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Illinois Environmental Protection Agency
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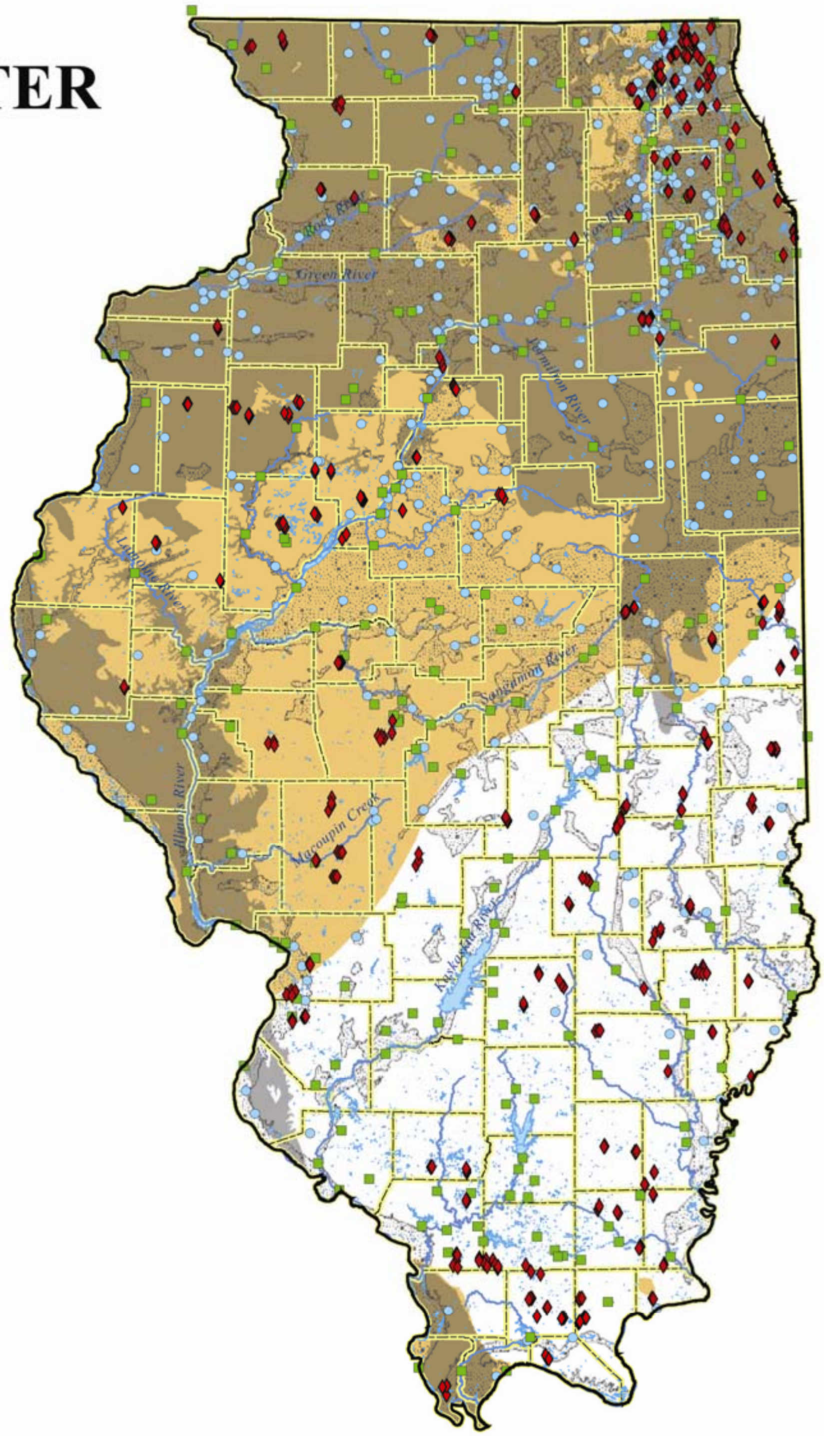
ILLINOIS WATER MONITORING STRATEGY 2007 - 2012



Ambient Water Quality Monitoring Stations

- Lake Site
- Stream Site
- Groundwater Well
- Major River
- Lake
- Sand & Gravel Aquifer
- Shallow Bedrock Aquifer
- Deep Bedrock Aquifer
- County Boundary

Illinois Environmental Protection Agency
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ILLINOIS WATER MONITORING STRATEGY

2007-2012

Illinois Environmental Protection Agency
Bureau of Water
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

ACES	Agency Compliance and Enforcement System
ADB	Assessment Database
AIS	Aquatic Invasive Species
ALMP	Ambient Lake Monitoring Program
ArcIMS	Arc Internet Map Server
AWQMN	Ambient Water Quality Monitoring Network
AWWA	American Water Works Association
BMP	Best Management Practice
BOL	Bureau of Land
BOW	Bureau of Water
CFR	Code of Federal Regulations
CSO	Combined Sewer Overflow
CTAP	Critical Trends Assessment Program
CWA	Clean Water Act
CWS	Community Water Supply
DDT	Dichloro-diphenyl-trichloroethane
DO	Dissolved Oxygen
DQO	Data Quality Objective
DWPC	Division of Water Pollution Control
EnPPA	Illinois EPA/USEPA Environmental Performance Partnership Agreement
FCMP	Fish Contaminant Monitoring Program
FFY	Federal Fiscal Year
FRSS	Facility-Related Stream Survey
FTE	Full-time Equivalent
GC/MS	Gas Chromatography/Mass Spectrometry
IBI	Index of Biotic Integrity
IBS	Intensive Basin Survey
ICLP	Illinois Clean Lakes Program
IDNR	Illinois Department of Natural Resources
IDPH	Illinois Department of Public Health
IDOT	Illinois Department of Transportation
IEPA	Illinois Environmental Protection Agency
IGPA	Illinois Groundwater Protection Act
ILCS	Illinois Compiled Statutes
Illinois EPA	Illinois Environmental Protection Agency
INHS	Illinois Natural History Survey
IOC	Inorganic Chemical
ISGS	Illinois State Geological Survey
ISWS	Illinois State Water Survey
ITFM	Intergovernmental Task Force on Monitoring Water Quality
JWPP	Jardine Water Purification Plant – city of Chicago
LIMS	Laboratory Information Management System
LRP-IBI	Lake and Reservoir Phytoplankton – Index of Biotic Integrity
LMMCC	Lake Michigan Monitoring Coordinating Council
LTRMP	Long-Term Resource Monitoring Program
MCL	Maximum Contaminant Level
mg/L	Milligram per Liter (unit of measure)
mIBI	Macroinvertebrate Index of Biotic Integrity
MSR	Management System Review

NAWQA	National Ambient Water Quality Assessment
NES	National Lake Eutrophication Study
NMN	National Water Quality Monitoring Network for U.S. Coastal Waters
NLS	USEPA National Lakes Survey
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NWI	Illinois National Wetlands Inventory
ORSANCO	Ohio River Valley Water Sanitation Commission
PCBs	Polychlorinated biphenyls
pdf	Portable Data Format
pH	Potential of Hydrogen
PMN	Pesticide Monitoring Subnetwork
PWS	Public Water Supply
QA	Quality Assurance
QAC	Quality Assurance Committee
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
QHEI	Qualitative Habitat Evaluation Index
QMP	Quality Management Plan
QSCC	Quality Systems Coordinating Committee
RfD	Reference dose
SCR	Side Channel Reservoir
SDWA	Safe Drinking Water Act
SDWIS	Safe Drinking Water Information System
SOC	Synthetic Organic Compound
SOP	Standard Operating Procedure
SQL	Structural Query Language
STORET	STOrage and RETrieval
SWAP	Source Water Assessment Program
SWPP	South Water Purification Plant – city of Chicago
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TSA	Technical System Audit
USEPA	United States Environmental Protection Agency
USFDA	United States Food and Drug Administration
USGS	United States Geological Survey
VLMP	Volunteer Lake Monitoring Program
VOC	Volatile Organic Compound
WHPA	Wellhead Protection Area
WTWG	Wetland Technical Working Group

OVERVIEW OF MONITORING STRATEGY

Monitoring the environmental conditions of Illinois' streams, lakes, and groundwater provides vital information for achieving the natural resource goals of the Illinois Environmental Protection Agency (Illinois EPA). The monitoring performed by Illinois EPA Bureau of Water (BOW) and its partner organizations provides the basis for ensuring that Illinois waters continue to be safe for drinking and recreation while supporting other beneficial uses, such as aquatic life, aesthetic enjoyment, agriculture, and industry.

This document*, Illinois Water Monitoring Strategy 2007-2012,* describes how and why Illinois EPA will monitor the environmental conditions in Illinois surface water and groundwater during the years 2007 through 2012. This document is divided into the following sections:

1. **Introduction** explains the purposes served by this document, including a brief history of its precursor documents.

2. **Monitoring Objectives** defines the primary reasons why Illinois EPA BOW monitors Illinois waters.

3. **Monitoring Design** describes Illinois EPA BOW monitoring, with specific reference to how and to what extent this monitoring serves the purposes of various programs and activities. This section also addresses specific monitoring efforts planned for 2007 through 2012 and how each effort is expected to advance the primary monitoring objectives of Illinois EPA BOW.

4. **Environmental Indicators** describes the types of data and information obtained via monitoring and how this information contributes to the resource management and pollution control activities performed by Illinois EPA BOW.

5. **Quality Assurance** and **Data Management** address how Illinois EPA BOW ensures the quality and availability of monitoring data and related information for those who rely regularly on it.

6. **Data Analysis and Assessment** describes how Illinois EPA BOW interprets and uses monitoring data and associated environmental indicators to support its primary resource management and pollution control activities.

7. **Reporting** provides a brief description of all reports produced by Illinois EPA BOW and includes an Illinois EPA website where an electronic version of the report can be found. Other state agency reports that contain environmental information provided by Illinois EPA BOW are also included where possible.

8. **Programmatic Evaluation** describes how Illinois EPA BOW evaluates its primary resource management and pollution control activities.

9. **General Support and Infrastructure Planning** describes the current status and projected needs for advancing Illinois EPA BOW primary monitoring objectives.

Throughout this monitoring strategy, Illinois EPA BOW provides recommendations and strategies for improving many aspects of its monitoring programs. These recommendations include specific efforts already planned and funded for 2007 through 2012, as well as efforts that represent potential gains as time and resources allow.

INTRODUCTION

To track environmental conditions (i.e., water quality) and to evaluate the efficacy of water pollution control programs as required by state and federal regulations, Illinois EPA BOW has been monitoring Illinois surface water since 1970. Over this 35-year period, Illinois EPA BOW has refined this monitoring to keep pace with technological advances, broadening environmental concerns and increasing opportunities to benefit from collaboration with other agencies and public partners.

Since 1970, Illinois EPA BOW has performed occasional reviews of our monitoring programs to assess the degree to which monitoring data and related information has been meeting our changing and expanding needs and those of various partners with similar environmental responsibilities. In June 1996, Illinois EPA BOW conducted and published the first formal, comprehensive review of our monitoring programs, *Surface Water Monitoring Strategy, 1996-2000* (IEPA 1996). The second monitoring strategy (IEPA 2002) addressed Illinois EPA BOW monitoring programs that were supported by federal Clean Water Act (CWA) Section 106 funds for the period 2002 through 2006. This document described the primary surface water and groundwater programs in a framework based on guidance developed and published by the United States Environmental Protection Agency (USEPA 2003a).

This current monitoring strategy represents a third comprehensive review of Illinois EPA BOW surface water and groundwater monitoring activities. The content and design of this strategy closely follows the USEPA guidance, *Elements of a State Water Monitoring and Assessment Program* (USEPA 2003b), and thereby is intended to fulfill the monitoring strategy requirements of the CWA and associated regulations.

MONITORING OBJECTIVES

Illinois EPA BOW primary monitoring objectives are identified and discussed below. The USEPA (2003b) requests that each state describe how it achieves the monitoring element called "Monitoring Objectives." Specifically, USEPA (2003b) requests that each state identify:

> *… monitoring objectives critical to the design of a monitoring program that is efficient and effective in generating data that serve its management decision needs. EPA expects the State to develop a strategy and implement a monitoring program that reflects a full range of State water-quality management objectives, including, but not limited to, Clean Water Act goals.*

Moreover, Title 40, Section 130.4 of the Code of Federal Regulations (CFR) requires:

> *The State's water monitoring program shall include collection and analysis of physical, chemical, and biological data and quality assurance and control programs to assure scientifically valid data. The uses of these data include determining abatement and control priorities; developing and reviewing water quality standards, TMDLs, wasteload allocations, and load allocations; assessing compliance with NPDES permits by dischargers; reporting information to the public through the section 305(b) report and reviewing station-specific monitoring efforts.*

Illinois EPA's monitoring objectives for surface water and groundwater are:

1a. Determine attainment of designated uses and identify impaired waters.

1b. Identify causes and sources of impairment to water quality.

1c. Identify trends in water quality and maintain the flexibility to address emerging threats to water quality.

2. Establish, review and revise water quality standards, including use designations and use attainability.

3. Implement water management programs.

4. Evaluate the effectiveness of water management programs.

Objectives 1a through 1c: Determine attainment of designated uses, identify impaired waters; identify causes and sources of water quality impairments; and identify trends in water quality while maintaining the flexibility to address emerging threats to water quality.

Via several programs, Illinois EPA regularly monitors streams, lakes (including Lake Michigan), and groundwater throughout Illinois for various chemical, physical, and biological conditions. For each use designated in every water body, Illinois EPA interprets the relevant monitoring information to assess attainment of the use. When at least one designated use is not attained in a water body, the water body is impaired. In these cases, the relevant monitoring information also is used to identify potential causes and sources of the impairment. This regular monitoring and assessment allows Illinois EPA to identify how environmental conditions change through time in Illinois waters. Illinois EPA tracks statewide changes in these conditions by regularly reporting, in the Integrated 305(b)/303(d) Report, the percentages of stream miles, lake acres, and groundwater monitoring wells that are attaining each of several applicable designated uses. As resources and expertise allow and as the need arises, Illinois EPA may perform formal statistical trends analysis on specific waters.

Specifically, in accordance with 40 CFR 130.8(b)(1), Illinois EPA monitoring and assessment of *aquatic life use* in Illinois surface waters address the extent to which conditions in Illinois lakes and streams "*provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife.*" Also, via assessments of *primary contact use* and *secondary contact use*, Illinois EPA uses the monitoring information to determine the extent to which conditions in Illinois lakes and streams "*allow recreational activities in and on the water*" in accordance with 40 CFR 130.8(b)(1). Via identification and tracking of waters with impaired uses and via identification of potential causes of impairment, Illinois EPA also uses monitoring information for "*identification and priority setting for water quality-limited segments still requiring total daily maximum loads,*" in accordance with 40 CFR 130.7(b), and for reporting "*an estimate of the extent to which CWA control programs have improved water quality or will improve water quality . . . and recommendations for future actions necessary and identifications of waters needing action*" in accordance with 40 CFR 130.8(b)(2).

Objective 2: Establish, review, and revise water quality standards, including use designations and use attainability.

All stream, lake, and groundwater monitoring information are available to help establish, review, or revise water quality standards. Specific applications include: (a) defining and designating uses in Illinois waters, (b) determining numeric thresholds for assessing use attainment, and (c) determining numeric thresholds for effluent limits.

Development of water quality standards for Illinois often requires information on ancillary water quality parameters related to or influencing the parameter for which a standard is being developed, as well as for the parameter itself. For example, development of the sulfate standard required analyses of hardness and chloride data from the surface water Ambient Water Quality Monitoring Network (AWQMN) and Intensive Basin Surveys (IBS). Even when adoption of updated water quality standards does not involve development of the numeric standard—a USEPA-developed standard is being considered—data from the waters of the state are important to gauge impact of the proposed standard and to answer important questions such as: What natural or anthropogenic factors affect attainability of the proposed standard? Such analysis is vital in determining if a national criterion suits the Illinois environment or if the criterion needs regional modifications.

As part of the process for establishing new or revised groundwater quality standards, Section 8(b)(1) of the Illinois Groundwater Protection Act (IGPA), [415 ILCS 55/8(b)(1) (1998)], states that the Illinois Pollution Control Board shall consider the following, in addition to the factors set forth in Title VII of the Environmental Protection Act, in promulgating water quality standards for groundwater:

1. Recognition that groundwater differs in many important respects from surface water, including water quality, rate of movement, direction of flow, accessibility, susceptibility to pollution, and use.

2. Classification of groundwater on an appropriate basis, such as its utility as a resource or susceptibility to contamination.

3. Preference for numerical water quality standards, where possible, over narrative standards, especially where specific contaminants have been commonly detected in groundwater or where federal drinking water levels or advisories are available.

4. Application of nondegradation provisions for appropriate groundwaters, including notification limitations to trigger preventive response activities.

5. Relevant experiences from other states where groundwater protection programs have been implemented.

6. Existing methods of detecting and quantifying contaminants with reasonable analytical certainty.

Objective 3: Implement water management programs.

Illinois EPA BOW uses water quality monitoring data from streams, lakes, and groundwater to support implementation of various water management programs and associated projects. These applications include, but are not limited to, the following:

1. Implement lake restoration projects through the Illinois Clean Lakes Program (ICLP).

2. Determine the extent of use impairment and identify potential causes and sources of use impairment for the purpose of developing and prioritizing Total Maximum Daily Loads (TMDL).

3. Develop watershed plans, determine Best Management Practices (BMPs), and implement restoration projects through adaptive management for nonpoint source (NPS) pollution control through the Section 319 Program.

4. Prioritize inspections of permitted point-source discharges and other regulated facilities via the National Pollutant Discharge Elimination System (NPDES) Permit Program.

5. Implement statewide groundwater and wellhead protection programs.

Illinois EPA BOW maintains flexibility in using water quality monitoring data to implement programs and projects by annually reviewing and revising monitoring priorities based on availability of resources or competing needs for monitoring information.

Objective 4: Evaluate the effectiveness of water management programs.

Illinois EPA BOW uses water quality monitoring data from streams, lakes, and groundwater to evaluate the effectiveness of various water management programs and associated projects. These applications include, but are not limited to, the following:

1. Evaluate effectiveness of restoration activities in lakes through the ICLP.

2. Estimate the extent to which water pollution control programs have improved water quality or will improve water quality for *aquatic life use, primary contact use, and secondary contact use*, in accordance with 40 CFR 130.8(b)(2), through regular assessments of use attainment in waters statewide.

3. In limited ways, determine the effectiveness of watershed management actions (e.g., BMPs) and evaluate "*to the extent that appropriate information is available, reductions in nonpoint source pollutant loading and improvements in water quality . . . resulting from implementation of the management program*" in accordance with CWA Section 319(h)(11).

4. Evaluate impacts on aquatic life of NPDES permitted discharges and evaluate the effectiveness of inspection and compliance assurance activities of dischargers.

5. In limited ways, use wastewater discharge monitoring data and other facility data to generally assess the performance of treatment facilities.

6. Evaluate statewide groundwater protection programs.

MONITORING DESIGN

Water Quality Monitoring Programs

Illinois EPA BOW has developed and currently conducts various monitoring programs and efforts to assess the quality of the state's surface and ground waters and to evaluate the effectiveness of policies and activities related to water pollution control, drinking water protection, and groundwater protection. Aspects of these programs are required by the Clean Water Act (CWA), the Illinois Environmental Protection Act (Act), and the Illinois Groundwater Protection Act (IGPA). For example, in 1986, the Act was amended to require an ambient groundwater monitoring program. Also, the IGPA, adopted in 1987, requires implementation of an ambient monitoring network that includes community water supply (CWS) wells.

These monitoring programs range from comprehensive ambient monitoring of lakes and streams, to fixed-station groundwater monitoring, to specialized wastewater monitoring that assesses compliance or facility performance, to groundwater testing for herbicide transformation products. The monitoring design of each program is based on water body type (i.e., lake, stream, and groundwater) and specific primary objectives. Consequently, each program has a unique combination of sampling design, stations, sampling frequency and parameters monitored (Appendix A).

Table 1 shows each of BOW's aforementioned primary monitoring objectives (rows) and each BOW monitoring program (columns) currently operating or expected to be in operation during the next five years, 2007 through 2012. An assessment of the extent to which each meets its primary objectives is included.

Table 2 includes an overview of each BOW monitoring program. For a more detailed discussion of field, laboratory, and data management procedures for each program, please see the *Illinois EPA BOW Quality Assurance Project Plan (QAPP)* (IEPA 1994).

Table 1. Primary objectives of Illinois EPA Bureau of Water monitoring and the extent to which each program or effort meets its primary objectives. Objectives 1a, 1b, 1c, and 4 may apply statewide (IL) or at smaller spatial scales (S) such as sites, water bodies, or watersheds. Some programs are designed to achieve only a limited set of objectives; lack of a symbol indicates that the objective does not pertain primarily to the program or effort, at the spatial scale indicated.

● indicates objective is sufficiently supported; room for improvement, but not a priority	⌖ indicates objective is partially supported; improvement efforts planned for 2007-2012	○ indicates objective is partially supported; potential improvements beyond 2012

Primary Monitoring Objectives	**Spatial Scale**	**Surface Water Section**							**Watershed Management Section**	**Division of Water Pollution Control/Field Operations, Permits, & Compliance Assurance sections**		**Toxicity Assessment Unit**	**Ground-water Section**
		Ambient Water Quality Monitoring Network	Intensive Basin Surveys	Facility-Related Stream Surveys	Ambient Lake Monitoring Program	Illinois Clean Lakes Program	Volunteer Lake Monitoring Program	Lake Michigan Monitoring Program	Watershed-Based Monitoring	NPDES Permittee Self-Monitoring	Municipal/ Industrial-Effluent Monitoring	Fish Contaminant Monitoring Program	Groundwater Monitoring
1a-Determine attainment of designated uses & identify impaired waters	IL	○	○		○							○	●
	S	⌖	●	●	⌖	⌖	⌖	●	⌖			●	●
1b-Identify causes & sources of impairment	IL	○	○		○							○	●
	S	⌖	⌖	⌖	⌖	●	⌖	○	⌖	○	○	●	●
1c-Identify trends in water quality & maintain the flexibility to address emerging threats	IL	○	○		○							○	⌖
	S	⌖	⌖	⌖	⌖	⌖	⌖	○	⌖			●	⌖
2-Develop water quality standards		⌖	⌖	⌖	⌖	⌖		○		○	○		⌖
3-Implement water-management program(s)		⌖	⌖	●	○	○	⌖	○	⌖	●	●	○	○
4-Evaluate the effectiveness of water-management programs	IL	○	○				○	○				○	⌖
	S	○	○	⌖	○	⌖	○	○	⌖	●	●	○	⌖

Table 2. Summary of Illinois EPA water monitoring program designs.			
Monitoring Program or Activity	**Parameters or Features Monitored (Appendix A)**	**Spatial Design and Number of Stations or Surveys**	**Summary and Comments**
Ambient Water Quality Monitoring Network , including -Pesticide Subnetwork -Large-rivers Subnetwork	Water chemistry	Fixed locations; 213 stations statewide	Sampling stations in each of three regions: south (68 stations), central (75), and north (70). Except for Mississippi River stations, each station is sampled once every 6 weeks (9 times per year). Mississippi River stations are sampled once every three months. (Appendix B).
Intensive Basin Surveys	Water and sediment chemistry, habitat quality, fish assemblage, and macroinvertebrate assemblage	Predominantly fixed locations; typically about 100 stations sampled per year; statewide	Surveys are conducted on a 5-year cycle cooperatively with the Illinois Department of Natural Resources; each basin survey comprises about 10 to 35 stations. Six to eight basin surveys annually; one to three surveys per each of three regions (north, central, south) per year.
Facility-Related Stream Surveys	Water and effluent chemistry, habitat quality, macroinvertebrate assemblage	Predominantly fixed locations; typically about 20-30 surveys per year with 3-7 stations per survey; statewide	7 - 15 surveys per year, in each of three regions (north, central, south). Each survey consists of sampling upstream and incrementally downstream of wastewater-treatment discharges. Sampling may be conducted in response to legal, CSO, TMDL, water quality standard issues; plant performance; or toxicity issues.
Ambient Lake Monitoring Program	Water and sediment chemistry, temperature, dissolved oxygen profiles, macrophytes, and occasionally phytoplankton	Fixed locations; 50 lakes statewide	14 to 19 lakes are sampled annually in each of the three regions. Water samples are collected 5 times: April, June, July, August, and October. Sediment samples are typically collected once annually. Sampling may include shoreline erosion and macrophyte assessments and other indicators of lake quality.
Illinois Clean Lakes Program	Water and sediment chemistry, temperature, dissolved oxygen profiles fish tissue contaminants, bathymetry macrophytes and phytoplankton, and shoreline erosion survey	Predominantly fixed locations; number of lakes sampled per year varies statewide	Phase 1 and Phase 2 projects include physical observations and in-lake water chemistry sampling twice-monthly April through Oct. and once monthly Nov. through March. Sediment samples are typically collected once annually. Additionally, Phase 1 studies include tributary water chemistry monitoring during low and high flow periods. The following are conducted once per study: Bathymetric and shoreline surveys, and macrophyte and phytoplankton assessments.
Volunteer Lake Monitoring Program	Water chemistry, temperature, dissolved oxygen profiles, and Secchi disk transparency	Fixed locations; 100 lakes: water chemistry and Secchi transparency, 175 lakes: Secchi transparency only	Tier 1 volunteers: Secchi Disk transparency only twice per month from May through October at all stations. Tiers 2 and 3: Tier 1 monitoring requirements + water chemistry sampling once per month from May – August and October. Tier 2 water chemistry taken at Station 1 only. Tier 3 water chemistry taken at Station 1 and may have additional stations added.
Lake Michigan Monitoring Program	Water chemistry and fish tissue contaminants	Fixed locations; 80 water chemistry stations & 6 fish tissue contaminant stations	Water chemistry is sampled monthly January through December, based on a memorandum of agreement with the city of Chicago. (IEPA 2001)
Watershed-Based Monitoring	Metric/parameter coverage as necessary	Variable	Includes monitoring at the watershed scale to address the following: causes and sources of use impairment, BMP effectiveness, TMDL effectiveness, and other project-specific needs.
Fish Contaminant Monitoring Program	Fish tissue contaminants	Predominantly fixed locations; 100 stream and lake stations & 6 Lake Michigan stations; statewide	Typically, about 450 fish tissue samples are collected per year statewide by the IDNR. Fish tissue analysis is conducted by Illinois EPA organics laboratory.
Special Surveys	Metric/parameter coverage as necessary for survey objectives	Variable	Surveys may consist of mini-intensive surveys, sediment chemistry or fish contaminant surveys, lake quality assessments, livestock waste sampling, toxic contaminants, or monitoring to satisfy conditions of grant-funded projects.
Ambient Network of Community Water Supply Wells	Water chemistry	Fixed locations; 350 stations statewide	Sampling is conducted out of the Rockford Regional Office and Springfield Central Office. Each station is sampled 1 time per year on a biennial rotation with the Rotating Monitoring Network.
Rotating Monitoring Network	Water chemistry	Fixed locations; 350 stations statewide; biannually	Sampling is conducted out of the Rockford Regional Office and Springfield Central Office. Sampling stations are varied based upon program needs and are sampled 1 time per year on a biennial rotation with the CWS Network.

