as a cause of impairment and those non-native species are contributing to an increase in the level of some pollutant, but that pollutant is not identified;

d) if only nonpollutant causes are identified such as dissolved oxygen or habitat related causes, and there is reason to suspect that a pollutant impairment is likely, but the quantity and timing of water sampling is insufficient to detect it;
e) if dissolved oxygen is identified as a cause and a pollutant is suspected of contributing to low DO, but that pollutant is not identified.
f) if no causes of any type are identified.

Aquatic Life – Lake Michigan

Aquatic life use assessments are based on the applicable Lake Michigan Basin Water Quality Standards (Table B-4). The most-current three years of water quality data are used. Table C-9 provides the guidelines used to assess *aquatic life* use in Lake Michigan-basin waters.

Table C-9. Guidelines for Assessing *Aquatic Life* Use in Lake Michigan Basin Waters.

Water Chemistry: Lake Michigan Basin Water Quality Standards exceedances for any one parameter over three-year period. [1]	Fully Supporting (Good)	Not Supporting (Fair)	Not Supporting (Poor)
Conventionals [2] and other pollutants [3] Percent of samples	≤10%	>10≤25%	>25%
Toxics (priority pollutants, including chlorine, metals and un-ionized ammonia) [4] Acute (number of exceedances)	<2	2	>2
Toxics (priority pollutants, including chlorine, metals and un-ionized ammonia) [4] Chronic (percent of samples and mean)	≤10% and mean ≤standard	>10% and mean ≤standard	>10% and mean >standard

1. based on the most current three years of data from Lake Michigan Monitoring Program (LMMP) sampled six times per year
2. 35 Ill. Adm. Code, 302.502, 302.503, 302.507 including dissolved oxygen, pH, and water temperature
3. 35 Ill. Adm. Code 302.504 (b) including barium, chloride, iron, manganese, and total dissolved solids
4. 35 Ill. Adm. Code 302.504 (a, e), 302.535 (a, b) and 302.540 including ammonia nitrogen/un-ionized ammonia, arsenic, benzene, bis (2-ethylhexyl) phthalate, cadmium, chlorine (total residual), chromium, copper, cyanide, dieldrin, endrin, ethylbenzene, lead, lindane, ,mercury, nickel, parathion, pentachlorophenol, toluene, xylenes (total) and zinc

After a segment of Lake Michigan is assessed as Not Supporting *aquatic life* use, potential causes of impairments are identified. The primary methods for identifying and listing potential causes of specific use impairments for *aquatic life* use are described below and in Table C-10.

- Whenever possible, these guidelines are based on Lake Michigan Basin Water Quality Standards. In general, at least one exceedance of a numeric standard within the most-current three-year period serves as a guideline for identifying a potential cause of impairment. Also used are exceedances of the narrative portion of the Lake Michigan Basin Water Quality Standards which states that waters "...must be free from sludge or bottom deposits, floating debris, visible oil, odor, plant or algal growth, color or turbidity of other than natural origin." (35 Ill. Adm. Code, Section 302).

- For several potential causes, there are no applicable standards; however, quantitative data are available for assessments. In these cases, statistical methods were used. All available Lake Michigan surface data from 1978 through 1996 were evaluated and a value equal to the 85th-percentile was used as the guideline for listing a potential cause of impairment.

- Sediment data are also used for listing potential causes. In general, whenever a sediment parameter was found at heavily polluted levels (USEPA 1977), it was listed as a potential cause of impairment.

Table C-10. Guidelines for Identifying Potential Causes of Impairment of *Aquatic Life* Use in Lake Michigan.

	Basis for Identifying Causes[1] [6]				
	Criteria based on Water Quality Standards[2]			Non-Standards-based Criteria[3]	
Potential Cause	**Acute Criteria**	**Chronic Criteria**	**Narrative Criteria**	**Sediment Criteria**	**Other Criteria**
Pesticides and other Organic Pollutants					
Benzene	3900 µg/L	800 µg/L	---	---	---
bis (2-ethylhexyl) phthalate	76 µg/L[4]	17 µg/L[4]	---	---	---
Dieldrin	240 ng/L	56 ng/L	---	---	---
Endrin	0.086 µg/L	0.036 µg/L	---	---	---
Ethylbenzene	150 µg/L	14 µg/L	---	---	---
Lindane (gamma BHC)	0.95 µg/L	---	---	---	---
Parathion	0.065 µg/L	0.013 µg/L	---	---	---
Pentachlorophenol (PCP)	Table B-4[5]	Table B-4[5]	---		
Polychlorinated biphenyls (PCBs)	---	---	Toxic effects[8]	10,000 µg/kg	---
Toluene	2000 µg/L	610 µg/L	---	---	---
Xylenes (total mixed)	1200 µg/L	490 µg/L	---	---	---
Metal Pollutants					
Arsenic	340 µg/L (dissolved)	1148 µg/L (dissolved)	---	8 mg/kg	---
Barium	5 mg/L	---	---	60 mg/kg	---
Cadmium	Table B-4[5]	Table B-4[5]	---	14 mg/kg	---
Copper	Table B-4[5]	Table B-4[5]	---	590 mg/kg	---
Chromium, hexavalent	16 µg/L	11 µg/L	---	---	---
Chromium, trivalent	Table B-4[5]	Table B-4[5]	---	---	---
Chromium (total)	---	---	Toxic effects[8]	75 mg/kg	---
Iron	1 mg/L (dissolved)	---	---	25,000 mg/kg	---
Lead	Table B-4[5]	Table B-4[5]	---	60 mg/kg	---
Manganese	1 mg/L	---	---	500 mg/kg	---
Mercury	1700 ng/L (dissolved)	910 ng/L (dissolved)	---	1.0 mg/kg	---
Nickel	Table B-4[5]	Table B-4[5]	---	50 mg/kg	---
Selenium	---	5.0 µg/L (dissolved)	---	---	---
Zinc	Table B-4[5]	Table B-4[5]	---	200 mg/kg	---

Table C-10 (continued). Guidelines for Identifying Potential Causes of Impairment of *Aquatic Life* Use in Lake Michigan.

	Basis for Identifying Causes[1] [6]				
	Criteria based on Water Quality Standards[2]			Non-Standards-based Criteria[3]	
Potential Cause	**Acute Criteria**	**Chronic Criteria**	**Narrative Criteria**	**Sediment Criteria**	**Other Criteria**
Other Pollutants					
Ammonia (Total)	15 mg/L[5]	---	---	---	---
Ammonia (Un-ionized)	Table B-4[5]	Table B-4[5]	---	---	---
Chlorides	500 mg/L	---	---	---	---
Chlorine[5]	19 µg/L	11 µg/L	---	---	---
Cyanide[5]	22 µg/L	5.2 µg/L	---	---	---
Fluoride	1.4 mg/L	---	---	---	---
Oil and Grease	---	---	unnatural sources[9]	---	Observed degradation from oil and grease [7]
pH[5]	>7.0 & <9 in open waters >6.5 & <9.0 in remainder of basin	---	---	---	---
Phosphorus (Total)	---	---	---	650 mg/kg	0.01 mg/L
Sedimentation/Siltation (Bottom Deposits)	---	---	unnatural sources[9]	---	---
Temperature, Water[5] *(used only for thermal point sources)*	1.7°C maximum rise in water temperature[5]	[5]	unnatural temperature changes[4])	---	Observed degradation from unnatural temperature changes [7]
Total Dissolved Solids	1000 mg/L or Conductivity > 1667 umho/cm	---	---	---	---
Total Suspended Solids	---	---	---	---	6.0 mg/L
Turbidity	---	---	unnatural sources[9]	---	Observed degradation from turbidity [7]
Nonpollutant Causes					
Alteration in stream-side or littoral vegetative covers	---	---	---	---	Observed degradation from alteration in stream-side or littoral vegetative covers [7]
Aquatic Algae	---	---	unnatural sources[9]	---	chlorophyll a (corrected) > 6 µg/L or algal cells > 1900/ml
Aquatic Plants (Macrophytes)	---	---	unnatural sources[9]	---	Observed degradation from aquatic plants [7]
Non-Native Aquatic Plants	---	---	unnatural sources[9]	---	Observed degradation from non-native aquatic plants [7]
Non-Native Fish, Shellfish, or Zooplankton	---	---	---	---	Observed degradation from non-native fish, shellfish or zooplankton [7]
Oxygen, Dissolved [5]	≥90% saturation in open waters 5.0 mg/L in remainder of basin[10]	---	---	---	---

1. Unless otherwise indicated, for numeric criteria serving as guidelines, a single exceedance indicates that the substance is a potential cause of impairment. For applying these guidelines, Illinois EPA typically uses data from the Lake Michigan Monitoring Program (LMMP) (most recent three years).
2. Illinois Lake Michigan Basin Water Quality Standards, 35 Ill. Adm. Code, Subpart E
3. Non-standards based numeric criteria for substances in water are based on 85th-percentile values from a set of observations from the Lake Michigan Monitoring Program for years 1978-1996. Criteria for substances in sediment are based on levels considered heavily polluted in *Guidelines for Classification of Great Lakes harbor sediments*, USEPA, 1977.
4. The criterion was derived according to 35 Ill. Adm. Code 302.540. Derived water quality criteria are available at www.epa.state.il.us/water/water-quality-standards/water-quality-criteria.html. Any single value above the chronic criteria indicates a potential cause of impairment.
5. Numeric criteria used as cause guidelines are available in Table B-4 with further explanation.
6. All table entries of "---" indicate that a cause guideline is not applicable or is unavailable.
7. site-specific observation, information, or knowledge
8. 35 Ill. Adm. Code 302.540
9. 35 Ill. Adm. Code 302.515
10. Dissolved oxygen must not be less than 90% of saturation, except due to natural causes, in the open waters of Lake Michigan. The other waters of the Lake Michigan Basin must not be less than 6.0 mg/L during at least 16 hours of any 24 hour period, nor less than 5.0 mg/L at any time.

Indigenous Aquatic Life

Illinois' Secondary Contact and Indigenous Aquatic Life Standards (35 Ill. Adm. Code, 302, Subpart D) apply to about 86 miles of canals, channels and modified streams and Lake Calumet, in northeastern Illinois (35 Ill. Adm. Code 303.441). The standards are intended to protect *indigenous aquatic life* limited only by the physical configuration of the body of water, characteristics, and origin of the water and the presence of contaminants in amounts that do not exceed these water quality standards.

On October 26, 2007, Illinois EPA filed a comprehensive rulemaking notice with the Illinois Pollution Control Board to change use definitions, use designations, and associated water-quality standards for the waters currently co-designated for *secondary contact* use and for *indigenous aquatic life* use. This rulemaking process also includes the following three General Use waters: the North Shore Channel (IL_HCCA-02); Chicago River (IL_HCB-01); and the Calumet River (IL_HAA-01). The proposal is available on the Illinois Pollution Control Board website at http://www.ipcb.state.il.us/documents/dsweb/Get/Document-59147/. Because of these proposed comprehensive changes, (see Section B-2) no new assessments of *indigenous aquatic life* use have been made in this cycle or in the 2008 cycle. All previous assessments of *indigenous aquatic life* use (and *aquatic life* use for the three general use waters listed above) which were approved in the 2006 cycle have been carried forward to 2010 without change. Those assessments of *indigenous aquatic life* use were based on the methodology described below.

Fully Supporting status of *indigenous aquatic life* use is intended to represent aquatic-life conditions consistent with conditions judged as reasonably attainable in these highly modified waters. Unlike most assessments of *aquatic life* use, assessment of *indigenous aquatic life* use is not based primarily on direct measures of aquatic life; rather, it is based primarily on surrogate water chemistry data. All available water chemistry data are compared to the appropriate Secondary Contact and Indigenous Aquatic Life standards (Table B-2). Assessments of *indigenous aquatic life* use rely on frequency of exceedance guidelines to better represent the true risk of impairment to aquatic life than would a single exceedance of a water quality criterion. Table C-11 provides the guidelines used to assess *indigenous aquatic life* use in applicable streams and in Lake Calumet. Table C-12 provides the guidelines for identifying potential causes of indigenous aquatic life impairment.

Table C-11. Guidelines for Assessing *Indigenous Aquatic Life* Use in Illinois Streams.

Degree of Use Support	Guidelines
Fully Supporting (Good)	For every available pollutant or stressor, ≤ 10% of observations exceed an applicable standard.
Not Supporting (Fair)	For any one pollutant or stressor, > 10% but ≤ 25% of observations exceed an applicable standard.
Not Supporting (Poor)	For any one pollutant or stressor, > 25% of observations exceed an applicable standard.

Table C-12. Guidelines for Identifying Potential Causes of Impairment of *Indigenous Aquatic Life* Use in Illinois Streams and Lake Calumet.

	Basis for Identifying Causes[1] [6]			
	Criteria based on Water Quality Standards[2]		Non-Standards-based Criteria[3]	
Potential Cause	**Acute Criteria**	**Narrative Criteria**	**Sediment Criteria**	**Other Criteria**
Pesticides and other Organic Pollutants				
Aldrin	---	---	1.0/1.2 μg/kg	---
alpha-BHC	---	---	1.0 μg/kg	---
Chlordane	---	---	23/12 μg/kg	---
DDT	---	---	34/180 μg/kg	---
Dieldrin	---	---	15 μg/kg	---
Endrin	---	---	1.0 μg/kg	---
Heptachlor	---	---	1.0 μg/kg	---
Heptachlor epoxide	---	---	3.8/1.6 μg/kg	---
Hexachlorobenzene	---	---	1.0 μg/kg	---
Lindane (Gamma BHC)	---	---	1.0 μg/kg	---
Methoxychlor	---	---	5.0 μg/kg	---
Polychlorinated biphenyls (PCBs)	---	---	180/89 μg/kg	---
Metal Pollutants				
Arsenic	1000 μg/L	---	18/95.5 mg/kg	---
Barium	5000 μg/L	---	230/397 mg/kg	---
Cadmium	150 μg/L	---	9.3/14 mg/kg	---
Copper	1000 μg/L	---	170/590 mg/kg	---
Chromium, hexavalent	300 μg/L	---	---	---
Chromium, trivalent	1000 μg/L	---	---	---
Chromium (total)	---	---	110/49 mg/kg	---
Iron	500 μg/L (dissolved)	---	53,000/56,000 mg/kg	---
Lead	100 μg/L	---	245/339 mg/kg	---
Manganese	1000 μg/L	---	2,300/5,500 mg/kg	---
Mercury	0.5 μg/L	---	1.40/0.701 mg/kg	---
Nickel	1000 μg/L	---	45/43 mg/kg	---
Selenium	1000 μg/L	---	---	---
Silver	100 μg/L	---	5/1 mg/kg	---
Zinc	1000 μg/L	---	760/1,100 mg/kg	---
Other Pollutants				
Ammonia (Un-ionized)[4]	0.1 mg/L[4]	---	---	---

Table C-12 (continued). Guidelines for Identifying Potential Causes of Impairment of *Indigenous Aquatic Life Use* in Illinois Streams and Lake Calumet.

	Basis for Identifying Causes[1] [6]			
	Criteria based on Water Quality Standards[2]		Non-Standards-based Criteria[3]	
Potential Cause	**Acute Criteria**	**Narrative Criteria**	**Sediment Criteria**	**Other Criteria**
Other Pollutants	---	---	---	---
Cyanide[4]	0.1 µg/L	---	---	---
Fluoride	15 mg/L	---	---	---
Oil and Grease	15 mg/L	unnatural sources[8]	---	---
pH	≥6.0 & ≤9.0	---	---	---
Phenols	0.3 mg/L	---	---	---
Phosphorus (Total)	---	---	2,800/2,179 mg/kg	0.61 mg/L (streams only)
Sedimentation/Siltation (Bottom Deposits)	---	unnatural sources[8]	---	
Sludge		unnatural sources[8]		
Temperature, Water[4] *(used only for thermal point sources)*	100° F maximum & shall not exceed 93 ° F more than 5% of time	---	---	---
Total Dissolved Solids	1500 mg/L (Conductivity >2500 umho/cm)	---	---	---
Total Suspended Solids	---	---	---	116 mg/L (streams only)[7]
Turbidity	---	unnatural sources[8]	---	Observed degradation from turbidity[5]
Nonpollutant Causes				
Aquatic Algae	---	unnatural sources[8]	---	Observed degradation from aquatic algae[5]
Aquatic Plants (Macrophytes)	---	unnatural sources[8]	---	Observed degradation from aquatic plants[5]
Fish Kills	---	---	---	Documented fish kill; IDNR or Ill. EPA Records
Fish-Passage Barrier	---	---	---	Observed degradation from fish passage barrier[5]
Low flow alterations	---	---	---	Observed degradation from low flow alterations[5]
Non-Native Aquatic Plants	---	unnatural sources[8]	---	Observed degradation from non-native aquatic plants[5]
Non-Native Fish, Shellfish, or Zooplankton	---	---	---	Observed degradation from non-native fish, shellfish, or zooplankton[5]
Other flow alterations	---	---	---	Observed degradation from other flow alterations[5]
Oxygen, Dissolved [4]	≥ 4.0 mg/L[4]	---	---	---

Footnotes for Table C-12.