Ambient Water Quality Monitoring Network

1. Relationship to Monitoring Objectives. For the Ambient Water Quality Monitoring Network (AWQMN), objectives 1(a-c), 2, 3, and 4 are partially supported. Efforts are planned during 2007-2012 to improve objectives 1a, 1b, and 1c (site scale); 2; and 3 (Table 1).

2. Program Summary. Historically, stream water quality data in Illinois have been collected by several state and federal agencies including the Illinois State Water Survey (ISWS), the Illinois Department of Public Health (IDPH), Illinois EPA, and the U.S. Geological Survey (USGS). This monitoring has resulted in a rich data set from streams ranging in size from small agricultural drainage ditches to the Mississippi River. Between Water Years 1972 and 1977 (a water year is October 1 through September 30), Illinois EPA operated a 538-station monitoring network. Evaluation of this older data was presented in a series of reports prepared by the Illinois Water Information System Group, headed by Ronald Flemal and Donovan Wilkin (Peckham 1980).

In 1976, USEPA published *Basic State Water Monitoring Program* (USEPA 1976). Based on this document, Illinois EPA developed a set of criteria that were designed to identify baseline water quality conditions on a statewide basis. These criteria included locating stations in recreational areas, commercial or sport fishing areas, shellfish areas, populated areas especially near surface water supply intakes, land use areas such as municipal, industrial, agricultural, and areas of potential development. Additional considerations included clean waters as well as degraded areas of concern, co-location with USGS gaging stations, and, whenever possible, stations with previous historical data (Wallin and Schaeffer 1979). Of the 538 original stations, 108 met the selection criteria and were retained. This new network, which began operation in October 1977, incorporated USGS water quality sampling methodologies. Older stream water quality data (i.e., from 1945 through 1971) have also been collected by the ISWS and the IDPH at many of these stations (Winget 1976).

The present AWQMN design began in Water Year 1977 and included 209 stations through September 1996. Beginning in Water Year 2001, the AWQMN was increased to 213 stations (Figure 1). This network currently includes 202 stations on interior streams and the Wabash River, sampled by Illinois EPA nine times a year on a six-week rotation, and an additional 11 stations sampled quarterly on the Mississippi River. The monitoring of the three large river systems bordering Illinois is discussed in more detail under the large rivers subnetwork program. A comprehensive description of the AWQMN program, including a list of monitoring network stations, is provided in Appendix B.

Illinois EPA uses the AWQMN to (a) provide baseline water quality information; (b) characterize and define trends in the physical, chemical, and biological conditions of the Illinois' waters; (c) identify new or existing water quality problems; and (d) act as a triggering mechanism for special studies or other appropriate actions. Additional uses of AWQMN data include the review of existing water quality standards and establishment of water quality-based effluent limits for NPDES permits. The AWQMN is integrated with other Illinois EPA chemical and biological stream monitoring programs that are more regionally based (specific watersheds or point source receiving stream) and cover a shorter time span (e.g., one year) to evaluate compliance with water quality standards and determine designated use support as required in CWA Section 305(b).

Sites of the AWQMN were selected to sufficiently represent statewide water resource conditions (Wallin and Schaeffer 1979). Illinois EPA recognizes that it is not possible to assign frequentist statistical uncertainties to assessments of statewide condition based on conditions at these nonrandomly selected AWQMN sites. However, lack of frequentist statistical uncertainties does not necessarily make such generalizations inaccurate. Moreover, the use of a probability-based design to allow frequentist-based estimates of uncertainty does not ensure that generalizations from the sample to the target population (e.g., statewide) are accurate. Illinois EPA thinks that it is reasonable to generalize to statewide the conditions exhibited at AWQMN sites because the sites were selected with this purpose in mind. For example, the South Carolina Department of Health and Environmental Control (2004) compared use-attainment results based on monitoring data from a nonrandomly selected fixed-site network versus a probability-based network. Between the two sets of data they found little meaningful difference in the percentages of stream miles assessed as fully supporting, partially supporting, or not supporting various uses.

Lack of a probability-based monitoring design that allows estimates of uncertainty based on frequentist statistics does not mean that monitoring information from sites based on alternative monitoring designs cannot provide an accurate picture of statewide water-resource conditions. Addressing, in part, the monitoring-design objective that monitoring sites "... provide for the general characterization of the State's surface waters ..." and "... the overall quality of the State's water," USEPA (1975) states, "A few critically located stations may be extremely valuable while a large number of randomly selected stations may yield meaningless data." However, Illinois EPA recognizes that the spatial design of the current AWQMN "... may not be the best allocation of resources to provide statistically valid data ..." (Wallin and Schaeffer 1979) and acknowledges some of the advantages of a probability-based monitoring design that could be used to supplement the current fixed-station design.

Since October 1985, Illinois EPA has operated a Pesticide Monitoring Subnetwork (PMN) to expand screening for toxic organic substances. The PMN originally consisted of 30 AWQMN stations that were adjusted annually to provide additional monitoring coverage in conjunction with the IBS program. However, beginning with the 2007 Water Year, the emphasis of the PMN shifted to ambient stations associated with or in close proximity to public water supply intakes. This change in emphasis is intended to provide more information for 305(b)/303(d) public water supply designated use assessments. The old network was scrapped and 12 new stations, located in the vicinity of public water supply (PWS) surface intakes, were added to six existing stations retained from the old network that were also in the vicinity of PWS surface intakes. Pesticide sampling is conducted at each station nine times per year. A comprehensive description of the

AWQMN program including the PMN and a list of monitoring network stations is provided in Appendix B.

Between 1977 and 1999, the Illinois EPA operated four AWQMN stations on the Mississippi River. These were located at Fulton (M-04), Elsah (J-05), Keokuk, IA (K-04), and Thebes (I-84). Water quality monitoring at Thebes has always been done by the Missouri USGS with a subset of parameters analyzed at the Illinois EPA laboratories. To enhance monitoring coverage on the Mississippi River, the BOW Surface Water Monitoring Section added seven additional stations in 1999 and reduced the sampling frequency to quarterly. The additional sampling stations were placed at approximately 50-mile intervals. Upstream of St. Louis, Missouri, these sites are located at Corps of Engineers lock and dams. In the open river section below St. Louis, samples are collected by boat.

Data collected on the Mississippi River by the Illinois EPA is provided to the states of Iowa and Missouri for their biennial water quality assessment reports (305b/303d). Interstate cooperation on the Mississippi River for CWA activities are facilitated through the Upper Mississippi River Basin Association.

Additional water quality monitoring on the Mississippi River is conducted by various federal agencies including the USGS which operates the Long Term Resource Monitoring Program (LTRMP) primarily in pools 12, 26 and a portion of the open river below St. Louis. The USGS also operates the National Ambient Water Quality Assessment (NAWQA) which consists of the Thebes station plus two additional sites located near Illinois EPA AWQMN stations.

Illinois EPA participates in surface water monitoring activities of the Ohio River mainstem through cooperation with the Ohio River Valley Water Sanitation Commission (ORSANCO) and participation on the ORSANCO Monitoring Strategy and Biological Water Quality Subcommittees. Illinois EPA staff also participates in the collection of fish-assemblage samples from the Ohio River mainstem at the Corps of Engineers Smithland Lock and Dam, the review of Ohio River fish tissue contaminant data, and the development of standard operating procedures (SOPs) for biological sampling.

Illinois EPA currently conducts monitoring at one station on the Wabash River. This station (B-06) is located at the State Route 154 bridge at Hutsonville, Illinois. Additional water quality monitoring is conducted by ORSANCO at the State Route 141/62 bridge northeast of New Haven, Illinois.

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Figure 1. Illinois EPA Ambient Water Quality Monitoring Network Stations.

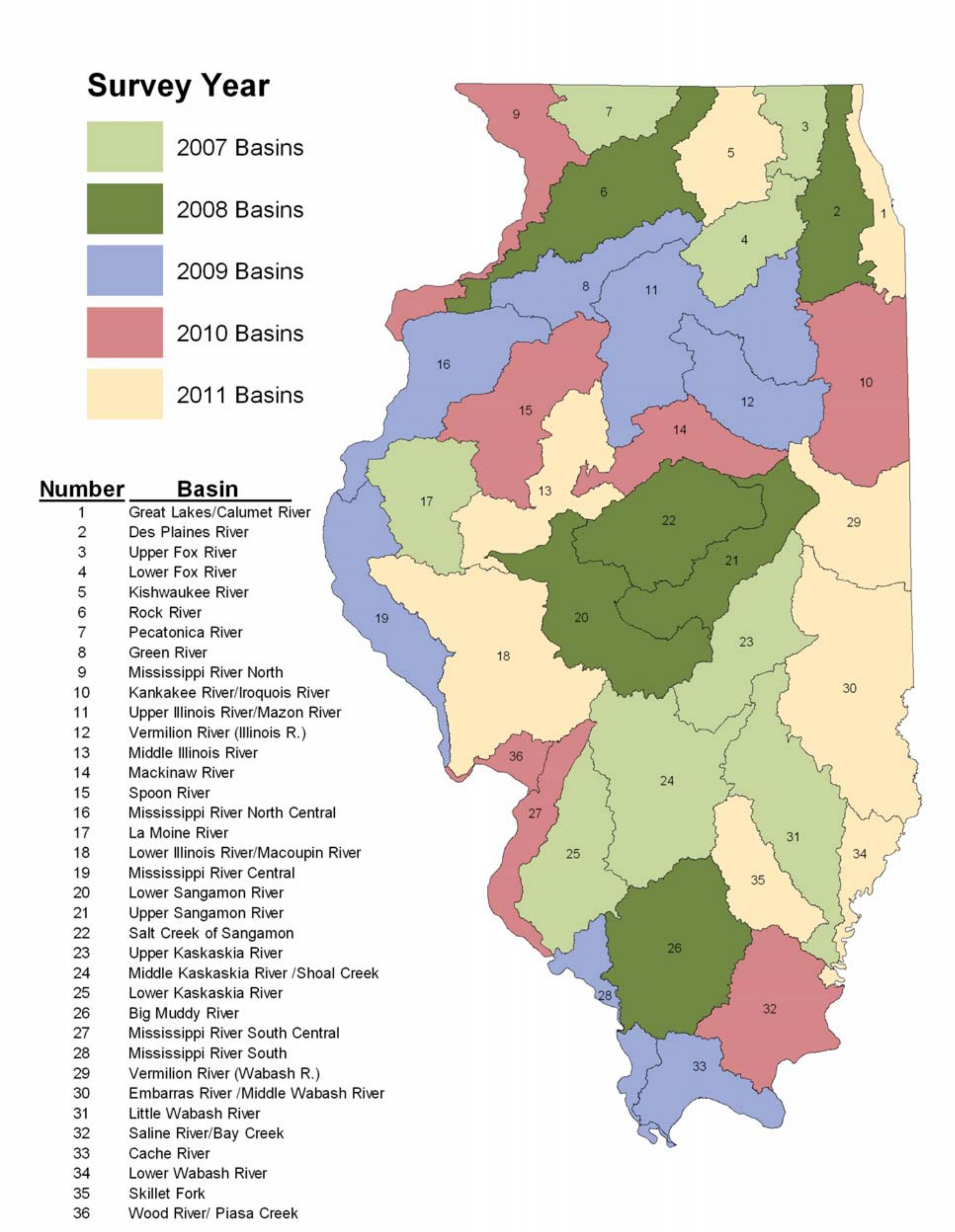
Intensive Basin Surveys

1. Relationship to Monitoring Objective. Intensive Basin Surveys (IBS) sufficiently support objective 1a (site scale) and partially support objectives 1a (statewide scale), 1b, 1c, 2, 3, and 4. Efforts are planned during 2007-2012 to improve objectives 1b and 1c (site scale), 2, and 3 (Table 1).

2. Program Summary. Surveys are conducted in selected basins each year by Illinois EPA BOW in cooperation with the Illinois Department of Natural Resources (IDNR). An IBS is designed to meet several objectives, some of which apply only to one of the two cooperating entities. Basins are selected each year so that statewide coverage is achieved once every five years. Each year, more than 100 stations are monitored for biological, chemical, and physical indicators of aquatic resource condition. Figure 2 shows the IBS schedule projected through 2011.

Intensive Basin Surveys are a major source of information for assessing attainment of *aquatic life use* in Illinois streams. At each IBS station, fish and macroinvertebrate assemblages, physical habitat (including stream discharge), and water chemistry are measured or otherwise characterized to determine resource conditions. Sampling for fish-tissue contaminants and sediment chemistry also is conducted to screen for the accumulation of toxic substances. For IBS sites that occur near an AWQMN site, water chemistry samples from the AWQMN monitoring are used. Appendix C provides a comprehensive description of the IBS program.

Figure 2. Intensive Basin Surveys 2007-2011 Monitoring Schedule.



Facility-Related Stream Surveys

1. Relationship to Monitoring Objective. Facility-Related Stream Surveys (FRSS) sufficiently support objectives 1a and 3. Efforts are planned during 2007-2012 to improve objectives 1b, 1c, 2, and 4 (Table 1).

2. Program Summary. Illinois EPA conducts FRSS primarily on wadeable streams. These surveys involve the collection of macroinvertebrate, water chemistry, stream flow, and habitat data upstream, and incrementally downstream, from municipal and industrial wastewater treatment facility discharges. The FRSS information is used to evaluate water quality impacts and the need for additional wastewater treatment controls. Data are also used to (a) characterize the existing and potential aquatic resource of each receiving stream; (b) determine whether there is a significant biological impact to the receiving stream; and (c) support BOW's NPDES permit reissuance activities.

Selection criteria for determining FRSS candidates are based on a number of factors including requests from BOW field staff to document CWA 303(d) listings, water quality standards issues, NPDES permit expiration dates, and identification of effluent toxicity. Surveys are also frequently linked with IBS (e.g., conducted in the same time frame and watershed). Depending on staff resources, 10 to 30 surveys may be conducted annually, usually during July through September.

Ambient Lake Monitoring Program

1. Relationship to Monitoring Objectives. The Ambient Lake Monitoring Program (ALMP) partially supports objectives 1a, 1b, 1c, 2, 3 and 4. Efforts are planned during 2007-2012 to improve objectives 1a, 1b, 1c (site scale); and 2 (Table 1).

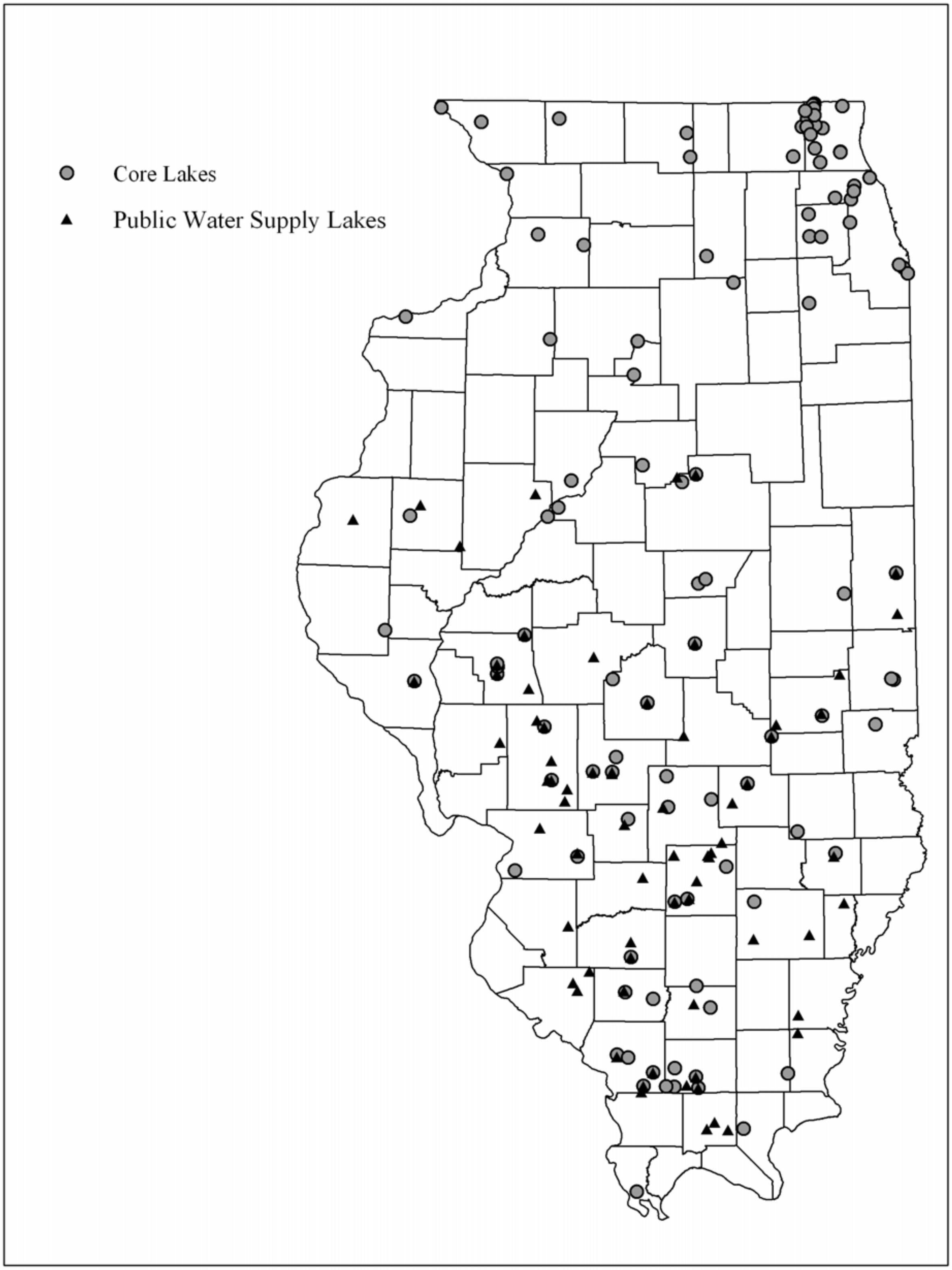
2. Program Summary. Illinois EPA conducts the ALMP at approximately 50 inland lakes annually to diagnose lake problems, encourage development of management plans, and to evaluate the effectiveness of programs implemented. ALMP monitoring involves the collection of physical data (e.g., temperature/dissolved oxygen profiles, water clarity, and watercolor), water and sediment chemical data, and field observations, including weather conditions and the presence of algae and macrophytes.

Inland lakes monitored as part of the ALMP are monitored five times: 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 stations. Station 1 is the deep lake station. A near-surface and a near-bottom water sample are collected at this station. Station 2 is generally at mid-lake and Station 3 is typically located in the headwater area of the lake. Near-surface-only water samples are collected at Stations 2 and 3. Water quality parameters analyzed include suspended solids, nutrients, and chlorophyll. A sediment grab sample is collected at Stations 1 and 3 once during the sampling season and analyzed for organic and inorganic constituents. Lakes that serve as source water for public water supplies are also sampled for organic and inorganic compounds as part of the Source Water Protection Program. A more detailed description of the Illinois ALMP is provided in a recently developed *Lake Notes* brochure (Appendix D).

To enhance Illinois EPA's ability to assess lake trends, a total of 78 inland lakes have been chosen to be included in a trends-monitoring program that began in 1991. These 78 lakes, collectively known as the Ambient Core Lakes (Figure 3), are sampled on a three-year rotating schedule. Other ALMP lakes are monitored less frequently, usually once every five years.

Because of the number of lakes monitored by Illinois EPA, it is often necessary to sample multiple lakes either in a single day or on consecutive days. Illinois EPA recognizes the fact that this operating procedure may inadvertently lead to the spread of Aquatic Invasive Species (AIS) if appropriate precautions are not taken. Beginning in 2005, Illinois EPA has worked, and will continue to work, with Illinois-Indiana Sea Grant to develop a Hazard Analysis and Critical Control Point plan. This plan has proven useful in that Illinois EPA has identified steps that can be taken to help prevent the spread of AIS. The plan is reevaluated every year prior to the monitoring season so that adjustments can be made before monitoring actually starts.

Figure 3. Core and Public Water Supply Lakes of the Ambient Lake Monitoring Program.



Illinois Clean Lakes Program

1. Relationship to Monitoring Objectives. The Illinois Clean Lakes Program (ICLP) sufficiently supports objective 1b. Efforts are planned during 2007-2012 to improve objectives 1a, 1c, 2, and 4 (Table 1).

2. Program Summary. The ICLP is a financial assistance grant program that fosters lake owners' interest and commitment to long-term, comprehensive lake management. Generally, three to five lakes are sampled each year as part of the ICLP. Grant availability in any given year depends on the level of ICLP funding appropriated by the state legislature.

The monitoring design follows the ALMP. However, sampling frequency is enhanced for the ICLP. For ICLP Phase I and II projects, lake monitoring is generally conducted twice a month from April to October and monthly from November to March for a one-year period. Water quality samples are collected from one foot below the surface, intake depth (for lakes with a PWS intake), and two feet above the bottom at the deepest station. Surface samples (one foot below the surface) are also collected at two other lake stations. In addition, Phase I monitoring includes flow and chemical data collected at major inflows and outflows for development of nutrient, sediment, and hydrologic budgets. Additional Phase I monitoring and mapping activities include: major biological resources (i.e., phytoplankton, fish populations, aquatic vegetation, and periodically, zooplankton and benthos), bathymetric (water depth) maps, sedimentation surveys, fish contaminant monitoring conducted pursuant to the Fish Contaminant Monitoring Program (FCMP), and surficial or core sediment sampling and analyses.

Detailed diagnostic/feasibility studies (Phase I) scientifically document the causes, sources, and magnitude of lake impairment. Data generated from these monitoring studies are used to recommend lake protection/restoration practices for future implementation. Final monitoring conducted at the conclusion of the Phase II project is intended to assess the effectiveness of the BMPs implemented during the project.

Volunteer Lake Monitoring Program

1. Relationship to Monitoring Objectives. The Volunteer Lake Monitoring Program (VLMP) partially supports objectives 1a, 1b, 1c, 3, and 4. Efforts are planned during 2007-2012 to improve objectives 1a, 1b, 1c, and 3 (Table 1).

2. Program Summary. The VLMP serves as an educational program that teaches Illinois citizens about lake ecosystems, contributing to an understanding of lake/watershed relationships and promoting informed decision-making. It also provides a cost-effective method of gathering fundamental information about inland lakes.

About 175 lakes statewide participate annually in the VLMP. Water quality monitoring locations for this program are determined in the same manner as the ALMP. Each VLMP lake generally has three stations: Station 1 is the deep station; Station 2 is at mid-lake and generally mid-depth; and Station 3 is located in the headwater area or opposite of

Station 2. Volunteers are requested to monitor each station twice a month from May through October. Volunteers collect Secchi transparency, total depth, and various field observations at each station. Additionally, volunteers collect water quality samples on a monthly basis at 100 lakes. These samples are analyzed for nutrients, suspended solids, and chlorophyll. In addition to monitoring, volunteers are given a zebra mussel sampler and trained to identify zebra mussels.

The basic VLMP includes training volunteers to measure water clarity (transparency) by using a Secchi disk. These measurements are used to document changes in the transparency of lake water within a given year, and to develop transparency trends over many years. Monitoring is conducted twice a month from May to October, typically at three stations per lake. The basic program also includes monitoring for zebra mussels. The main purpose of this effort is to determine whether or not zebra mussels are being transported from the state's major rivers to inland lakes.

The expanded VLMP includes volunteer collection of water samples from one foot below the surface of the water, in addition to the collection of Secchi transparency and zebra mussel information. Samples are shipped to Illinois EPA or private laboratories for analysis of basic water quality parameters including: ammonia, nitrates, total phosphorus, as well as total and volatile suspended solids. Chlorophyll sampling and analysis are also performed. Water samples are collected at twice the Secchi depth, filtered, and sent to the laboratory for analysis. Chlorophyll data, Secchi transparency information, and water quality measurements are used for assessing a lake's condition or trophic status.

Illinois EPA is examining the role volunteer-collected data plays in environmental decision-making. To accommodate the varying needs of volunteers and Illinois EPA, a three-tiered approach for the collection and use of volunteer data was developed. Each tier requires a different level of effort, experience, and time commitment. As the tiers become more complex, more detailed sampling and data returns are expected. As a result, the volunteer is asked to commit to a more rigorous sampling effort for a greater return of information and investment in exchange. Tier 1 volunteers collect Secchi disk transparency at all established stations on their lake. For Tier 2, in addition to Secchi disk transparency at all stations, volunteers collect water quality samples at Station 1, the lake's representative station. Tier 3 volunteers collect both Secchi disk transparency and water quality samples at up to three stations on their lake. Tier 2 and 3 volunteers also collect chlorophyll samples.

Lake Michigan Monitoring Program

1. Relationship to Monitoring Objectives. The Lake Michigan Monitoring Program sufficiently supports objective 1a and partially supports objectives 1b, 1c, 2, 3, and 4 (Table 1).

2. Program Summary. Recognizing the great importance of Lake Michigan as a natural asset, the 75th Illinois General Assembly authorized Illinois EPA through 615 ILCS 5/14a to "*regularly conduct water quality and lake bed surveys to evaluate the ecology*

and quality of water in Lake Michigan." Since 1977, the Illinois/Indiana portion of Lake Michigan has been monitored under the terms of a cooperative agreement between the city of Chicago and Illinois EPA (IEPA 2001).

The current Lake Michigan Monitoring Program, as conducted by the city of Chicago's Water Quality Surveillance Section, consists of 80 stations on five separate surveys:

a. 14 Open Water stations (6-18 miles offshore) (Figure 4)

b. 23 Jardine Water Purification Plant (JWPP) Radial stations (Figure 5)

c. 22 South Water Purification Plant (SWPP) Radial stations (Figure 5)

d. 10 North Shore stations (1-4 miles offshore) (Figure 6)

e. 11 South Shore stations (<1-6 miles offshore) (Figure 6)

Radial surveys are designed to collect samples within a ten-mile radius of the water purification plants. An ideal monitoring season would consist of 22 surveys: four open water surveys, six radial surveys, and twelve shore surveys. Water quality parameters routinely collected by the city include water temperature, nutrients, solids, chloride, sulfate, bacteria, and plankton.

Shore surveys are conducted more often than radial and open water surveys. Generally six north shore and six south shore surveys are run each year. As a result, Illinois EPA attempts to accompany the city of Chicago on these shore surveys in order to collect additional information not routinely collected by the city including: metals, cyanide, pesticides, phenols, chlorophyll, and field measurements of pH, dissolved oxygen, conductivity, and turbidity.

The Lake Michigan Monitoring Program is utilized by Illinois EPA to provide ongoing water quality information to define trends in chemical and biological conditions of the state's portion of Lake Michigan, to identify new or existing water quality problems, and to review existing water quality standards. Because of the size of Lake Michigan and the availability of the city of Chicago's tugboat, as well as weather related problems, significant Illinois EPA staff resources are required to conduct these annual surveys.

It is the intention of Illinois EPA to expand the activities of the Lake Michigan Monitoring Program by building/expanding relationships with the city of Chicago as well as other agencies and organizations. One such group that Illinois EPA is planning on actively participating in during the next cycle is the Lake Michigan Monitoring Coordination Council (LMMCC).

Figure 4. Lake Michigan Open Water Survey Sampling Stations.

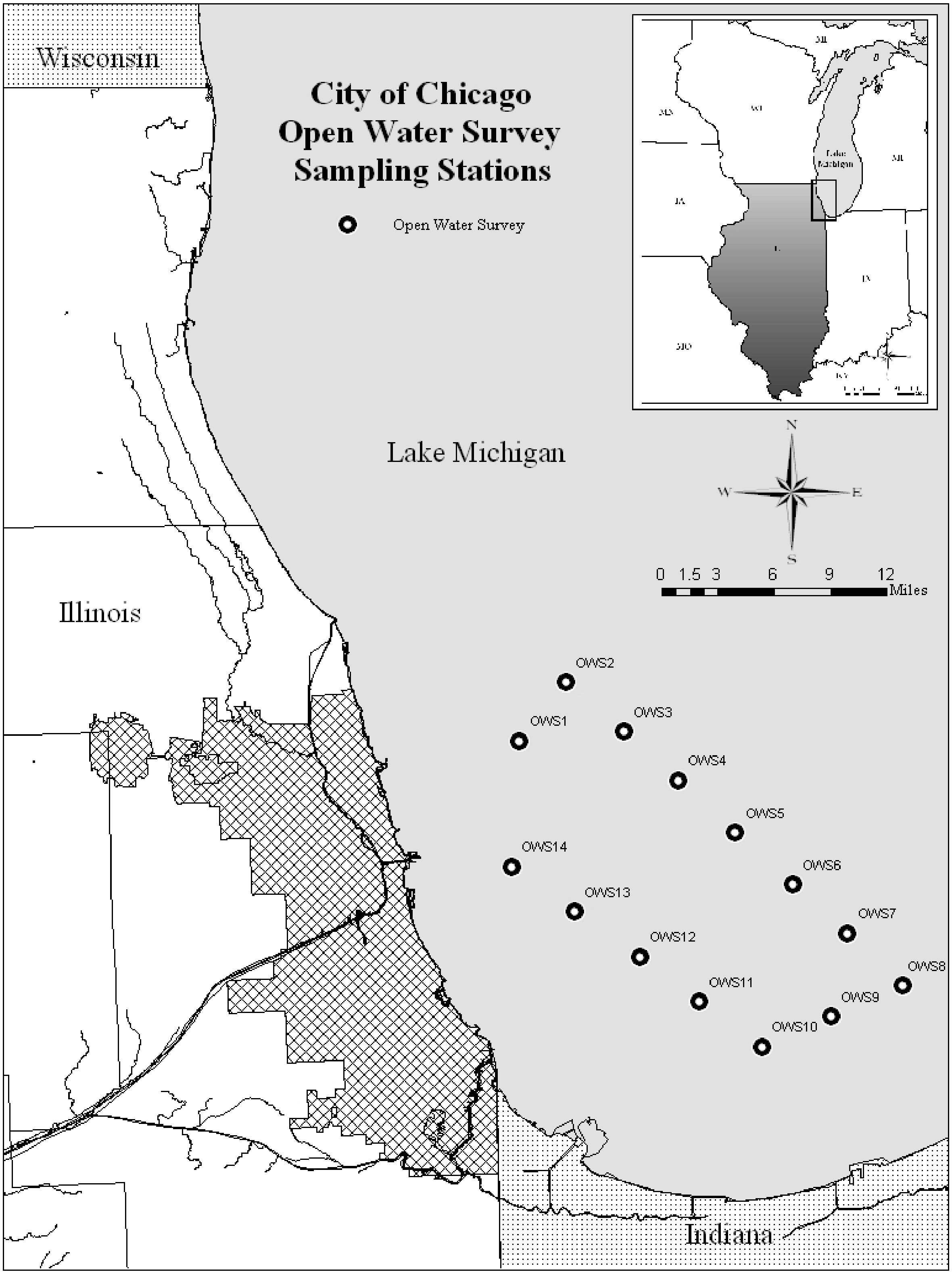


Figure 5. Lake Michigan Radial Survey Sampling Stations.

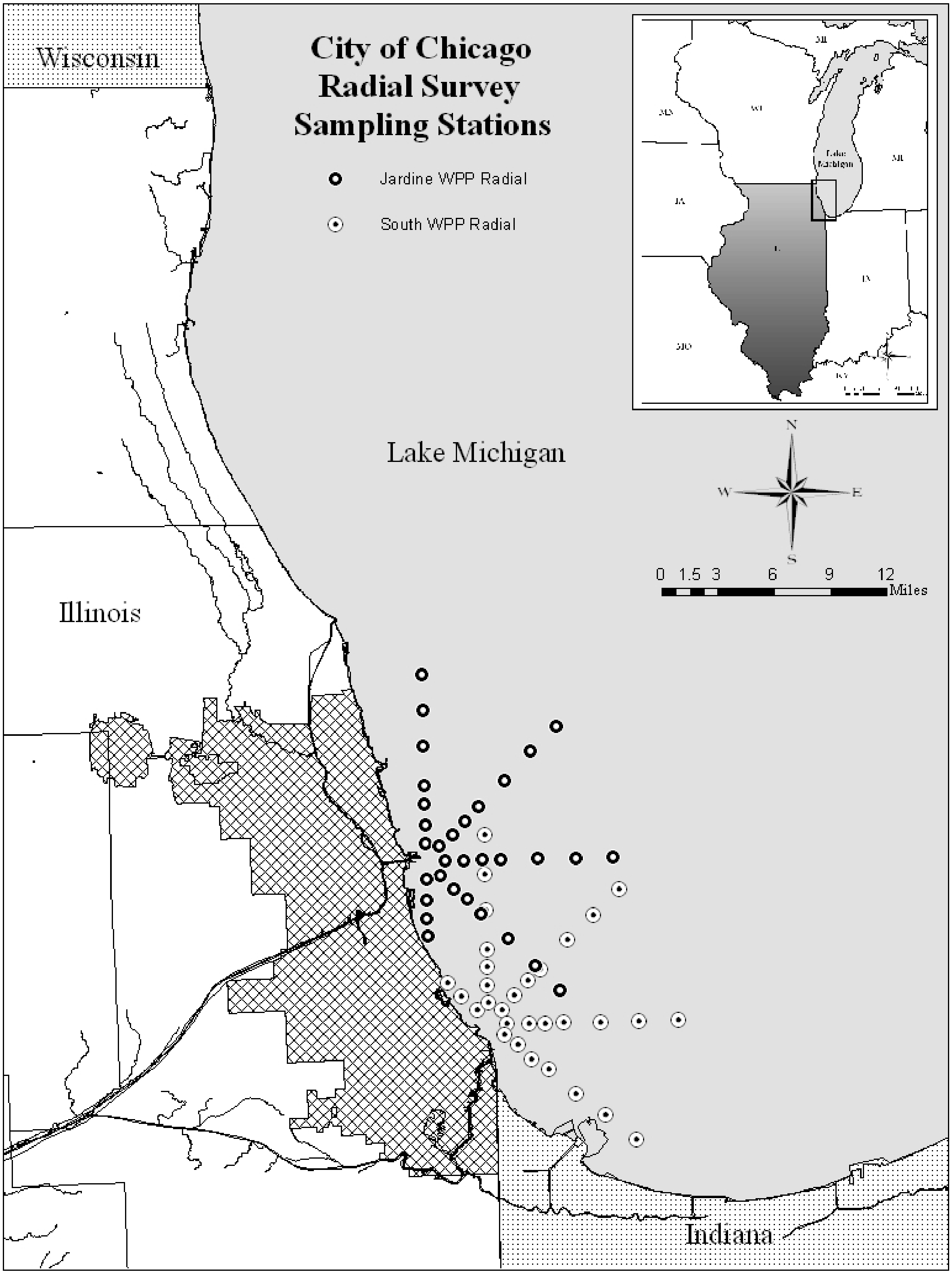
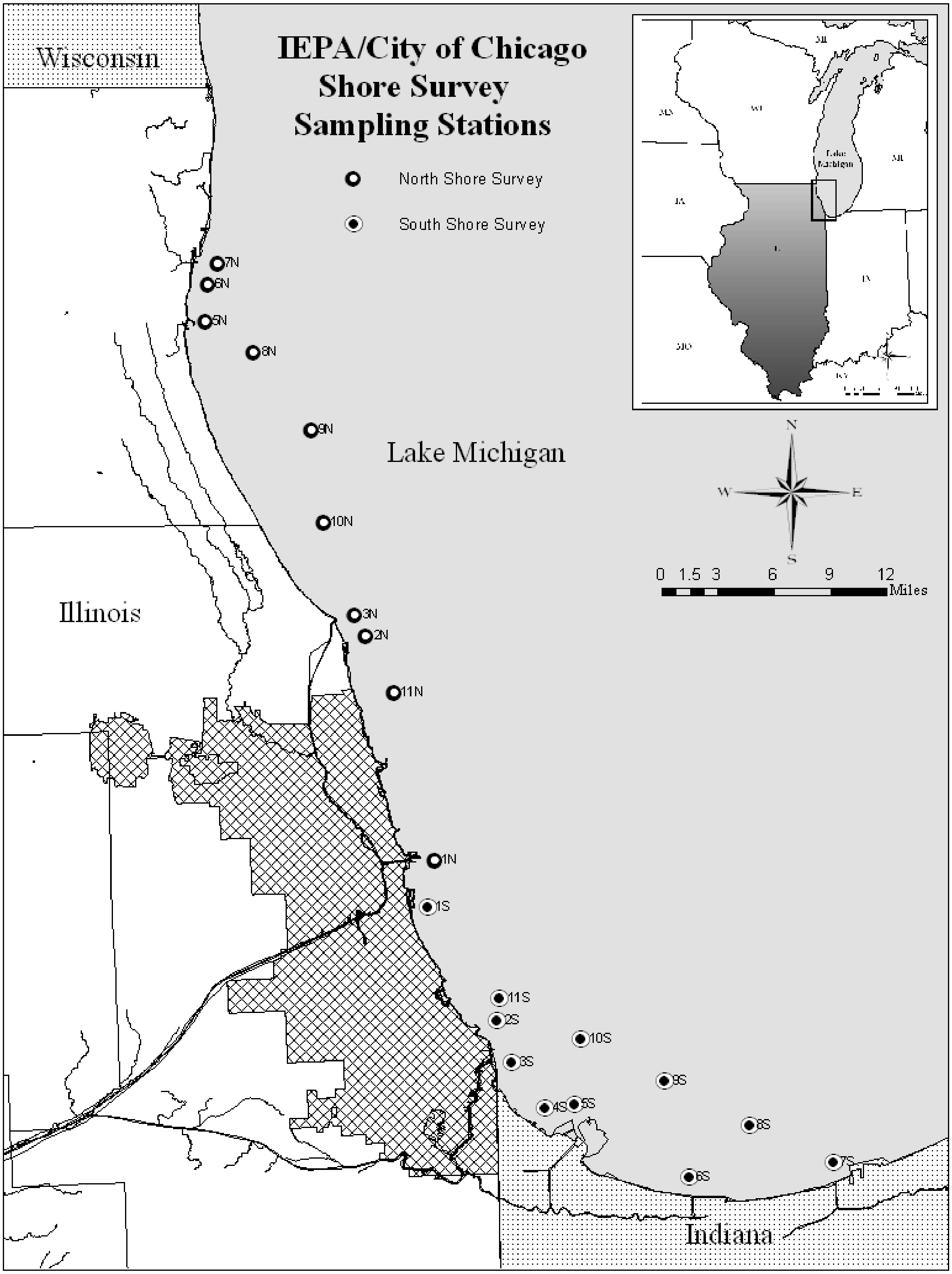


Figure 6. Lake Michigan North and South Shore Monitoring Stations.



The LMMCC reflects and responds to similar initiatives underway at state and federal levels. In 1992 the Intergovernmental Task Force on Monitoring Water Quality (ITFM) was formed to review water quality monitoring activities in the United States. The ITFM's final report recommended a strategy for improving nationwide water quality monitoring efforts. Specifically, the strategy highlighted the need for comparable and scientifically defensible information, interpretations, and evaluations of water quality conditions to support decision making at local, state, tribal, interstate, and national levels. The 1998 CWA Plan echoed these recommendations and called for the development of comparable data standards, resource classifications, inventory methods, and protocols.

As a result, the LMMCC was begun in 1999 to respond to the need for enhanced coordination, communication, and data management among the many agencies and organizations that conduct or benefit from monitoring efforts in the Lake Michigan basin. The LMMCC works toward developing a systematic and comparable approach to the collection, data management, interpretation, and dissemination of environmental data related to issues, policies, and resource management involving environmental monitoring in the Lake Michigan drainage basin. The LMMCC addresses the full range of aquatic resources, including groundwater and surface water, biology, chemistry, and physical components.

The LMMCC was selected in March of 2007 to participant in a pilot project as part of the National Water Quality Monitoring Network for U.S. Coastal Waters and Their Tributaries (NMN). A Lake Michigan NMN pilot will enable partners in the basin to better address these stressors and the management issues associated with them. Moreover, the explicit linkage between upland, coastal, and offshore waters necessitates a more coordinated monitoring network. The Lake Michigan NMN pilot will be a strong and well-timed catalyst for assessing, observing, monitoring, and reporting needs for rapidly emerging ecological problems. The pilot will also be an excellent surrogate for most coastal marine environments, since it focuses on integrating observations of complex physical, chemical, and biological processes with implementation of enhanced monitoring strategies. Finally, assessing the efficacy of a Lake Michigan monitoring strategy will generate knowledge that could be applied to the other lakes to restore and protect the entire Great Lakes ecosystem.

The pilot study will examine current Lake Michigan monitoring and gaps in relation to the proposed NMN design specifications. During the project, Lake Michigan monitoring stakeholders will test and refine the NMN design for nine resource components. The project may serve as a catalyst for enhanced monitoring coordination throughout the Great Lakes basin. Work on the pilot study is scheduled to be completed by January 2008. The next demonstration phase is anticipated to begin shortly thereafter, and most likely will involve improvements to existing monitoring sites, and installation of new sites, sensors, and data systems needed to fill critical data gaps in selected regions.

For more information, see http://acwi.gov/monitoring/network or http://wi.water.usgs.gov/lmmcc

Watershed-Based Monitoring (e.g., Nonpoint Source/BMP, TMDL)

1. Relationship to Monitoring Objectives. Watershed-based monitoring partially supports objectives 1a, 1b, 1c, 3, and 4. Efforts are planned during 2007-2012 to improve objectives 1a, 1b, 1c, 3, and 4.

2. Program Summary. When monitoring data from various surface water programs are available and relevant to specific CWA Section 319 projects, Illinois EPA uses these data to "*evaluate ... to the extent that appropriate information is available, reductions in nonpoint source pollutant loading and improvements in water quality ... resulting from implementation of the management program,*" in accordance with CWA Section 319(h)(11). When monitoring data from various Agency surface water programs or contractual efforts are available and relevant to specific watershed or TMDL plans, Illinois EPA intends to use these data to help develop the plan, track its success, and adapt it accordingly.

National Pollutant Discharge Elimination System Permittee Self-Monitoring

1. Relationship to Monitoring Objectives. Self-monitoring required of NPDES permittees sufficiently supports objectives 3 and 4, and partially supports objectives 1b and 2 (Table 1).

2. Program Summary. All permittees whose permits contain numerical effluent limits are required to perform effluent self-monitoring for the parameters regulated by their permit. Facilities designated as "major dischargers" are also required to perform whole effluent toxicity testing prior to renewal of their permits. The monitoring may be completed by Illinois EPA staff or by using a contract laboratory. Monitoring results are regularly reviewed by staff in the BOW Compliance Assurance and Field Operations Sections, and when results indicate permit limits are being exceeded, compliance or enforcement action may be initiated. The monitoring results are also considered when reviewing permit applications, developing water quality standards, and making use impairment decisions.

Municipal and Industrial Effluent Monitoring

1. Relationship to Monitoring Objectives. Monitoring of municipal and industrial effluents sufficiently supports objectives 3 and 4, and partially supports objectives 1b and 2 (Table 1).

2. Program Summary. Monitoring of municipal and industrial wastewater treatment facilities in Illinois is the responsibility of BOW's Division of Water Pollution Control Field Operations Section. Illinois EPA BOW's wastewater monitoring programs are conducted from seven regional offices located throughout the state: Des Plaines, Rockford, Peoria, Champaign, Springfield, Collinsville, and Marion.

Illinois EPA BOW's municipal and industrial effluent monitoring provides inspections and monitoring of NPDES discharges and other wastewater sources (e.g., livestock and stormwater) to verify compliance with applicable permit limits and water pollution control laws and regulations.

An annual strategy for the Division of Water Pollution Control's inspection program is prepared and provided to USEPA Region 5 pursuant to the annual Performance Partnership Agreement (IEPA 2006a). Regional inspection plans prepared according to the strategy include a description of the facilities to be monitored and the frequency of sampling. Procedures for routine wastewater effluent monitoring are provided in a *Facility Inspection Manual for Reconnaissance Technicians* (IEPA 1992) that is being incorporated into the BOW Quality Management Plan (QMP). A *Field Procedures Manual* has also been developed to provide program and training guidance to Field Operations Section staff (IEPA 2000).

Fish Contaminant Monitoring Program

1. Relationship to Monitoring Objectives. The Fish Contaminant Monitoring Program (FCMP) sufficiently supports objectives 1a, 1b, and 1c (site scale), and partially supports objectives 1a, 1b, 1c (statewide scale); 3; and 4 (Table 1).

2. Program Summary. Illinois EPA participates in the FCMP in accordance with a memorandum of agreement with IDNR, IDPH, and Illinois Department of Agriculture. Fish samples are analyzed for approximately 28 parameters. During the 2005 Water Year, 450 fish samples were collected from 100 Illinois inland lakes and streams. Six fish samples were also collected from the Illinois waters of Lake Michigan. A comprehensive description of the FCMP is provided in Appendix E.

The statewide monitoring network consists of the following components:

a. Intensive Basin Survey Samples. A minimum of one complete sample (i.e., two bottom feeders, one omnivore, and one predator species) is collected from each basin scheduled for an intensive survey each year. Additional samples shall be collected at the discretion of the field sampling team where it is known or anticipated that the public regularly fishes in the water body (e.g., presence of a boat launch, evidence of fishing activity such as discarded bait containers, etc.). Such samples focus on the species and sizes of fish known or anticipated to be sought by anglers. The FCMP may also request the IBS field sampling team obtain samples from specific water bodies within basins scheduled for an intensive survey, or in response to requests from the public or local officials.

b. Follow-up Samples. Specific numbers and sizes of one or more species (often two sizes of bottom feeders, omnivores, and predators, plus one pan fish and any other species regularly targeted by anglers) may be requested by the FCMP to follow up on bodies of water where previous samples have indicated one or more species exhibit contaminants above a level of concern—either risk-based or U.S. Food and Drug Administration criteria. Such samples are also requested by the FCMP on a regular basis to evaluate the continued need for an existing advisory on a species or modifications of the existing advisory.

c. Lower Priority Samples. Bodies of water from which no species have been found with contaminants above a level of concern—either risk-based or U.S. FDA criteria—are assigned a lower priority for sampling frequency. Such bodies shall be resampled on a recurring basis (e.g., every five to ten years), as permitted by budgetary and laboratory capacity constraints.

d. Lake Michigan Samples. Samples of Chinook and/or Coho salmon, lake, rainbow, and brown trout, yellow perch, rainbow smelt, bloater chubs, and alewives are collected annually from the open waters of Lake Michigan according to specific size ranges for salmon and trout and as available for other species. In addition, selected harbors and tributaries are sampled for representative predators, omnivores, and bottom feeders, as needed.

e. Special Samples. As necessitated by special circumstances (e.g., investigations of spills, fish kills, and toxic chemical cleanup stations) the FCMP may request specific numbers and sizes of selected fish or other aquatic species be collected by field sampling teams or other personnel. Such samples may be designated as high priority for analysis by Illinois EPA or another designated laboratory. Costs for collection and analysis of such samples shall be paid, to the extent possible, by the party or parties responsible for the special circumstance.

Groundwater Monitoring Program

1. Relationship to Monitoring Objectives. The Groundwater Monitoring Program sufficiently supports objectives 1a and 1b, and partially supports objectives 1c, 2, 3, and 4. Efforts are planned during 2007-2012 to improve objectives 1c, 2, and 4 (Table 1).

2. Program Summary. The collection of high quality chemical data is essential in assessing groundwater programs. In response to this belief, Illinois EPA and the USGS Illinois District Office, located in Urbana, began a cooperative effort to implement a pilot groundwater monitoring network (i.e., ambient monitoring network) in 1984. CWS ambient network design started with pilot efforts in 1984, moved to implementation of the ISWS network design for several years, and was followed by sampling all of Illinois' CWS wells (3,000+) until 1995.

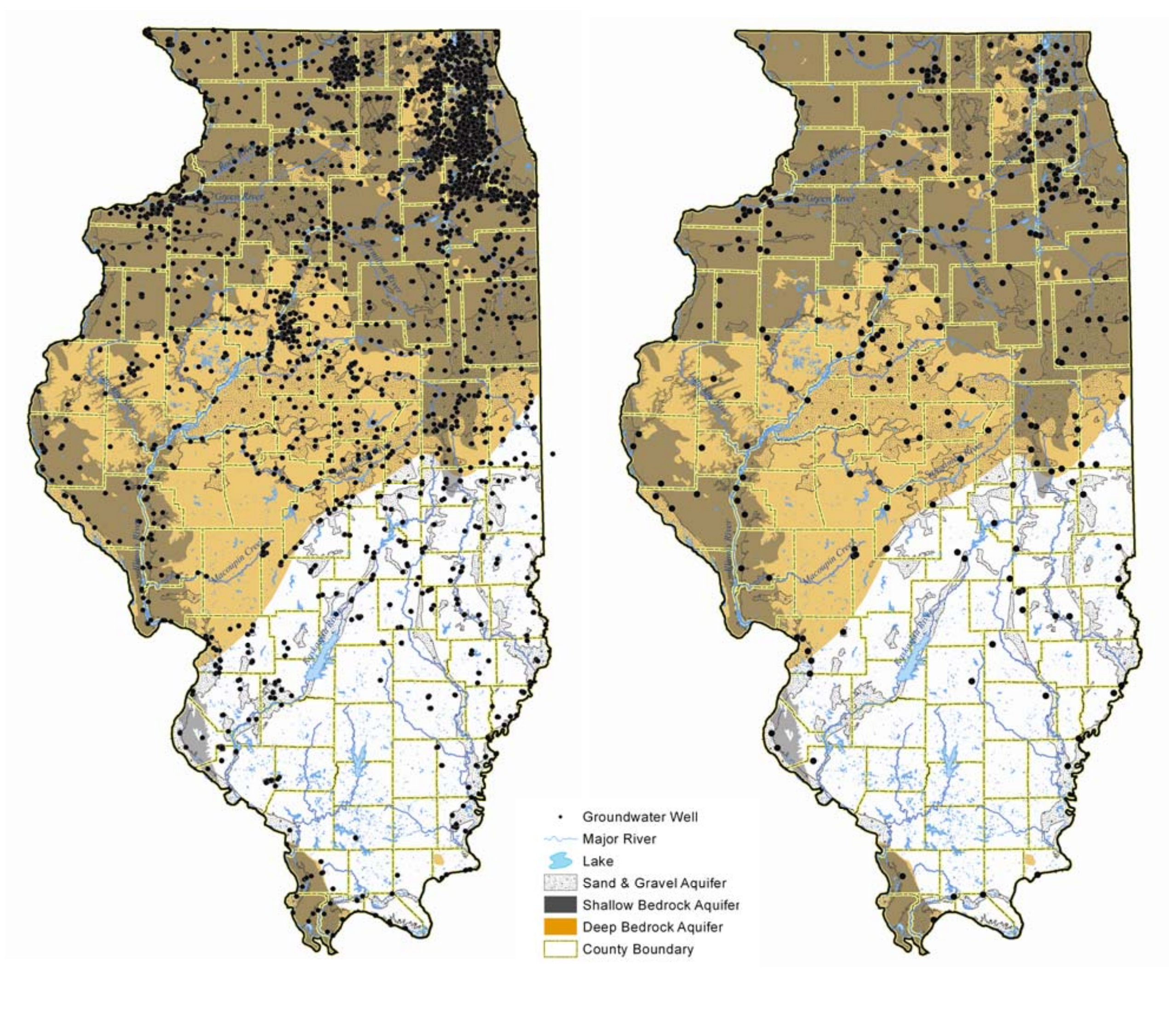
From the experience gained from this prototype network, Illinois EPA designed a probabilistic monitoring network of CWS wells. The design of this network was completed in coordination with the USGS, the Illinois State Geological Survey (ISGS), and the ISWS, with USGS performing the detailed design. These network wells were selected using a random stratified probability-based approach (95 percent statistical confidence in the data with an associated plus or minus five percent precision and accuracy level) with a goal of representing contamination levels in the population of all active CWS wells. Further, the random selection of the CWS wells was stratified by depth, aquifer type, and the presence of aquifer material within 50 feet of land surface. Illinois EPA used geological well log and construction log detail to perform this process.

The random stratified selection process included nearly 3,000 CWS wells resulting in 356 fixed monitoring locations in Figure 7. This probabilistic network is designed to (a) provide an overview of the groundwater conditions in the CWS wells; (b) provide an overview of the groundwater conditions in the principle aquifers (e.g., sand and gravel, Silurian, Cambrian-Ordovician, etc.); (c) establish baselines of water quality within the principle aquifers; (d) identify trends in groundwater quality in the principle aquifers; and (e) evaluate the long-term effectiveness of the Illinois Groundwater Protection Act, Clean Water Act, and Safe Drinking Water Act (SDWA) program activities in protecting groundwater in Illinois.

Additionally, in order to prevent spatial or temporal bias, 17 random groups of 21 wells, with alternates, were selected from all 356 fixed station wells. To further assure maximum temporal randomization within practical constraints, the samples from each sample period are collected over a three-week period.

Figure 7. Active Community Water Supply Wells and Community Water Supply Network Wells.

All CWS Wells in Illinois | **CWS Network Wells in Illinois**



Illinois EPA utilizes routine monitoring data to determine if deterioration (or improvement) in water quality has occurred over time. In principle, this information will accurately represent hydrogeologic conditions at a station and enable an understanding of the dynamics of subsurface aquifer systems. Illinois EPA has determined that the practical elements of a viable long-term groundwater monitoring program should include (a) evaluation of hydrogeologic setting and program information needs, (b) evaluation of well performance and purging strategies, and (c) execution of effective sampling protocols that include the appropriate selection of sampling mechanisms and materials, as well as sample collection, preservation, and handling procedures.

Groundwater in Illinois is routinely monitored for biological and chemical contaminants and, to some degree, withdrawal rates. Since 1997, Illinois EPA has operated an ambient network of CWS wells via a rotating approach. The random stratified probabilistic network consisting of 356 fixed stations is sampled every other year to allow the flexibility to conduct special/intensive monitoring during the second year cycle.