1. Unless otherwise indicated, for numeric criteria serving as guidelines, a single exceedance indicates that the substance is a potential cause of impairment. For applying these guidelines, Illinois EPA typically uses data from our three primary stream-monitoring programs: Ambient Water Quality Monitoring Network (most recent three years), Intensive Basin Survey (most recent survey), Facility-Related Stream Survey (most recent survey).
2. Illinois Secondary Contact and Indigenous Aquatic Life Water Quality Standards, 35 Ill. Adm. Code, 302, Subpart D
3. When two numbers are listed for sediment guidelines the first number applies to streams and the second number applies to Lake Calumet. Criteria for substances in stream sediment represent the minimum threshold of "highly elevated" levels (Short 1997). Criteria for substances in Lake Calumet sediment represent the minimum threshold of "highly elevated" levels (Mitzelfelt 1996). Criteria for substances in stream water are based on 85^{th}-percentile values determined from a statewide set of observations from the Ambient Water Quality Monitoring Network, for water years 1978-1996.
4. Numeric criteria used as cause guidelines are available in Table B-2 with further explanation.
5. site-specific observation, information, or knowledge
6. All table entries of "---" indicate that a cause guideline is not applicable or is unavailable.
7. The criteria for Total Suspended Solids listed in this table is for streams. Criteria for Total Suspended Solids for Lake Calumet are the same as those listed for inland lakes in Table C-8.
8. 35 Ill. Adm. Code 302.403

Fish Consumption – Streams, Inland Lakes and Lake Michigan

Fish consumption use is associated with all water bodies in the state. The assessment of *fish consumption* use is based on water body-specific fish-tissue data and also on fish-consumption advisories issued by the Illinois Fish Contaminant Monitoring Program (FCMP). A list of water bodies having advisories can be found in the Illinois Department of Natural Resources' (IDNR) publication ***2009 Illinois Fishing Information*** (http://dnr.state.il.us/fish/digest/). Fish-consumption advisories are incorporated into the process for assessing *fish consumption* use as explained below.

The FCMP uses the U.S. Food & Drug Administration's (FDA) Action Levels as criteria for determining the need for advisories, except for polychlorinated biphenyls (PCBs), mercury, and chlordane. For these contaminants the FDA criteria have been replaced by a risk-based process developed in the *Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory* (Anderson et al. 1993, herein after referred to as the Protocol). The Protocol requires the determination of a Health Protection Value (HPV) for a contaminant, which is then used with five meal consumption frequencies (eight ounces of uncooked filet): 1) Unlimited (140 meals/year); 2) One meal/week (52 meals/year); 3) One meal/month (12 meals/year); 4) One meal/two months (six meals/year); and 5) Do not eat (0 meals/year). The level of contaminant in fish is then calculated that will not result in exceeding the HPV at each meal consumption frequency. The Protocol also assumes a 50% reduction of contaminant levels for organic chemicals (not used for mercury) when recommended cleaning and cooking methods are used. The HPVs, target populations, critical health effects to be protected by the HPVs, and the criteria for PCBs, mercury and chlordane for the various meal frequencies, are listed in Table C-13 as well as the FDA action levels for other contaminants.

Except in extraordinary circumstances, two or more recent sampling events in a water body in two different sampling years finding fish exceeding a level of concern for one or more contaminants are necessary for issuing or changing an advisory (based on data collected since 1985). Similarly, two or more recent samples finding no fish exceeding criteria are necessary for rescinding an advisory. For any contaminant except mercury, the issuance of a fish-consumption advisory for a specific water body provides the basis for a determination that *fish consumption* use is impaired, with the contaminant of concern listed as a cause of impairment. Currently, fish-consumption advisories are in effect only for PCBs, chlordane and mercury. However, a statewide fish-consumption advisory ("no more than one meal per week of predator fish" for pregnant or nursing women, women of childbearing age, and children less than 15 years of age) has been issued for mercury because fish-tissue data indicated widespread contamination above criteria levels throughout the state. This statewide advisory applies to all waters in Illinois even though not all water bodies were sampled and not all samples exceeded the criteria levels for that advisory.

This last sentence represents a fundamental difference between the purpose and methodology for issuing fish-consumption advisories and assessing attainment of *fish consumption* use. Fish-consumption advisories are, as their name implies, advice to the public on how best to avoid a certain level of exposure to contaminants which **may** be present in fish tissue. The purpose of assessing attainment of *fish consumption* use is to identify those specific waters where *fish*

consumption use **is** impaired. While statewide or watershed advisories are a justifiable, conservative approach to the protection of human health, they do not identify the specific waters where contaminants are known to occur and may be overprotective in waters where contaminants do not occur.

Because of this, Illinois EPA does not assess *fish consumption* use as Not Supporting in all waters of the state based on the statewide fish-consumption advisory for mercury. Rather, *fish consumption* use is assessed as Not Supporting only for those specific waters where at least one fish-tissue sample is available and where at least one fish species exceeds the 0.06 mg/kg criterion for mercury. Also, because the statewide advisory is for predator species, *fish consumption* use is only assessed as Fully Supporting in those waters where predator fish-tissue data from the most recent two years do not show mercury contamination above criteria levels. Waters where sufficient fish-tissue data are unavailable are considered Not Assessed.

Table C-14 shows the guidelines used for assessing attainment of *fish consumption* use.

The IDNR publication referenced at the beginning of this section notes that there is a statewide one-meal-per-week mercury advisory, but does not list those specific waters where mercury was found in fish-tissue above the 0.06 mg/kg criteria. Only those waters with more restrictive mercury advisories (with greater levels of contamination) were listed. The result is that there will appear to be more waters impaired for *fish consumption* use due to mercury on the 2010 303(d) List than listed for a mercury advisory in the IDNR publication.

Table C-15 lists guidelines for identifying potential causes of *fish consumption* use impairment. Although all parameters with FDA action levels are listed in the table, only PCBs, mercury and chlordane have ever been detected in Illinois fish samples at levels that would warrant a fish-consumption advisory.

Table C-13. Health Protection Values (HPVs) and Criteria Levels for Sport-Fish-Consumption Advisories for Polychlorinated Biphenyls, Methyl Mercury, and Chlordane; and FDA Action Levels for Other Contaminants.

CHEMICAL	HPV (ug/kg/d)	TARGET POPULATION[1], EFFECT	MEAL FREQUENCY	CRITERIA LEVELS (mg/kg)
Polychlorinated biphenyls	0.05	All (emphasis on sensitive), Reproductive/ developmental effects	Unlimited 1 meal/week 1 meal/month 1 meal/2 months Do not eat	0-0.05 0.06-0.22 0.23-0.95 0.96-1.9 >1.9
Methyl mercury	0.1	Sensitive, Reproductive/ developmental effects	Unlimited 1 meal/week 1 meal/month Do not eat	0-0.05 0.06-0.22 0.23-1.0 >1.0
Methyl mercury	0.3	Nonsensitive, Nervous system effects	Unlimited 1 meal/week 1 meal/month Do not eat	0-0.15 0.16-0.65 0.66-1.0 >1.0
Chlordane	0.15	All, Liver effects	Unlimited 1 meal/week 1 meal/month 1 meal/2months Do not eat	0-0.15 0.16-0.65 0.66-2.8 2.9-5.6 >5.6

	FDA Action Level (mg/kg)
Aldrin	0.3
DDT (Total)	5.0
Dieldrin	0.3
Endrin	0.3
Heptachlor	0.3
Heptachlor epoxide	0.3
Mirex	0.1
Toxaphene	5.0

1. Sensitive Population includes pregnant or nursing women, women of child-bearing age, and children under 15; Nonsensitive Population includes women beyond child-bearing age and men over 15.

Table C-14. Guidelines for Assessing *Fish Consumption* Use in all Illinois Waters Including Streams, Inland Lakes, and Lake Michigan.

Degree of Use Support	Guidelines[1]
Fully Supporting[6] (Good)	PCBs are less than 0.06 mg/kg and chlordane is less than 0.16 mg/kg in fish tissue in the two most recent years of samples for each species collected since 1985; and, mercury is less than 0.06 mg/kg in fish tissue in the two most recent years of samples for each species collected since 1985 and those samples include at least one predator species[2] of a "large size class[3]" in two different years.
Not Supporting (Fair)	A water body-specific[4], "restricted consumption[5]" fish-consumption advisory is in effect; or, mercury is greater than or equal to 0.06 mg/kg in fish tissue of any species, in at least one of the two most recent years of samples collected in 1985 or later[7].
Not Supporting (Poor)	A "no consumption" (i.e., "Do Not Eat") fish-consumption advisory, for one or more fish species, is in effect for the general human population; or, a commercial fishing ban is in effect.
Not Assessed	None of the guidelines above apply.

1 In general, all data for each named stream or lake are combined to make the assessment. For larger rivers, assessments may be made for partial river segments.

2 "Predatory species" include northern pike, muskellunge, flathead catfish, chinook salmon, coho salmon, lake trout, brown trout, white bass, striped bass, striped-bass hybrids, smallmouth bass, largemouth bass, spotted bass, sauger, walleye, and saugeye.

3 "Large size class" is dependant on the particular species and the water body where the species is collected.

4 Although a general statewide advisory for mercury exists, Illinois EPA assesses *fish consumption* use as "Not Supporting" only for specific waters from which fish tissue has been collected and analyzed for contaminants and mercury contamination is confirmed. Fish-tissue data needed to confirm the advisory are not available from all waters.

5 Restricted consumption is defined as limits on the number of meals or size of meals consumed per unit time, per fish species. In Illinois, restricted-consumption advisories are: 1 meal/week, 1 meal/month, or 1 meal/2 months.

6 An assessment of Fully Supporting *fish consumption* use requires fish-tissue data from two different years (1985 or later). If more than two years of fish-tissue data are available (1985 or later), only the two most recent years of data (per species) are used in the assessment process.

7 Only one sample of fish tissue (1985 or later) exceeding criteria levels is necessary for an assessment of Not Supporting (Fair). If more than two years of fish-tissue data are available (1985 or later), only the two most recent years of data (per species) are used in the assessment process.

Table C-15. Guidelines for Identifying Potential Causes of Impairment of *Fish Consumption* Use in Illinois Streams, Inland Lakes and Lake Michigan.

Potential Cause	Basis For Identifying Cause
Aldrin	Fish-consumption advisory or commercial fishing ban is in effect, attributable to any applicable parameter[1].
Chlordane	
DDT	
Dieldrin	
Endrin	
Heptachlor	
Heptachlor epoxide	
Mirex	
Polychlorinated biphenyls (PCBs)	
Toxaphene	
Mercury	Water body-specific fish-tissue data indicating mercury ≥0.06 mg/kg

Primary Contact – Streams and Inland Lakes

According to Illinois water quality standards, "primary contact" means "*...any recreational or other water use in which there is prolonged and intimate contact with the water involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard, such as swimming and water skiing*" (35 Ill. Adm. Code 301.355). The assessment of *primary contact* use is based on fecal coliform bacteria data. The General Use Water Quality Standard for fecal coliform bacteria specifies that during the months of May through October, based on a minimum of five samples taken over not more than a 30-day period, fecal coliform bacteria counts shall not exceed a geometric mean of 200/100 ml, nor shall more than 10 percent of the samples during any 30-day period exceed 400/100 ml (35 Ill. Adm. Code 302.209). This standard protects *primary contact* use of Illinois waters by humans. Due to limited state resources, fecal coliform bacteria is not normally sampled at a frequency necessary to apply the General Use standard, i.e., at least five times per month during May through October, and very little data available from others are collected at the required frequency. Therefore, assessment guidelines are based on application of the standard when sufficient data is available to determine standard exceedances; but, in most cases, attainment of *primary contact* use is based on a broader methodology intended to assess the likelihood that the General Use standard is being attained.

To assess *primary contact* use, Illinois EPA uses all fecal coliform bacteria from water samples collected in May through October, over the most recent five-year period (i.e., 2002 through 2006 for this report). Based on these water samples, geometric means and individual measurements of fecal coliform bacteria are compared to the concentration thresholds in Tables C-16 and C-17. To apply the guidelines, the geometric mean of fecal coliform bacteria concentration is calculated from the entire set of May through October water samples, across the five years. No more than 10% of all the samples may exceed 400/100 ml for a water body to be considered Fully Supporting.

Some portions of stream segments are exempt from the fecal coliform bacteria water quality standard; *primary contact* use does not apply in these portions (35 Ill. Adm. Code 302.209). Stream miles assessed for *primary contact* use only include those reaches represented by Ambient Water Quality Monitoring Network stations where such exemptions do not apply. Since we typically do not collect fecal coliform bacteria samples in lakes, *primary contact* use assessments are limited to those lakes for which fecal coliform data is available from outside sources, primarily the Lake County Health Department, Lakes Management Unit.

Table C-16. Guidelines for Assessing *Primary Contact* Use in Illinois Streams and Inland Lakes.

Degree of Use Support	Guidelines
Fully Supporting (Good)	No exceedances of the fecal coliform bacteria standard in the last five years and the geometric mean of all fecal coliform bacteria observations ≤200/100 ml, and ≤10% of all observations exceed 400/100 ml.
Not Supporting (Fair)	One exceedance of the fecal coliform bacteria standard in the last five years (when sufficient data is available to assess the standard) or The geometric mean of all fecal coliform bacteria observations in the last five years ≤200/100 ml, and >10% of all observations in the last five years exceed 400/100 ml or The geometric mean of all fecal coliform bacteria observations in the last five years >200/100 ml, and ≤25% of all observations in the last five years exceed 400/100 ml.
Not Supporting (Poor)	More than one exceedance of the fecal coliform bacteria standard in the last five years (when sufficient data is available to assess the standard) or The geometric mean of all fecal coliform bacteria observations in the last five years >200/100 ml, and >25% of all observations in the last five years exceed 400/100 ml

Table C-17. Guidelines for Identifying Potential Causes of Impairment of *Primary Contact* (Swimming) Use in Illinois Streams and Inland Lakes.

Potential Cause	Basis for Identifying Cause - Numeric Standard[1]
Fecal Coliform	Geometric mean of at least five fecal coliform bacteria observations collected over not more than 30 days during May through October >200/100 ml or > 10% of all such fecal coliform bacteria observations exceed 400/100 ml or Geometric mean of all fecal coliform bacteria observations (minimum of five samples) collected during May through October >200/100 ml or > 10% of all fecal coliform bacteria observation exceed 400/100 ml.

1. The applicable fecal coliform standard (35 Ill. Adm. Code, 302, Subpart B, Section 302.209) requires a minimum of five samples in not more than a 30-day period. However, because this number of samples is seldom available in this time frame the criteria are also based on a minimum of five samples over the most recent five-year period.

Primary Contact – Lake Michigan

For Lake Michigan open waters, the assessment of *primary contact* use is based on fecal coliform bacteria. Fecal coliform bacteria data are collected as part of the Lake Michigan Monitoring Program, but insufficient numbers of samples are collected during a 30-day period to appropriately apply the standard (Table B-4). In addition, these samples are collected in the open lake from one to six miles off shore and may not reflect conditions at beaches. At approximately 51 Lake Michigan beaches, local agencies collect daily *Escherichia coli* bacteria samples during the swimming season. Beaches are closed by these agencies if samples exceed 235/100 ml *Escherichia coli* bacteria (77 Ill. Adm. Code 820). *Primary contact* use is assessed by using criteria in Tables C-18 (beaches) and C-19 (open waters). Criteria for identifying causes of impairment for *primary contact* use are shown in Table C-20.

Table C-18. Guidelines for Assessing *Primary Contact* Use at Lake Michigan Beaches (USEPA 1997).

Degree of Use Support	Guidelines (1)
Fully Supporting (Good)	On average, less than one bathing area closure per year of less than one week's duration.
Not Supporting (Fair)	On average, one bathing area closure per year of less than one week's duration.
Not Supporting (Poor)	On average, one bathing area closure per year of greater than one week's duration, or more than one bathing area closure per year.

1. Based on most-current three years of data (if available) from local agencies using Illinois Department of Public Health Bathing Beach Code (77 Ill. Adm. Code 820.400): An *Escherichia coli* count of 235 colonies/100 ml in each of two samples collected on the same day shall require closing the beach. Note: beaches in Lake County and suburban Cook County are closed when one sample exceeds 235/100 ml; beaches in Chicago are closed when two consecutive samples exceed 235/100 ml.

Table C-19. Guidelines for Assessing *Primary Contact* Use in the Open Waters of Lake Michigan.

Degree of Use Support	Guidelines [1, 2]
Fully Supporting (Good)	Geometric mean of all fecal coliform bacteria samples <200/100 ml and ≤10% of samples exceed a count of 400/100 ml.
Not Supporting (Fair)	The geometric mean of all fecal coliform bacteria samples <200/100 ml, and >10% of samples exceed a count of 400/100 ml. or The geometric mean of all fecal coliform bacteria samples >200/100 ml and ≤25% of samples exceed a count of 400/100 ml.
Not Supporting (Poor)	The geometric mean of all fecal coliform bacteria samples >200/100 ml and >25% of samples exceed a count of 400/100 ml.

1. Based on most-current three years of data from Lake Michigan Monitoring Program sampled approximately six times per year.
2. 35 Ill. Adm. Code 302.505 (2002).

Table C-20. Guidelines for Identifying Potential Causes of Impairment of *Primary Contact* (Swimming) Use in Lake Michigan Beaches and Open Waters.

Potential Cause	Basis For Identifying Causes - Numeric Standard[1,2]
Fecal Coliform	Geometric mean of all fecal coliform bacteria observations (minimum of five samples) collected during the most recent three years >200/100 ml
Escherichia coli	On average at least one bathing beach closure per year based on *E. coli* bacteria

1. The applicable fecal coliform standard in 35 Illinois Administrative Code, Part 302, Subpart E, Section 302.505 requires a minimum of 5 samples in not more than a 30-day period. However, because this number of samples is seldom available in this time frame the criteria are based on a minimum of five samples (May through October) over the most recent three year period.
2. Department of Public Health Bathing Beach Code (77 Ill. Adm. Code 820.400): An *Escherichia coli* count of 235 colonies/100 ml in each of two samples collected on the same day shall require closing the beach. Note: beaches in Lake County and suburban Cook County are closed when one sample exceeds 235/100 ml; beaches in Chicago are closed when two consecutive samples exceed 235/100 ml.