An average of 350 wells has been maintained since the inception of the probabilistic monitoring network in 1996. When a well in this network is taken out of service, or otherwise not readily able to be sampled, Illinois EPA designates an alternative well with generally the same location, depth, and aquifer properties. By doing this, Illinois EPA has historical datasets for over 455 CWS wells that are currently or have been previously sampled in the probabilistic network.

Network stations have been sampled within a fixed three-week time frame biennially since 1996. Monitoring at all stations is completed using Hydrolab® samplers to insure natural/optimum groundwater conditions. Water quality parameters include field temperature, field specific conductance, field pH, field pumping rate, inorganic chemical (IOC) analysis, synthetic organic compound (SOC) analysis, and volatile organic compounds (VOC) analysis. All laboratory analytical procedures are documented in Quality Assurance Program Plans developed by Illinois EPA Division of Laboratories, and in the Illinois Pollution Control Board's Groundwater Quality Standards (35 Ill. Adm. Code 620). Data specific to groundwater monitoring are verified and stored via a multi-step process that includes a transition from the Illinois EPA Laboratory Information Management System (LIMS) database to reside within the Safe Drinking Water Information System (SDWIS) database.

Since 1993, Illinois EPA has operated a pesticide monitoring subnetwork of the ambient CWS network. Initially, Illinois EPA tested all wells in the CWS Network for triazine and alachlor using the immunoassay-screening method. Positive results were resampled and analyzed using gas chromatography and mass spectrometry (GC/MS). However, in the 1998 monitoring cycle, Illinois EPA discontinued the use of immunoassay and randomly selected 50 percent of the network wells to be analyzed for SOC's using Quality Assurance Project Plans. During the 2000 monitoring cycle, the remaining wells in the network were analyzed for SOCs. The rotation has been carried forth to the current day network, and will be maintained in the future pending available resources.

During the 1997 monitoring cycle, Illinois EPA initiated a rotating monitoring network/special intensive monitoring program. The purpose of this monitoring network is to maximize resources and increase monitoring coverage of groundwater quality at CWS wells. It was determined that the primary purposes of the probabilistic network referred to above, could be realized by reducing the monitoring frequency to a biennial basis. As a result, Illinois EPA is currently able to concentrate on specialized monitoring programs at high priority areas during alternative years. The rotation between the probabilistic network and the rotating monitoring network/special intensive monitoring program has been carried forth to the current day, and will be maintained in the future, pending available resources.

Components of the rotating monitoring network/special intensive monitoring program include:

a. Highly Susceptible Community Water Supply Monitoring Network. In 1997, monitoring was focused on concerns related to highly susceptible CWS wells. These wells were prioritized as a result of the detection of organic contaminants in the treated water samples obtained during routine monitoring required by the SDWA. The strategy in these instances is to have Illinois EPA sample the untreated water from the CWS wells to identify whether the source water is contaminated or if the contamination occurred after removal of the water from the aquifer (e.g., from recent work at the facility, errant contamination by sampler or laboratory, etc.). This also provides information regarding the quality of the water for each well in the event that the facility may need to alter its pumping strategy. Other wells relegated to the "problem well" network include those in the vicinity of an incident (e.g., spills) or other unusual events where possible contamination of the source water is of concern. These wells may have no history of contamination and may be periodically sampled to record the data regarding the normal condition of water in case of future contamination and to assure the community that the groundwater quality has not been compromised.

b. New Community Water Supply Well Monitoring Network. During the 1999 monitoring cycle, attention focused on "new" CWS wells with little or no monitoring history. New wells are CWS wells from which Illinois EPA staff has not previously taken raw (untreated) water samples. Organic and inorganic samples were collected from these wells. Sampling new wells provides Illinois EPA with information regarding the characteristics of the water in the aquifers around the state and provides background data for those wells in case the integrity of the water in the aquifer is compromised in the future.

c. Radon Sampling. During the 2001 monitoring cycle Illinois EPA, with assistance of the Illinois Department of Nuclear Safety (now the Illinois Emergency Management Agency's Division of Nuclear Safety) conducted a radon-monitoring program. The purpose of this monitoring network was to determine the statewide occurrence of radon in CWS wells. To accomplish this task Illinois EPA utilized the CWS network as a statistical base for the program. The CWS network consists of 17 three-week sample periods. Within these sample periods, the Illinois EPA randomly selected ten sampling stations from which seven primary stations were selected. The remaining three stations were held as alternative stations that could be sampled if one of the primary stations could not be sampled.

d. Herbicide Transformation Products. The USGS, in cooperation with Illinois EPA, conducted from October 2001 to September 2002 a study of herbicides and their transformation products (also referred to as degradates or metabolites) in Illinois' source water aquifers. Water samples were collected from 117 public-supply wells distributed statewide. The wells were selected using a stratified random method to ensure representation of the various unconsolidated (glacial, alluvial) and bedrock (carbonate, sandstone) aquifers of the state, as well as various aquifer depths, well depths, and near-well (within two miles) land uses. Samples were analyzed for 18 herbicides and 18 transformation products, including three triazine and 14 chloroacetanilide products (Mills and McMillan 2004).

e. Nitrate/Nitrite. In 2003, there was again a concentration on the wells that had organic contaminants in treated water samples. In addition, a subset of wells was selected from the CWS network for more intensive analysis based on the total nitrogen. Wells that had levels that exceeded 1.0 mg/L (milligram per liter) had additional analysis performed to determine nitrate and nitrite concentrations. This selection threshold was selected based upon the maximum contaminant level (MCL) for nitrite, which is 1.0 mg/L. This subset initially included 57 wells, 42 of which had nitrate and nitrite analysis performed. The total nitrogen ranged from 0.63 mg/L to 12.20 mg/L, of which three of the samples exceeded the groundwater standard of 10.0 mg/L. However, analysis showed that the total nitrogen consisted entirely of nitrate. Nitrite levels in all 42 wells were below the detection limit of 0.1 mg/L.

Overview of Major Monitoring Gaps and Weaknesses and Improvement Efforts Planned for 2007 through 2012

Limited integration exists among Illinois EPA BOW monitoring programs and efforts (i.e., each column in Table 1). Moreover, the different monitoring programs or efforts focus on different temporal and spatial scales. These properties make it difficult to determine the degree to which each of the primary monitoring objectives (i.e., each row in Table 1) is being supported holistically rather than on a program-specific basis. As Table 1 implies, the ultimate goal is to advance every monitoring program or effort to "sufficiently supported" status (black circle) for every relevant monitoring objective. Short of this ideal achievement, determining if Illinois EPA BOW monitoring holistically meets each primary monitoring objective depends on selecting a threshold (i.e., how many programs or efforts?) at which each objective is judged "sufficiently supported"—an exercise that Illinois EPA believes is of limited utility and provides limited insight. Current practical limits on time, expertise, and supporting funds prevent achievement of this ideal. Currently, to meet our varied monitoring needs, Illinois EPA BOW believes that the best strategy for improvement is to first address programs and efforts individually. As program-specific advances are realized, Illinois EPA will try to capitalize as much as possible on incorporating improvements that can benefit multiple programs simultaneously. In the meantime, Illinois EPA BOW will review and coordinate current monitoring programs and efforts to maximize their BOW-wide benefits as far as reasonably possible.

Illinois EPA BOW currently does not monitor all surface-water types. Coordination of an Illinois wetlands group, collecting data from headwater streams, and assisting in the development and application of biological assessment and monitoring in large rivers, represents steps towards achieving the ultimate goal of resource management for all surface-water types in Illinois.

To support each of the primary monitoring objectives (Table 1), Illinois EPA BOW relies heavily on various environmental indicators. Some of these indicators are much less developed than others. For example, Illinois EPA BOW indicators of biological condition in lakes are less developed than those used for streams; whereas, indicators of nutrient-related impacts in streams are less developed than those for lakes. Lacking for both streams and lakes are indicators based on periphyton or phytoplankton. Illinois EPA BOW plans various monitoring efforts in 2007 through 2012 to help improve our environmental indicators and thereby advance our primary monitoring objectives. Because a comprehensive dataset is the foundation of a reliable environmental indicator, Illinois EPA BOW plans to begin some basic monitoring of periphyton, phytoplankton, and algal toxins to advance the development of these relatively new and undeveloped indicators. Additional planned efforts to monitor the effects of nutrient removal in select wastewater treatment discharges and to expand continuous monitoring of dissolved oxygen, pH, conductivity, and water temperature in streams will contribute to better understanding of nutrient-related impacts and to developing meaningful water quality standards for nutrients.

Table 3. Illinois EPA Bureau of Water planned monitoring efforts for 2007 through 2012 [(1)]. The monitoring objectives expected to be advanced by each effort are indicated by number.

Primary monitoring objectives:

1a. Determine attainment of designated uses and identify impaired waters.

1b. Identify causes and sources of impairments to water quality.

1c. Identify trends in water quality and maintain the flexibility to address emerging threats to water quality.

2. Establish, review, and revise water quality standards, including use designations and use attainability.

3. Support implementing water management programs.

4. Support evaluating the effectiveness of water management programs.

Surface Water Monitoring Efforts	Monitoring Program(s)	Relevant Monitoring Objectives	Start Date
1. Coordinate an Illinois Wetland Technical Work Group.		1a, 1b, 1c, 2, 3	2005
2. Refine monitoring for conditions at PWS intakes in streams.	AWQMN, IBS, FRSS	1a, 1b, 1c	2006
3. Assist in development and application of biological assessment and monitoring in large rivers.	AWQMN, IBS, FRSS	1a, 1b, 1c, 3	2005
4. Collect periphyton in streams.	IBS, FRSS	1b, 1c, 2	2007
5. Begin collecting environmental data in frequently intermittent streams.	IBS, FRSS	1a, 1b, 1c, 2, 3	2007
6. Expand continuous monitoring for dissolved oxygen, pH, conductivity, and water temperature in streams.	IBS, FRSS	1a, 1b, 1c, 2	2004
7. Monitor effects of nutrient removal in selected wastewater treatment discharges.	FRSS	1a, 1b, 1c, 2, 4	2004
8. Continue to collect phytoplankton to develop a lake classification and a phytoplankton index of lake condition.	ALMP, ICLP, VLMP	1a, 1b, 1c, 2	2005
9. Use satellite imagery and collect Secchi transparency data to evaluate and track water clarity in lakes statewide.	ALMP, ICLP, VLMP	1a, 1c, 4	2006
10. Expand monitoring of algal toxins in selected lakes.	ALMP, ICLP	1a, 1b, 1c, 4	2007
11. Monitor water column mercury concentrations in lakes.	ALMP, ICLP		2007
12. Expand scope and applicability of monitoring data from the VLMP.	VLMP	1a, 1b, 1c, 3	2006
13. Monitor success of watershed-based restoration efforts in selected waters (e.g., Measure W, National Nonpoint Monitoring Program, TMDL).	Watershed-based	1b, 1c, 3, 4	2006
14. Participation and potential future activity in probability-based monitoring of major surface waters (e.g., inland lakes, wetlands, streams).	NA	1c	2004
Groundwater Monitoring Efforts			
15. Evaluate VOC trend data from 1990 to the present and compare to probabilistic results.	Groundwater	1a, 1b, 4	2005
16. Publish trend data in a nationally peer reviewed journal.	Groundwater	1b, 1c	2006
17. Evaluate causal data to determine the potential source of VOC trends.	Groundwater	1c, 4	2006
18. Continue groundwater quality standards development discussion with the Groundwater Advisory Council and stakeholders; prepare Illinois Pollution Control Board proposal.	Groundwater	2	2006
19. Continue to implement rotating network (fixed/special/intensive).	Groundwater	1b, 1c	2007

(1) All planned monitoring efforts are scheduled to be completed by 2012, assuming necessary funds and resources are available.

Planned Monitoring Efforts for 2007-2012

In 2007 through 2012, Illinois EPA BOW will initiate several monitoring efforts intended to advance the primary objectives of BOW monitoring (Table 3). These planned efforts respond to the need to address gaps and weaknesses that currently prevent Illinois EPA BOW from fully meeting the primary objectives of each program (Table 1).

1. Coordinate an Illinois Wetland Technical Working Group (WTWG). Currently, Illinois EPA neither monitors environmental conditions nor assesses attainment of uses in wetlands. With the help of other government agencies and interested stakeholders, Illinois EPA has begun and will continue to address how to include wetlands in Illinois water quality management. Inclusion of wetlands represents progress toward the ultimate goal of resource management for all surface water types in Illinois. Recently, Illinois EPA coordinated the creation of an Illinois WTWG that comprises natural resource professionals and stakeholders with diverse public and private interests. This wetland work group will address (a) how to define the beneficial uses of Illinois wetlands; (b) how to monitor wetland resources to assess if such uses are being attained; (c) how to identify causes of non-attainment; and (d) how to track wetland resource conditions through time.

These goals have been complied and are outlined in the document titled *Wetland Monitoring and Assessment Program for the State of Illinois.* As of August 2007, funding has been received/applied for to implement two main components of this document. Funding from the IDNR's State Wildlife Grant (funded through US Fish and Wildlife Service) has been awarded to Ducks Unlimited, Inc. to update the National Wetlands Inventory for the State of Illinois. Additionally, the Illinois Natural History Survey (INHS) has applied for funding (through USEPA) to develop a wetlands Index of Biotic Integrity for the state of Illinois. The funding and completion of these two components are major steps forward in development of a wetlands monitoring program in Illinois.

2. Refine monitoring for conditions at public water supply intakes in streams. Beginning in October 2006, Illinois EPA enhanced the set of analytes monitored at each of several stream stations of the AWQMN. These stations occur near PWS intakes; therefore, analytes that have numeric *public and food processing water supply use* standards (35 Ill. Adm. Code 302.304) were added. In 2007 to 2012, Illinois EPA will update location information for all PWS intakes in streams and refine the current monitoring design to improve the ability to determine ambient water quality conditions at intakes, thereby improving the accuracy and reliability of assessments of *public and food processing water supply use*. This effort will advance monitoring objectives 1a, 1b, and 1c (Table 1).

3. Assist in development and application of biological monitoring and assessment in large rivers. Illinois EPA will continue to participate in various efforts to monitor the environmental condition of large rivers, including USEPA's "Survey of the Nation's

Rivers" project and ongoing large-river sampling and biological assessment studies by the Midwest Biodiversity Institute and USEPA Region 5. Specifically, Illinois EPA will work with USEPA Region 5 and the Midwest Biodiversity Institute on recently funded biological surveys of the Illinois, Fox, and Kankakee Rivers. These efforts will advance monitoring objectives 1b, 1c and 3 (Table 1).

4. Collect periphyton in streams. Recent nutrient related research has indicated that periphyton is the predominant form of algae in most wadeable streams in Illinois. For Illinois waters, understanding the interactions among nutrients, primary producers (e.g., periphyton), biological integrity, and the various conditions (e.g., light, turbidity, flow, dissolved oxygen) that influence or result from these interactions, is essential for setting appropriate water quality standards for nutrients. To aid development of water quality standards for nutrients in Illinois streams, Illinois EPA will begin collecting periphyton at stream stations where continuous monitoring of selected physicochemical parameters is also conducted. In September 2006, Illinois EPA collected periphyton samples from depositional and erosional areas at nine stream stations where DO, pH, specific conductance, and temperature were measured continuously (i.e., 15- to 30-minute intervals) for 96 hours. These periphyton samples were analyzed for chlorophyll *a* and algal biomass. Information from periphyton sampling will aid nutrient standards development by helping to reveal meaningful nutrient concentration thresholds that relate to the quality of aquatic life in Illinois streams. This information also will be useful for identifying and mediating causes of aquatic life impairment and for revealing overall trends in environmental conditions. This effort will advance monitoring objectives 1b, 1c, and 2 (Table 1).

5. Begin collecting environmental data in frequently intermittent streams. Currently, Illinois EPA neither directly monitors environmental conditions nor directly assesses attainment of uses in frequently intermittent (1^{st}-3^{rd} order) streams. During 2007 through 2012, Illinois EPA intends to begin limited collection of biological, physical, and chemical data in intermittent streams, with an emphasis on data useful for developing indicators to assess the impacts of NPS pollutants and pollution. Inclusion of intermittent streams represents progress toward the ultimate goal of resource management for all surface water types in Illinois. This monitoring effort will assist the IBS monitoring program in meeting primary monitoring objectives 1a, 1b, 1c, 2, 3, and 4.

6. Expand continuous stream monitoring for dissolved oxygen, pH, conductivity, and water temperature. Illinois EPA is currently developing water quality standards for nutrients. To aid this development, Illinois EPA will expand its continuous monitoring of selected physicochemical parameters in Illinois streams. In summer 2007 (i.e., mid-June through mid-September), Illinois EPA will perform continuous monitoring of water temperature, DO, pH, and specific conductance at approximately 25 pre-selected stream stations statewide. Each station will be monitored at 30-minute intervals for approximately seven days. Stations will likely be located in basins scheduled for IBS sampling, and selection criteria will include the presence of impaired aquatic life attributable to low DO likely due to excessive nutrients, or the need for an enhanced level of protection against low DO, relative to typical *general use* waters. Each station will be

sampled twice—once in the period June 1 through July 31, and again in August 1 through September 15. This effort will advance monitoring objectives 1a, 1b, 1c, 2, and 3 (Table 1).

7. Monitor effects of nutrient removal in selected wastewater treatment discharges. Three monitoring studies are underway to document downstream effects of sewage treatment plant phosphorus removal to a discharge limit of 1.0 mg/L or below. Pre-implementation monitoring was initiated in summer 2004 at Fiddle Creek (Wauconda), Manhattan Creek (Manhattan), and in 2005 at Salt Creek (Metropolitan Water Reclamation District of Greater Chicago). Phosphorus removal technologies at these plants were to be implemented in 2005, but have been delayed. Plans are to monitor for approximately one year after phosphorus removal is on-line and the following paragraphs describe current progress on each project. These monitoring efforts will assist the FRSS and TMDL programs in meeting primary monitoring objectives 1a, 1b, 1c, 2, and 4.

a. Fiddle Creek (Wauconda). The Village of Wauconda has not yet instituted phosphorus removal, nor will they be ready to for another year or two. Pre-expansion phosphorus removal data have been collected in 2004 and 2005. In 2006 the village of Wauconda collected water quality samples every two weeks from May through October. The 2004 and 2005 water quality and macroinvertebrate data have been tabulated for this project. The 2006 water quality data have not been tabulated or reviewed.

b. Manhattan Creek (Manhattan). Pre-expansion phosphorus removal data were collected in 2004 and 2005. This data included water quality, macroinvertebrates, habitat, and continuous monitoring data. Sediments were also collected in 2004. In 2006 only macroinvertebrate and habitat data were collected. Water quality collections and continuous monitoring were not completed in 2006 due in part to high flow conditions and other monitoring duties. The 2004 and 2005 water quality data and macroinvertebrate data have been tabulated for this project. The continuous monitoring data are also available for both years.

c. Salt Creek (Des Plaines River drainage). In September 2005, Illinois EPA staff conducted pre-phosphorus removal macroinvertebrate monitoring at three stations where the Metropolitan Water Reclamation District of Greater Chicago has continuous monitoring meters installed (Kennedy Boulevard, Thorndale Avenue, and Wolf Road). Because of high flow conditions in September and October 2006, and other monitoring commitments, macroinvertebrate monitoring was not done in 2006. The DuPage River/Salt Creek TMDL Workgroup has contracted with Midwest Biodiversity Institute to do biological surveys (fish and macroinvertebrates) on these two watersheds. Sampling in West Branch DuPage River was completed in 2006. Sampling in East Branch DuPage River and Salt Creek is scheduled for summer 2007. The 2005 Salt Creek macroinvertebrate samples have been sorted and identified.

8. Continue to collect phytoplankton to develop a lake classification and a phytoplankton index of lake condition. In September 2003, Illinois EPA was awarded Section 104(b)(3) nutrient criteria development grant funding targeted at increasing our understanding of inland lake phytoplankton community response to nutrient enrichment. In order to begin that process, this initial project was designed to retrieve and transcribe all Illinois EPA historical phytoplankton data into an appropriate database. Phytoplankton data included in this project were from samples collected between 1986 and 2003. Data were available for a total of 104 inland lakes and reservoirs. The database was ultimately completed in late 2004. With the completion of the phytoplankton database, Illinois EPA was in a position to proceed with development of a Lake and Reservoir Phytoplankton Index of Biotic Integrity (LRP-IBI) biological assessment tool that could contribute to better resource quality conditions and nutrient impairment assessments required by Sections 305(b) and 303(d). In 2005, Illinois EPA entered into contractual arrangements with Eastern Illinois University to first develop a classification system for Illinois lakes and reservoirs based on physical and chemical variables, as well as ecoregional and relevant geomorphological features. Subsequent evaluation of relationships of phytoplankton assemblages within these derived lake classes, and development and testing of a multimetric LRP-IBI is planned in 2007 and 2008. This effort will advance monitoring objectives 1a, 1b, 1c, and 4 (Table 1).

9. Use satellite imagery and collect Secchi transparency data to evaluate and track water clarity in lakes statewide. With FFY 2006 Supplemental Section 106 monitoring program funding, Illinois EPA will work collaboratively with members of the North American Lake Management Society, University of Minnesota, University of Indiana, Illinois EPA FOS, citizen volunteers, and others on a Landsat imagery/remote sensing project, utilizing water clarity information, for a statewide assessment of lake water resource condition. A prototype water clarity assessment for Illinois (representing a baseline water clarity condition for future water clarity trends analyses) based on Landsat imagery and Secchi transparency data will be developed by the end of 2007, with project results reported and displayed in future Illinois EPA integrated reports. This effort will advance monitoring objectives 1a, 1c, and 4 (Table 1).

10. Expand monitoring of algal toxins in selected Illinois lakes. With FFY 2006 Supplemental Section 106 monitoring program funding, Illinois EPA will continue to expand 2005 and 2006 algal toxin monitoring over the next two years to study occurrence, relationship, and potential impact on *primary contact*, *aesthetic quality*, and/or *public and food processing water supply use* support attainment. Monitoring plans will be designed to collect algal and algal toxin data throughout the summers of 2007 and 2008. Summary reports of observations and findings (including probable presentation at state lakes association conferences) will subsequently be available in 2009. This effort will advance monitoring objectives 1a, 1b, 1c, and 4 (Table 1).

11. Monitor water column mercury concentrations in lakes. Illinois EPA will initiate a cooperative effort with the United States Geological Survey (USGS) to monitor water column concentrations of mercury in lakes beginning in summer 2007. Illinois EPA is participating in the USEPA National Lakes Survey (NLS) of 17 randomly selected lakes

which involves the collection of samples for analysis of many parameters, but not for the low levels of mercury that are typically observed in water column samples. Low-level mercury studies require special clean sampling techniques and expensive analysis by EPA Method 1631.

The NLS study already will be monitoring lakes for dissolved organic carbon, pH and sulfate, which are critical parameters for interpreting water column mercury data. The USGS has agreed to analyze samples collected as part of the Illinois' NLS effort for both total mercury and methyl mercury provided that they have access to the ancillary data needed to model mercury cycling in lake ecosystems. This cooperative study will also monitor mercury and other parameters in 33 additional randomly selected Illinois lakes. A final summary report will be completed for all 50 lakes covered by this project by the end of 2009. This effort will advance monitoring objectives 1a, 1b, 1c, and 4 (Table 1).

12. Expand scope and applicability of monitoring data from the Volunteer Lake Monitoring Program. In 2006, the VLMP initiated a tiered approach to volunteer data collection and use. This approach will assist us in meeting our monitoring objectives 1a, 1b, 1c, and 3. Data collected by Tier 3 volunteers are subject to the same quality assurance (QA) and quality control (QC) requirements as data collected by Illinois EPA staff for the ALMP. Moreover, data collected by volunteers in Tier 3 will be used to (a) determine attainment of designated uses; (b) identify causes and sources of impairment; and (c) identify trends and to determine impaired waters subject to 303(d). These changes will be incorporated into the 2008 *Illinois Integrated Water Quality Report and Section 303(D) List*.

13. Monitor success of watershed-based restoration efforts in selected waters (e.g., Measure W, National Nonpoint Monitoring Program, TMDL).

Measure W: In response to USEPA's *2006 - 2011 Strategic Plan: Charting Our Course* (www.epa.gov/ocfopage/plan/plan.htm) submitted to the U.S. Congress in September 2006, Illinois EPA plans to monitor water quality in selected impaired waters to identify problems and evaluate the effectiveness of watershed-based improvement efforts. Surveys will be linked whenever possible with IBSs (e.g., conducted in the same time frame and watershed) and will focus on measuring the success of implemented TMDL plans or CWA Section 319 projects (e.g., application of BMPs). Surface Water Section staff will coordinate closely with NPS and TMDL staff to accomplish this linkage. Illinois EPA is working with USEPA Region 5 to plan appropriate management and monitoring efforts to effect improvement by 2012. This effort will advance monitoring objectives 3 and 4 (Table 1). Of the seven 12-digit HUC watersheds selected to meet the Measure W goals, six will be monitored under the Agency's existing Intensive Basin Program or Lake Monitoring Program. The other watershed (Waukegan) will not only be included in the Intensive Basin Program but will also undergo additional monitoring by Lake County Health Department and Illinois EPA. This monitoring will quantify Measure W successes as well as the implementation of the watershed-based plan. Success will be measured by use attainment within these seven watersheds.

Kickapoo Creek National Nonpoint Source Pollution Monitoring Program: Stream restoration will convert two miles (3 km) of agricultural drainage ditches in the east and west branches of Kickapoo Creek into meandering stream channels within an 80-acre (32-hectare) park. New wetland basins will be created within the meander bends throughout the park to reduce stormwater runoff rates. The park landscape will maximize the enhancement of native wetland, riparian, and aquatic species for the parks trail system. Present sediment transport capacity in the restored stream segments will be maintained in order to prevent the loss of wetland plant communities and instream habitat resulting from excessive sediment deposition.

Monitoring will be conducted according to an upstream/downstream design. Fish and macroinvertebrates will be monitored in the restored reach and in an upstream control reach. Sediment and nutrient concentrations and loads will be measured at stations upstream and downstream of the development area and at a third control station on the west branch of Kickapoo Creek. Effectiveness of created wetlands will be assessed by monitoring the concentration and loads of nutrients entering the wetland vegetation and the concentrations and loads entering the stream. Detailed monitoring of the vegetation community in the riparian plantings within the restoration area will contribute to better understanding of vegetation management in river restoration elsewhere in the state and region.

The project is currently in its first year of monitoring and is expected to continue through 2015.

TMDL and watershed-based plan implementation monitoring: The Surface Water Section is working closely with the Watershed Management Section to determine which watersheds have significantly implemented a TMDL Implementation Plan or the Watershed-based Plan. Once these are identified, these watersheds will be placed on a high priority for sub-watershed site selection within the IBS program. For those watersheds with the expertise and an approved QAPP, they will be given consideration for CWA Section 319 funding to implement follow up monitoring. In all cases, these monitoring protocols will be looking at use attainment for the sub-watersheds receiving BMPs as identified in either the TMDL Implementation Plan or the Watershed-based Plan.