Secondary Contact – Streams, Inland Lakes and Lake Michigan

According to Illinois water quality standards, "secondary contact" means "*...any recreational or other water use in which contact with the water is either incidental or accidental and in which the probability of ingesting appreciable quantities of water is minimal, such as fishing, commercial and recreational boating and any limited contact incident to shoreline activity*" (35 Ill. Adm. Code 301.380). Although *secondary contact* use is associated with all waters of the state, no specific assessment guidelines have been developed to assess *secondary contact* use because existing water quality standards have no water quality criterion that specifically address this use. However, consistent with the meanings of these two uses, in any water where *primary contact* use is assessed as Fully Supporting, *secondary contact* use is also assessed as Fully Supporting. In all other circumstances *secondary contact* use is not assessed.

Public and Food Processing Water Supply – Streams, Inland Lakes, and Lake Michigan

Attainment of *public and food processing water supply* use is assessed only in waters in which the use is currently occurring, as evidenced by the presence of an active public-water-supply intake. The assessment of *public and food processing water supply* use is based on conditions in both untreated and treated water (Table C-21). By incorporating data through programs related to both the federal Clean Water Act and the federal Safe Drinking Water Act, Illinois EPA believes that these guidelines provide a comprehensive assessment of *public and food processing water supply* use.

Assessments of *public and food processing water supply* use recognize that characteristics and concentrations of substances in Illinois surface waters can vary and that a single assessment guideline may not protect sufficiently in all situations. Using multiple assessment guidelines helps improve the reliability of these assessments. When applying these assessment guidelines, Illinois EPA also considers the water-quality substance, the level of treatment available for that substance, and the monitoring frequency of that substance in the untreated water.

One of the assessment guidelines for untreated water relies on a frequency-of-exceedance threshold (10%) because this threshold represents the true risk of impairment better than does a single exceedance of a water quality criterion. Assessment guidelines also recognize situations in which water treatment that consists only of "*...coagulation, sedimentation, filtration, storage and chlorination, or other equivalent treatment processes*"(35 Ill. Adm. Code 302.303; hereafter called "conventional treatment") may be insufficient for reducing potentially harmful levels of some substances. To determine if a Maximum Contaminant Level (MCL) violation in treated water would likely occur if treatment additional to conventional treatment were not applied (see 35 Ill. Adm. Code 302.305), the concentration of the potentially harmful substance in untreated water is examined and compared to the MCL threshold concentration. If the concentration in untreated water exceeds an MCL-related threshold concentration, then an MCL violation could reasonably be expected in the absence of additional treatment.

Table C-21 provides the guidelines for assessing attainment of *public and food processing water supply* use in Illinois streams, inland lakes, and Lake Michigan. In general, compliance with an

MCL for treated water is based on a running 4-quarter (i.e., annual) average, calculated quarterly, of samples collected at least once per quarter (Jan.-Mar., Apr.-Jun., Jul.-Sep., and Oct.-Dec.). However, for some untreated-water intake locations, sampling occurs less frequently than once per quarter; therefore, statistics comparable to quarterly averages or running 4-quarter averages cannot be determined.for untreated water. Rather, for substances not known to vary regularly in concentration in Illinois surface waters (untreated) throughout the year, a simple arithmetic average concentration of all available results is used to compare to the MCL threshold. For substances known to vary regularly in concentration in surface waters during a typical year (e.g., atrazine), average concentrations within the relevant sub-annual (e.g., quarterly) periods are used. Table C-22 lists the guidelines for identifying potential causes of *public and food processing water supply* use impairment.

Table C-21. Guidelines for Assessing *Public and Food Processing Water Supply* Use in Illinois Streams, Inland Lakes, and Lake Michigan.

Degree of Use Support	Guidelines
Fully Supporting (Good)	For each substance in untreated water [1], for the most-recent three years of readily available data or equivalent dataset, a) ≤ 10% of observations exceed an applicable Public and Food Processing Water Supply Standard [2]; and b) for which the concentration is not readily reducible by conventional treatment, i) no observation exceeds by at least fourfold the treated-water Maximum Contaminant Level threshold concentration[3] for that substance; and ii) no quarterly average concentration exceeds the treated-water Maximum Contaminant Level threshold concentration[3] for that substance; and iii) no running annual average concentration exceeds the treated-water Maximum Contaminant Level threshold concentration[4] for that substance. And [4], For each substance in treated water, no violation of an applicable Maximum Contaminant Level [3] occurs during the most recent three years of readily available data.
Not Supporting (Fair)	For any single substance in untreated water, [1] for the most-recent three years of readily available data or equivalent dataset, a) > 10% of observations exceed a Public and Food Processing Water Supply Standard [2]; or b) for which the concentration is not readily reducible by conventional treatment, i) at least one observation exceeds by at least fourfold the treated-water Maximum Contaminant Level threshold concentration[3] for that substance; or ii) the quarterly average concentration exceeds the treated-water Maximum Contaminant Level threshold concentration[3] for that substance; or iii) the running annual average concentration exceeds the treated-water Maximum Contaminant Level threshold concentration[3] for that substance. Or, For any single substance in treated water, at least one violation of an applicable Maximum Contaminant Level [3] occurs during the most recent three years of readily available data.
Not Supporting (Poor)	Closure to use as a drinking-water resource (cannot be treated to allow for use).

1. Includes only the untreated-water results that were available in the primary computer database at the time data were compiled for these assessments.
2. See Table B-2 and 35 Ill. Adm. Code 302.304, 302.306.
3. 35 Ill. Adm. Code 611.300, 611.301, 611.310, 611.311, 611.325.
4. Some waters were assessed as Fully Supporting based on treated-water data only.

Table C-22. Guidelines for Identifying Potential Causes of Impairment of *Public and Food Processing Water Supply* Use in Illinois Streams, Inland Lakes and Lake Michigan.

	Basis For Identifying Cause[1, 4]	
Potential Cause	**Numeric Standard[2]**	**Maximum Contaminant Level[3]**
1,1,1-Trichloroethane	---	0.2 mg/L
1,1,2-Trichloroethane	---	5 µg/L
1,2,4-Trichlorobenzene	---	0.07 mg/L
1,2-Dibromo-3-chloropropane (Dibromochloropropane DBCP)	---	0.2 µg/L
1,2-Dichloroethane	---	5 µg/L
1,2-Dichloropropane	---	5 µg/L
2,3,7,8-Tetrachlorodibenzo-p-dioxin (only)	---	0.03 ng/L
2,4,5-TP (Silvex)	0.01 mg/L	0.05 mg/L
2,4-D	0.1 mg/L	0.01 mg/L
Alachlor	---	2 µg/L
Aldrin	1 µg/L	1 µg/L
Antimony	---	6 µg/L
Arsenic	0.05 mg/L	0.010 mg/L
Asbestos	---	7 MFL[5]
Atrazine	---	3 µg/L
Barium	1.0 mg/L	2 mg/L
Benzene	---	5 µg/L
Benzo[a]pyrene (PAHs)	---	0.2 µg/L
Beryllium	---	4 µg/L
Cadmium	0.010 mg/L	5 µg/L
Carbofuran	---	0.04 mg/L
Carbon tetrachloride	---	5 µg/L
Chlordane	3 µg/L	2 µg/L
Chlorides	250 mg/L	---
Chlorobenzene (mono)	---	0.1 mg/L
Chromium (total)	0.05 mg/L	0.1 mg/L
cis-1,2-Dichloroethylene	---	0.07 mg/L
Cyanide	---	0.2 mg/L
Dalapon	---	0.2 mg/L
DDT	0.05 mg/L	0.05 mg/L
DEHP (di-sec-octyl phthalate) (Di(2-ethylhexyl)phthalate)	---	6 µg/L
Di (2-ethylhexyl) adipate	---	0.4 mg/L
Dichloromethane (methylene chloride)	---	5 µg/L

Table C-22 (cont.). Guidelines for Identifying Potential Causes of Impairment of *Public and Food Processing Water Supply* Use in Streams, Inland Lakes and Lake Michigan.

	Basis For Identifying Cause[1, 4]	
Potential Cause	**Numeric Standard[2]**	**Maximum Contaminant Level[3]**
Dieldrin	1 µg/L	1 µg/L
Dinoseb	---	7 µg/L
Diquat	---	0.02 mg/L
Endothall	---	0.1 mg/L
Endrin	0.2 µg/L	2 µg/L
Ethylbenzene	---	0.7 mg/L
Ethylene dibromide	---	0.05 µg/L
Fecal Coliform	geometric mean of five samples in ≥30 days ≥2000 per 100 ml	---
Fluoride	---	4 mg/L
Glyphosate	---	0.7 mg/L
Heptachlor	0.1 µg/L	0.1 µg/L
Heptachlor epoxide	0.1 µg/L	0.1 µg/L
Hexachlorobenzene	---	1 µg/L
Hexachlorocyclopentadiene	---	0.05 mg/L
Iron	0.3 mg/L (dissolved)	1.0 mg/L (for CWS serving ≥1000 people or ≥300 connections)
Lead	0.05 mg/L	---
Lindane	4 µg/L	0.2 µg/L
Manganese	0.15 mg/L	0.15 mg/L (for CWS serving ≥1000 people or ≥300 connections)
Mercury	---	2 µg/L
Methoxychlor	0.1 mg/L	0.04 mg/L
Nitrate/Nitrite (nitrate + nitrite as N)	---	10 mg/L
Nitrogen, Nitrate	10 mg/L	10 mg/L
Nitrogen, Nitrite	---	1 mg/L
o-Dichlorobenzene	---	0.6 mg/L
Oil and Grease	0.1 mg/L	---
Oxamyl (Vydate)	---	0.2 mg/L
Parathion	0.1 mg/L	---
p-Dichlorobenzene	---	0.075 mg/L
Pentachlorophenol (PCP)	---	1 µg/L
Phenols	1 µg/L	---
Picloram	---	0.5 mg/L
Polychlorinated biphenyls (PCBs)	---	0.5 µg/L
Selenium	0.01 mg/L	0.05 mg/L
Simazine	---	4 µg/L

Table C-22 (cont.). Guidelines for Identifying Potential Causes of Impairment of *Public and Food Processing Water Supply* Use in Streams, Inland Lakes and Lake Michigan.

	Basis For Identifying Cause[1, 4]	
Potential Cause	**Numeric Standard[2]**	**Maximum Contaminant Level[3]**
Styrene	---	0.1 mg/L
Sulfates	250 mg/L	---
Tetrachloroethylene	---	5 µg/L
Thallium	---	2 µg/L
Toluene	---	1 mg/L
Total Dissolved Solids	500 mg/L	---
Toxaphene	5 µg/L	3 µg/L
trans-1,2-Dichloroethylene	---	0.1 mg/L
Trichloroethylene	---	5 µg/L
Vinyl chloride	---	2 µg/L
Vinylidene chloride (1, 1–Dichloroethylene)	---	7 µg/L
Xylene(s) (total) (mixed)	---	10 mg/L
Zinc	---	5 mg/L

1. In general, for untreated water, a cause is identified if:
   a) 10% or more of the observations exceed the applicable numeric standard; or
   b) for any substance for which the concentration is not readily reducible by conventional treatment,
      i) any observation exceeds by at least threefold the treated-water Maximum Contaminant Level threshold concentration for the substance; or
      ii) any quarterly average concentration exceeds the treated-water Maximum Contaminant Level threshold concentration for the substance; or
      iii) any running annual average concentration exceeds the treated-water Maximum Contaminant Level threshold concentration for that substance.

   For treated water, a cause is identifed if there is any violation of the Maximum Contaminant Level for the substance.

   Identification of causes is based primarily on data from these monitoring programs: Ambient Water Quality Monitoring Network, Intensive Basin Surveys, Ambient Lake Monitoring Program, Illinois Clean Lakes Program, Lake Michigan Monitoring Program, Source Water Assessment Program.
2. The numeric standard is based on 35 Ill. Adm. Code 302, Subpart C: Public and Food Processing Water Supply Standards (See Table B-2).
3. Maximum Contaminant Levels are from 35 Ill. Adm. Code 611, Subpart F: Maximum Contaminant Levels (MCLs) and Maximum Residual Disinfectant Levels (MRDLs).
4. All table entries of "---" indicate that a cause guideline is not applicable or is unavailable.
5. MFL – million fibers per liter, for fibers less than 10 microns.

Aesthetic Quality – Inland Lakes

Aesthetic quality use is associated with all water bodies in the state except those Chicago area water bodies where Secondary Contact and Indigenous Aquatic Life Standards apply. However, methods for assessing *aesthetic quality* use have only been developed for inland lakes and *aesthetic quality* use is not assessed in other water body types.

The Aesthetic Quality Index (AQI) (Table C-23) is the primary tool used to assess *aesthetic quality* for inland lakes. The AQI represents the extent to which pleasure boating, canoeing, and aesthetic enjoyment are attained at a lake. The Trophic State Index (TSI; Carlson 1977), the percent-surface-area macrophyte coverage during the peak growing season (June through August), and the median concentration of nonvolatile suspended solids are used to calculate the AQI score. Higher AQI scores indicate increased impairment (Table C-24).

Assessments of *aesthetic quality* use are based primarily on physical and chemical water quality data collected by the Illinois EPA through the Ambient Lake Monitoring Program or the Illinois Clean Lakes Program, or by non-Illinois EPA persons under an approved quality assurance project plan. The physical and chemical data used for *aesthetic quality* use assessments include: Secchi-disk transparency, chlorophyll *a*, total phosphorus (epilimnetic samples only), nonvolatile suspended solids (epilimnetic samples only), and percent surface area macrophyte coverage. Data are collected a minimum of five times per year (April through October) from one or more established lake sites. Data are considered usable for assessments if meeting the following minimum requirements (Figure C-3): 1) At least four out of seven months (April through October) of data are available, 2) At least two of these months occurs during the peak growing season of June through August (this requirement does not apply to NVSS) and 3) Usable data are available from at least half of all lakes sites within any given lake each month. As outlined in Figure C-3, a whole-lake TSI value is calculated for the median Secchi-disk transparency, median total phosphorus (epilimnetic sample depths only), and median chlorophyll *a* values. A minimum of two parameter-specific TSI values are required to calculate a parameter-specific use support determination. An assessment is then made based on the parameter specific use support determinations. The 0.05 mg/L Illinois General Use Water Quality Standard for total phosphorus in lakes (35 Ill. Adm. Code 302.205) has been incorporated into the weighting criteria used to assign point values for the AQI. Table C-25 lists the guidelines for identifying potential causes of *aesthetic quality* use impairment.

Figure C-3. Flow Chart for Assessing Attainment of Aesthetic Quality Use in Lakes.

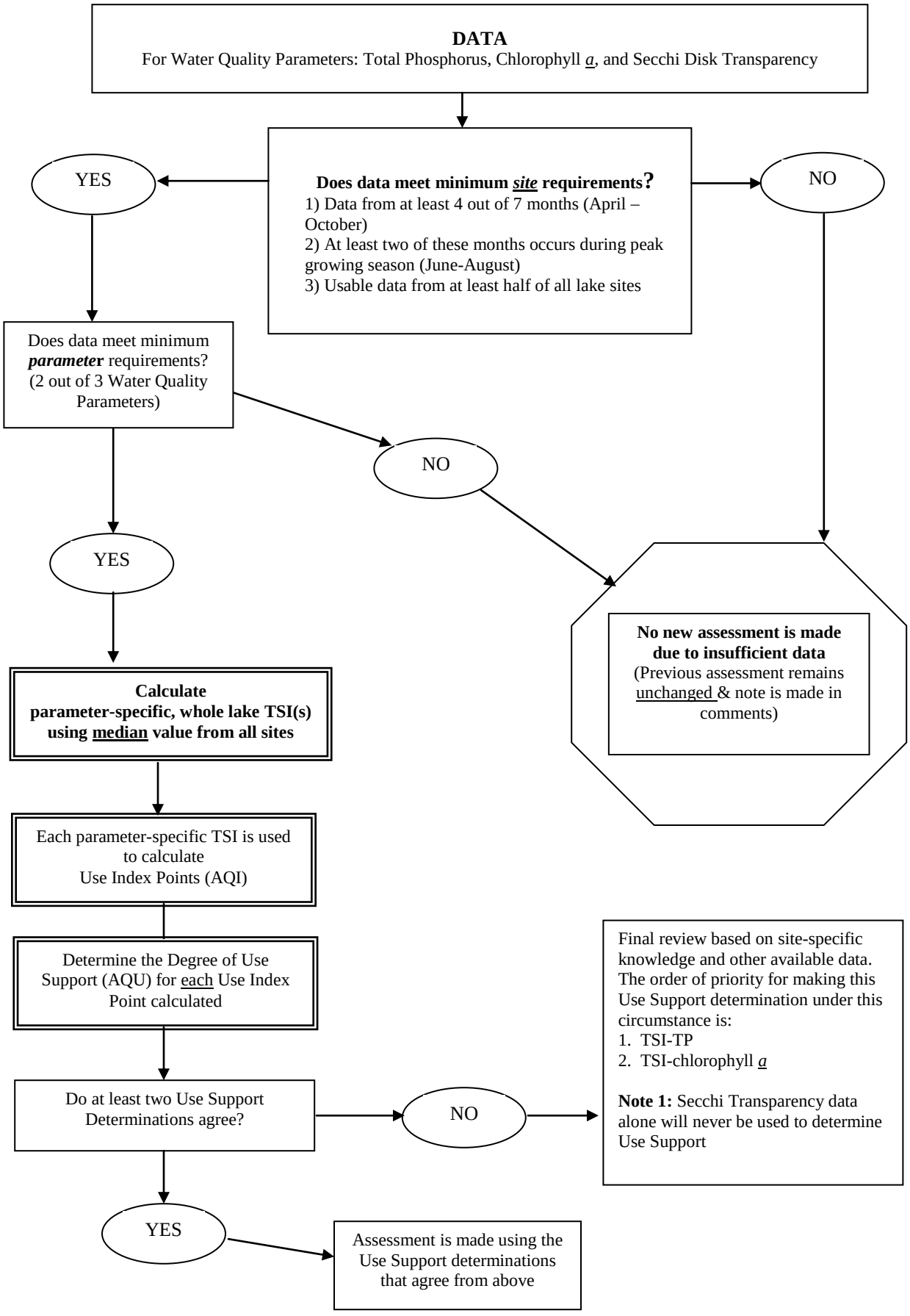


Table C-23. Aesthetic Quality Index.