14. Participation and potential future activity in probability-based monitoring of major surface waters (e.g., inland lakes, wetlands, and streams). While supporting it’s primary objective of conducting individual resource-level assessments of use attainment (Objective 1a) and cause/source identification (Objective 1b) to support Clean Water Act Sections 305(b) and 303(d) Integrated Reporting, the Illinois EPA feels that implementation of its existing inland lake and stream monitoring programs, and continued collaboration with the INHS and their Critical Trends Assessment Program (CTAP) to monitor the State’s wetland resources, provide a sufficient level of effort and information to produce state-level assessments of condition and trend (e.g., what percent of the State’s lakes, wetlands, and streams are in good, fair, and poor condition - Objective 1c; and what are the key stressors – Objective 1b).

In addition, over the last several years, the Agency has begun to participate at various levels (e.g., national, regional, state) and in various stages in probability-based sampling of its major surface water resources (inland lakes, wetlands, and wadeable and non-wadeable streams). Nationally, participation in probability-based surveys has been heavily promoted by and conducted by states in association with USEPA's national and regional-scale Surveys of the Nation's Waters. Clean Water Act Section 106 set-aside "Monitoring Initiative" grant funds are allocated to states who develop work plans, and are approved to implement the work plans, to support both collaboration on statistically-valid (probability-based) surveys of the nation's waters, and implementation of elements contained in State comprehensive monitoring strategies (i.e., this 2007-2012 Monitoring Strategy document).

Following is a summary of past and potential future probability-based monitoring activities for 2007-2012.

a. Inland Lakes. Beginning in 2006, Illinois EPA began active participation in planning efforts for USEPA's "Survey of the Nation's Lakes" (survey). The purpose of this survey is to generate statistically valid reports on the condition of our nation's lakes, ponds, and reservoirs and to identify key stressors to these systems. According to USEPA, the survey is designed to address two key questions about the quality of the nation's lakes: What percent of the nation's lakes are in good, fair, and poor condition for key indicators of trophic state, ecological health, and recreation and What is the relative importance of key stressors such as nutrients and pathogens?

Sampling for the survey was completed during the 2007 summer growing season. Field crews collected a variety of measurements and indicators from an index site located at the deepest point of the lake (or in the middle of the lake if the lake was deeper than 50 meters), and documented conditions of the littoral zone and shoreline at numerous points around the lake.

USEPA selected lakes using a probability-based survey design. The sample size included 1,000 lake sampling events nationally, including 909 discrete lakes, with 91 of the lakes scheduled for revisits. An oversample of additional lakes was also provided so states could also conduct a state-scale survey in addition to the national/regional survey if they desired. The design also included a representative subset of the lakes that were included in the National Lake Eutrophication Study (NES), conducted by EPA in 1972, to allow for a trends assessment from the original NES study.

Seventeen lakes from Illinois were randomly selected by USEPA for inclusion in the national survey. Seventy-nine additional lakes were included in the oversample draw, for a total of 96 Illinois lakes identified for potential inclusion in the national survey. Six of the original 17 lakes were eliminated from the survey because they did not meet USEPA's criteria for lake type or because of access issues. Those six lakes were replaced with the first six lakes from the oversample list meeting all of the appropriate criteria. Four of the 17 lakes were scheduled for revisits, in accordance with survey protocols. Sampling was conducted under contract by Eastern Illinois University.

To enhance the survey, Illinois EPA chose to select an additional 37 Illinois Enhancement Lakes to be sampled along with the 17 national survey lakes to satisfy several state and regional goals. Twenty-nine of the 37 Illinois Enhancement Lakes were selected from the balance of the USEPA oversample list. Five Illinois Enhancement Lakes were additionally selected, outside of any probability draw, to generate a minimum list of 50 total lakes and to enhance spatial coverage throughout the state. The three remaining Illinois Enhancement Lakes were also selected outside of any probability draw to reflect least disturbed or reference conditions per a USEPA Region 5 request.

In all, 17 lakes in Illinois were sampled as part of the national survey: Thirty-seven additional lakes were sampled to contribute to 1) a state-scale inland lakes survey, 2) evaluation of an Illinois-derived LRP-IBI, and 3) a statewide assessment of water mercury levels. For those 37 Illinois Enhancement Lakes, all trophic state and recreational indicators included as part of the national survey were included in the Illinois enhancement effort. However, not all ecological integrity indicators (e.g., benthic macroinvertebrates, diatoms, and the physical habitat of the shoreline and littoral zone) were included as part of this enhancement effort. In association with the USGS in Madison, Wisconsin, all 54 lakes were also monitored for water mercury.

b. Wetlands. Illinois EPA began an effort to develop a comprehensive Wetland Monitoring and Assessment Program (program) in late 2005. This program is a cooperative effort between numerous state agencies including the Illinois EPA, IDNR, INHS, Illinois Department of Transportation (IDOT), USGS and others. A Wetland Technical Working Group was initiated in early 2006 to guide development of the overall program.

Initially, the program is being designed to assess the status and trends of wetland resources throughout Illinois, including basic quantitative and qualitative evaluations. Over time, and as resources allow, it is hoped that the program will incorporate metrics, indices, and measurements that will support assessment determinations for Clean Water Act Section 305(b) and 303(d) purposes.

The monitoring of wetland resources will be patterned after the existing IDNR's CTAP wetland monitoring efforts, which were initiated in 1997. The CTAP wetland monitoring efforts are conducted by the INHS.

Currently, INHS/CTAP monitors 226 wetland resources throughout the state on a five-year rotational basis. Sites for the INHS/CTAP wetland monitoring network were selected through a probabilistic design using the 1,765 Illinois Public Land Survey townships as the sampling units. These individual townships were randomly ranked, and the emergent, forested, and scrub-shrub wetland sites identified within the randomly ranked townships were sequentially selected from this list and scheduled for monitoring. Some sites selected were found to be impractical because of inadequate resource characteristics (such as unsuitable habitat or inadequate access) or denial of permission from a landowner. In each case, a replacement site was selected by proceeding sequentially down the list of randomly ranked wetlands and townships. Of the 226 wetlands monitored, 166 were emergent, 58 were forested, and two were scrub-shrub.

Through 2006, INHS/CTAP has completed two five-year rounds of probabilistic monitoring. With input provided by the WTWG, INHS/CTAP will be adding approximately 30 wetland reference sites to the wetland monitoring network over the next few years. These reference sites are high quality natural areas which represent the best potential characteristics, quality, and function of the various wetland types.

Illinois EPA plans to work with and support the activities of the INHS/CTAP to continue on with the state-level, five-year rotational, probabilistic wetland monitoring program design. Results of these surveys will be reported on in Illinois EPA's biennial Integrated Reporting process.

As outlined in their Wetland Monitoring and Assessment Program report, the Agency wishes to strengthen this monitoring effort by securing funding for completion of an updated Illinois National Wetland Inventory (NWI), as well as development of a Wetland Index of Biotic Integrity (IBI). Completion of the NWI and IBI over the next several years will serve to greatly enhance the state's joint requirement to monitor, assess, and report on the status and trends of Illinois wetland resources.

Finally, the Agency is in the very early stages of learning from USEPA about the initial planning phase of the National Wetlands Survey. Like the national wadeable streams, rivers and lakes surveys, the goal of this effort is to determine on a national and regional scale the good, fair, or poor condition of the nation's wetlands, and determine the key stressors that impair wetland quality. Monitoring will likely take place beginning in summer 2011. At this time, it has not been determined if Illinois EPA will participate in this national survey.

c. Streams. The Agency participated in the National Wadeable Streams Assessment, the first-ever statistically valid survey of the biological condition of small, wadeable streams throughout the country. The monitoring work for the survey was conducted in 2004-2005. The final report, "Wadeable Streams Assessment: Collaborative Survey of the Nation's Streams," is available at http://www.epa.gov/owow/streamsurvey/

Like the National Wetlands Survey, the Agency is in the very early stages of learning from USEPA about the initial planning phase of the National Rivers Survey. Agency staff attended a planning meeting that was held in San Antonio, Texas, January 10-12, 2007, to engage states, tribes and other interested parties in designing the rivers survey. The goal of the rivers survey is to address two key questions about the quality of the nation's non-wadeable rivers and streams: 1) What percent of the nation's non-wadeable rivers are in good, fair, and poor condition for key indicators of ecological health and human activities; and 2) What is the relative importance of key stressors such as nutrients and pathogens? The survey is expected to answer these questions on a national and regional scale.

Planning for the survey will take place throughout 2007 and early 2008. USEPA will be forming subcommittees for each of the indicators selected as well as for sampling protocols in order to determine the overall design of the survey. Once designed, it will potentially take two years of actual monitoring activity to complete the survey, likely in the summers of 2008 and 2009.

At this time, it has not been determined if Illinois EPA will participate in this national survey.

15. Evaluate VOC trend data from 1990 to the present and compare to probabilistic results. Year-to-year evaluation of the Illinois EPA ambient network of CWS wells have shown fluctuations of VOCs; however, analyses of data collected from 1990 to the present shows a statistically significant increasing trend of CWS wells with VOC detections. Analytical detection levels and sampling frequencies have not changed significantly during this time frame. The results show the importance of doing long-term monitoring such that trend analysis can be performed. More importantly, this data shows an increasing trend of groundwater degradation. Illinois EPA will continue to evaluate this groundwater monitoring data to determine the causes and potential sources of this trend.

16. Publish trend data in a nationally peer reviewed journal. The Illinois EPA has used the analyses of CWS groundwater monitoring data collected from 1990 to the present to develop a draft research paper on the trend of VOC detections in Illinois groundwater. Once completed, the research paper will be submitted to the editorial staff of *Ground Water Monitoring and Remediation Journal.* The Illinois EPA will also plan to present the findings of this research to both state and national audiences at annual conferences such as the Ground Water Protection Council and Illinois Section-AWWA.

17. Evaluate causal data to determine the potential source of VOC trends. Illinois EPA continues to evaluate the potential causes and sources of VOC contamination to determine what might be causing this trend. Spatial analyses will be conducted, taking into account multiple variables including VOC detects, CWS wells with delineated contributing recharge areas or wellhead protection areas (WHPA), well depth, principal aquifers being utilized, potential for aquifer recharge, and the proximity of clean up sites. Statistical analyses will be conducted to determine if the well detection points are coincident with clean-up sites within the WHPA.

18. Continue groundwater quality standards development discussion with the Groundwater Advisory Council stakeholders, and prepare Illinois Pollution Control Board proposal. The Illinois EPA has developed a draft proposal to add 41 contaminants

with groundwater quality standards. One of the 41 includes revising the arsenic standard to be parallel with the drinking water standard. Forty proposed standards are new. These new standards are proposed for contaminants based on their common occurrence in Illinois groundwater pursuant to the requirement outlined in the Illinois Groundwater Protection Act (415 ILCS 55/8). The most controversial groundwater standard proposed is for perchlorate (i.e., rocket fuel). Illinois EPA is using the procedure for deriving standards pursuant to the provisions codified in the Board's groundwater standards at Subpart F.

19. Continue to implement rotating network (fixed/special/intensive). As previously described in the Groundwater Monitoring Design section of this report, Illinois EPA will continue to maintain a Rotating/Special/Intensive Groundwater Monitoring Network. Sampling is conducted during alternate years from the Probabilistic Network. The 2007 Rotating Network is concentrating on the sampling of new CWS wells and those with detections of VOC's or other contaminants. This on-going network will continue to be implemented in alternate years as staffing and resources allow.

Potential Monitoring Efforts for 2007-2012

This section describes several potential monitoring activities that are neither specifically planned nor funded for 2007 through 2012. As time and resources allow, Illinois EPA would like to pursue these additional activities. These efforts represent potential advancement of the primary monitoring objectives addressed in Table 1.

1. Monitor progress of site-specific water pollution control projects (e.g., upgrades of municipal wastewater treatment facilities). As described earlier, in 2007 through 2012 Illinois EPA plans to monitor the instream effects of nutrient removal at a few selected municipal wastewater treatment facilities. Monitoring at additional facilities would provide a basis for reaching some general conclusions about the costs and benefits of nutrient removal on a larger spatial scale. Further refinement of pre- and post-monitoring designs would improve the scientific validity of such conclusions. These potential efforts would help identify causes of water quality impairment and help evaluate the effectiveness of management activities related to the regulation of point source discharges, thereby advancing monitoring objectives 1b and 4 (Table 1).

2. Monitor specific impaired watersheds to evaluate the success of implemented TMDL plans. Pre- and post-monitoring of implemented TMDL plans provides a direct way to assess the success of the plan. Likely, an adaptive implementation approach would be most beneficial because it minimizes overinvestment in ineffective pathways to restoration. Although this type of monitoring is occurring in a few pilot watersheds, a statewide program needs to be developed. This potential effort would help identify causes of water quality impairment, help support the implementation of TMDL plans, and help evaluate the effectiveness of management activities related to TMDL plan implementation, thereby advancing monitoring objectives 1a, 1b, 3, and 4 (Table 1).

3. Monitor the effectiveness of BMPs for alleviating impacts of nonpoint source pollutants or pollution. Developing the relevant indicators and then monitoring environmental conditions before and after the application of BMPs in Illinois watersheds provide direct ways to assess the success of such activities. Successful monitoring will require data collection and interpretation at time intervals and spatial scales most relevant to the expected effects of those practices. In addition, monitoring designs and restoration activities must be flexible enough to accommodate an adaptive management approach. This potential effort would help identify causes of water quality impairment, help support the implementation of CWA Section 319 programs, and help evaluate the effectiveness of management activities related to such implementation, thereby advancing objectives 1b, 3, and 4 (Table 1). Although this is not a formalized program at this time, the Agency is piloting one such effort. Through this pilot process (Otter Lake, Macoupin County), we will be better able to design a program when funding and staff become available.

4. Expand monitoring in Lake Michigan. As time and resources allow, it is the intention of Illinois EPA to further expand the Lake Michigan Monitoring Program in the coming cycle. This would be accomplished by expanding sampling activities (i.e., increasing the number and frequency of the Harbor Sampling Program) and by building relationships with other agencies and various groups who have a vested interest in Lake Michigan. Hopefully, cooperation with these entities will lead to future projects and as well as funding opportunities that would help to further monitoring activities.

5. Monitor for emerging contaminants. Discussions among the Upper Mississippi River Basin Association and USEPA's National Exposure Research Lab resulted in a summer 2007 perfluorochemical (PFC) monitoring effort designed to characterize PFCs in the waters of the Mississippi River from its headwaters at Lake Itasca, Minnesota, to its confluence with the Ohio River at Cairo, Illinois. The results of this monitoring effort have not been summarized at the time of this writing.

Currently the Illinois EPA is experiencing both analytical and funding resource constraints to monitor emerging contaminants such as endocrine disruptors, pharmaceuticals, estrogen-mimicking compounds, PFCs, and new-age pesticides. A mechanism to enhance the analytical capability of Illinois EPA laboratories to provide analyses of such emerging surface and groundwater contaminants needs to be identified. Another option is to investigate the possibility of establishing long-term contractual services with qualified external laboratories with the appropriated analytical expertise. Necessary resources to implement either option should then be identified.

ENVIRONMENTAL INDICATORS

Overview

Monitoring the environmental conditions of Illinois waters provides vital data and related information for assessing attainment of uses, identifying impairment, and determining how to restore impaired waters. Monitoring information also helps evaluate the success of Illinois EPA BOW water pollution control programs, restoration efforts, and related activities. To use monitoring data and information effectively, it must be interpreted and represented clearly and concisely in terms of indicators of environmental condition. This section describes the indicators that Illinois EPA BOW uses.

Beneficial Uses and Water Quality Standards

Beneficial uses and water quality standards provide the primary context in which Illinois EPA BOW interprets and uses indicators of environmental condition. Beneficial uses of Illinois surface waters include *aquatic life use, primary contact use* (e.g., swimming, water skiing), *secondary contact use* (e.g., boating, fishing), *public and food processing water supply use, fish consumption use,* and *aesthetic quality*. *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 use* 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).

The Illinois Pollution Control Board has established five primary categories of narrative and numeric water quality standards designed to protect the beneficial uses of Illinois waters: General Use Water Quality Standards, Public and Food Processing Water Supply Standards, Secondary Contact and Indigenous Aquatic Life Standards, Lake Michigan Basin Water Quality Standards, and Groundwater Quality Standards.

1. <u>General Use Standards (35 Ill. Adm. Code 302, Subpart B).</u> 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. 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.

2. <u>Public and Food Processing Water Supply Standards (35 Ill. Adm. Code 302, Subpart C).</u> These standards protect the state's surface water for human 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.

3. <u>Secondary Contact and Indigenous Aquatic Life Standards (35 Ill. Adm. Code 302, Subpart D).</u> These standards are intended to protect limited uses of those waters not suited for *general use* activities but nonetheless suited for *secondary contact use* and capable of supporting indigenous aquatic life, limited only by the water body's physical configuration, characteristics, origin, 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 use* standards do not apply—about 86 miles of canals, channels, modified streams, and Lake Calumet in northeastern Illinois (See Figure 8).

4. <u>Lake Michigan Basin Water Quality Standards (35 Ill. Adm. Code 302, Subpart E).</u> These standards protect the beneficial uses of the open waters, 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.

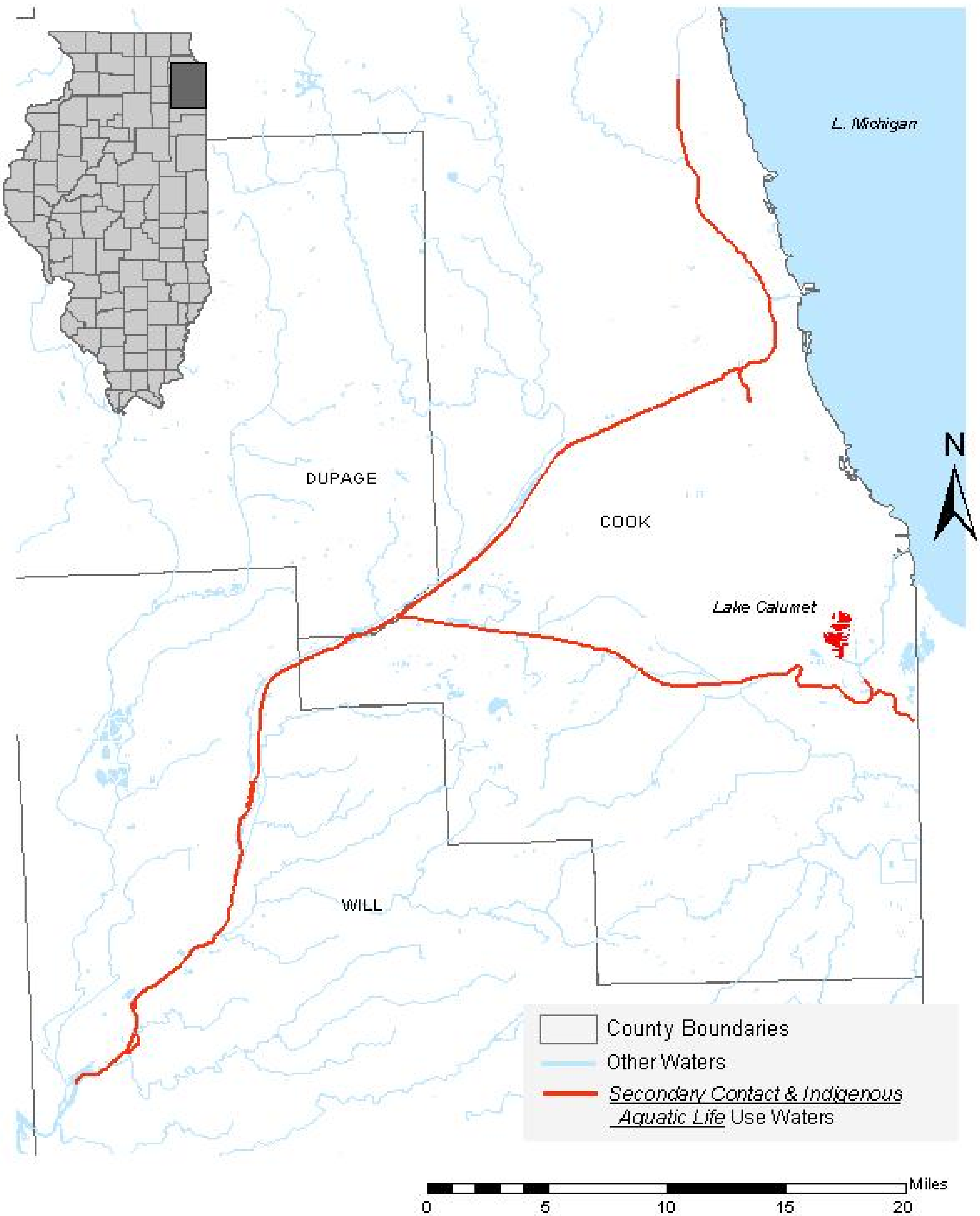
5. <u>Groundwater Quality Standards (35 Ill. Adm. Code 620.410).</u> These standards protect groundwater that has been designated as a Class I (potable resource groundwater) supply, from persons causing, threatening or allowing the release of any contaminant to groundwater so as to cause a groundwater quality standard to be exceeded. Groundwater is not required to meet the *general use* standards and *public and food processing water supply use* standards of 35 Ill. Adm. Code 302, Subparts B and C.

Illinois EPA BOW uses monitoring information to assess the attainment of each of several beneficial uses in Illinois waters (Table 4). Table 4 also indicates the water bodies in which each beneficial use applies and the applicable water quality standards used to help assess attainment of each use.

Table 4. Beneficial uses of Illinois waters and applicable water quality standards.		
Beneficial Use	**Illinois Water bodies in Which the Use and Standards Apply [1]**	**Applicable Illinois Water Quality Standards**
Aquatic Life	Streams, inland lakes	General Use Water Quality Standards
	Lake Michigan basin waters	Lake Michigan Basin Water Quality Standards
Aesthetic Quality	Streams, inland lakes	General Use Water Quality Standards
	Lake Michigan basin waters	Lake Michigan Basin Water Quality Standards
Indigenous Aquatic Life	Specific water bodies (Figure 8)	Secondary Contact and Indigenous Aquatic Life Standards
Primary Contact	Streams, inland lakes	General Use Water Quality Standards
	Lake Michigan basin waters	Lake Michigan Basin Water Quality Standards
Secondary Contact	Streams, inland lakes	General Use Water Quality Standards
	Lake Michigan basin waters	Lake Michigan Basin Water Quality Standards
	Specific water bodies (Figure 8)	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 Water Quality Standards
	Lake Michigan basin waters	Lake Michigan Basin Water Quality Standards
	Specific water bodies (Figure 8)	Secondary Contact and Indigenous Aquatic Life Standards
Potable Resource Water	Groundwater designated as Class I (potable resource groundwater)	Groundwater Quality Standards

[1] As defined in 35 Ill. Adm. Code 302.201, 303, and 620.

Figure 8. Waters in which *Secondary Contact Use and Indigenous Aquatic Life Use* Standards apply. (The uses and water quality standards for some of these waters are currently being evaluated for potential revision.)



Indicators of Environmental Condition in Surface Waters

Illinois EPA BOW uses a wide variety of core and supplemental measures to indicate chemical, physical, and biological conditions in surface waters. For each type of water body and applicable use as shown in Table 5, Illinois EPA BOW uses the indicators to assess use attainment, to determine the degree of nonattainment, and to identify potential causes of nonattainment. Outside of this primary context, the indicators also are used to help implement or evaluate the effectiveness of various BOW activities:

1. Lake restoration projects (ICLP)

2. Projects for NPS pollution control (CWA Section 319 program)

3. Developing and prioritizing TMDLs

4. Prioritizing inspections of permitted point source discharges and other regulated facilities (NPDES permit program)

5. Compliance assurance activities of dischargers

6. Assessing the general performance of wastewater treatment facilities

Indicators of Environmental Condition in Groundwater

Groundwater monitoring data are used as a primary indicator to characterize water quality conditions and statistically evaluate and assess potential impairments to aquifers in Illinois. To accomplish this objective, an average of 350 CWS wells has been maintained as part of a probabilistic monitoring network. Monitoring at all stations is completed by using Hydrolab® samplers to insure that in-situ groundwater conditions are reached prior to sampling. Water quality parameters include field temperature, field specific conductance, field pH, field pumping rate, IOC analysis, SOC, and VOC analysis.

Table 5. Environmental Indicators Used by the Illinois EPA Bureau of Water.

	Streams	Inland Lakes	Lake Michigan	Ground-water
Aquatic Life	Biological - fish Index of Biotic Integrity - macroinvertebrate Index of Biotic Integrity Chemical - dissolved oxygen - pH - conductivity - nutrients in water and sediment - metals in water and sediment - various inorganics in water & sediment (some are S [1]) - various organics in water & sediment (some as S) Physical - temperature - turbidity - instream and riparian habitat (inc. Qualitative Habitat Evaluation Index) - flow (S)	Biological - chlorophyll a -Trophic State Index (phosphorus, chlorophyll a, Secchi depth) - aquatic macrophyte coverage - phytoplankton assemblage (S) Chemical - dissolved oxygen (depth profile) - pH - conductivity - phosphorus - metals in water & sediment - various inorganics in water (some as S) Physical - temperature (depth profile) - Secchi depth	Chemical - dissolved oxygen - pH - conductivity - nutrients in water - metals in water - various inorganics in water - various organics in water Physical - temperature - turbidity	*N A.*[2]
Aesthetic Quality	(*applicable, but assessment guidelines and corresponding indicators not yet developed*)	Biological/Chemical/Physical - Recreation Use Index (phosphorus, non-volatile suspended solids, chlorophyll a, Secchi depth, and macrophyte coverage)	(*applicable, but assessment guidelines and corresponding indicators not yet developed*)	*N A.*

<table>
<tr><th colspan="5">Table 5. (continued)</th></tr>
<tr><th></th><th>Streams</th><th>Inland Lakes</th><th>Lake Michigan</th><th>Groundwater</th></tr>
<tr><td>Indigenous Aquatic Life</td><td><u>Chemical</u>
- dissolved oxygen
- pH
- conductivity
- nutrients in water and sediment
- metals in water and sediment
- various inorganics in water & sediment (some as S)
- various organics in water and sediment (some as S)

<u>Physical</u>
- temperature
- turbidity
- flow (S)</td><td><u>Chemical</u>
- dissolved oxygen (depth profile)
- pH
- conductivity
- phosphorus in water
- metals in water
- various inorganics in water (some as S)

<u>Physical</u>
- temperature (depth profile)
- Secchi depth</td><td>N A.</td><td>N A.</td></tr>
<tr><td>Primary Contact and Secondary Contact</td><td>Biological (human pathogen)
- fecal coliform bacteria</td><td>(Human-pathogen indicators not monitored)</td><td><u>Biological (human pathogen)</u>
- fecal coliform bacteria
- Escherichia coli</td><td>N A.</td></tr>
<tr><td>Public and Food-Processing Water Supply</td><td colspan="4"><u>Biological (human pathogen)</u>
- fecal coliform bacteria

<u>Chemical</u>
- various inorganics and organics</td></tr>
<tr><td>Fish Consump-tion</td><td colspan="3"><u>Chemical</u>
- mercury
- chlordane, polychlorinated biphenyls, and other organics</td><td>N A.</td></tr>
<tr><td>Potable Resource Water</td><td colspan="3">N A</td><td>- temperature
- pH
- conductivity
- various inorganics
- various organics</td></tr>
</table>

[1] "S" indicates a supplemental indicator, all others are core indicators.