Evaluation Factor	Parameter	Weighting Criteria	Points
1. Median Trophic State Index (TSI)	For data collected May-October: Median lake TSI value calculated from total phosphorus (samples collected at one foot depth), chlorophyll *a*, and Secchi-disk transparency	Actual Median TSI Value	Actual Median TSI Value
2. Macrophyte Coverage	Average percentage of lake surface area covered by macrophytes during peak growing season (June through August). Determined by: a. Macrophyte survey conducted during same water year as the chemical data used in the assessment; or b. Average value reported on the VLMP Secchi Monitoring Data form.	a. <5 b. ≥5<15 c. ≥15<25 d. ≥25	a. 0 b. 5 c. 10 d. 15
3. Nonvolatile Suspended Solids (NVSS) Concentration	Median lake surface NVSS concentration for samples collected at one foot depth, (reported in mg/L).	a. <3 b. ≥3<7 c. ≥7<15 d. ≥15	a. 0 b. 5 c. 10 d. 15

Table C-24. Guidelines for Assessing *Aesthetic Quality* Use in Illinois Inland Lakes.

Degree of Use Support	Guidelines
Fully Supporting (Good)	Total AQI points are <60
Not Supporting (Fair)	Total AQI points are ≥60<90
Not Supporting (Poor)	Total AQI points are ≥90

Table C-25. Guidelines for Identifying Potential Causes of Impairment of *Aesthetic Quality* Use in Illinois Inland Lakes.

	Basis for Identifying Causes[1]		
Potential Cause	**Numeric Standard[2]**	**Narrative Standard**	**Other Criteria**
Aquatic Algae		Unnatural Algal Growth	Median chlorophyll a (corrected) data >20 μg/L
Aquatic Plants (Macrophytes)		Unnatural Plant Growth	≥5% of lake surface area covered by macrophytes
Phosphorus (Total)	0.05 mg/L[3]		0.05 mg/L[3]
Total Suspended Solids			Median surface nonvolatile suspended solids ≥3 mg/L

1. In general, a single exceedance of the criteria results in listing the parameter as a potential cause of impairment. Determination of causes is normally based on the most recent year of data from the Ambient Lake Monitoring Program (ALMP) or Illinois Clean Lakes Program (CLP).
2. From Illinois General Use Water Quality Standards 35 Illinois Administrative Code, Part 302, Subpart B.
3. The total phosphorus standard applies to lakes of 20 acres or larger. However, an observation of total phosphorus greater than 0.05 mg/L in lakes under 20 acres in size is also used to indicate a cause of impairment.

Assessment Type and Assessment Confidence

Illinois EPA uses USEPA's Assessment Database program version 2.3.0. This program, which stores and organizes assessment information, contains two fields (Assessment Type and Assessment Confidence) which are associated with each assessed use. For each use assessed the assessor must choose at least one assessment type from the following choices: Biological, Habitat, Physical/Chemical, Toxicological, Pathogen Indicators, Other Public Health Indicators and Other Aquatic Life Indicators. After selecting an assessment type, the assessor must assign an assessment confidence from the following choices. Low, Fair, Good or Excellent.

Illinois has defined these fields as follows: **Assessment Type** indicates the primary (or single most important) data type that was used to make a use-attainment determination. **Assessment Confidence** indicates a judgment by Illinois EPA of the relative degree of reliability of a use-attainment assessment based on the quality, quantity, usefulness and acceptability of the specific data set and data type used to make the assessment. Currently, we have not developed comprehensive guidelines for judging the reliability of assessments. In general, Illinois EPA rates all assessments that are based on data meeting Illinois EPA's QA/QC requirements as having Good assessment confidence. Volunteer-lake-monitoring data are considered "Insufficient Data" for use-attainment assessments and 303(d) listings and are therefore listed as having a Low level of confidence. Table C-26 shows the assessment types and assessment confidence levels used in the majority of assessments.

Table C-26. Assessment Type and Assessment Confidence Level for Illinois Assessments. (A small number of exceptions apply).

Water Type	Assessed Use	Assessment Type	Assessment Confidence
Freshwater Lake (VLMP)	None	PHYSICAL/CHEMICAL	LOW
Freshwater Lake (non-VLMP)	Aquatic Life	PHYSICAL/CHEMICAL	GOOD
	Indigenous Aquatic Life	PHYSICAL/CHEMICAL	GOOD
	Aesthetic Quality	PHYSICAL/CHEMICAL	GOOD
	Primary Contact	PATHOGEN INDICATORS	GOOD
	Public & Food Processing Water Supply	PHYSICAL/CHEMICAL	GOOD
	Fish Consumption	PHYSICAL/CHEMICAL	GOOD
	Secondary Contact (only if PCU=Fully Supporting)	PATHOGEN INDICATORS	GOOD
Stream	Aquatic Life	BIOLOGICAL	GOOD
	Indigenous Aquatic Life	PHYSICAL/CHEMICAL	GOOD
	Primary Contact	PATHOGEN INDICATORS	GOOD
	Secondary Contact (only if PCU=Fully Supporting)	PATHOGEN INDICATORS	GOOD
	Public & Food Processing Water Supply	PHYSICAL/CHEMICAL	GOOD
	Fish Consumption	PHYSICAL/CHEMICAL	GOOD
	Aesthetic Quality	(Not applicable because currently not assessed)	
Lake Michigan Open Water	Aquatic Life	PHYSICAL/CHEMICAL	GOOD
	Primary Contact	PATHOGEN INDICATORS	GOOD
	Secondary Contact (only if PCU=Fully Supporting)	PATHOGEN INDICATORS	GOOD
	Public & Food Processing Water Supply	PHYSICAL/CHEMICAL	GOOD
	Fish Consumption	PHYSICAL/CHEMICAL	GOOD
	Aesthetic Quality	(Not applicable because currently not assessed)	
Lake Michigan Shoreline	Aquatic Life Use	(Not applicable because currently not assessed)	
	Primary Contact	PATHOGEN INDICATORS	GOOD
	Secondary Contact (only if PCU=Fully Supporting)	PATHOGEN INDICATORS	GOOD
	Public & Food Processing Water Supply	(Not applicable because not designated)	
	Fish Consumption	(Not applicable because currently not assessed)	
	Aesthetic Quality	(Not applicable because currently not assessed)	
Lake Michigan Bay(s) & Harbor	Aquatic Life	BIOLOGICAL	GOOD
	Primary Contact	(Not applicable because currently not assessed)	
	Secondary Contact	(Not applicable because currently not assessed)	
	Public & Food Processing Water Supply	(Not applicable because not designated)	
	Fish Consumption	PHYSICAL/CHEMICAL	GOOD
	Aesthetic Quality	(Not applicable because currently not assessed)	

PCU = *primary contact* use.

Identifying Potential Sources of Impairment for All Uses and Water Types

Once a use is assessed as impaired (Not Supporting) we attempt to identify the sources related to the impairment. Table C-27 contains guidelines for identifying potential sources of use impairment in Illinois streams, inland lakes, and Lake Michigan-basin waters. Illinois EPA defines potential sources as known or suspected activities, facilities, or conditions that may be contributing to a cause of impairment of a designated use. Each potential source identified is linked to at least one specific cause of impairment. Information used to identify potential sources of impairment include Facility-Related Stream Survey data, ambient-monitoring data, effluent-monitoring data, facility discharge monitoring reports, review of National Pollutant Discharge Elimination System permits and compliance records, land use data, personal observations, and documented site-specific knowledge.

Table C-27. Guidelines for Identifying Potential Sources of Use Impairment in Illinois Streams, Inland Lakes and Lake Michigan-Basin Waters.

Potential Source[3]	Guidelines
Acid Mine Drainage	Low pH and iron deposition due to mine drainage based upon actual observation and/or other existing data.
Agriculture	General agricultural related activities based upon satellite land use, actual observation and/or other existing data.
Animal Feeding Operations (NPS)	Open area feedlots or animal holding buildings and impervious areas based upon satellite land use, actual observation and/or other existing data.
Aquaculture (Not Permitted) or Aquaculture (Permitted)	Fish production facility based upon actual observation and/or other existing data.
Atmospheric Deposition – Acidity, or Atmospheric Deposition – Nitrogen, or Atmospheric Deposition - Toxics	Atmospheric deposition of nutrients, minerals, etc based upon actual observation and/or other existing data.
Channelization	Straightening of stream meanders based upon actual observation and/or other existing data.
Combined Sewer Overflows	Combined sanitary and storm sewer overflow based upon FRSS, Agency effluent monitoring, Discharge Monitoring Reports and/or other existing data.
Contaminated Sediments [1]	High concentrations of metals and organic compounds in sediment based upon actual observation and /or other existing data. For inland lakes see source methodology notes [1] below.
Crop Production (Crop Land or Dry Land)	Nonirrigated crop production based upon satellite land use, actual observation and/or other existing data.
Dam Construction (Other than Upstream Flood Control Projects)	Dam construction activities based upon actual observation and/or other existing data.
Discharges from Biosolids storage, application or disposal	Storage, application or disposal of sludge based upon actual observation and/or other existing data.
Drainage/Filling/Loss of Wetlands	Draining or filling in of wetland areas based upon actual observation and/or other existing data.
Dredge Mining	Underwater mining (e.g., sand and gravel) activities based upon satellite land use, actual observation and/or other existing data.
Dredging (e.g., for Navigation Channels)	Deepening of stream channels based upon actual observation and/or other existing data.
Golf Courses	Golf course runoff directly to lake.

Potential Source[3]	**Guidelines**
Habitat Modification - other than Hydromodification	General alteration of riparian habitat based upon actual observation and/or other existing data
Highway/Road/Bridge Runoff (Nonconstruction Related)	Salt and pesticide runoff from highways, roads & bridges based upon actual observation and/or other existing data.
Highways, Roads, Bridges, Infrastructure (New Construction)	Highway/road/bridge construction activities based upon actual observation and/or other existing data.
Impacts from Abandoned Mine Lands (Inactive)	Abandoned mining operation based upon actual observation and/or other existing data.
Impacts from Hydrostructure Flow Regulation/Modification	Alteration of normal flow regimes (e.g., dams, channelization, impervious surfaces, water withdrawal) based upon actual observation and/or other existing data.
Inappropriate Waste Disposal	Illegal waste disposal sites based upon actual observation and/or other existing data.
Industrial Land Treatment	Land application of industrial wastes based upon actual observation and/or other existing data.
Industrial Point Source Discharge	Industrial point source discharge based upon FRSS, Agency effluent, DMR and/or other existing data.
Irrigated Crop Production	Irrigated crop production based upon satellite land use, actual observation and/or other existing data.
Lake Fertilization	Artificial fertilization activities (e.g., addition of triple super-phosphate to create algal blooms for macrophyte control or enhance lake fertility) based upon actual observation and/or other existing data.
Landfills	Leachate and/or runoff from landfills based upon actual observation and/or other existing data.
Leaking Underground Storage Tank Leaks	Leaks from storage tanks based upon actual observation and/or other existing data.
Livestock (Grazing or Feeding Operations	Riparian and/or upland pastureland grazing based upon satellite land use, actual observation and/or other existing data
Loss of Riparian Habitat	Removal of riparian vegetation based upon actual observation and/or other existing data.
Marina Boat Construction, or Marina Boat Maintenance, or Marina Dredging Operations, or Marina Fueling Operations, or Marina-related Shoreline Erosion, or Marina/Boating Pumpout releases, or Marina/Boating Sanitary On-vessel Discharges	In-water and on-land releases based upon actual observation and/or other existing data.
Mill Tailings	Milling operations based upon satellite land use, actual observation and/or other existing data.
Mine Tailings	Mine processing activities (e.g., gob piles) based upon satellite land use, actual observation and/or other existing data.
Municipal Point Source Discharges	Municipal point source discharge based upon FRSS, Agency effluent, DMR and/or other existing data.
Natural Sources [2]	See source methodology notes [2] below.
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	Septic system leachate or surface runoff based upon actual observation and/or other existing data.
Other Recreational Pollution Sources	Other recreational impacts based upon actual observation and/or other existing data.
Other Spill Related Impacts	Accidental spills based upon actual observation and/or other existing data.
Permitted Silvicultural Activities	General forest management related runoff based upon satellite land use, actual observation and/or other existing data.
Pesticide Application	Herbicide/algicide applications (e.g., eradication of a beneficial macrophyte community, reduced dissolved oxygen. levels after application) based upon actual observation and/or other existing data.

Potential Source[3]	Guidelines
Petroleum/Natural Gas Activities	Oil and gas production activities based upon satellite land use, actual observation and/or other existing data.
RCRA Hazardous Waste Sites	Hazardous waste leachate or surface runoff based upon actual observation and/or other existing data.
Runoff from Forest/Grassland/Parkland	Watershed related nonpoint source runoff other than from previously specified sources (e.g., lawn or parkland fertilization, leaf litter/forest bed runoff) based upon actual observation and/or other existing data.
Salt Storage Sites	Salt storage for winter highway maintenance based upon actual observation and/or other existing data.
Sanitary Sewer Overflows (Collection System Failures)	Broken sanitary sewer line or overflow based upon FRSS, Agency effluent and/or other existing data.
Septage Disposal	Disposal of septic tank sludge based upon actual observation and/or other existing data.
Site Clearance (Land Development or Redevelopment)	New residential/commercial construction activities based upon actual observation and/or other existing data.
Source Unknown	No identifiable source based upon available information.
Specialty Crop Production	Truck farming, orchards, or horticultural areas based upon satellite land use, actual observation and/or other existing data.
Streambank Modifications/Destabilization or Littoral/Shore Area Modifications (Nonriverine)	Shoreline modification/destabilization activities (e.g., bank erosion, rip rap, loss of habitat) based upon actual observation and/or other existing data.
Subsurface (Hardrock) Mining	Subsurface coal mining activities based upon satellite land use, actual observation and/or other existing data.
Surface Mining	Surface mining (e.g., coal, limestone) activities based upon satellite land use, actual observation and/or other existing data.
Unpermitted Discharge (Domestic Wastes)	Wildcat sewer discharge based upon FRSS, Agency effluent and/or other existing data.
Upstream Impoundments (e.g., Pl-566 NRCS Structures)	Upstream impoundment based upon actual observation and/or other existing data.
Urban Runoff/Storm Sewers	Urban and storm sewer runoff based upon actual observation and/or other existing data
Waterfowl	Nutrient enrichment from waterfowl wastes based upon actual observation and/or other existing data.

1. This primarily refers to sediment and sediment-associated phosphorus deposition in the lake, but also to sediments with highly elevated levels of a metal or priority organic, especially when those substances are associated with a fish advisory.
2. The Natural Sources category is reserved for waters impaired due to naturally occurring conditions (i.e., not caused by or related to past or present human activity) or due to catastrophic conditions. Clearly defined cases include: 1) metals due to naturally occurring deposits, 2) dissolved oxygen or pH associated with poor aeration or natural organic materials, where no human-related sources are present, 3) habitat loss or pollutant loads due to catastrophic floods, which are excluded from water quality standards or other regulations, 4) high temperature, low dissolved oxygen, or high concentrations of pollutants due to catastrophic droughts with flows less than the average minimum seven-day low flow which occurs once every 10 years.
3. Other rare or uncommon sources in addition to those listed here are available in the Assessment Database and may be used when appropriate.

C-3. Assessment Results

This section presents the results of Illinois' surface water assessments, including the five-part categorization of all surface waters, the Section 303(d) List, state level summaries of designated use support and CWA Section 314 (Lakes Program) reporting requirements.

Five-Part Categorization of Surface Waters

USEPA's latest Integrated Report guidance (USEPA 2005) requires all waters of the state to be reported in a five category system as below. Although the guidance allows waters to be placed into more than one category, Illinois EPA treats all categories as mutually exclusive.

Category 1: Segments are placed into Category 1 if all designated uses are supported, and no use is threatened. (Note: Illinois does not assess any waters as threatened)

Category 2: Segments are placed in Category 2 if some, but not all of the designated uses are supported. (All other uses are reported as Not Assessed or Insufficient Information)

Category 3: Segments are placed in Category 3 when there is insufficient available data and/or information to make a use-support determination for any use.

Category 4 contains segments which have at least one impaired use but a TMDL is not required. Category 4 is further subdivided as follows based on the reason a TMDL is not required.

Category 4a: Segments are placed in Category 4a when a TMDL to address a specific segment/pollutant combination has been approved or established by USEPA. Illinois EPA places water bodies in category 4a only if TMDLs have been approved for all pollutant causes of impairment.

Category 4b: Segments are placed in Category 4b if technology-based effluent limitations required by the Act, more stringent effluent limitations required by state, local, or federal authority, or other pollution control requirements (e.g., best management practices) required by local, state or federal authority are stringent enough to implement applicable water quality standards (see 40 CFR 130.7(b)(1)) within a reasonable period of time.