[2] *N A.* = Not applicable.

Recommendations and Strategies for Improvement

The following recommendations and strategies represent Illinois EPA BOW's perspectives on how to improve our use of environmental indicators in resource management and water pollution control. Because Illinois EPA BOW primarily uses these indicators in the context of protecting, assessing, and restoring attainment of the beneficial uses of Illinois waters, some of the following recommendations also address aspects of this context more than they address specific indicators per se.

1. Define and designate tiered aquatic life uses and determine corresponding use attainment criteria. Illinois EPA has begun and will continue efforts toward defining tiered aquatic life uses and corresponding biological criteria as potential revisions to existing Illinois *aquatic life use* designations and corresponding water quality standards. In existing Illinois water quality standards, aquatic life uses are broadly defined and designated, which results in both underestimating and overestimating attainability of aquatic life conditions for some individual water bodies. Moreover, existing Illinois numeric water quality standards that apply to aquatic life are largely in terms of surrogate physicochemical thresholds rather than direct biological thresholds. These water quality standards do not adequately reflect advances in the use of non-chemical data (i.e., biological criteria) for achieving the CWA's interim aquatic life goal and ultimate objective to "*restore and maintain the chemical, physical, and biological integrity of the Nation's waters.*" (CWA Section 101(a)). Although numeric standards for various physicochemical parameters in water have proven effective for controlling point source discharges, their ability to consistently reflect and thus sufficiently protect biological integrity is limited.

2. Define and designate uses in wetlands and determine corresponding use attainment criteria. As Illinois EPA learns more about Illinois wetland resources through the Wetland Technical Working Group we will define and designate appropriate uses and propose appropriate water quality standards for wetlands. (See Monitoring Design, Recommendations, and Strategies for Advancing Primary-Monitoring Objectives). Additionally, through the development of a wetland IBI, we will be able to gauge the biological health of the state's wetlands as outlined in the USEPA's tiered approach to wetlands assessment. The Illinois wetland IBI will use a multimetric vegetation index as the core indicator of the multivariable index. This primary index will be supported by several proposed supplemental indicators. These supplemental indicators would be used to support the vegetative core indicator on a site-by-site basis dependent upon predetermined criteria. The applicability/suitability of these supplemental indicators would need to be investigated in more detail before they were incorporated into multivariable wetland IBI in addition to the vegetation component. Level 3 assessments will be utilized in standards development (including tiered aquatic life uses), mitigations performance criteria development/monitoring, and for integrated reporting for CWA 305(b)/303(d) reports.

3. Investigate and consider potential improvements to guidelines for assessing attainment of *primary contact use*, *secondary contact use*, and *aesthetic quality*. Illinois EPA has been evaluating the existing Illinois water quality criteria for fecal coliform bacteria (or other pathogen indicators) and considering potential revisions to guidelines for assessing

attainment of *primary contact use* and *secondary contact use* in the state's surface waters. We have also begun developing and evaluating potential guidelines for how to assess *aesthetic quality* in both streams and lakes. Illinois EPA anticipates that preliminary assessments of *aesthetic quality* will be available by 2010.

4. Develop a phytoplankton index of lake condition. In 2005, Illinois EPA BOW contracted with Eastern Illinois University to develop a classification system for Illinois lakes and reservoirs based on physical and chemical variables, as well as ecoregional and relevant geomorphological features. Deriving from these efforts, in 2007 and 2008 the contractor will evaluate relationships of phytoplankton assemblages in each lake class to develop and test a multimetric index of lake condition. This project will be completed by 2009.

5. Begin collecting environmental data in frequently intermittent streams. Currently, Illinois EPA neither directly monitors environmental conditions nor directly assesses attainment of uses in frequently intermittent streams. During 2007 through 2012, Illinois EPA intends to begin limited collection of biological, physical, and chemical data in frequently intermittent streams, with an emphasis on data useful for developing indicators to assess the impacts of NPS pollutants and pollution. Inclusion of frequently intermittent streams represents progress toward the ultimate goal of resource management for all surface water types in Illinois.

6. Amend groundwater quality standards. Illinois EPA evaluated the electronically reported groundwater data for all Illinois Resource Conservation and Recovery Act and solid waste facilities under our purview. Illinois EPA Bureau of Land (BOL) Permit Section provides regulatory oversight for these facilities. A data query was conducted for a list of approximately 300 groundwater parameters not included in 35 Ill. Adm. Code 620, Subpart C. The evaluated data set spanned from April 1984 to April 2004. Illinois EPA has also evaluated contaminants at various cleanup stations. The parameters of both groups have all been detected and confirmed to be groundwater contaminants. Illinois EPA has developed a proposal for these contaminants and anticipates proposing these to the Board by the end of the year.

Illinois EPA is proposing a groundwater standard for perchlorate based on the new reference dose published by USEPA and recommended by the National Academy of Science. Illinois EPA proposes to use the default relative source contribution (RSC) term of 20 percent in the calculation of a reference dose (RfD). A groundwater standard of 0.0049 milligram per liter being proposed to the Board is based on this RfD using the health advisory procedure under 35 Ill. Adm. Code 620 Subpart F.

Additionally, Illinois EPA is proposing an amendment to the existing groundwater standard of 0.050 mg/L for arsenic based on the amendment of the federal drinking water standard or maximum contaminant level for arsenic to 0.010 mg/L. The following contaminants are being considered for additional groundwater quality standards (Table 6):

Table 6. Proposed updates to Illinois groundwater quality standards.
Inorganic Chemicals
Arsenic
Molybdenum
Perchlorate
Vanadium
Volatile Organic Compounds
Acetone
2-Butanone (MEK)
Carbon disulfide
Chloroform
Dichlorodifluoromethane
1,1-Dichloroethane
Isopropylbenzene (Cumene)
Trichlorofluoromethane
Semivolatile Organic Compounds
Acenaphthene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzoic acid
Chrysene
Diethylphthalate
Di-n-butyl phthalate
Di-n-octylphthalate
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
2-Methylnaphthalene
2-Methylphenol
Naphthalene
P-Dioxane
Pyrene
Pesticides/PCBs
alpha-BHC
Dicamba
MCPP (Mecoprop)
Explosives
1,3-Dinitrobenzene
2,4-Dinitrotoluene
2,6-Dinitrotoluene
HMX
Nitrobenzene
RDX
1,3,5-Trinitrobenzene
2,4,6-Trinitrotoluene

QUALITY ASSURANCE

Bureau of Water Quality System

The USEPA requires that all non-EPA organizations performing work on behalf of USEPA through extramural agreements meet minimum quality requirements applicable to the collection, analysis, evaluation, and reporting of environmental data. Collectively, the policies and programmatic management systems developed that pertain to quality are known as a "Quality System." The primary goal of a Quality System is to ensure that environmental programs and decisions are supported by data of the type and quality needed and expected for their intended use (USEPA 2001a). In conjunction with initiating a Quality System, Illinois EPA BOW developed the *Quality Assurance Project Plan: Integrated Water Monitoring Program Document* (IEPA 1994). Illinois EPA BOW submitted this plan to USEPA in 1994, and USEPA approved it in August 1997. The plan incorporates the precursor BOW document, *Bureau of Water Quality Assurance and Field Methods Manual* (IEPA 1989).

Bureau of Water Quality System Goals and Objectives

The primary objective of the BOW's Quality System is to ensure that environmentally related data collection and processing activities performed for Illinois EPA will result in the production of data that are of known and documented quality, are suitable for their intended purpose, and can be used with a high degree of certainty by the intended user to support specific decisions or actions. This includes those monitoring and measurement activities conducted or supported by Illinois EPA through the budget process. This goal is achieved by ensuring that appropriate resources are made available and proper procedures followed throughout the process of planning for, collecting, analyzing, and interpreting environmental data.

Quality Assurance Tools and Practices

Various tools and procedures are used to plan, implement, and evaluate the Quality System. Managers and staff members are informed of the availability and use of these tools through Illinois EPA-wide or BOW-specific training, and through expertise provided by the BOW Quality Assurance Officer (QAO). The BOW has delegated primary responsibility for coordinating the development and enhancement of the BOW Quality System to the Bureau QAO. The Bureau QAO reports to the Bureau Chief on quality assurance issues and serves on Illinois EPA's Quality Systems Coordinating Committee (QSCC). The QSCC meets on a monthly basis or as necessary to discuss QA implementation plans, policy, procedures, and common QA issues across Illinois EPA. The Bureau QAO and designated staff serving as section QAOs make up the BOW Quality Assurance Committee (QAC).

Primary quality assurance planning and implementation tools include the BOW QMP, consideration of data quality objectives, program- or project-specific Quality Assurance Project Plans (QAPPs), and SOPs. Most of these tools are used directly by BOW staff with help, as necessary, from the BOW QAOs.

Quality Management Plan

USEPA Region 5 quality assurance staff approved the current BOW QMP Revision 2 in April 2007. To effectively implement the QMP, the BOW designated a full-time Quality Assurance Officer (QAO). The BOW has designated part-time QAOs in two sections of the Division of Water Pollution Control—Field Operations Section and Surface Water Section. A QAO has also been designated in the Division of Public Water Supply Groundwater Section.

The BOW QMP has been developed to address the quality assurance requirements for receiving federal financial assistance, as embodied in *EPA Requirements for Quality Management Plans* (USEPA 2001a). The QMP describes the delegation of QA roles and responsibilities in the BOW and the policies, procedures, and systems governing BOW's QA Program. The QMP serves as the "umbrella" document and has precedence in internal QA policy matters over all other BOW quality-related documents.

The QMP applies to all BOW programs, activities, contracts, and intergovernmental agreements or other sources that generate environmental data used to make decisions or support actions related to the BOW's defined mission and responsibilities. The QMP establishes the foundation for implementing an effective and comprehensive QA program (i.e., Quality System) in the BOW, covering all BOW activities that involve the generation of environmental data. Environmental data includes information or measurements resulting from any field data collection activity; laboratory analyses; or models involving the assessment of chemical, physical, or biological factors relating to the environment.

In accordance with current USEPA guidelines, the QMP is revised and resubmitted to USEPA Region 5 every five years. Revision 2 will be in effect during the next five-year monitoring cycle.

Quality Assurance Project Plans

The BOW QAPP (Illinois EPA 1994) presents the policies and procedures, organization, objectives, quality assurance requirements, and quality control activities designed to achieve the type and quality of environmental data necessary to support project or program objectives. Following guidelines in *EPA Requirements for QA Project Plans* (USEPA 2001b), it is the policy of BOW that no data collection or analyses will occur without a QAPP or equivalent documentation, in accordance with Illinois EPA and Bureau QMPs. All internal and external environmental data collection activities are subject to this requirement. All contracts need to address quality assurance requirements (e.g., data quality and reporting requirements) when those contracts pertain to, or have an impact on, data collection or analysis activities.

The BOW QAPP (IEPA 1994) covers BOW's environmental monitoring programs. Additional individual QAPPs will be reviewed annually, and updated or revised as necessary. Any revisions to or deviations from an existing QAPP must be reviewed and approved by the appropriate program/project manager and QAO. Illinois EPA BOW plans a major revision and update to the BOW QAPP (IEPA 1994) during the next five-year monitoring cycle. The BOW QAO will continue to maintain a file that tracks the status of individual project QAPPs submitted for review or that have been approved.

Data Quality Objectives

Illinois EPA BOW is committed to sound science and thus, the generation, compilation, and analysis of environmental data that are technically and legally defensible, and of adequate quality to support the intended use. Illinois EPA BOW encourages the use of the Data Quality Objectives (DQO) process in the planning phase of all environmental data collection activities. *Guidance for the Data Quality Objectives Process, USEPA QA/G-4* (USEPA 2006) is used for the development of DQOs. DQOs will be incorporated into QAPPs where appropriate and, in all cases will be communicated to staff responsible for field, laboratory, and data assessment. This requirement is applicable to all parties that generate environmental data for use or consideration by Illinois BOW. The DQO process will be more widely employed as Illinois EPA BOW revises QAPPs over the next five-year monitoring cycle.

Standard Operating Procedures

Illinois EPA BOW's QAPP includes SOPs to promote consistency, thereby reducing work effort and improving data comparability, credibility, and defensibility. The BOW QAPP (IEPA 1994) provides standardized guidelines and quality control procedures for the collection of environmental data in conjunction with all water monitoring programs (Table 7). These guidelines and procedures are maintained in document control format and kept current. Illinois EPA BOW requires that SOPs be clearly written and adequately detailed (USEPA 2001c).

Applicable SOP's and guidance are routinely reviewed for accuracy and completeness. New monitoring techniques or data management procedures that have the potential to enhance data quality are evaluated and implemented as appropriate. Revisions of SOPs are inevitable as Illinois EPA BOW monitoring programs adapt to advances in equipment, technology, field methods, and environmental indicators (e.g., biological indices).

Over the next five-year monitoring cycle, several SOP-related initiatives will have the potential to enhance the quality and utility of environmental information generated by BOW monitoring. These initiatives include new macroinvertebrate sampling procedures and evaluation/revision of existing stream water chemistry, physical habitat, and sediment chemistry collection procedures.

Table 7. Standard operating procedures applicable to Illinois EPA Bureau of Water monitoring programs.	
Monitored Element or Type of Water	**Title of SOP Section(s)**
Water chemistry	Ambient stream water quality monitoring; special stream surveys
Macroinvertebrates	Macroinvertebrate monitoring; special stream surveys
Physical habitat	Stream habitat and discharge monitoring; special stream surveys
Sediment chemistry	Bottom sediment sampling
Fish	Fish sampling, electrofishing safety, and fish contaminant monitoring; special stream surveys
Lakes	Lake monitoring
Wastewater	Wastewater sampling procedures
Groundwater	Groundwater sampling procedures

Technical System Audits

All Illinois EPA programs that employ environmental sample collection and analyses are subject to a Technical System Audit (TSA). A TSA of a BOW program would involve a thorough review of the facilities, equipment, data collection and analysis procedures, documentation, data validation, management, training procedures, and reporting aspects of the technical system for collecting or processing environmental data. A corrective action period follows the issuance of the written report.

Each BOW water quality monitoring program will be subject to a TSA during the next five-year monitoring cycle. Field surveillance audits will be conducted on the sample collection activities in each BOW water quality monitoring program over the next five-year monitoring cycle.

Management System Reviews

A Management System Review (MSR) qualitatively assesses Illinois EPA BOW's organization and procedures to determine if the Quality System in place is adequate to ensure the quality of the program's data. The Bureau QAO, Section QAOs and management representatives from outside the organizational area (e.g., division or section) being focused on will conduct the MSR by using USEPA *Guidance on Assessing Quality Systems* - QA/G-3

(USEPA 2003a). At least one MSR of the BOW's water quality monitoring programs will be conducted during the next five years.

Personnel Qualifications and Training

Illinois EPA BOW is committed to ensuring that staff and managers are properly trained and qualified to fulfill their required QA responsibilities. Maintaining staff proficiency in performing all environmental sampling, testing, and data analysis activities is the joint responsibility of the individuals filling those positions and the relevant section manager or supervisor. Technical training in environmental monitoring and assessment is ongoing. Section and BOW QAOs keep a current record of all QA training completed by staff and managers in their respective areas.

Recommendations and Strategies for Improvement

In general, as resources allow and needs arise during the years covered by this monitoring strategy, the QA components of various Illinois EPA BOW monitoring programs or activities will be reviewed and updated. Some specific and currently recognized potential improvements follow.

Quality Assurance for the Ambient Water Quality Monitoring Network

Existing sampling techniques are based on methods developed and used by the USGS in 1977. These water quality sampling procedures are described in Section B of the BOW QAPP (IEPA 1994). The relevant portions of this document will be updated as time and resources allow and, as the need arise.

Over the past 25 years, significant improvements have been made to water quality sampling procedures. Advances have been made in laboratory analysis precision and accuracy, and new environmental contaminants are present. The resources and personnel are not available to update QA documents and SOPs annually; therefore, Illinois EPA reviews and changes these documents as time and resources allow. Illinois EPA will review current sampling techniques, core parameters, and implement changes to applicable SOPs, as necessary, to enhance collection methods and resultant data quality. This review will include an assessment of whether Illinois EPA BOW should implement new clean hands techniques for trace metal sampling to assure metal data reported reflects true environmental levels versus values that possibly reflect contamination resulting from sample methods. Illinois EPA BOW also will review recent advances in method development and refinement by the USGS and other agencies and build on these improvements.

Water quality sampling at large river stations is conducted by using applicable procedures described in Section B of the BOW QAPP (IEPA 1994). Because some stations require the use of watercraft for water quality monitoring, certain sampling techniques have been and may continue to be modified as necessary to accommodate this sampling approach and will be reflected in planned revisions of Section B.

Quality Assurance for Intensive Basin Surveys

Guidelines applicable to the collection and management of IBS biological, chemical, and physical data are provided in applicable sections of the BOW QAPP (IEPA 1994). During the past ten years, several new biological indices and improved field collection methods pertinent to IBSs have been developed. As Illinois EPA, BOW gains more experience with these new monitoring tools, corresponding revisions to their SOPs may be needed and will be made as time and resources allow.

Quality Assurance for Groundwater Monitoring

Chapter M of the BOW QAPP (IEPA 1994) provides standardized guidelines and quality control procedures for the collection of water quality data generated in conjunction with the groundwater monitoring programs. In addition, the Groundwater Section field staff continue to participate in the USGS National Field Quality Assurance (blind sample) program. In 2006, field personnel and their equipment were tested with 100 percent of the results satisfactory. In addition, latex gloves have been incorporated into the sampling procedure based on recommendations from past QA reviews. As resources allow, it is anticipated that this QA review will continue.

DATA MANAGEMENT

Surface Water

Illinois EPA BOW achieves data management of water monitoring and assessment information as described below. The USEPA requests that each state describe how it achieves the monitoring element called "data management." Specifically, USEPA (2003b) requests that each state describe how it "*uses an accessible electronic data system for water quality, fish tissue, toxicity, sediment chemistry, habitat, biological data, with timely data entry (following appropriate metadata and State/Federal geo-locational standards) and public access.*"

Laboratory Results and Corresponding Sample Information for Physicochemical Conditions in Water, Sediment or Fish Tissue

1. Storage. This information is stored in an Illinois EPA version of the STORET (version 2.x) system and then regularly transferred to the analogous national STORET system. The STORET (i.e., STORage and RETrieval) information system was created by USEPA. All results are geographically referenced via latitude and longitude coordinates of each sampling station.

2. Retrieval/Accessibility. Information in Illinois EPA STORET is available to the public upon request. Illinois-based information in national STORET is available to the public via accessing the national STORET website.

3. Timing. Although some laboratory results and corresponding sample information get stored in Illinois EPA STORET within two months of the collection date of the environmental sample, for other results much longer delays exist in the transfer to Illinois EPA STORET and subsequently to national STORET. For all results and corresponding sample information, Illinois EPA is working to decrease the lag time between sample collection and availability in national STORET, with the ultimate goal of no more than one year between collection and availability in national STORET. Existing delays are attributable to several factors: (a) difficulties in the transfer of information from Illinois EPA's Laboratory Information Management System (LIMS); (b) limited staff time and expertise to complete conversion and information transfer of Illinois EPA STORET from version 1 to version 2 (conversion and transfer to version 2 is required to allow transfer of information from Illinois EPA STORET to national STORET); and (c) limited Illinois EPA resources devoted to systems management of surface water monitoring information.

Field-Measured Results and Corresponding Sample Information for Physicochemical Conditions in Water

1. Storage. This information is stored in Illinois EPA STORET and then regularly transferred to national STORET. All results are geographically referenced via latitude and longitude coordinates of each sampling station.

2. Retrieval/Accessibility. Information in Illinois EPA STORET is available to the public upon request. Illinois-based information in national STORET is available to the public via accessing the national STORET website.

3. Timing. Similar to the situation with laboratory results, delays exist in the transfer of this information to national STORET, primarily because prior to mid-April 2006, all field-measured results were being entered by laboratory staff into Illinois EPA's LIMS, which is not designed to accommodate field-measured results as efficiently as laboratory results. To decrease delays, Illinois EPA currently is creating a database specifically for processing field-measured results and corresponding information. This database will allow efficient information entry by field staff and efficient subsequent transfer to Illinois EPA STORET, with the ultimate goal of no more than six months between the date of field measurement and availability of measurement results in national STORET.

Results and Information from Biological and Physical Habitat Monitoring

1. Storage. This information is stored in an Illinois EPA database called BIOS (Microsoft Access format). As needed, Illinois EPA continues to enhance BIOS by accommodating new information (e.g., scores for a macroinvertebrate IBI; scores for a QHEI). Because national STORET cannot readily accommodate some of the Illinois-based biological and physical habitat information, the information in Illinois EPA BIOS is not transferred to national STORET. All results in Illinois EPA BIOS are geographically referenced via latitude and longitude coordinates of each sampling station.

2. Retrieval/Accessibility. Information in Illinois EPA BIOS is available to the public upon request.

3. Timing. For Illinois EPA, most biological and physical habitat information is available in BIOS within two years of sample collection. Compared to physicochemical results of water, sediment or fish tissue samples, biological information has a longer lag time between sample collection and availability, primarily attributable to the longer processing time required for biological samples.

Results of Whole Effluent Toxicity Testing

1. Storage. This information is stored as hardcopy in Illinois EPA files.

2. Retrieval/Accessibility. Information in Illinois EPA hardcopy files is available to the public upon request.

3. Timing. Typically, results are stored in hardcopy files no later than four months after the toxicity tests are performed.

Information on Assessments of Use Attainment

1. Storage. Illinois EPA regularly assesses the attainment of each of various beneficial uses in Illinois surface waters. When applicable, potential causes and sources of impairment (nonattainment) are identified for each assessment. This assessment information is stored in the Illinois EPA version of the Assessment Database (ADB), which is a nationally standardized database created by USEPA. This database does not store physicochemical, biological or habitat results; rather, it contains the assessment related conclusions of interpreting those results. In accordance with reporting requirements in the CWA, Illinois EPA regularly provides information in the ADB to USEPA. Each water body (assessment unit) in the ADB is geographically referenced to a surface water feature in the National Hydrography Dataset (NHD).

2. Retrieval/Accessibility. Information in the Illinois EPA ADB is available to the public upon request.

3. Timing. Assessment information in the Illinois EPA ADB is updated every two years, based on the schedule of reporting required by the CWA. Information for every assessment unit is not updated on this schedule; rather, each assessment unit is addressed according to the schedule of sampling of its particular monitoring program (e.g., once every five years for each stream station in the IBS program). Currently, a lag of up to three years exists between the collection time of information used in assessments and the time the assessment conclusions are entered into the ADB.

Groundwater

There are three basic types of data to be managed in the groundwater monitoring program: field data, laboratory data, and groundwater station inventory data.

Groundwater Monitoring Data

Field data includes all data/information prepared or added to the groundwater monitoring field sheet, database coding sheet, well-site survey reports, source water assessment fact sheets or other risk assessment documents. Normally, the person collecting samples maintains this information. Monitoring at all stations is completed with Hydrolab® samplers to ensure optimum conditions are reached prior to sample collection. Field and laboratory analysis sheets are filled out completely and accurately. Field parameter data should be collected, as outlined in Section M-2.2.1 of the BOW QAPP (IEPA 1994) and accurately recorded on the field sheet. Likewise, all other reported documentation is field verified to ensure that database information, as well as assessment data maintained by Illinois EPA, is accurate. Then the data are submitted to the appropriate Illinois EPA supervisory staff, such that updates can be made.

Laboratory data are generally obtained through the Illinois EPA Laboratories. The data can be provided in two basic formats, hard copy and electronically, through databases. Hard copies are provided to the Planning and Assessment Unit Manager who then submits the results to the appropriate sample collector and CWS official. Electronic data are currently being compiled on the LIMS and transferred to a holding bin where it is reviewed for QC. All change to data must be made manually, and then the data are electronically transferred to SDWIS and PROTEUS.

The initial station selection depends on a number of programmatic constraints as described in Section M-1.0 of the BOW QAPP (IEPA 1994). Once a well is selected as a sample station and it is included as part of the monitoring network, basic inventory data are assimilated. The groundwater station inventory data should include the geologic profile of the well, physical attributes of the well, and any data describing the well (or well field). These data are researched and verified whenever it is possible, through driller's logs, engineering files, operator interviews, and on-station validation. The data are then reconciled with the Illinois EPA data systems.

1. Storage. All ambient groundwater and compliance monitoring data are now in SDWIS. SDWIS is being integrated with PROTEUS. PROTEUS is a database under development using web-based development tools. Groundwater, source water, and public water supply engineering evaluation data and SDWIS will be integrated in a new database.

2. Retrieval/Accessibility. PROTEUS will enhance the current retrieval and accessibility to SDWIS data. SDWIS data are currently available to the public over the internet via Drinking Water Watch (http://www.epa.state.il.us/drinking-water-watch/index.jsp). PROTEUS will also provide accessibility externally via SWAP ArcIMS (http://www.epa.state.il.us/enfo/) and internally via MSSQL 2005 reporting tools®.

3. Timing. The ambient network samples are collected and submitted to Illinois EPA laboratories. Inorganic analysis is performed by the Champaign laboratory, with an average turnaround time of four to six months. Organic samples are submitted to the Springfield laboratory, where the turnaround time tends to be one month. Hard copies are mailed to Illinois EPA BOW in Springfield once testing is completed. Laboratory Information Management System (LIMS) transfers the analytical data electronically to a holding bin, as described above, until QC of the information is completed. The timing for transfer to SDWIS/PROTEUS varies based on the number of errors.

Recommendations and Strategies for Improvement

Illinois EPA BOW recognizes the need for improving data management. As resources allow during the years covered by this monitoring strategy, Illinois EPA BOW intends to address various gaps and weaknesses in data management as addressed below. These improvements would result in direct benefits to both public users and Illinois EPA users of surface water monitoring information while helping to advance several of Illinois EPA BOW's primary monitoring objectives.

Improvements in Storage

Illinois EPA BOW will learn if and how STORET can accommodate continuous monitoring results. To maximize their utility, the results of continuous monitoring of ambient physicochemical conditions need to be stored in an accessible database. Continuous monitoring refers to placement of equipment in ambient conditions to record automatically over short intervals (e.g., once every 30 minutes) selected parameters such as water temperature, DO, pH, and specific conductivity. Continuous monitoring at a station can last from one day to several weeks depending on specific objectives.

Illinois EPA BOW will evaluate the feasibility of direct entry of field-measured physicochemical, biological, and physical habitat data to computer databases. Direct entry of field data to a computer database improves efficiency and reduces the chance of errors in recording measurements by hand to hardcopy and then entering by hand from hardcopy to the computer database.