Category 4c: Segments are placed in Category 4c when the state demonstrates that the failure to meet an applicable water quality standard is not caused by a pollutant, but instead is caused by other types of pollution (i.e. only nonpollutant causes of impairment). Water bodies placed in this category are usually those where aquatic life use is impaired by habitat related conditions. (See discussion in Section C-2 Assessment Methodology, Aquatic Life-Streams)

Category 5: Segments are placed in Category 5 if available data and/or information indicate that at least one designated use is not being supported and a TMDL is needed. Water bodies

in Category 5 (and their pollutant causes of impairment) constitute the 303(d) List that USEPA will review and approve or disapprove pursuant to 40 CFR 130.7.

Table C-28 shows the results of this categorization for all Illinois surface waters. The category for each individual water body is shown in Appendices B2-B6

Table C-28. Size of Surface Waters Assigned to Reporting Categories[(1)].

Water Body Type	Category							Total in State	Total Assessed
	1	2	3	4a	4b	4c	5		
Streams: miles	0	7,399	102,234	350	0	592	8,669	119,244	17,010
Inland Lakes: acres	0	3,788	170,463	1,134	0	0	143,093	318,477	148,014
Lake Michigan Bays and Harbors: sq. miles	0	0	0	0	0	0	2.50	2.50	2.50
Lake Michigan Open Waters: sq. miles	0	0	1375	0	0	0	151	1526	151
Lake Michigan Shoreline: miles	0	0	0	0	0	0	63	63	63

1. Categories are mutually exclusive. Illinois does not report water bodies in more than one category.

Section 303(d) List

The Clean Water Act and USEPA regulations require states to submit a list of water-quality-limited waters still requiring TMDLs, pollutants causing the impairment, and a priority ranking for TMDL development (including waters targeted for TMDL development within the next two years. This integrated report combines all of the requirements of sections 305(b), 303(d) and 314 into a single document.

Category 5 waters constitute Illinois' 303(d) List. The complete list is found in Appendix A-1. The development of this list is based on the assessment methodology for determining attainment of designated uses for each water body segment as described previously in Section C-2. Those waters which have at least one Not Supporting designated use and at least one pollutant cause of impairment are included on the 303(d) List unless they fall under the specific exceptions described in categories 4a, 4b or 4c. Waters included on previous lists are also included on the current list unless new information is available to update the assessment or there is other "good cause" for delisting them (see below). A complete list of all water bodies, all use attainment assessments, all identified potential causes of impairment (both pollutant and nonpollutant) and potential sources of impairment is found in Appendix B.

Prioritization of the Illinois Section 303(d) List

USEPA regulations at 40 CFR Part 130.7(b)(4) require establishing a priority ranking of the 303(d) listed waters for the development of TMDLs that accounts for the severity of pollution and the designated uses. For the purposes of the Illinois Section 303(d) List, the prioritization

process was done on a watershed basis instead of on individual water body segments. Illinois EPA watershed boundaries are based on USGS ten-digit hydrologic units. Developing prioritization at this watershed scale provides Illinois with the ability to address watershed issues at a manageable level and document improvements to a watershed's health. The Illinois Section 303(d) List was prioritized based on the steps listed below:

Step 1- The first step in the prioritization process is based on use designations, establishing a High, Medium and Low Priority for specific uses.

- High Priority – watersheds containing one or more waters that are Not Supporting *public and food processing water supply* use.

- Medium Priority – watersheds containing one or more waters that are Not Supporting *aquatic life* use, *fish consumption* use, or *primary contact* (swimming) use.

- Low Priority – watersheds containing waters that are Not Supporting *aesthetic quality* use only.

Step 2 - The second step in the prioritization process is based on the overall severity of pollution. For the purposes of this process, severity of pollution is determined by summing the number of potential causes (i.e., atrazine, manganese, etc.) of impairment to a water body segment. The watersheds with more potential causes of impairments were identified and listed as higher priority than those listed with fewer causes within each of the priority groups identified in Step 1.

EXAMPLE: *Watershed A has three water body segments with a total of 15 potential causes identified. Watershed B has four water body segments with a total of 10 potential causes identified. Both* waters *were assessed for public water supply use. Therefore, Watershed A (public water supply use with 15 potential causes) will be ranked above Watershed B (public water supply use with 10 potential causes) for TMDL development within the High Priority Category identified in Step 1.*

Criteria for Higher Prioritization in Scheduling TMDL Development

Once the waters have been prioritized as specified above for the 303(d) List, Illinois EPA may also give consideration to the following criteria to indicate a higher priority within each priority category (High, Medium and Low) when scheduling TMDL development. Those waters meeting the criteria may be selected for TMDL development over those that do not meet the criteria, regardless of priority ranking on the list.

i) A water body's potential for improvement: Best professional judgment for identifying potential improvement will be based, in part, upon the capacity of the data to pinpoint the potential cause-source relationship, and the availability and likelihood of successfully implementing regulatory and voluntary programs to achieve water quality improvement.

ii) The degree of public support and source-water protection (surface water) for improvement: Expressions of public support for an impaired watershed may include but are not limited to: active publicly supported watershed planning groups, ongoing public water quality monitoring programs and other similar efforts.

Criteria for Lower Prioritization in Scheduling TMDL Development

Along with the above factors, Illinois EPA may use the following criteria to indicate a lower priority within each priority category (High, Medium and Low) when scheduling TMDL development. Although these lower priority waters may not be scheduled for TMDL development at this time or may not be appropriate candidates for TMDLs in the future, Illinois EPA will continue ongoing efforts, and support new approaches that will result in these waters meeting full support and being removed from the Section 303(d) List. In that regard, each of the following criteria contains a brief explanation of the actions that Illinois EPA may take to improve or enhance the status of those waters. Those waters meeting the criteria below may be passed over on the list regardless of priority ranking.

i) 303(d) listed waters that are interstate waters—e.g., Mississippi River, Ohio River, Lake Michigan and others. In these waters, the Illinois EPA will continue to work closely with other states and USEPA in addressing issues related to Section 303(d) requirements. USEPA is expected to take a lead role in coordinating the state efforts.

ii) 303(d) listed waters where the potential causes of impairment are pollutants for which there are no numeric water quality standards in Illinois—e.g., phosphorus in streams, and others. Pending development of appropriate numeric water quality standards as may be proposed by the Agency or others and adopted by the Illinois Pollution Control Board, Illinois EPA will continue to work with watershed planning groups and others to identify causes and treat potential sources of impairment.

iii) 303(d) listed waters with legacy issues—e.g., mining, and in-place contaminated sediments. The Illinois EPA will continue to work with watershed planning groups and others to identify causes and treat potential sources of impairment.

iv) 303(d) listed waters with impairment by naturally occurring background levels: The Illinois EPA will continue to work with watershed planning groups and others to identify causes and treat potential sources of impairment.

v) 303(d) listed waters with unknown causes of impairment. In these cases, depending upon available resources, additional data collection and/or site-specific analysis will be instituted to determine causes of impairment and/or the accuracy of the assessment.

The priority ranking for Illinois' 303(d) listed waters is shown in Appendix A-1.

Scheduling of TMDL Development

In accordance with USEPA regulations under 40 CFR Part 130.7(b)(4), "the priority ranking shall specifically include the identification of waters targeted for TMDL development in the next two years." In addition, USEPA guidance encourages states to ensure that the schedule provides that all TMDLs for every pollutant-segment combination listed on previous Section 303(d) Lists be established in a time frame that is no longer than eight to 13 years from the time the pollutant-segment combination is first identified in Category 5.

In Illinois, development of TMDLs will be conducted on a watershed basis (i.e. USGS 10 digit hydrologic units) meaning that impaired waters upstream of a particular segment will have all TMDLs conducted at the same time. Illinois' long-term TMDL schedule (Table C-29) indicates the number of watersheds for which TMDL efforts will be initiated over the next 13 years. Appendix A-3 shows the watersheds, water bodies and pollutants for which TMDLs will be completed in the next two years. The TMDL development schedule provided here replaces all schedules previously submitted by the Illinois EPA to USEPA. The schedule will be reviewed and updated in the future, as needed, to ensure timely development of TMDLs, given available resources.

The Illinois EPA's long-term schedule for TMDL development for all waters on the 2010 Section 303(d) List, projected over a 13-year period, is consistent with other Illinois EPA program cycles which are typically five years, including statewide monitoring programs such as the rotational intensive river basin surveys and issuance of NPDES permits. The long-term TMDL development schedule will be reviewed and revised, as needed, in conjunction with future Section 303(d) Lists submitted to USEPA.

Table C-29. Tentative Long-term TMDL Schedule.

Year	Number of Watersheds Scheduled for TMDLs
2010-2011	22
2011-2012	22
2012-2013	22
2013-2014	22
2014-2015	22
2015-2016	22
2016-2017	22
2017-2018	22
2018-2019	22
2019-2020	22
2020-2021	22
2021-2022	22
2022-2023	22

Removal of Waters Previously Listed on the 2008 Section 303(d) List

USEPA guidance for the 2006 Integrated Report explains what constitutes good cause for not including in the current submission segments that were included on the previous Section 303(d) List. These include:

1. The assessment and interpretation of more recent or more accurate data in the record demonstrate that the applicable WQS(s) is being met.

2. The results of more sophisticated water quality modeling demonstrate that the applicable WQS(s) is being met.

3. Flaws in the original analysis of data and information led to the segment being incorrectly listed.

4. A demonstration pursuant to 40 CFR 130.7(b)(1)(ii) that there are effluent limitations required by state or local authorities that are more stringent than technology-based effluent limitations, required by the CWA, and that these more stringent effluent limitations will result in the attainment of WQSs for the pollutant causing the impairment.

5. A demonstration pursuant to 40 CFR 130.7(b)(1)(iii) that there are other pollution control requirements required by state, local, or federal authority that will result in attainment of WQSs for a specific pollutant(s) within a reasonable time (i.e., 4b).

6. Documentation that the state included on a previous Section 303(d) List an impaired segment that was not required to be listed by EPA regulations, e.g., segments where there is no pollutant associated with the impairment.

7. Approval or establishment by EPA of a TMDL since the last Section 303(d) List.

8. A state inappropriately listed a segment that is within Indian country, as defined in 18 U.S.C. Section 1151.

9. Other relevant information that supports the decision not to include the segment on the Section 303(d) List.

All water body/pollutant combinations on Illinois' Section 303(d) List from 2008 (Illinois EPA 2008) are included on the 2010 Section 303(d) List except the water body/pollutant combinations removed under the criteria cited above. Illinois EPA delists entire water bodies if all the designated uses are assessed as fully supporting or if all pollutant causes of impairment have been addressed by approved TMDLs. Listed causes of impairment may change when uses are reassessed even if the water is still considered impaired.

In a few instances when pollutant causes are delisted, there is a potential for an entire water body segment to be moved from Category 5 (the 303d List) to Category 4C (waters impaired by

pollution but not by any pollutant). In general, when any delisting results in a water body being moved from Category 5 to Category 4C, a review is conducted to determine whether any pollutant may still be causing impairment in that water body. If it is suspected that the water body is still impaired by a pollutant, cause unknown is listed and the water body remains on the 303(d) List.

Illinois' 2008 Section 303(d) list was partially disapproved by USEPA on October 22, 2008. Illinois EPA objected to the partial disapproval and sent a letter to USEPA on February 11, 2009 explaining in detail the reasons for those objections. The three main unresolved issues are: 1) Illinois' removal of total nitrogen from its 2008 303(d) List as a cause of aquatic life use impairment; 2) a change in one of the guidelines Illinois uses to identify sedimentation/siltation as a cause of aquatic life use impairment which resulted in the removal of some listings of sedimentation/siltation; and, 3) the reclassification of dissolved oxygen as a nonpollutant cause of impairment and the subsequent removal of this cause from Illinois' 2008 303 (d) List. The disputed waters and causes that Illinois removed from its 2008 303(d) List are not included on Illinois' 2010 303(d) List and are not reported in the 2010 Integrated Report.

Illinois EPA's 2008 Integrated Report, USEPA's decision document and Illinois EPA's detailed comments and legal analysis regarding USEPA's partial disapproval of the 2008 303(d) list and proposal to list additional waters are available on the Agency's website at http://www.epa.state.il.us/water/tmdl/303d-list.html.

Appendix A-4 lists all segment/pollutant combinations included in the 2008 303(d) List that was submitted to USEPA in 2008 but not included on the 2010 303(d) List submission.

TMDL Development and Implementation Status

In Illinois individual contractors that have been selected through a competitive bidding process develop the TMDLs. Illinois EPA personnel manage the contracts. There are three stages in the TMDL development process.

Stage 1- Watershed Characterization, Data Analysis and Methodology Selection

- Description of the watershed
- Collection/analysis of available data
- Identify methodologies, procedures and models
- Determine if additional data is needed

Stage 2- Data Collection (optional stage)*

- Evaluate Stage 1 and collect additional data as needed
- The Agency or a contractor will collect data

Stage 3- Model calibration, TMDL Scenarios, Implementation Plan

- Develop TMDLs with data from Stages 1 and 2
- Develop and evaluate several scenarios
- Develop an implementation plan

*Stage 2 was added in the 2003 round of TMDLs. If Stage 1 identifies data as lacking, additional data may be collected for a more accurate TMDL.

Appendix A-6 shows the implementation status of all TMDLs for the state of Illinois and includes the TMDL watersheds in progress. We anticipate that TMDL development for each watershed will be completed approximately two years from the initiation date. Stage 1 is scheduled to take a maximum of nine months. Stage 2 is optional and the time frame will depend on the type and quantity of additional data required. Stage 3 has a maximum time frame of 18 months. To date, contractors are doing most of the TMDL development work for Illinois EPA.

The Illinois EPA views TMDLs as a tool for developing water-quality-based solutions that are incorporated into an overall watershed management approach. The TMDL establishes the link between water quality standards attainment and water-quality-based control actions. For these control actions to be successful, they must be developed in conjunction with local involvement, which incorporates regulatory, voluntary and incentive-based approaches with existing applicable laws and programs. The four Illinois programs that have provided funds for implementation of TMDL watersheds include: Illinois EPA's Nonpoint Source Management Program, Illinois Clean Lakes Program (ICLP), and Priority Lake and Watershed Implementation Program (PLWIP), as well as the Illinois Department of Agriculture's Conservation Practices Program (CPP).

The Illinois EPA administers the Illinois Nonpoint Source Management Program, the ICLP and the PLWIP. The Illinois Nonpoint Source Management Program was developed to meet the

requirements of Section 319 of the Clean Water Act (CWA). Section 319 projects can include educational programs and nonpoint source pollution control projects such as Best Management Practices (BMPs). The ICLP is a financial assistance grant program that supports lake owners' interest and commitment to long-term, comprehensive lake management and ultimately results in improved water quality and enhanced lake use. The PLWIP supports lake protection/restoration activities at priority lakes where causes and sources of problems are apparent, project sites are highly accessible, project size is relatively small, and local entities are in a position to quickly implement needed treatments. Appendix A-7 shows past and present projects in TMDL watersheds funded under these programs.

Beginning in July of 2002, the Illinois Department of Agriculture began shifting a portion of its CPP funds to Soil and Water Conservation Districts to more directly address water quality concerns within TMDL watersheds. This program gives incentive payments to landowners/operators within that watershed to promote the use of management practices that reduce/control the movement of pollutants causing the water quality impairment.

Statewide Summary of Designated Use Support

Streams

Aquatic life, *fish consumption*, *primary contact (swimming)*, *secondary contact*, *indigenous aquatic life*, and *public and food processing water supply* uses were individually assessed for degree of use support (Table C-30). Of the total 119,244 stream miles in Illinois, 17,010 stream miles (14.3%) were assessed for at least one of these six uses. *Aquatic life* use was Fully Supporting in 63.2 percent of the stream miles assessed for this use.

Table C-30. Statewide Individual Use-Support Summary for Streams, 2010.

Designated Use	Statewide Miles Designated	Miles Assessed	Miles Fully Supporting (Good)	Miles Not Supporting (Fair)	Miles Not Supporting (Poor)	Miles Not Assessed
Aquatic Life	119,151	16,753	10,587	5,130	1,036	102,398
Fish Consumption	119,244	3,930	0	3,619	311	115,314
Indigenous Aquatic Life	93	93	34	53	6	0
Primary Contact	118,578	4,009	745	1,375	1,890	114,569
Public and Food Processing Water Supply	1,157	1,157	110	1,047	0	0
Secondary Contact[1]	119,244	733	733	--	--	118,511
Aesthetic Quality[2]	119,151	--	--	--	--	119,151

Designated Use	Miles Assessed	Percent of Statewide Miles Assessed	Percent of Assessed Miles as Fully Supporting (Good)	Percent of Assessed Miles as Not Supporting (Fair)	Percent of Assessed Miles as Not Supporting (Poor)	Percent of Statewide Miles Not Assessed
Aquatic Life	16,753	14.1	63.2	30.6	6.2	85.9
Fish Consumption	3,930	3.3	0.0	92.1	7.9	96.7
Indigenous Aquatic Life	93	100.0	36.4	57.5	6.1	0.0
Primary Contact	4,009	3.4	18.6	34.3	47.1	96.6
Public and Food Processing Water Supply	1,157	100.0	9.5	90.5	0.0	0.0
Secondary Contact[1]	733	0.6	100.0	--	--	99.4
Aesthetic Quality[2]	--	--	--	--	--	100.0

Note: Numbers and percentages may not add up due to slight rounding errors.

1. By definition, Secondary Contact Use is "Fully Supporting" in all waters in which Primary Contact Use is "Fully Supporting."
2. Assessment guidelines are not yet fully developed; see Section C-2 Assessment Methodology.

Potential causes of impairment for all designated uses in streams are summarized in Table C-31. Potential sources of impairment for all designated uses in streams are summarized in Table C-32. Results of individual use assessments are available in Appendix B-2.