Illinois EPA BOW will develop computer assisted data-checking procedures (e.g., logic tests) to enhance the quality of the information being stored. Data checking before rather than after storage in Illinois EPA STORET improves efficiency and limits the potential of unknowingly providing erroneous data to users.

Illinois EPA BOW will continue to standardize and enhance the information related to each result stored in our databases. For each applicable result of a laboratory analysis, specific information about the method of analysis, method detection limit, minimum or maximum quantitative limit, and reporting limit will be included. These specifics improve a data user's ability to interpret the result.

Regarding USEPA's recent decision to phase out the national STORET system, Illinois EPA BOW will evaluate alternatives to our current storage and retrieval of data in Illinois EPA STORET. Illinois EPA will work toward meeting the requirements of uploading information to the new national system by the end of 2009, which is when USEPA anticipates they will no longer accept STORET exports.

Improvements in Retrieval/Accessibility

Illinois EPA BOW will develop ways to enhance information retrieval from our primary databases, Illinois EPA STORET and BIOS. Ultimately, Illinois EPA BOW will work toward a single, web-based, map-based system for easy retrieval of all the types of surface water monitoring and assessment information available for a station or for multiple stations (as selected) throughout the state. This system would serve both the public as well as Illinois EPA staff who must interpret monitoring information to meet the various monitoring objectives addressed earlier in this document. Ideally, to be most useful to Illinois EPA users, the system will also include preprogrammed data analysis routines that perform typical data comparisons used perennially to assess attainment of designated uses and to identify potential causes of use impairment. For example, the system may include routines that determine the number and percentage of exceedances of relevant numeric thresholds of chemical, physical, or biological conditions. By making surface water monitoring data and related information widely and easily accessible to a broad range of users, this retrieval system would encourage and enhance the use of this information to support a broader range of water quality objectives than the typical status and trends reporting.

Until this ultimate map-based retrieval system is fully developed and operational, Illinois EPA BOW will make smaller enhancements. Illinois EPA BOW will examine ways to link BIOS information to the existing “Water Quality Mapping Tool” (available at Illinois EPA's website) so that the biological and physical habitat information in BIOS can be accessed by the public via a simple, map-based program. To help Illinois EPA users retrieve biological and physical habitat information in the BIOS database, a front-end query form will be created that provides data in a report-ready tabular format. This enhancement will improve Illinois EPA BOW staff's ability to obtain, interpret, and then report on aquatic life conditions, thus serving several of Illinois EPA BOW’s primary surface water monitoring objectives 1a, 1b, 1c, and 4 (Table 1).

Improvements in Timing

Illinois EPA BOW will examine ways to speed the flow of information at all steps: sample collection, initial processing, computer storage, and computer retrieval. However, increasing the speed of information flow must be balanced with the time required to ensure the integrity of the information. Specifically, to improve initial processing, Illinois EPA BOW will create new data forms to communicate better with various laboratories the types of analyses requested. These forms will also be standardized to improve efficiency and accuracy of computer storage and retrieval of lab results and related sample information. By improving the organization and speed of initial flow of results into computer databases, Illinois EPA BOW speeds their availability and thereby enhances the abilities of data users and decision makers in achieving primary objectives.

DATA ANALYSIS AND ASSESSMENT

Overview

The CWA requires Illinois EPA to determine and report regularly on the extent to which the beneficial uses of the state's waters are being attained. The beneficial uses assessed by Illinois EPA include *potable resource groundwater*, *primary contact* (e.g., swimming, water skiing), *fish consumption*, *aquatic life*, and *aesthetic quality*. The guidelines and criteria used by Illinois EPA BOW to assess attainment of uses are explained in *Illinois Integrated Water Quality Report and Section 303(d) List - 2006* (IEPA 2006b), available on the Illinois EPA website, http://www.epa.state.il.us/water/water-quality/index.html.

To assess attainment of beneficial uses of surface water, Illinois EPA BOW uses water quality data collected via various surface water monitoring programs and activities. These monitoring data are also critical for identifying potential causes of use impairment and for reviewing the adequacy of existing water quality standards, effluent limits in permits, and nondegradation decisions. Table 5 provides a summary of the data typically used. For a more detailed explanation of how Illinois EPA BOW analyzes and interprets water quality data to assess attainment of uses and to identify causes of impairment, see *Illinois Integrated Water Quality Report and Section 303(d) List - 2006* (IEPA 2006b).

Illinois EPA BOW plans to continue its participation in interstate cooperative activities on the Mississippi River. This work has been facilitated through the Upper Mississippi River Basin Association and includes five upper Mississippi River states (Minnesota, Wisconsin, Iowa, Illinois and Missouri) along with support from USEPA Regions 5 and 7. These states have a memorandum of understanding delineating assessment reaches on the Mississippi River and have developed several reports that are available on the UMBRA website (http://www.umrba.org/wq) regarding issues on this interstate water.

Data Solicitation

Illinois EPA BOW continues to refine the process of soliciting data for consideration in assessing attainment of beneficial uses and in identifying causes of use impairment. Guidance and associated information on how to submit data to Illinois EPA are provided in "*Guidance for Submittal of Surface Water Data,*" available on the Illinois EPA website, http://www.epa.state.il.us/water/water-quality/guidance.html. As appropriate, Illinois EPA BOW will update this guidance for the Integrated Report due in April 2008, and subsequently thereafter.

Illinois EPA BOW also expects to continue the routine consideration of physical and chemical water data provided by public entities such as the city of Chicago (Lake Michigan data), USGS, the Lake County Public Health Department, and any organizations that respond to our solicitation.

REPORTING

Illinois Integrated Water Quality Report and Section 303(d) List - 2006

The *Illinois Integrated Water Quality Report and Section 303(d) List - 2006* (IEPA 2006b) was the first time Illinois EPA combined information that was previously reported in two documents, the *Illinois Water Quality Report* and *Illinois Section 303(d) List*. This integrated report format is based on new federal guidance designed to fulfill the requirements of CWA Sections 305(b), 303(d), and 314. While much of the information remains the same, significant changes from previous reports are explained in the integrated report.

In spite of these changes, the basic purpose of this report is the same as previous water quality reports—to provide information to the federal government and the citizens of Illinois on the condition of surface water and groundwater in the state. An electronic copy of the *Illinois Integrated Water Quality Report and Section 303(d) List - 2006* (IEPA 2006b) may be found on Illinois EPA's website at http://www.epa.state.il.us/water/tmdl/303d-list.html.

Section 319 Nonpoint Source Reports

Grants issued by USEPA under CWA Section 319 include a condition requiring the submittal of a status report every six months. This report is prepared to satisfy that condition and publicize the Illinois EPA's accomplishments in controlling NPS pollution. Copies of these reports may be found on the Illinois EPA's website at http://www.epa.state.il.us/water/watershed/reports/biannual-319/index.html.

Beaches Act Reports

Data collected in the open waters of Lake Michigan, along with data collected by local agencies at approximately 51 Lake Michigan beaches during the swimming season, are used to assess *primary contact use* in Lake Michigan and its swimming beaches. These data are reported in *Illinois Integrated Water Quality Report and Section 303(d) List - 2006* (IEPA 2006b) and by the Illinois Department of Public Health on its website at http://www.idph.state.il.us/envhealth/beachhome.htm. This program fulfills, in part, requirements of the Beaches Environmental Assessment and Coastal Health Act of 2000.

Intensive Basin Survey Reports

The chemical, biological, and physical data generated from the intensive basin surveys are used and reported in a variety of documents and media. The primary written reports include BOW IBS reports, the *Illinois Integrated Water Quality Report and Section 303(d) List - 2006* (IEPA 2006b), and biological stream characterization.

Specific Basin Reports

The BOW developed a very detailed format for IBS reporting with the first basin report completed in 1977. From the period of 1982 through 1997, over 30 basin reports were developed covering virtually every major watershed in Illinois. With the second cycle of basin surveys initiated in 1996 and completed in 2000, there was no longer a need for some of the detail provided in previous reports. The accelerated five-year completion schedule also necessitated some reporting format changes. Currently, Illinois EPA IBS reports include an executive summary and all data collected for that survey. These reports are currently prepared as time allows.

Illinois Clean Lakes Monitoring Program Reporting

For each Phase I or Phase II project, a detailed final report is required. A typical Phase I report includes a detailed analysis of historical limnological data and one year of current limnological data, including morphology and bathymetric, shoreline, and macrophyte maps. In addition, nutrient, sediment, and water budgets are defined for the lake. Other information is provided including a summary of lake usage, a detailed description of land use in the watershed, an estimate of the amount of NPS pollution contributed to the lake by each land use category, as well as a discussion of biological resources and their ecological relationships. Finally, recommendations are made for protection/restoration activities, including costs and time schedules. For Phase II projects, the final report includes details for each water quality improvement project implemented and a discussion of the success or failure of each.

Lake Michigan Monitoring Program

Lake Michigan data are used to develop use support assessments required by CWA Section 305(b). These use assessments are based on current general use water quality standards and guidelines as described in the *Illinois Integrated Water Quality Report and Section 303(d) List - 2006* (IEPA 2006b). The Illinois EPA and the City of Chicago, biennially as required by statute, jointly prepare a separate detailed report summarizing Lake Michigan water quality.

Total Maximum Daily Load Reports

CWA Section 303(d) requires states to identify waters that do not meet applicable water quality standards or do not fully support their designated uses. States are required to submit a prioritized list of impaired waters, known as the 303(d) List, to the USEPA for review and approval. The CWA also requires that a TMDL be developed for each identified pollutant in an impaired water body. Completed TMDL reports may be found on the Illinois EPA website at http://www.epa.state.il.us/water/tmdl/report-status.html.

Reporting of Whole Effluent Toxicity Testing

Results from Illinois EPA sponsored bioassays are distributed to pertinent staff, usually within a few months of the lab report becoming available. The cover memorandum contains explicit instructions for the Permit Section to incorporate the appropriate monitoring conditions in the renewed permit. The report and summary sheet become part of the permit or division files after submission to Permit Section.

Fish Contaminant Monitoring Reporting

In the annual publication, G*uide to Illinois Fishing Regulations*, the IDNR provides a list of water bodies where fish consumption advisories exist. This guide is available at all IDNR offices and commercial facilities where Illinois fishing licenses are available. It is available electronically on IDNR's website at http://dnr.state.il.us/fish/digest/index.htm. The Illinois Department of Public Health also posts fish consumption advisories on their website at http://www.idph.state.il.us/envhealth/fishadv/fishadvisory05.htm, and publishes and distributes additional outreach materials as needed. Additionally, Illinois EPA uses fish consumption advisories and fish tissue data to assess attainment of *fish consumption use* in waters throughout Illinois. These assessments are reported in the *Illinois Integrated Water Quality Report and Section 303(d) List - 2006* (IEPA 2006b).

Illinois Groundwater Protection Program Biennial Comprehensive Status and Self-Assessment Reports

These biennial reports provide a policy perspective on groundwater quality and quantity protection in Illinois, including a comprehensive status and assessment of the program. Further, these documents provide the reporting required concerning a water quantity planning and management program. The Illinois Groundwater Protection Act created a comprehensive, prevention-based policy focused on the beneficial uses of groundwater and preventing degradation. The biennial reports give the status of various elements of groundwater protection, and provide future directions for groundwater protection program activities. The biennial reports, first completed in 1988-1989, may be found on the Illinois EPA's website at http://www.epa.state.il.us/water/groundwater/groundwater-protection/index.html.

PROGRAMMATIC EVALUATION

Illinois EPA water monitoring programs are reviewed annually in conjunction with preparation of the Illinois EPA/USEPA Environmental Performance Partnership Agreement (EnPPA). This agreement, which sets the mutual state/federal agenda of continued environmental progress, also outlines Illinois EPA plans to prevent, control, and abate water pollution on a fiscal year basis, and the strategy for conducting ongoing surface water programs and new monitoring initiatives. The EnPPA is an evolving public document that allows the general public an opportunity to understand and comment on Illinois EPA surface water monitoring programs.

Evaluation of the effectiveness of surface water monitoring programs to provide suitable and timely data to achieve the program objectives established in this strategy is a continual and ongoing process in the BOW. In addition to annual reviews conducted for the Illinois EPA Environmental Performance Agreement, preparation of the *Illinois Integrated Water Quality Report and Section 303(d) List - 2006* (IEPA 2006) provides the Illinois EPA with a mechanism to evaluate the adequacy of surface water monitoring programs and geographic coverage in Illinois. This reporting effort also affords the Illinois EPA an opportunity to assess the extent to which appropriate data are available for assessment of environmental impairments, short and long-term trends, and the effectiveness of water pollution control programs. The annual EnPPA and the Integrated Report serve to continually indicate that the Illinois EPA is on target in acquiring monitoring information to meet program objectives.

GENERAL SUPPORT AND INFRASTRUCTURE PLANNING

The U.S. Environmental Protection Agency (USEPA 2003b) requests that each state describe how it addresses the monitoring element called "General Support and Infrastructure Planning." Specifically, USEPA (2003b) requests that "*the State identifies current and future monitoring resources it needs to fully implement its monitoring program strategy*."

This part of the monitoring strategy describes the current status of Illinois EPA BOW's monitoring resources and the projected needs for advancing our primary monitoring objectives (Tables 1 and 3). These projected needs address monitoring/assessment efforts that either are planned for 2007 through 2012 (Table 3) or represent potential future action.

Current Staff and Training

Illinois EPA BOW's inability to hire and maintain sufficient numbers of well-qualified staff is a major limiting factor in advancing our primary monitoring objectives. Since 2002, the number of staff in the Bureau of Water has decreased by about 17 percent while there has been no concurrent reduction in responsibilities or expected output. Surface Water Section monitoring staff, who work in the Bureau of Water, has decreased by ten percent.

For Illinois EPA staff, general skills training in computer use, writing, and personal development is available through an Illinois EPA group that coordinates with potential vendors to provide training. Specific technical training also is available to BOW staff through formal courses and workshops offered by USEPA, professional organizations or private corporations. These courses and workshops include topics such as specific database application instruction, understanding and applying quality assurance/control, and using biological information to define tiered aquatic life uses.

Current Laboratory Resources

Illinois EPA BOW receives laboratory analysis of water, sediment, and fish tissue samples from the Illinois EPA Division of Laboratories. Illinois EPA BOW also receives laboratory analysis of water samples from various private laboratories, under contract. In general, this combination of laboratory services is meeting the current analytical needs of Illinois EPA BOW monitoring.

Current Funding

Illinois EPA BOW's ability to advance our primary monitoring objectives (Table 1) will continue to be limited primarily by the number of well-qualified, well-trained staff, and sufficient supporting resources (e.g., laboratory resources, information-management infrastructure). Because of the primary importance of staffing and the limited budgetary scope of this monitoring strategy, Illinois EPA BOW presents projected needs in terms of additional full-time employee (FTE) equivalents (Table 8). If these projected needs are unmet, Illinois EPA BOW will be unable to fully advance all of our primary monitoring objectives.

Table 8. Projected needs for advancing Illinois EPA Bureau of Water's primary monitoring objectives.		
Monitoring/ Assessment Element	**Monitoring/Assessment Effort**	**Projected Needs**
Monitoring Design	Planned efforts *Surface Water* -Coordinate an Illinois Wetland Technical Working Group -Refine monitoring for conditions at public-water supply intakes in streams -Assist in biological assessment and monitoring in large rivers -Collect periphyton in streams -Begin collecting environmental data in headwater streams -Expand continuous monitoring parameters -Monitor effects of nutrient removal in selected wastewater-treatment discharges -Collect phytoplankton to develop phytoplankton index of lake condition -Use satellite imagery and collect Secchi-transparency data to evaluate and track water clarity in lakes -Expand monitoring of algal toxins in lakes -Expand scope and applicability of monitoring data from the VLMP -Monitor success of TMDL-based or Section 319-based restoration efforts *Groundwater* -Evaluate VOC data -Publish trend data -Continue groundwater quality standards development discussions and prepare proposal to the Illinois Pollution Control Board -Continue to implement rotating network Potential efforts -Monitor progress of site-specific water-pollution-control projects -Monitor specific impaired watersheds to evaluate the success of implemented Total Maximum Daily Load plans -Monitor the effectiveness of BMPs for alleviating impacts of nonpoint-source pollutants or pollution -Expand monitoring in Lake Michigan	Staff and Training -Additional field technicians (15 FTE) for monitoring -Additional specialists (20 FTE) to: -design and implement monitoring -coordinate routine regional monitoring and assessment with project-specific monitoring and assessment -Additional management staff (1 FTE) -Additional training, for technical staff, in: -developing and using monitoring designs -analyzing and interpreting environmental data, including statistical applications Laboratory Resources -Ensure sufficient laboratory resources to accommodate increased number of samples and parameters for analysis Funding -Additional funds to support the "Staff and Training" and "Laboratory Resources" needs described above

Environmental Indicators	-Define and designate tiered aquatic life uses and determine corresponding use-attainment criteria -Define and designate uses in wetlands and determine corresponding use-attainment criteria -Investigate and consider potential improvements to guidelines for assessing attainment of the two uses, *primary contact use* and *aesthetic quality* -Collect phytoplankton to develop a lake classification and phytoplankton index of lake condition -Begin collecting environmental data in headwater streams -Amend Groundwater Quality Standards	<u>Staff and Training</u> - Additional specialists (4 FTE) to: -develop and apply water quality standards (including new uses) and environmental indicators -Additional training, for technical staff, in: -defining and designating beneficial uses -understanding and applying use-attainability analysis -understanding and developing water quality standards, including biological criteria -understanding and using statistics for all of the above <u>Laboratory Resources</u> (not applicable) <u>Funding</u> -Additional funds to support the "Staff and Training" needs described above
Quality Assurance	-Review current sampling techniques, core parameters, and implement changes to applicable "Standard Operating Procedures" as necessary to enhance collection methods and resultant data quality -Review recent advances in method development and refinement by the U.S. Geological Survey and other agencies and build on these improvements -As new information on biological indices and field-sampling methods becomes available, corresponding revisions to information-collection or information-management guidelines will be made -Enhance post-analysis quality control of analytical results (e.g., incorporate logic tests)	<u>Staff and Training</u> -Additional specialists (3 FTE) to develop and apply quality assurance and quality control -Additional training, for technical staff, in understanding, developing, and applying quality assurance and quality control <u>Laboratory Resources</u> -Additional database capability for post-analysis quality control of analytical results before release, including logic tests

		Funding -Additional funds to support the "Staff and Training" and "Laboratory Resources" needs described above
Data Management	Data/information storage -Learn if and how STORET can accommodate continuous-monitoring results -Evaluate the feasibility of direct entry of field-measured physicochemical, biological, and physical-habitat data to computer databases -Develop computer-assisted data-checking procedures (e.g., logic tests) to enhance the quality of the information being stored -Continue to standardize and enhance the information related to each stored result -Evaluate alternatives to our current storage and retrieval of data in Illinois EPA STORET and work toward meeting the requirements of uploading information to the new national system Data/information retrieval -Work toward a single, web-based, map-based system for easy retrieval of surface-water monitoring and assessment information Data/information timing -Examine ways to speed the flow of information at all steps of "data management": sample collection, initial processing, computer storage, and computer retrieval	Staff and Training - Additional specialists (6 FTE) to: -process and manage data/information -develop geospatial databases -develop and apply web-based applications for storage and retrieval of monitoring and assessment information -coordinate continued out-sourcing of data/information management to non-IEPA entities -Additional management staff (1 FTE) -Additional training, for technical staff, in: -processing and managing computer-based data/information -developing and using geospatial databases -developing and using web-based storage and retrieval systems Laboratory Resources -Additional database capability for post-analysis quality control of analytical results before release, including logic tests -Additional capability for tracking the status of samples submitted for analysis -Additional capability for directly querying the IEPA laboratory database (i.e., LIMS)

		<u>Funding</u> -Additional funds to support the "Staff and Training" and "Laboratory Resources" needs described above
Data Analysis and Assessment	-Continue to refine the bases and guidelines for determining attainment of uses; for identifying potential causes of use impairment; and for reviewing the adequacy of existing water quality standards, effluent limits in permits, and nondegradation decisions	Other than those mentioned above, no specific "Data Analysis and Assessment" efforts are identified. Refinements occur as time, expertise, and resources allow. <u>Staff and Training</u> -Additional staff and training, as needed <u>Laboratory Resources</u> (not applicable) <u>Funding</u> -Additional funds to support the "Staff and Training" needs described above
Administrative Support		<u>Staff and Training</u> -Additional staff (4 FTE) <u>Laboratory Resources</u> (not applicable) <u>Funding</u> -Additional funds to support the "Staff and Training" needs described above
		Total FTE = 54

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APPENDICES

Illinois Water Monitoring Strategy

2007-2012

Illinois Environmental Protection Agency
Bureau of Water
Springfield, IL

APPENDIX A

Laboratory and Field Parameters Assessed in Bureau of Water Monitoring Programs

Illinois Environmental Protection Agency
Bureau of Water
Springfield, IL

Appendix A. Laboratory and field parameters assessed in Bureau of Water Monitoring Programs.

STORET #	Parameter	BIOSURVEY Facility-Related	BIOSURVEY Intensive Basin	FISH TISSUE	AWQMN	LAKES AND RESERVOIRS ALMP	LAKES AND RESERVOIRS VLMP	LAKES AND RESERVOIRS Clean Lakes	LAKES AND RESERVOIRS Lake Michigan	POINT SOURCE	GROUND-WATER
Water Inorganics											
410	Alkalinity, Total as CaCO3		X		X*	X		X			X
415	Alkalinity, Pheno. as CaCO3					X		X			
1106	Aluminum, Dissolved	X	X		X						
1105	Aluminum, Total	X	X		X	X*		X*	X	X	X
1097	Antimony										X
1002	Arsenic, Total	X*	X*		X*			X*	X	X*	X
1005	Barium, Dissolved	X	X		X	X*					
1007	Barium, Total	X	X		X	X*		X*	X	X	X
1010	Beryllium, Dissolved	X	X		X						
1012	Beryllium, Total	X	X		X	X*		X*	X	X	X
80082	BOD, Carbonaceous	X								X	
310	BOD, Total	X								X*	
1020	Boron, Dissolved	X	X		X	X*		X*			
1022	Boron, Total	X	X		X	X*			X	X	X
1025	Cadmium, Dissolved	X	X		X						
1027	Cadmium, Total	X	X		X	X*		X*	X	X	X
915	Calcium, Dissolved	X	X		X						
916	Calcium, Total	X	X		X	X*		X*	X	X	X
940	Chloride, Total	X*	X*		X*				X	X	X
1030	Chromium, Dissolved	X	X		X						
1032	Chromium, Hex.									X*	
1034	Chromium, Total	X	X		X	X*		X*	X	X	X
1035	Cobalt, Dissolved	X	X		X						
1037	Cobalt, Total	X	X		X	X*		X*	X	X	X
94	Conductivity, Lab	X*	X*		X*	X		X	X	X	
1040	Copper, Dissolved	X	X		X						
1042	Copper, Total	X	X		X	X*		X*	X	X	X
718	Cyanide, Dissolved									X*	
720	Cyanide, Total	X*	X		X*				X		X
31616	Fecal Coliform Bacteria				X				X		
951	Fluoride	X*	X*		X*				X	X*	X
900	Hardness	X	X		X	X*		X*	X	X	X
1046	Iron, Dissolved	X	X		X						
1045	Iron, Total	X	X		X	X*		X*	X	X	X
1049	Lead, Dissolved	X	X		X						
1051	Lead, Total	X	X		X			X*	X	X	X
925	Magnesium, Dissolved	X	X		X						
927	Magnesium, Total	X	X		X	X*		X*	X	X	X
1056	Manganese, Dissolved	X	X		X						
1055	Manganese, Total	X	X		X	X*		X*	X	X	X
71900	Mercury	X	X		X				X	X	X
1065	Nickel, Dissolved	X	X		X						
1067	Nickel, Total	X	X		X	X*		X*	X	X	X
610	Nitrogen, Ammonia	X	X		X	X	X*	X	X	X	X
625	Nitrogen, Kjeldahl	X*	X		X	X		X		X*	
630	Nitrogen, NO3+NO2	X	X		X	X	X*	X	X	X	X
556	Oil and Grease	X*								X	
680	Organic Carbon, Total	X*	X*		X*					X*	
32730	Phenols	X*	X*		X*				X	X*	X
666	Phosphorus, Dissolved	X	X		X	X		X	X		
665	Phosphorus, Total	X	X		X	X	X*	X	X	X	X
400	pH, Lab	X*	X*		X*	X		X	X	X	
937	Potassium Total	X	X		X	X*		X*	X	X	X
935	Potassium, Dissolved	X	X		X						
11503	Radium 226 and 228, Total								X*	X*	X*
1147	Selenium				X						X
956	Silica								X		X
1075	Silver, Dissolved	X	X		X						
1077	Silver, Total	X	X		X	X*		X*	X	X	X
929	Sodium Total	X	X		X	X*		X*	X	X	X
930	Sodium, Dissolved	X	X		X						
70300	Solids, Dissolved (ROE)	X*	X		-				X	X	X
530	Solids, Total Suspended	X	X		X	X	X*	X		X	

Appendix Table 1. (cont) Laboratory and field parameters assessed in Bureau of Water Monitoring Programs.

		BIOSURVEY				LAKES AND RESERVOIRS					
STORET #	Parameter	Facility-Related	Intensive Basin	FISH TISSUE	AWQMN	ALMP	VLMP	Clean Lakes	Lake Michigan	POINT SOURCE	GROUND-WATER
Water Inorganics (cont)											
535	Solids, Volatile Suspended	X*	X		X	X	X*	X		X	
1080	Strontium, Dissolved	X	X		X						
1082	Strontium, Total	X	X		X	X*		X*	X	X	X
945	Sulfate	X*	X		X*			X*	X	X	X
745	Sulfide									X*	
1059	Thallium										X
76	Turbidity, NTU	X*	X		X	X	X*	X	X	X	
1085	Vanadium, Dissolved	X	X		X						
1087	Vanadium, Total	X	X		X	X*		X*	X	X	X
1090	Zinc, Dissolved	X	X		X						
1092	Zinc, Total	X	X		X	X*		X*	X	X	X
Water Organics											
00000	4-Methylphenol									X*	
00000	4,6-Dinitro-2-methylphenol									X*	
00000	2-Methylphenol									X*	
00000	4-Chloroaniline									X*	
00000	4-Nitroaniline									X*	
34200	Acenaphthylene									X*	
34205	Acenaphthene									X*	
34220	Anthracene									X*	
34230	Benzo (B) Fluoranthene									X*	
34242	Benzo (K) Fluoranthene									X*	
34247	Benzo (A) Pyrene					X*		X*		X*	X
34273	Bis (2-Chloroethyl) Ether									X*	
34278	Bis (2-Chloroethoxy) Methane									X*	
34283	Bis (2-Chloroisopropyl)									X*	
34292	Butyl Benzyl Phthalate									X*	
34320	Chrysene									X*	
34336	Diethylphthalate									X*	
34341	Dimethylphthalate									X*	
34376	Fluoranthene									X*	
34381	Fluorene									X*	
70017	Hexachlorocyclopentadiene					X*		X*		X*	
34391	Hexachlorobutadiene									X*	
34396	Hexachloroethane									X*	
34403	Ideno (1,2,3-cd) Pyrene									X*	
34408	Isophorone									X*	
34428	N-Nitroso-di-n-Propylamine									X*	
34447	Nitrobenzene									X*	
34452	4-Chloro-3-Methylphenol									X*	
34461	Phenanthrene									X*	
34469	Pyrene									X*	
34488	Trichlorofluoromethane									X*	
34521	Benzo (GHI) Perylene									X*	
34526	Benzo(A)Anthracene									X*	
34531	1,2-Dichloroethane									X*	
34556	Dibenz (AH) Anthracene									X*	
34576	2-Chloroethylvinyl Ether									X*	
34581	2-Chloronaphthalene									X*	
34586	2-Chlorophenol									X*	
34591	2-Nitrophenol									X*	
34596	Di-N-Octylphthalate									X*	
34601	2,4-Dichlorophenol									X*	
34606	2,4-Dimethylphenol									X*	
34611	2,4-Dinitrotoluene									X*	
34616	2,4-Dinitrophenol									X*	
34621	2,4,6-Trichlorophenol									X*	
34626	2,6-Dinitrotoluene									X*	
34631	3,3'-Dichlorobenzidine									X*	
34636	4-Bromophenyl Phenyl Ether									X*	
34641	4-Chlorophenyl Phenyl Ether									X*	
34646	4-Nitrophenol									X*	

Appendix Table 1. (cont) Laboratory and field parameters assessed in Bureau of Water Monitoring Programs.