Table C-31. Summary of Potential Causes for All Use Impairments in Streams, 2010.

Potential Cause of Impairment	Stream Miles Impaired
Fecal Coliform	3,265
Oxygen, Dissolved	3,204
Mercury	3,066
Polychlorinated biphenyls	2,817
Alteration in stream-side or littoral vegetative covers	2,181
Phosphorus (Total)	2,077
Manganese	2,013
Sedimentation/Siltation	1,911
Cause Unknown	1,460
Total Suspended Solids (TSS)	1,234
Other flow regime alterations	726
Loss of Instream Cover	704
Changes in Stream Depth and Velocity Patterns	658
pH	585
Chloride	444
Aquatic Algae	424
Atrazine	280
Iron	248
Aquatic Plants (Macrophytes)	174
Sulfates	159
Aldrin	153
Hexachlorobenzene	148
Total Dissolved Solids	143
Fish-Passage Barrier	139
Arsenic	138
Methoxychlor	137
Dioxin (including 2,3,7,8-TCDD)	131
Terbufos	125
Chlordane	98
DDT	93
Nitrogen, Nitrate	85
Copper	73
Endrin	65
Zinc	65
Phenols	60
Silver	52
Nickel	51
Temperature, water	47
Ammonia (Total)	47
Low flow alterations	38
Boron	36
Fluoride	36
Barium	32
Oil and Grease	32
Cadmium	27
Cyanide	23
Sludge	22
Lindane	22
Dieldrin	20
Chlorine	14
Chromium (total)	14
2,4-D	13
Heptachlor	13
Nonnative Fish, Shellfish, or Zooplankton	9
Ammonia (Un-ionized)	8
.alpha.-BHC	6
Lead	6
Fish Kills	4

Table C-32 Statewide Summary of Potential Sources of All Use Impairments in Streams.

Potential Source of Impairment	Stream Miles Impaired
Source Unknown	6,338
Atmospheric Deposition - Toxics	3,047
Crop Production (Crop Land or Dry Land)	2,396
Channelization	2,321
Municipal Point Source Discharges	1,421
Urban Runoff/Storm Sewers	1,218
Agriculture	1,081
Loss of Riparian Habitat	756
Animal Feeding Operations (NPS)	657
Streambank Modifications/destabilization	547
Impacts from Hydrostructure Flow Regulation/modification	483
Dam or Impoundment	465
Natural Sources	455
Contaminated Sediments	422
Surface Mining	395
Livestock (Grazing or Feeding Operations)	252
Combined Sewer Overflows	251
Habitat Modification - other than Hydromodification	182
Site Clearance (Land Development or Redevelopment)	173
Impacts from Abandoned Mine Lands (Inactive)	172
Upstream Impoundments (e.g., Pl-566 NRCS Structures)	134
Petroleum/natural Gas Activities	116
Mine Tailings	102
Non-irrigated Crop Production	85
Acid Mine Drainage	84
Industrial Point Source Discharge	77
Highway/Road/Bridge Runoff (Non-construction Related)	72
Irrigated Crop Production	50
Runoff from Forest/Grassland/Parkland	39
Drainage/Filling/Loss of Wetlands	29
Pesticide Application	22
Dredging (E.g., for Navigation Channels)	19
Unpermitted Discharge (Domestic Wastes)	18
Sanitary Sewer Overflows (Collection System Failures)	14
Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	13
Other Recreational Pollution Sources	10
Coal Mining (Subsurface)	8
Golf Courses	7
Highways, Roads, Bridges, Infrastructure (New Construction)	5
Industrial Land Treatment	4
Managed Pasture Grazing	3

Inland Lakes

Aquatic life, *fish consumption*, *primary contact (swimming)*, *secondary contact*, *public food and processing water supply*, *aesthetic quality*, and *indigenous aquatic life* uses were individually assessed in lakes for degree of use support as shown in Table C-33. Of the total 318,477 acres of lakes and ponds in Illinois, 148,014 acres (378 lakes) were assessed for at least one of these seven uses. *Aquatic life* use was Fully Supporting in 91.3 percent of the lake acres assessed for this use.

Table C-33. Statewide Individual Use-Support Summary for Inland Lakes.

Designated Use	Statewide Acres Designated(1)	Acres Assessed	Acres Fully Supporting (Good)	Acres Not Supporting (Fair)	Acres Not Supporting (Poor)	Acres Not Assessed	Acres as Insufficient Information
Aesthetic Quality	316,877	142,553	13,936	117,773	10,844	166,192	8,133
Aquatic Life	316,877	142,571	130,098	12,455	18	166,173	8,133
Fish Consumption	318,477	92,280	6,840	84,864	575	226,197	0
Indigenous Aquatic Life	1,600	1,600	1,600	0	0	0	0
Primary Contact	316,877	1,814	1,092	722	0	315,063	0
Public and Food Processing Water Supply	75,907	75,655	15,673	59,982	0	252	0
Secondary Contact	318,477	1,092	1,092	0	0	317,385	0

Designated Use	Acres Assessed	Percent of Statewide Acres Assessed	Percent of Assessed Acres Fully Supporting (Good)	Percent of Assessed Acres Not Supporting (Fair)	Percent of Assessed Acres Not Supporting (Poor)	Percent of Statewide Acres Not Assessed	Percent of Statewide Acres as Insufficient Information
Aesthetic Quality	142,553	45.0	9.8	82.6	7.6	52.4	2.6
Aquatic Life	142,571	45.0	91.3	8.7	0.0	52.4	2.6
Fish Consumption	92,280	29.0	7.4	92.0	0.6	71.0	0.0
Indigenous Aquatic Life	1,600	100.0	100.0	0.0	0.0	0.0	0.0
Primary Contact	1,814	0.6	60.2	39.8	0.0	99.4	0.0
Public and Food Processing Water Supply	75,655	99.7	20.5	79.3	0.0	0.3	0.0
Secondary Contact	1,092	0.3	100.0	0.0	0.0	99.7	0.0

Designated Use	Number of Lakes Assessed	Percent of Statewide Lakes Assessed[1]	Percent of Assessed Lakes Fully Supporting (Good)	Percent of Assessed Lakes Not Supporting (Fair)	Percent of Assessed Lakes Not Supporting (Poor)	Percent of Statewide Lakes Not Assessed	Percent of Statewide Lakes as Insufficient Information
Aesthetic Quality	352	0.4	13.4	74.7	11.9	99.6	0.1
Aquatic Life	353	0.4	90.4	9.3	0.3	99.6	0.1
Fish Consumption	124	0.1	1.6	96.8	1.6	99.9	0.0
Indigenous Aquatic Life	1	100.0	100.0	0.0	0.0	0.0	0.0
Primary Contact	15	0.02	46.7	53.3	0.0	99.98	0.0
Public and Food Processing Water Supply	74	93.7	24.3	75.7	0.0	6.3	0.0
Secondary Contact(2)	7	0.01	100.0	0.0	0.0	99.99	0.0

Note: Numbers and percentages may not add up due to rounding.

1. Statewide, Illinois has 91,456 lakes and ponds designated for general uses, one lake designated for Indigenous Aquatic Life Use, and 80 lakes designated for Public and Food Processing Water Supply Use.

2. By definition, Secondary Contact Use is "Fully Supporting" in all waters in which Primary Contact Use is "Fully Supporting".

As described in Section C-1, the Volunteer Lake Monitoring Program (VLMP) is an educational program for Illinois citizens to learn about lake ecosystems, as well as a cost-effective method of gathering fundamental information about inland lakes. While VLMP data, in general, are considered insufficient for making use-support determinations and 303(d) listings, such data are useful for evaluating lake resource quality as good, fair or poor. A total of 122 lakes totaling approximately 8,133 acres had VLMP data available for evaluating resource quality. For these lakes, 95 percent of the total number and 97.5 percent of the total acres were rated as good resource quality for ***aquatic life*** use. Another five percent of the number and 2.5 percent of the acres were rated as fair.

Potential causes of use impairment for inland lakes are summarized in Table C-34. Potential sources of use impairment in inland lakes are summarized in Table C-35. Trophic status of inland lakes is summarized in Table C-36. Use assessment information for individual lakes is available in Appendix B-3

"Significant Publicly-Owned Inland Lakes" are defined as having 20 acres or more surface area; however, some smaller inland lakes, which provide substantial public access and benefits to the citizens of Illinois, have also been defined as "significant." For summary information regarding "significant publicly-owned inland lakes," refer to Appendix C.

Table C-34. Statewide Summary of Potential Causes of All Use Impairments in Inland Lakes.

Potential Cause of Impairment	Acres Impaired
Total Suspended Solids (TSS)	116,889
Phosphorus (Total)	105,580
Aquatic Algae	104,478
Mercury	77,514
Manganese	58,871
Aquatic Plants (Macrophytes)	36,897
Polychlorinated biphenyls	25,817
Cause Unknown	9,765
Oxygen, Dissolved	7,314
Sedimentation/Siltation	6,401
Chlordane	4,820
Turbidity	4,568
Silver	4,194
Atrazine	3,755
Aldrin	3,345
pH	3,233
Nitrogen, Nitrate	807
Fecal Coliform	722
Nonnative Fish, Shellfish, or Zooplankton	634
Endrin	524
Zinc	524
Cadmium	524
Nickel	325
Total Dissolved Solids	250
Fish Kills	172
Non-Native Aquatic Plants	62

Table C-35. Statewide Summary of Potential Sources for All Impaired Uses in Inland Lakes.

Potential Source of Impairment	Acres Impaired
Source Unknown	109,652
Crop Production (Crop Land or Dry Land)	102,174
Littoral/shore Area Modifications (Non-riverine)	99,164
Other Recreational Pollution Sources	83,394
Atmospheric Deposition – Toxics	77,212
Runoff from Forest/Grassland/Parkland	53,006
Urban Runoff/Storm Sewers	40,072
Municipal Point Source Discharges	27,642
Animal Feeding Operations (NPS)	25,355
Contaminated Sediments	13,231
On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	9,655
Agriculture	9,371
Rcra Hazardous Waste Sites	9,156
Dredging (E.g., for Navigation Channels)	9,038
Industrial Point Source Discharge	8,086
Natural Sources	6,715
Golf Courses	6,474
Waterfowl	6,295
Yard Maintenance	3,101
Impacts from Hydrostructure Flow Regulation/modification	2,150
Rural (Residential Areas)	2,037
Dam or Impoundment	1,513
Other Turf Management	1,151
Pesticide Application	925
Residential Districts	754
Highway/Road/Bridge Runoff (Non-construction Related)	727
Livestock (Grazing or Feeding Operations)	704
Site Clearance (Land Development or Redevelopment)	663
Impacts from Abandoned Mine Lands (Inactive)	250
Lake Fertilization	248
Streambank Modifications/destabilization	235
Wet Weather Discharges (Point Source and Combination of Stormwater, SSO or CSO)	225
Impervious Surface/Parking Lot Runoff	179
Landfills	172
Wildlife Other than Waterfowl	148
Unspecified Urban Stormwater	129
Pollutants from Public Bathing Areas	96
Introduction of Non-native Organisms (Accidental or Intentional)	88
Specialty Crop Production	71
Municipal (Urbanized High Density Area)	62
Loss of Riparian Habitat	59
Other Spill Related Impacts	40
Other Marina/Boating On-vessel Discharges	23
Permitted Silvicultural Activities	11
Upstream Impoundments (e.g., Pl-566 NRCS Structures)	4

Table C-36. Trophic Status – All Illinois Inland Lakes.

Trophic Status	Number of Lakes	Acres
Hypereutrophic (TSI ≥70)	120	68,505
Eutrophic (TSI ≥50 & <70)	289	75,724
Mesotrophic (TSI ≥40 & <50)	52	7,544
Oligotrophic (TSI <40)	11	550
Unknown	90,984	16,6154
Total:	91,456	318,477

Lake Michigan

Table C-37 provides a summary of Lake Michigan assessment results for each individual use: *aquatic life*, *fish consumption*, *primary contact (swimming)*, *secondary contact*, *aesthetic quality* and *public and food processing water supply*. Tables C-38 and C-39 provide summaries of causes and sources of use impairment for Lake Michigan-basin waters. Of the total 1,526 square miles of Lake Michigan open waters in Illinois jurisdiction, only 151 square miles were assessed. All 151 square miles were rated as Fully Supporting *aquatic life* use. Complete assessment results for individual segments are shown in Appendices B-4, B-5 and B-6.

Table C-37. Statewide Individual Use-Support Summary for Lake Michigan-Basin Waters.

Lake Michigan Bays and Harbors; Units: Square Miles

Designated Use[1]	Total Size	Total Assessed		Size Fully Supporting (Good)	Size Not Supporting (Fair)	Size Not Supporting (Poor)	Size Not Assessed
		Size	%				
Aesthetic Quality	2.5	0	0	0	0	0	2.5
Aquatic Life	2.5	2.46	98.3	2.40	0	0.06	0.05
Fish Consumption	2.5	2.46	98.3	0	0	2.46	0.05
Primary Contact	2.5	0	0	0	0	0	2.5
Secondary Contact[2]	2.5	0	0	0	0	0	2.5

Lake Michigan Open Water; Units: Square Miles

Designated Use[1]	Total Size	Total Assessed		Size Fully Supporting (Good)	Size Not Supporting (Fair)	Size Not Supporting (Poor)	Size Not Assessed
		Size	%				
Aesthetic Quality	1,526	0	0.	0	0	0	1526
Aquatic Life	1,526	151	9.9	151	0	0	1375
Fish Consumption	1,526	151	9.9	0.0	0	151	1375
Primary Contact	1,526	151	9.9	151	0	0	1375
Public and Food Processing Water Supplies	151	151	100	151	0	0	0
Secondary Contact[2]	1,526	151	9.9	151[2]	0[2]	0[2]	1375

Lake Michigan Shoreline; Units: Miles

Designated Use[1]	Total Size	Total Assessed		Size Fully Supporting (Good)	Size Not Supporting (Fair)	Size Not Supporting (Poor)	Size Not Assessed
		Size	%				
Aesthetic Quality	63	0	0.0	0	0	0	63
Aquatic Life	63	0	0.0	0	0	0	63
Fish Consumption	63	63	100	0	0	63	0
Primary Contact	63	63	100	0	0	63	0
Secondary Contact[2]	63	0	0.0	0	0	0	63

Note: Illinois EPA did not use the Insufficient Information category for Lake Michigan-basin waters in 2010.

1. .Illinois has jurisdiction over 1,526 square miles of Lake Michigan open water, 2.5 square miles of Lake Michigan bays and harbors and 63 miles of Lake Michigan shoreline, which are covered under the Lake Michigan Basin Water Quality Standards. Also, 151 square miles of Lake Michigan are designated for Public and Food Processing Water Supply Use.
2. By definition, Secondary Contact Use is "Fully Supporting" in all waters in which Primary Contact Use is "Fully Supporting".

Table C-38. Statewide Summary of Potential Causes of All Use Impairments in Lake Michigan-Basin Waters.

Lake Michigan Bays and Harbors; Units: Square Miles

Potential Cause of Impairment	Total Size
Mercury	2.46
Polychlorinated biphenyls	2.46
Copper	0.06
Zinc	0.06
Phosphorus (Total)	0.06
Cadmium	0.06
Lead	0.06
Chromium (total)	0.06

Lake Michigan Open Water; Units: Square Miles

Potential Cause of Impairment	Total Size
Mercury	151
Polychlorinated biphenyls	151

Lake Michigan Shoreline; Units: Miles

Potential Cause of Impairment	Total Size
Escherichia coli	63
Mercury	63
Polychlorinated biphenyls	63

Table C-39. Statewide Summary of Potential Sources of All Use Impairments in Lake Michigan-Basin Waters.

Lake Michigan Bays and Harbors; Units: Square Miles

Source	Total Size
Source Unknown	2.50
Atmospheric Deposition - Toxics	2.50
Contaminated Sediments	0.06
Industrial Point Source Discharge	0.06
Urban Runoff/Storm Sewers	0.06

Lake Michigan Open Water; Units: Square Miles

Source	Total Size
Atmospheric Deposition - Toxics	151
Source Unknown	151

Lake Michigan Shoreline; Units: Miles

Source	Total Size
Atmospheric Deposition - Toxics	63
Source Unknown	63
Urban Runoff/Storm Sewers	2
Combined Sewer Overflows	2

C-4 Wetlands Monitoring and Assessment Program

Overview

Wetlands have been defined as areas between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. Wetlands, such as marshes, swamps and bogs, support plants and animals adapted for life in water or in saturated soil.

Illinois once contained more than eight million acres of wetlands. The onset of development of the land for agricultural purposes and community development required the conversion of vast wetland areas to well-drained, functional open lands. Currently, approximately 920,000 wetland acres remain. Palustrine, riverine, and lacustrine wetlands are found in Illinois along the margins of lakes and ponds, throughout river flood plains, and as isolated depressions. Wetlands provide valuable habitat for 40 percent of the state's threatened and endangered species, as well as benefits such as flood storage, water quality improvement and groundwater recharge. Demands for improved public health and safety and pressures of agriculture and economic development continue to threaten modification, degradation, and conversion of the remaining wetlands. Alteration methods include dredging, filling, bridge construction, draining, flooding, and construction of dikes and levees. Besides these human activities, drought, sedimentation, overgrazing by wildlife, and other natural impacts can reduce a wetlands ability to function. It is difficult, if not impossible, to re-create or replace the multitude of benefits when wetland functions are lost.

The value of wetlands has become more evident as these areas have been depleted. Wetlands, as they relate to water quality, can prove to be valuable assets in pollution treatment and in providing high quality habitat. Increased public awareness of wetland function and value has placed special emphasis on the protection and creation of wetlands. This is reflected in state legislation. In the late 1980s, using federal guidelines, standards, specifications, and class systems and working with the federal government, the state completed an inventory of Illinois' remaining wetlands. This inventory has been included in the National Wetlands Inventory (NWI) of the U.S. Fish and Wildlife Service. The inventory is being used by the Natural Resource Conservation Service in identification of areas subject to the provisions of the Food Security Act and by Illinois EPA's Bureau of Water as part of its review process required for permit issuance, as well as other uses. State agencies have developed working agreements resulting in the reduction of wetland loss by state agency's actions. The Illinois Wetlands Protection Act (IWPA) established state policy and procedures that minimize the destruction of existing wetlands in Illinois as a result of state and state-supported activities. The IWPA, however, provides for those instances when adverse impacts to wetlands are unavoidable by requiring coordination with the Illinois Department of Natural Resources (IDNR) and mitigation of the unavoidable losses.

Wetland Monitoring and Assessment Program

In order to meet the requirements of the Clean Water Act (CWA), Illinois EPA developed a comprehensive document entitled, "*Wetland Monitoring and Assessment Program for the State of Illinois (IEPA/BOW/07-020).*" This document is being used by Illinois EPA and others to guide implementation of a statewide wetland monitoring and assessment program that allows for the collection of data and accurate assessment of wetland resources, as needed, to meet CWA Section 305(b) and 303(d) (Integrated Report) requirements. To develop the program, Illinois EPA coordinated with other state and federal agencies, academic institutions, research entities, and others to form a Technical Working Group comprised of individuals with expertise in wetland characterization, monitoring, sampling, and assessment. This working group provided much of the technical expertise to analyze available data, design needed research efforts, formulate monitoring and assessment protocols, and author the program document. The U.S. Geological Survey played a key role by assimilating and analyzing existing data and directing the research and protocol development efforts of the Technical Working Group. Input from Illinois Natural History Survey (INHS) staff that work within the state of Illinois' Critical Trends Assessment Program (CTAP) played a key role in development of the sampling protocol (chemistry, biology, and habitat) identified in the Wetland Monitoring and Assessment Program document.

CTAP Monitoring

Utilizing water chemistry, biology, and habitat metrics, CTAP is able to assess the health of various wetland resources throughout the state. Because it is impractical to individually sample every wetland in the state, a probabilistic monitoring design is used by CTAP to provide a reasonable determination of the health of the state's wetland resources while also being economically feasible, logistically practical, and statistically valid. This program yields comprehensive data and information that will be used to 1) establish a baseline of wetland resources and conditions from which to determine trends and changes in quantity and quality over time, 2) determine reference conditions for the various classes of Illinois wetlands, 3) develop and maintain a database which can provide for management and compensatory mitigation decisions, 4) provide information from which to evaluate wetlands restoration, creation, mitigation, and protection programs, 5) incorporate wetland summary information into this, and future, Integrated Reports, and 6) provide necessary information required to develop applicable water quality standards.

To date, two five-year wetland sampling cycles have been completed (1997-2001 and 2002-2006). The third sampling cycle (2007-2012) is not yet completed, so the following summary information focuses on the time period 1997-2006.

During this time, CTAP botanists monitored over 200 wetland sites across the state of Illinois (Figure C-4 and Table C-40). During the first five-year cycle of monitoring (1997-2001), 138 palustrine emergent wetlands and 46 forested wetlands (floodplain forests) were randomly selected and monitored. During the second five-year cycle (2002-2006), 118 of the palustrine emergent and 44 of the forested wetlands were re-monitored. In addition, another 31 palustrine emergent and three forested wetlands were randomly selected and monitored. To make

comparisons of the "average" condition of wetlands in Illinois, 11 high-quality emergent wetlands and nine high-quality forested wetlands were selected and monitored.

Based on cursory data analysis, wetlands in Illinois were generally found to be well populated with native plant species, but high-quality wetlands have fewer non-native species (see figures C-5, C-6, C-7 and C-8 below). A much more reliable indicator of Ecological Integrity is illustrated with the conservation value of high-quality wetlands, based on the Floristic Quality Index (FQI), which was much higher in reference than in randomly selected sites, and remained stable across sample periods. A high number (40, 29%) of randomly selected sites were dominated by reed canary grass (*Phalaris arundinacea*), which is a non-native, invasive plant species that usually dominates a wetland to the exclusion of other plant species.

CTAP botanists also observed that many wetland sites were small in size and subject to disturbances such as artificial drainage, mowing, herbicide drift, or past attempts at cultivation and farming. Cattle also actively grazed some sites. An analysis of wetland size and adjacent land cover and use is ongoing.

NWI and Wetland IBI Development Updates

In accordance with Wetland Monitoring and Assessment Program's objectives, two major wetland-related projects are underway and nearing completion.

Funding has been secured from the Illinois Department of Natural Resources and U.S. Fish and Wildlife Service to conduct a GIS/Remote Sensing based inventory (Level 1 Assessment) to update the NWI database for Illinois. As of this writing (April 2010), Ducks Unlimited has completed draft versions of the updated NWI shapefiles in 80 Illinois counties. These draft versions of the NWI update have been through a QA/QC process, but are still considered draft until field verification has been completed. To follow the progress of the NWI update for Illinois, please go to http://glaro.ducks.org/nwi and click on the status map. Ducks Unlimited anticipates completing the updated NWI for Illinois with the final report and final data ready for distribution by September 2010.

Funding has also been secured from USEPA to develop a Wetland IBI (Level 3 Assessment) based on at least ten years of probabilistic survey data collected by CTAP. As of this writing (April 2010), the INHS is in the final year of a three year project to create a statewide Wetlands IBI, with the goal of using insect, bird, and vegetation biological monitoring data to create metrics for IBI development. Much of the past two years has been spent characterizing sites to develop a disturbance gradient relative to levels of anthropogenic stress/disturbance. Having gathered and summarized most of the data necessary for establishing the disturbance gradient, INHS scientists are now approaching the final processes of correlating biological metrics of sites with their place along the disturbance gradient, and then choosing the metrics to go into the final IBI. The final step will be to validate and verify the Index.

Figure C-4. Wetlands monitored through the Critical Trends Assessment Program from1997-2006.

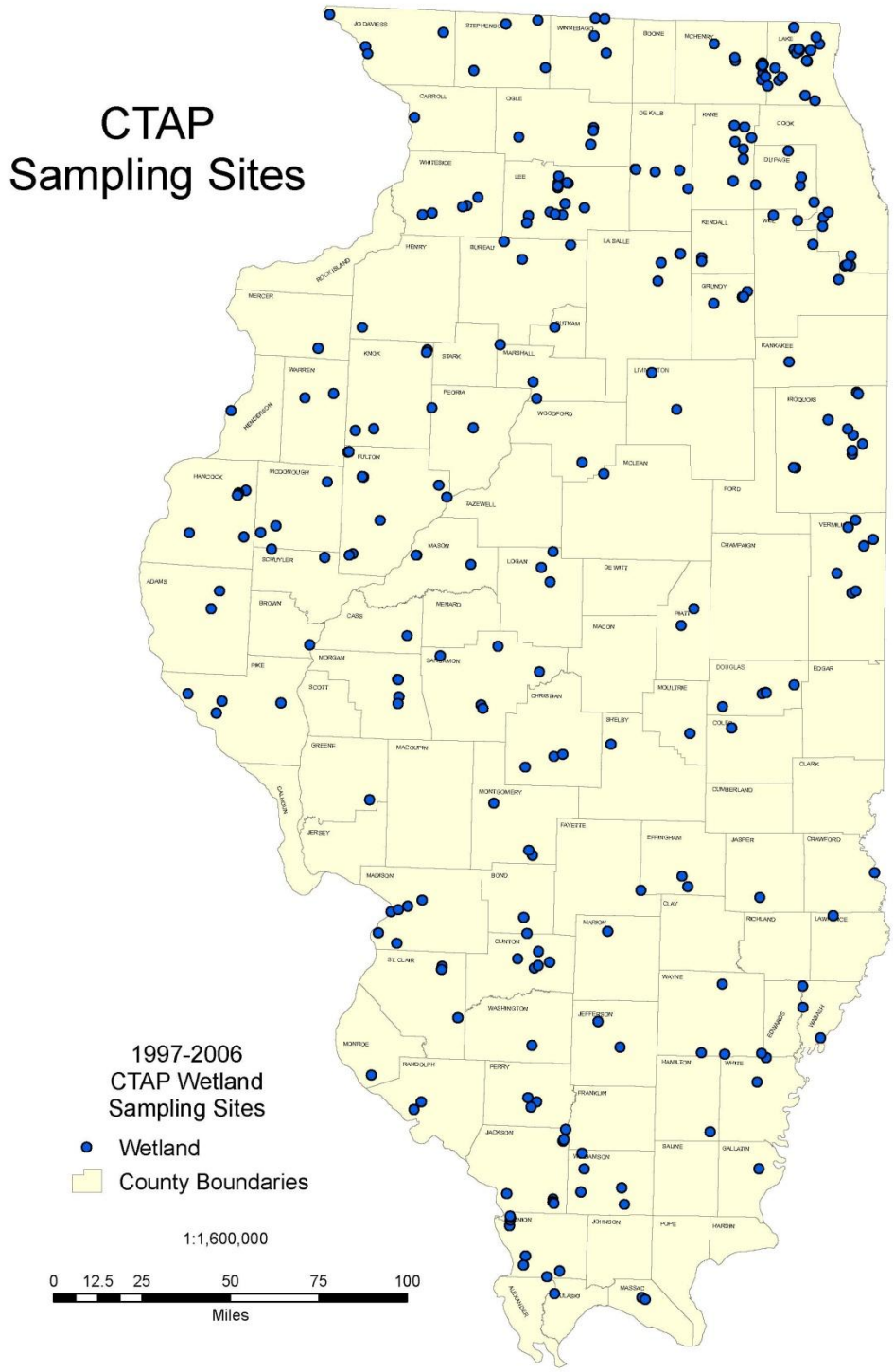
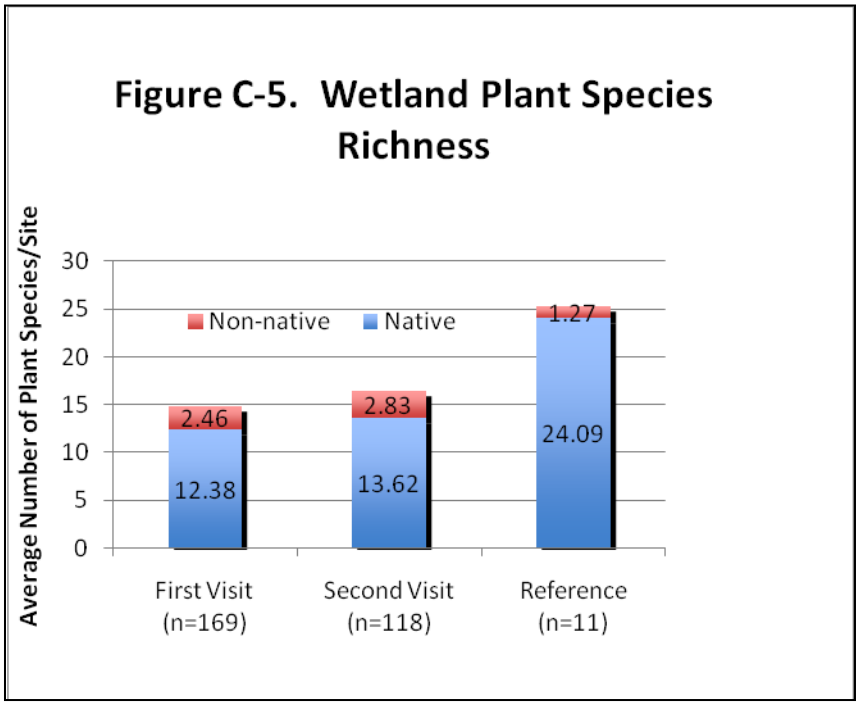


Table C-40. Summary of the number of wetland sites monitored by Critical Trends Assessment Program botanists from 1997 through 2006.

	First Visit (1997-2001)	Second Visit (2002-2006)	First Visit (2002-2006)	Reference Sites	Totals
Emergent Wetlands	138	118	31	11	**298**
Forested Wetlands	46	44	3	9	**102**
Totals	**184**	**162**	**34**	**20**	**400**



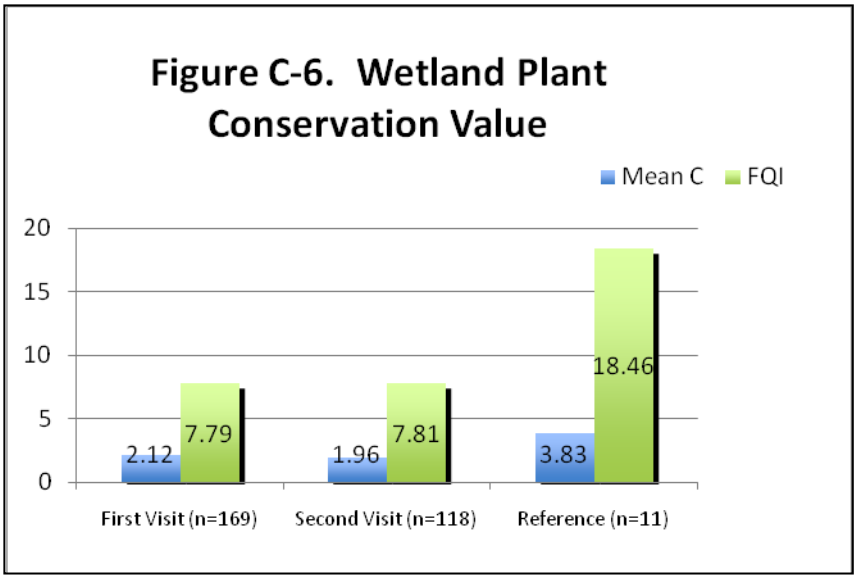


Figure C-6. Wetland Plant Conservation Value
Mean C
FQI
20
15
10
5
0
2.12
7.79
1.96
7.81
3.83
18.46
First Visit (n=169)
Second Visit (n=118)
Reference (n=11)

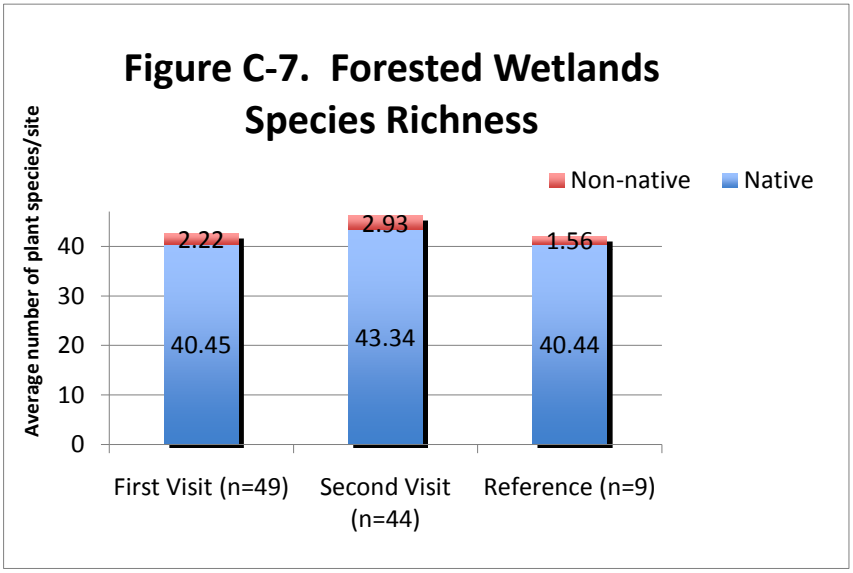


Figure C-7. Forested Wetlands Species Richness
Average number of plant species/site
Non-native
Native
40
30
20
10
0
2.22
40.45
2.93
43.34
1.56
40.44
First Visit (n=49)
Second Visit (n=44)
Reference (n=9)

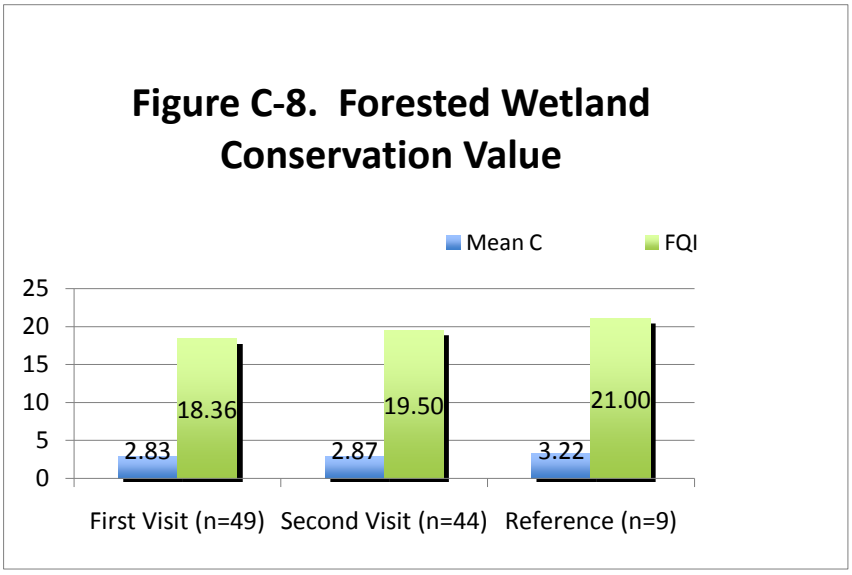


Figure C-8. Forested Wetland Conservation Value
Mean C
FQI
25
20
15
10
5
0
2.83
18.36
2.87
19.50
3.22
21.00
First Visit (n=49)
Second Visit (n=44)
Reference (n=9)

C-5 Trends in Surface Waters

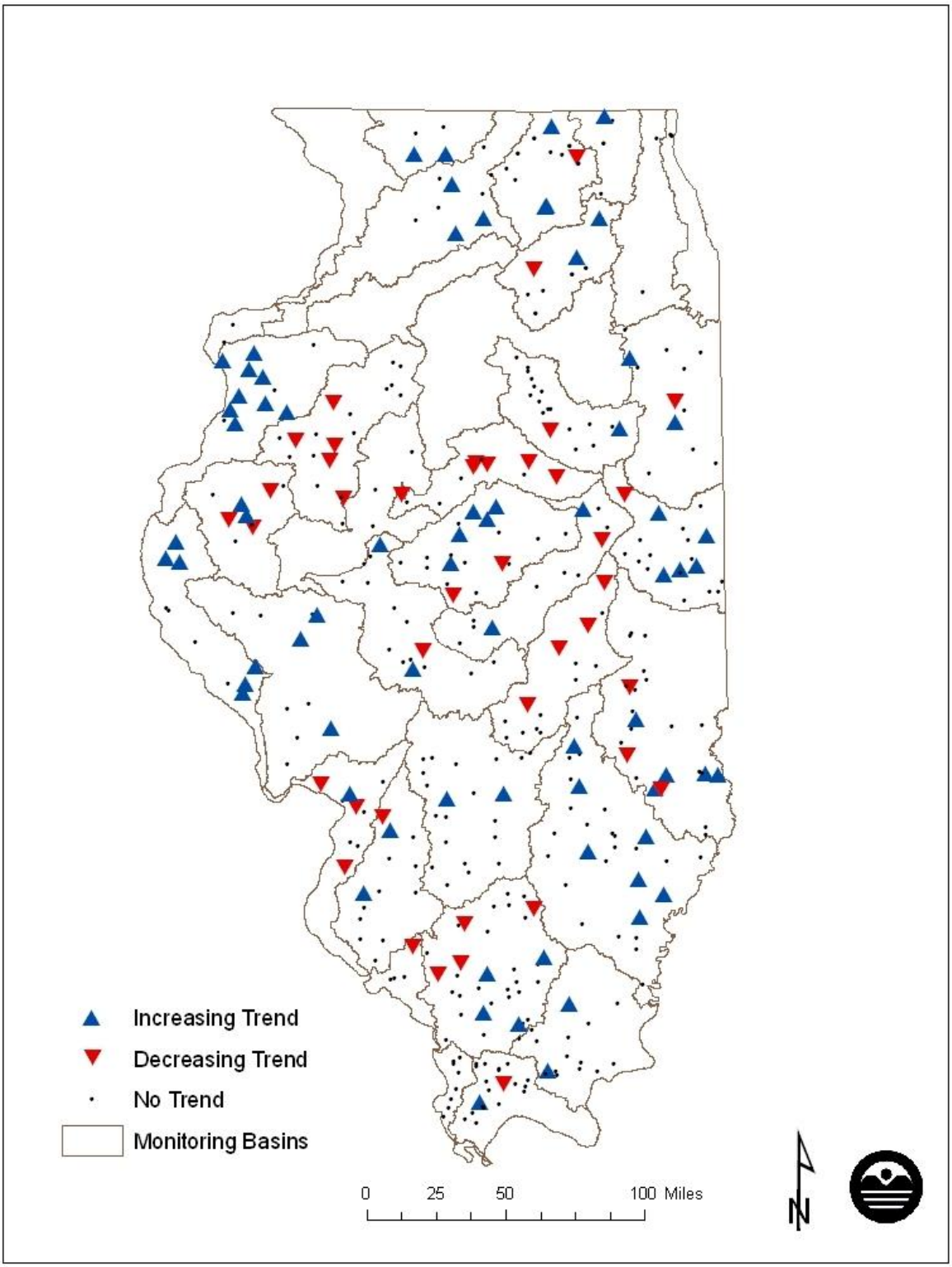
Illinois Streams Trends Assessment

To assess changes in ecological health of streams throughout Illinois, a trend analysis was performed utilizing readily available fish assemblage data collected from 1981 – 2004 as part of the Illinois EPA/IDNR Cooperative Intensive Basin Survey program. From this data set, an Index of Biotic Integrity for fish (Fish IBI) was calculated for each fish sample and used to assess changes in the ecological health of Illinois streams. Fish data were chosen for this comparison as it is the most representative, long-term, primary biological data set available in Illinois.

To evaluate trends, data were split into two separate groups: sites where only two Fish IBI scores (259 sites) were available and sites where three or more Fish IBI scores (159 sites) were available. For each of these 418 sites the Fish IBI scores were plotted against the year of collection. To document changes in stream condition, a meaningful trend was defined as a difference in Fish IBI score of 11 or more points between sample years. This 11 point cutoff was used as it is widely recognized in scientific literature, as well as the Illinois Department of Natural Resources internal analysis, as the point distinguishing meaningful differences in fish IBI scores (+/- 5 point difference plus one point to eliminate ties).

Each Fish IBI score for each year was plotted as a range of values that reflect the precision of a score; specifically, this range is depicted as a vertical line that extends five points above and below each Fish IBI score for any given year. For each site we compared the earliest Fish IBI score to the most recent one. Non-overlapping IBI ranges (i.e., greater than or equal to an 11 point difference) were interpreted as having a meaningful trend (increasing or decreasing). Out of this data set (418 stream sites), our analysis found no trend in Fish IBIs at 305 sites (73%), a decrease at 42 sites (10%), and an increase at 71 sites (17%) (Figure C-9).

Figure C-9. Statewide Trends in Fish Index of Biotic Integrity for Streams in Illinois, 1981-2004.



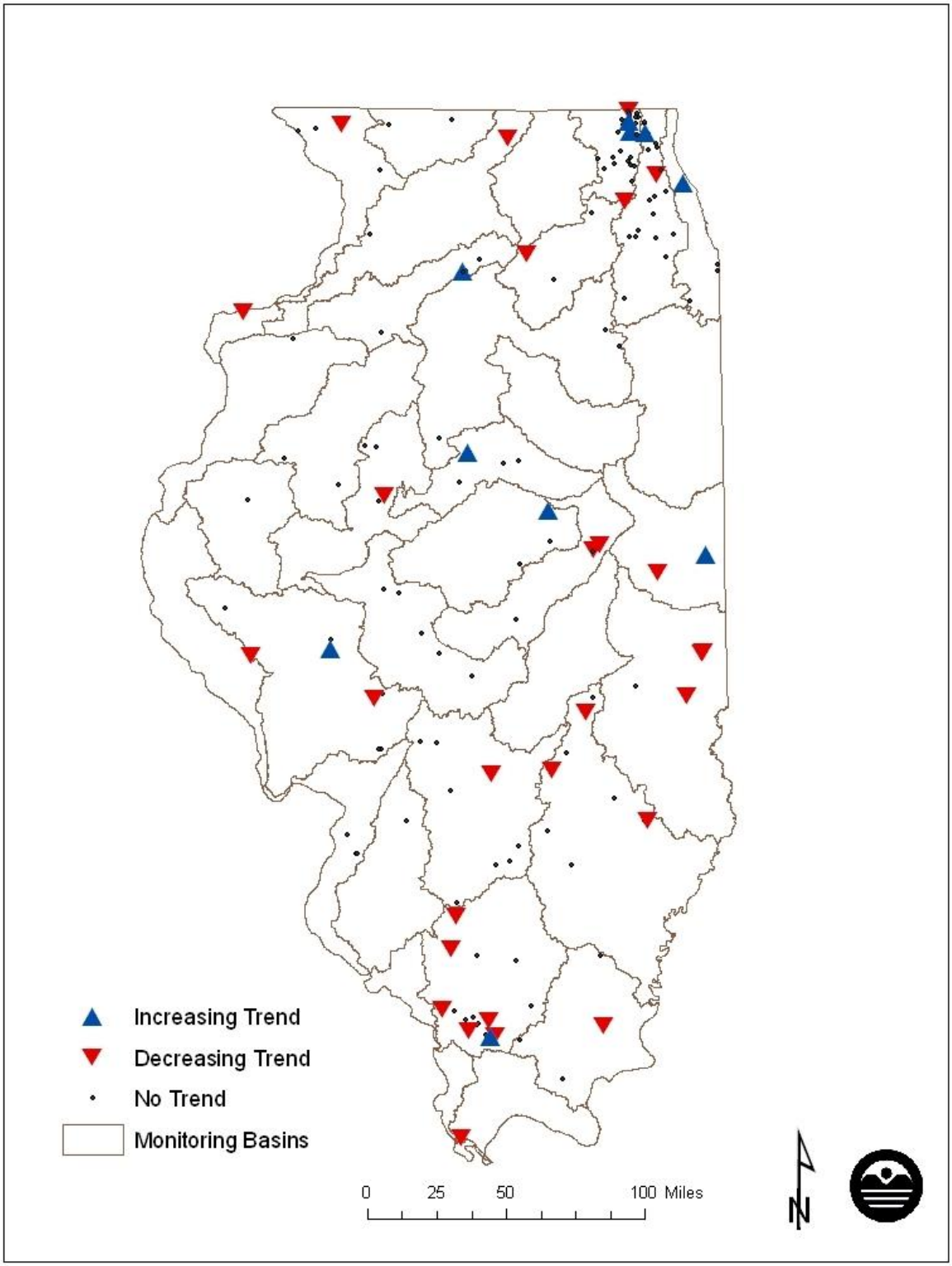
Illinois Inland Lake Trends Assessment

To assess and document changes in lake water quality throughout Illinois, a trend analysis was performed utilizing a data set which contains almost 30 years worth of lake data from several sources including the Illinois EPA's Ambient Lake Monitoring Program, Illinois Clean Lakes Program, and Volunteer Lake Monitoring Program, as well as from outside sources. The most consistently available measurement across all data sets was found to be Secchi disk transparency, which is a widely recognized indicator of overall lake water quality. Additionally, Secchi disk transparency can be directly correlated to other water quality parameters such as total suspended solids, total nutrients, and chlorophyll concentrations.

In order to assess trends within an individual lake over time, a nonparametric Mann-Kendall test for trends was used. A trend was defined as a significant change in Secchi disk transparency over time ($\alpha = 0.10$). For lakes with a sample size greater than ten, the data was subjected to a normal approximation to reduce the effects of tied values (zeros) in the data matrix. To minimize the effects of variability within a year, only data from July and/or August were utilized in the trend analysis. This also corresponds to the time period when water quality issues are most likely to have developed (i.e., reduced water clarity, increased algal productivity, elevated nutrient concentrations, etc) and provides a good assessment of quality during peak lake usage in Illinois. The median of all available values from within these two months was calculated and used as the representative Secchi disk transparency value for that year. Furthermore, for a lake to be included in the analysis, at least four years of Secchi disk transparency data were required.

The initial data set consists of Secchi disk transparency readings from 296 lakes (1979 - 2006). After applying minimum requirements (at least four years with July and/or August Secchi disk transparency data), the data set was reduced to 157 lakes with an *n* value (years) ranging from 4 to 27. Out of this data set (157 lakes), our analysis found no significant trend at 119 lakes (75.8%), a significant decrease at 28 lakes (17.8%), and a significant increase at 10 lakes (6.4%) (Figure C-10).

Figure C-10. Statewide Trends in Secchi Disk Transparency for Inland Lakes in Illinois, 1979 – 2006.



C-6 Public Health Issues

USEPA guidance asks states to provide information regarding public health issues including information on *fish consumption*, *primary contact* (swimming) and *public and food processing water supply* uses. The summaries of use support for these three uses are shown in Table C-41. Potential causes of impairment for these uses are shown in Table C-42.

Table C-41. Statewide Individual Use-Support Summary for Public Health Related Uses.

Streams: Designated Use	**Total Miles**	**Miles Assessed**	**Miles Fully Supporting (Good)**	**Miles Not Supporting (Fair)**	**Miles Not Supporting (Poor)**	**Miles Not Assessed**
Fish Consumption	119,244	3,930	0	3,619	311	115,314
Primary Contact	118,578	4,009	745	1,375	1,890	114,569
Public and Food Processing Water Supply	1,157	1,157	110	1,047	0	0
Inland Lakes: Designated Use	**Total Acres**	**Acres Assessed**	**Acres Fully Supporting (Good)**	**Acres Not Supporting (Fair)**	**Acres Not Supporting (Poor)**	**Acres Not Assessed**
Fish Consumption	318,477	92,280	6,840	84,864	575	226,197
Primary Contact	316,877	1,814	1,092	722	0	315,063
Public and Food Processing Water Supply	75,907	75,655	15,673	59,982	0	252
Lake Michigan Harbors: Designated Use	**Total Square Miles**	**Square Miles Assessed**	**Miles Fully Supporting (Good)**	**Miles Not Supporting (Fair)**	**Miles Not Supporting (Poor)**	**Square Miles Not Assessed**
Fish Consumption	2.5	2.46	2.40	0	.06	.05
Primary Contact	2.5	0	0	0	0	2.5
Lake Michigan Open Water: Designated Use	**Total Square Miles**	**Square Miles Assessed**	**Miles Fully Supporting (Good)**	**Miles Not Supporting (Fair)**	**Miles Not Supporting (Poor)**	**Square Miles Not Assessed**
Fish Consumption	1,526	151	0.0	0	151	1375
Primary Contact	1,526	151	151	0	0	1375
Public and Food Processing Water Supplies	151	151	151	0	0	0
Lake Michigan Shoreline: Designated Use	**Total Miles**	**Miles Assessed**	**Miles Fully Supporting (Good)**	**Miles Not Supporting (Fair)**	**Miles Not Supporting (Poor)**	**Miles Not Assessed**
Fish Consumption	63	63	0	0	63	0
Primary Contact	63	63	0	0	63	0

Note: Numbers may not add up due to slight rounding errors.

Table C-42. Potential Causes of Impairment for *Public and Food Processing Water Supply*, *Primary Contact* and *Fish Consumption* Uses in Illinois Waters.

STREAMS	Miles Impaired
Public and Food Processing Water Supply Use	
Manganese	891
Atrazine	231
Total Dissolved Solids	143
Nitrogen, Nitrate	85
Phenols	60
Iron	25
Chloride	11
Primary Contact Use	
Fecal Coliform	3,265
Fish Consumption Use	
Mercury	3,063
Polychlorinated biphenyls	2,789
Dioxin (including 2,3,7,8-TCDD)	131
Chlordane	80

INLAND LAKES	Acres Impaired
Public and Food Processing Water Supply Use	
Manganese	58,871
Atrazine	4,633
Nitrogen, Nitrate	1,685
Total Dissolved Solids	250
Primary Contact Use	
Fecal Coliform	722
Fish Consumption Use	
Mercury	77,514
Polychlorinated biphenyls	25,788
Chlordane	4,820

LAKE MICHIGAN BAYS AND HARBORS	Square Miles Impaired
Fish Consumption Use	
Polychlorinated biphenyls	3
Mercury	2

LAKE MICHIGAN OPEN WATERS	Square Miles Impaired
Fish Consumption Use	
Polychlorinated biphenyls	151
Mercury	151

LAKE MICHIGAN SHORELINE	Miles Impaired
Primary Contact Use	
Escherichia coli	63
Fish Consumption Use	
Polychlorinated biphenyls	63
Mercury	63

PART D: PUBLIC PARTICIPATION

The agency solicited information from the public to be used in the use assessment process as described in Section C-2.

We also solicit public input on the assessment results. A draft of the 2010 Integrated Report was placed on the Illinois EPA website (http://www.epa.state.il.us/water/tmdl/303d-list.html) for public review on March 30, 2010 and notices were sent out to all known interested parties of its availability. Hard copies of the report are available for those who request them. Notice of a public hearing was published on March 30, 2010; March 31, 2010; and April 7, 2010 in the Edwardsville Intelligencer. A public hearing will be held on April 29, 2010 to accept public comments. The hearing record will be closed at midnight on May 29, 2010. The agency responded to all pertinent comments and incorporated changes into the existing document. Responses to comments are documented in Appendix E.

For TMDL development, the Illinois EPA has a comprehensive approach offering opportunities for stakeholders to participate, review and comment throughout the TMDL development process. For watersheds in which the development of TMDLs is currently underway, the Illinois EPA holds three public meetings.

All public meetings are held at a location within the effected watershed to enable greater local participation. Illinois EPA and its contractor typically provide an update of the progress made. The final public meeting held within the watershed, is on the draft TMDL report. The public/stakeholders have an opportunity to comment 30 days prior to the meeting date, during the meeting and generally 30 days after the meeting. In addition, where applicable, the report is distributed to the Illinois Department of Agriculture, the USDA—Natural Resources Conservation Service and other state and federal partners prior to release to the public for technical review and input.

A TMDL stakeholders group of 30 to 40 members has been assembled. The group consists of representatives from environmental groups, point source dischargers, Illinois Environmental Regulatory Group, USEPA, nonpoint source related organizations including agricultural and commodity associations, and other organizations. Initial meetings of this group were held on February 5, 2002, and May 7, 2002, in Springfield, Illinois. The Illinois TMDL Stakeholders Workgroup meets from time to time to serve as a sounding board and review panel for development of various program elements.

In August 2003, the Science Advisory Committee (SAC) was formed made up of staff from the Illinois Department of Agriculture, Illinois Department of Natural Resources, University of Illinois Urbana-Champaign, University of Illinois Extension, Illinois State Water Survey, and an environmental group. The purpose of this committee is to provide technical advice and scientific analysis of issues related to TMDL development in Illinois. The SAC will review, comment upon and discuss TMDL interim reports throughout the TMDL development process.

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