STORET #	Parameter	BIOSURVEY Facility-Related	BIOSURVEY Intensive Basin	FISH TISSUE	AWQMN	LAKES AND RESERVOIRS ALMP	LAKES AND RESERVOIRS VLMP	LAKES AND RESERVOIRS Clean Lakes	LAKES AND RESERVOIRS Lake Michigan	POINT SOURCE	GROUND-WATER
Water Organics (cont)											
34694	Phenols									X*	
34696	Naphthalene									X*	
39100	Bis(2-Ethylhexyl) Phthalate									X*	
39110	Di-N-Butylphthlate									X*	
77041	Carbon Disulfide									X*	
77057	Vinyl Acetate									X*	
77103	2-Hexanone (MSK)									X*	
77147	Benzyl Alcohol									X*	
77247	Benzoic Acid									X*	
77277	Bromochloromethane									X*	
77416	2-Methylnaphthalene									X*	
77687	2,4,5-Trichlorophenol									X*	
78113	Ethylbenzene									X*	
78124	Benzene									X*	
78131	Toluene									X*	
78133	4-Methyl-2-Pentanone(MIBK)									X*	
78300	3-Nitroaniline									X*	
81302	Dibenzofuran									X*	
81552	Acetone									X*	
81595	2-Butanone (MEK)									X*	
39032	Pentachlorophenol	X*			X	X*		X*	X*	X*	X
39350	Chlordane Tech & Met	X*			X	X*		X*	X*		X
39062	Chlordane cis isomer	X*			X				X*		
39065	Chlordane trans isomer	X*			X				X*		
39330	Aldrin	X*			X	X*		X*	X*		
39337	alpha BHC	X*			X				X*		
39340	gamma BHC (Lindane)	X*			X*	X*		X*	X*		X
39700	Hexachlorobenzene	X*			X*	X*		X*	X*	X*	
39300	p,p' DDT	X*			X*	X*		X*	X*		
39310	p,p' DDD	X*			X*	X*		X*	X*		
39320	p,p' DDE	X*			X*	X*		X*	X*		
39380	Dieldrin	X*			X*	X*		X*	X*		
39390	Endrin				X*	X*		X*			X
39480	Methoxychlor				X*	X*		X*	X*		X
39516	PCB's				X*	X*		X*	X*	X*	X
39400	Toxaphene					X*		X*	X*		X
39410	Heptachlor				X*	X*		X*			X
39420	Heptachlor epoxide				X*	X*		X*			X
39348	Alpha-Chlordane				X*						
39810	Gamma-Chlordane				X*						
39730	2,4-D				X*	X*		X*			X
39760	Silvex				X*	X*		X*			X
30200	Dalapon				X*	X*		X*			X
38442	Dicamba				X*	X*		X*			
30191	Dinoseb				X*	X*		X*			X
39720	Picloram				X*	X*		X*			X
79193	Acifluorfen				X*	X*		X*			
30295	Propachlor					X*		X*			X*
39055	Simazine					X*		X*			X
39770	Dacthal					X*		X*			
77860	Butachlor					X*		X*			
77903	Di(2-Ethylhexyl) Adipate					X*		X*			
39107	Di(2-Ethylhexyl) Phthalate					X*		X*			X
49259	Acetochlor				X*	X*		X*			X*
Pesticide Monitoring Subnetwork											
39530	Malathion				X*						
39570	Diazinon				X*						
39600	Methyl Parathion				X*						
39630	Atrazine				X*	X*		X*			X
39640	Captan				X*						
39356	Metolachlor (Dual)				X*	X*		X*			X*
46313	Phorate				X*						

Appendix Table 1. (cont) Laboratory and field parameters assessed in Bureau of Water Monitoring Programs.

STORET #	Parameter	BIOSURVEY Facility-Related	BIOSURVEY Intensive Basin	FISH TISSUE	AWQMN	LAKES AND RESERVOIRS ALMP	VLMP	Clean Lakes	Lake Michigan	POINT SOURCE	GROUND-WATER
Pesticide Monitoring Subnetwork (cont)											
77825	Alachlor, Total (Lasso)				X*	X*		X*			X
81284	Treflan, Trifluralin				X*	X*		X*			
81294	Fonofos (Dyfonate)				X*						
81403	Chloropyrifos (Dursban)				X*						
81408	Metribuzin, Total				X*	X*		X*			X*
81410	Butylate, Total				X*						
81757	Cyanazine, (Bladex)				X*	X*		X*			X*
82088	Terbufos, Total				X*						
39357	Ronnel										
39398	Ethion										
38403	Ametryn										X*
	Dimethenamid										X*
	Flufenacet										X*
76190	Pendimethalin										X*
4037	Prometon										X*
39056	Prometryn										X*
38578	Propazine										X*
38887	Terbutryn										X*
46373	Deethylatrazine										X*
46374	Deisopropylatrazine										X*
	Cyanazine-amide										X*
	Acetochlor Ethanesulfonic Acid										X*
	Acetochlor Oxanilic Acid										X*
	Alachlor Ethanesulfonic Acid										X*
	Dimethenamid Ethanesulfonic Acid										X*
	Dimethenamid Oxanilic Acid										X*
	Flufenacet Ethanesulfonic Acid										X*
	Flufenacet Oxanilic Acid										X*
	Metolachlor Ethanesulfonic Acid										X*
	Metolachlor Oxanilic Acid										X*
Volatile Organics											
34531	1,2 Dichloroethane					X*			X*	X*	X
34423	Methylene Chloride					X*			X*	X*	X
34501	1,1-Dichloroethylene					X*			X*	X*	X
34506	1,1,1-Trichloroethane					X*			X*	X*	X
77093	Cis-1,2-Dichloroethylene					X*			X*	X*	X
34371	Ethylbenzene					X*			X*	X*	X
34496	1,1-Dichloroethane								X*	X*	X
81551	Xylene					X*			X*	X*	X
78124	Benzene					X*			X*	X*	X
34301	Chlorobenzene					X*			X*	X*	X
32104	Bromoform								X*	X*	
32106	Chloroform								X*	X*	
34716	Dichlorobenzene								X*	X*	
39180	Trichloroethylene					X*			X*	X*	X
32102	Carbon Tetrachloride					X*			X*	X*	X
34546	Trans - 1,2 Dichloroethylene					X*			X*	X*	
	Dichlorobromomethane								X*	X*	
34475	Tetrachloroethylene					X*			X*	X*	
78131	Toluene					X*			X*	X*	X
32105	Chlorodibromomethane								X*	X*	
32101	Bromodichloromethane									X*	
34511	1,1,2-Trichloroethane					X*				X*	X
34551	1,2,4-Trichlorobenzene					X*				X*	X
34536	1,2-Dichlorobenzene					X*				X*	X
34571	1,4-Dichlorobenzene					X*				X*	X
34541	1,2-Dichloropropane					X*				X*	X
77128	Styrene					X*				X*	X
34475	Tetrachloroethylene									X*	X
34546	Trans-1,2-Dichloroethylene									X*	X
39175	Vinyl Chloride					X*				X*	X
77562	1,1,1,2-Tetrachloroethane										

Appendix Table 1. (cont) Laboratory and field parameters assessed in Bureau of Water Monitoring Programs.

STORET #	Parameter	BIOSURVEY Facility-Related	BIOSURVEY Intensive Basin	FISH TISSUE	AWQMN	LAKES AND RESERVOIRS ALMP	LAKES AND RESERVOIRS VLMP	LAKES AND RESERVOIRS Clean Lakes	LAKES AND RESERVOIRS Lake Michigan	POINT SOURCE	GROUND-WATER
Volatile Organics (cont)											
34516	1,1,2,2-Tetrachloroethane									X*	
77168	1,1-Dichloropropene										
77443	1,2,3-Trichloropropane										
34566	1,3-Dichlorobenzene									X*	
77173	1,3-Dichloropropane										
77170	2,2-Dichloropropane										
81555	Bromobenzene										
34413	Bromomethane									X*	
34311	Chloroethane									X*	
34418	Chloromethane					X*				X*	
34704	Cis-1,3-Dichloropropene									X*	
81522	Dibromomethane										
77970	Total Chlorotoluenes										
34699	Trans-1,3-Dichloropropene									X*	
46491	Methyl Tert-Butyl Ether					X*					X
Fish Tissue											
39105	Lipids (%)		X*	X					X		
71930	Mercury		X*	X*					X		
34680	Aldrin		X*	X					X		
34682	Chlordane		X*	X					X		
34686	Heptachloroepoxide		X*	X					X		
34688	Heptachlorobenzene		X*	X					X		
39074	alpha BHC		X*	X					X		
39376	DDT		X*	X					X		
39404	Dieldrin		X*	X					X		
39515	PCB's		X*	X					X		
34685	Endrin		X*	X					X		
34687	Heptachlor		X*	X					X		
34691	Toxaphene		X*	X					X		
39785	Gamma BHC (Lindane)		X*	X					X		
81644	Methoxychlor		X*	X					X		
81645	Mirex		X*	X					X		
Sediment Metals and Nutrients											
70322	Volatile Solids (%)		X		X*	X		X	X		
627	Kjeldahl Nitrogen		X		X*	X		X	X		
668	Phosphorus		X		X*	X		X	X		
938	Potassium		X		X*	X		X	X		
1003	Arsenic		X		X*	X		X	X		
1008	Barium		X		X*	X		X	X		
1028	Cadmium		X		X*	X		X	X		
1029	Chromium		X		X*	X		X	X		
1043	Copper		X		X*	X		X	X		
1052	Lead		X		X*	X		X	X		
1053	Manganese		X		X*	X		X	X		
1068	Nickel		X		X*	X		X	X		
1078	Silver		X		X*	X		X	X		
1093	Zinc		X		X*	X		X	X		
1170	Iron		X		X*	X		X	X		
71921	Mercury		X		X*	X		X	X		
46489	TOC, Sediment %					X		X			
70318	Solids, % Wet Sample		X		X*	X		X			
Sediment Organochlorine Compounds (µg/kg)											
39519	PCB's		X		X*	X		X	X		
39333	Aldrin		X		X*	X		X	X		
39383	Dieldrin		X		X*	X		X	X		
39359	DDT		X		X*	X		X	X		
39351	Total Chlordane		X		X*	X		X	X		
39064	Chlordane, cis isomer (Alpha)		X		X*	X		X	X		
39067	Chlordane, trans isomer (Gamma)		X		X*	X		X	X		
39393	Endrin		X		X*	X		X	X		

Appendix Table 1. (cont) Laboratory and field parameters assessed in Bureau of Water Monitoring Programs.

STORET		BIOSURVEY				LAKES AND RESERVOIRS					
#	Parameter	Facility-Related	Intensive Basin	FISH TISSUE	AWQMN	ALMP	VLMP	Clean Lakes	Lake Michigan	POINT SOURCE	GROUND-WATER
Sediment Organochlorine Compounds (µg/kg) (cont)											
39481	Methoxychlor		X		X*	X		X	X		
39076	alpha BHC		X		X*	X		X	X		
39343	gamma BHC (Lindane)		X		X*	X		X	X		
39701	Hexachlorobenzene		X		X*	X		X	X		
39413	Heptachlor		X		X*	X		X	X		
39423	Heptachlor epoxide		X		X*	X		X	X		
81618	Trifluralin		X		X*	X		X			
39631	Atrazine		X		X*	X		X			
81407	Alachlor		X		X*	X		X			
81409	Metribuzin		X		X*	X		X			
38923	Metolachlor		X		X*	X		X			
82409	Pendimethanlin		X		X*	X		X			
49196	Captan		X		X*	X		X			
82543	Cyanazine		X		X*	X		X			
39321	p,p'-DDE		X		X*	X		X			
39311	p,p'-DDD		X		X*	X		X			
39301	p,p'-DDT		X		X*	X		X			
Chlorophyll											
32211	Chlorophyll *a* (corrected)	X*	X		X*	X	X*	X	X		
32210	Chlorophyll *a* (uncorrected)	X*	X		X*	X	X*	X	X		
32212	Chlorophyll *b*	X*	X		X*	X	X*	X	X		
32214	Chlorophyll *c*	X*	X		X*	X	X*	X	X		
32218	Phaeophytin	X*	X		X*	X	X*	X	X		
Phytoplankton						X		X	X		
FIELD PARAMETERS											
61	Discharge	X	X					X			
20	Temperature, Air (ºC)	X	X		X	X		X	X	X	
10	Temperature, Water (ºC)	X	X		X	X		X	X	X	X
94	Conductivity	X	X		X	X		X	X		X
400	pH	X	X		X	X		X	X		X
299	Oxygen, Dissolved	X	X		X	X		X			
410	Alkalinity, Total as CaCO3					X		X			
415	Alkalinity, Pheno. as CaCO3					X		X			
31616	Fecal Coliform Bacteria		X		X						
76	Turbidity, NTU	X*	X		X	X		X			
90	Redox, Field										X
77	Secchi Transparency					X	X	X	X		
Fish Tissue											
81614	# of Fish		X	X		X*		X*	X		
23	Weight of Fish		X	X		X*		X*	X		
24	Length of Fish		X	X		X*		X*	X		
74990	Fish Species (Numeric)		X	X							
84005	Fish Species (Alpha)		X	X							
74995	Anatomy (Numeric)		X	X							

X - Collected on a Routine basis.
X* - Not a Routine parameter, but site specific.

APPENDIX B

Ambient Stream Water Quality
Monitoring Network

Illinois Environmental Protection Agency
Bureau of Water
Springfield, IL

Purpose of the Network

In general, the goals of Illinois EPA surface water monitoring programs are to identify causes of pollution (toxics, nutrients, sedimentation) and their sources (point and nonpoint) of surface water impairments, determine the overall effectiveness of pollution control programs and identify long-term resource quality trends. The Ambient Water Quality Monitoring Network (AWQMN) specifically is utilized by the Illinois EPA to provide baseline water quality information, to characterize and define trends in the physical, chemical and biological conditions of the state's waters, provide a continuing assessment of BOW programs, identify new or existing water quality problems and to act as a triggering mechanism for special studies or other appropriate actions. With the exception of major population-industrial areas, AWQMN stations are located outside the immediate impact of point sources. Additional uses of the data collected by the Illinois EPA through the AWQMN program include the establishment of water quality based effluent limits for National Pollutant Discharge Elimination System (NPDES) permits. The AWQMN is integrated with other Illinois EPA stream sampling programs, both chemical and biological, which are more localized geographically (specific watershed or point-source receiving stream) and cover a shorter span of time (e.g., one year) to evaluate compliance with water quality standards and to determine designated use supports as required in Clean Water Act Section 305(b).

Station Information

Historically, stream water quality data in Illinois have been collected by several state and federal agencies including the Illinois State Water Survey (ISWS), the Illinois Department of Public Health (IDPH), Illinois EPA, and the U.S. Geological Survey (USGS). This monitoring has resulted in a rich data set from streams ranging in size from small agricultural drainage ditches to the Mississippi River. Between Water Years 1972 and 1977 (a water year is October 1 through September 30), Illinois EPA operated a 538-station monitoring network. Evaluation of this older data was presented in a series of reports prepared by the Illinois Water Information System Group, headed by Ronald Flemal and Donovan Wilkin (Peckham 1980).

In 1976, USEPA published *Basic State Water Monitoring Program* (USEPA 1976). Based upon this document, Illinois EPA developed a set of criteria that were designed to identify baseline water quality conditions on a statewide basis. These criteria included locating stations in recreational areas, commercial or sport fishing areas, shellfish areas, populated areas especially near surface water supply intakes, land use areas such as municipal, industrial, agricultural, and areas of potential development. Additional considerations included clean waters as well as degraded areas of concern, co-location with USGS gaging stations, and, whenever possible, stations with previous historical data (Wallin and Schaeffer 1979). Of the 538 original stations, 108 met the selection criteria and were retained. This new network, which began operation in October 1977, incorporated USGS water quality sampling methodologies. Older stream water quality data, (i.e., from 1945 through 1971), have also been collected by the ISWS and the IDPH at many of these stations (Winget 1976).

The present AWQMN design which began in Water Year 1977 included 209 stations through September 1996. Beginning in Water Year 2001, the AWQMN was increased to 213 stations

(Appendix B, Figure 1). The network currently includes 202 stations on interior streams and the Wabash River with an additional 11 stations sampled quarterly on the Mississippi River (Appendix B, Figure 1). In addition, there are five inactive plus 13 relocated stations for a grand total of 231 (Appendix B, Table 1).

The monitoring of the three large river systems bordering Illinois is discussed in more detail under the Great River Boundary Waters subnetwork program.

Appendix B, Table 1. List of inactive Illinois EPA ambient stream stations.

IEPA Code	Stream Name	Period of Record
A-06	Ohio River	1972-91
ATF-04	North Fork Saline River	1972-03 replaced by ATF-08
B-07	Wabash River	1974-87
DT-46	Fox River	1978-98 replaced by DT-01
E-28	Sangamon River	1978-01 replaced by E-18
EO-01	South Fork Sangamon	1979-01 replaced by EO-03
F-01	Kankakee River	1978-04 replaced by F-16
GB-16	DuPage River	2001-06 replaced by GB-10
GG-02	Hickory Creek	1979-03 replaced by GG-22
GI-01	Sanitary & Ship Canal	1987-92
J-05	Mississippi River	1989-95 replace by J-98
J-83	Mississippi River	1975-89 replaced by J-05
K-04	Mississippi River	1972-99 replaced by K-22
M-04	Mississippi River	1967-99 replaced by M-12
N-10	Big Muddy River	1977-99 replaced by N-06
NB-01	Kincaid Creek	1979-97
ND-02	Crab Orchard Creek	1972-97
OI-09	Shoal Creek	1982-99 replaced by OI-07

Station location information including the Illinois EPA station code, corresponding USGS station code, stream name, county, latitude and longitude are presented in Appendix B, Table 3. Active mainstem sites in the AWQMN include nine stations on the Sangamon and Kaskaskia Rivers, eight stations on the Illinois River, seven stations on the Des Plaines River, six stations on the Fox River, five stations each on the Little Wabash and Rock Rivers and four stations each on the Embarras River, Spoon River, and Big Muddy River. There are two stations each on the Kankakee River, LaMoine River, Vermilion River (Illinois), Mackinaw River, Green River, and Macoupin Creek. The Illinois EPA AWQMN program includes eight different streams named Sugar Creek and two different Indian Creeks, Vermilion Rivers, Salt Creeks, and Little Vermilion Rivers.

The Illinois EPA utilizes an alphanumeric stream coding system consisting of one to four alphabetic characters, which indicate the stream being sampled, and two numeric characters which represent the station number on the stream. The state is divided into 14 major basins (Appendix B, Figure 2):

A	Ohio River	I	Mississippi River (South)
B, C	Wabash River	J	Mississippi River (South Central)
D	Illinois River	K, L	Mississippi River (North Central)
DT	Fox River	M	Mississippi River (North)
E	Sangamon River	N	Big Muddy River
F	Kankakee River	O	Kaskaskia River
G, H	Des Plaines River	P	Rock River

The few streams which drain directly into Lake Michigan utilize the letter "Q" as a basin identifier. However, there are no AWQMN stations in this basin. Letter designations are generally added alphabetically to major tributaries as one moves upstream from the mouth. For minor tributaries, the second letter is usually "Z". Therefore the letter furthest to the right designates the stream within a watershed being sampled. Station numbers reflect the stations establishment over time (i.e., the oldest stations are generally "01") and are not related to upstream/downstream position within the watershed drainage.

For example, station DJBZ18 designates:

D- Illinois River
J- Spoon River
B- Big Creek
Z- Slug Run
18- Station number 18 on Slug Run

The single largest change to the AWQMN station list came during the 2000 water year when the number and location of stations monitored on the Mississippi River were altered. For the 2002 cycle, sampling locations were changed at three stations—E-28, EO-01, and GB-10. On the Sangamon River, E-28 was located at the bridge in Allerton Park and was moved 4 miles upstream to correspond with the USGS gage west of Monticello. On the South Fork Sangamon River, EO-01 was moved for safety reasons from Illinois Route 29 upstream 1.3 miles to a county road west of Rochester. On the DuPage River, GB-10 was moved due to safety concerns and the proximity of new wastewater treatment plant discharges from the Plainfield-Naperville Road bridge downstream 2.2 miles to 119th Street bridge west of Naperville. In 2004, F-01 on the Kankakee River was moved for safety reasons from the I-55 bridge upstream approximately 4.5 miles to Illinois Route 53 bridge at Wilmington (F-16).

Although the Illinois EPA does not sample the Mississippi River at Thebes (I-84), it is considered part of the "active" network because the Missouri USGS collects extra samples for Illinois EPA that are analyzed by the Illinois EPA labs. The USGS and Ohio River Valley Water Sanitation Commission (ORSANCO) sample other sites on the Mississippi River, Ohio River and Wabash River that overlap Illinois EPA AWQMN stations A-06, B-07, M-04, and J-05. Since the data from these four stations are not collected by, for, or analyzed by the Illinois EPA, these stations are classified as "inactive." In addition, many of the AWQMN stations are located at USGS gaging stations, resulting in an overlap with the USGS National Water Quality Assessment Program (NAWQA) at several sites within the Upper Illinois River and Lower Illinois River NAWQA units. The results from these stations are generally limited to dissolved parameters and are therefore not directly comparable to state standards which are based on total concentrations. However, although the data itself is not considered part of the AWQMN, the Illinois EPA can use quality assured data for assessment purposes.

Sample Collection and Analysis

The Illinois EPA collects water quality samples from AWQMN stations using methods developed by the USGS (Edwards and Glysson, 1988). Stations are sampled nine times per water year (a water year runs from October 1 to September 30) on an approximately six-week cycle. Mississippi River stations are sampled quarterly. In general, water quality samples are collected utilizing three equal width increments and an equal transit rate method. This method requires equal spacing of intervals across the stream cross-section which varies with stream width, and an equal transit rate or constant speed of lowering and raising the sampler. Samples are composited in a churn splitter before being transferred to the appropriate collection bottles. Dissolved parameters are collected by filtering through a 0.45 µm filter. The samples are analyzed by Illinois EPA, Division of Laboratories. Measurements of air and water temperature, DO, conductivity, pH and turbidity are done in the field. A summary of laboratory methods is provided in Appendix B, Table 2.

Since October 1985, Illinois EPA has operated a pesticide monitoring subnetwork to expand screening for toxic organic substances. The pesticide monitoring subnetwork originally consisted of 30 AWQMN stations that were adjusted annually to provide additional monitoring coverage in conjunction with the IBS program. However, to provide more information for 305(b)/303(d) designated use assessments, the emphasis of this program has shifted beginning with the 2007 water year to ambient sites associated with or in close proximity to public water supply intakes. Six stations {Lusk Creek (AK-02), Little Wabash River (C-19), Illinois River (D-30), Sangamon River (E-18), Des Plaines River (G-15), and Bear Creek (KI-02)} were retained from the original list of stations. With the beginning of the new water year, 12 stations meeting the criteria listed above were added to these six existing stations retained from the old network. Organic sampling is conducted at each station nine times per year. The industrial solvents subnetwork which began in 1988 consisted of 32 stations but was dropped in 1999. The largest concentration of industrial solvents stations were in the Des Plaines River basin (N=13). The chlorophyll subnetwork, consisting of 32 stations, was initiated in October of 2000 in response to requirements by U.S. EPA to develop nutrient criteria.

Illinois EPA uses the AWQMN to (a) provide baseline water quality information, (b) characterize and define trends in the physical, chemical, and biological conditions of the Illinois' waters, (c) identify new or existing water quality problems, and (d) act as a triggering mechanism for special studies or other appropriate actions. Additional uses of AWQMN data include the review of existing water quality standards and establishment of water quality-based effluent limits for NPDES permits. The AWQMN is integrated with other Illinois EPA chemical and biological stream monitoring programs that are more regionally based (specific watersheds or point source receiving stream) and cover a shorter time span (e.g., one year) to evaluate compliance with water quality standards and determine designated use support as required in CWA Section 305(b). The AWQMN station selection process was intended to allow Illinois EPA to make broad generalizations on the condition of waters statewide. Illinois EPA recognizes that such generalizations are not statistically verifiable but that does not necessarily make it incorrect. Illinois EPA also recognizes that a better way to generalize with statistical validity is to incorporate a probability-based design into station selection.

Data Results

The Illinois EPA stored water quality data through December 1998 in a USEPA database known as STORET. The AWQMN data was divided into two files*:* 21ILAMB and 21ILL. The 21ILAMB file contains data from the universal parameter groups for all stations beginning in October 1977 (or later depending on when the station was established) through December 1998. Pesticides and industrial solvents data are stored in the 21ILL file. Additional data which may be available from these stations include surficial sediments, stored in 21ILSED, and fish tissue, stored in 21ILFISH. Evaluation of the older data was presented in a series of reports prepared by the Illinois Water Information System Group, headed by Ronald Flemal and Donovan Wilkin (Peckham, 1980). Older stream water quality data (i.e., from 1945 through 1971) have also been collected by the ISWS and the Illinois Department of Public Health at many of these stations and was compiled in a USGS report (Winget, 1976). Water quality data collected by the Illinois EPA during the 1978 through 1992 water years has been published in a series of reports by the USGS entitled "*Water Resources Data: Illinois, Volume 1 and 2*." Since the network was operated in cooperation with the USGS for water years 1985 through 1991, a report comparing the results of concurrent and split samples was also prepared (Melching and Coupe, 1995). These historical data are also available through the internet at www.epa.gov/storet.

Great River Boundary Waters

Great River boundary water monitoring is considered a subset of the stream Ambient Water Quality Monitoring Network because these waters constitute interstate boundaries. Specific program elements that differ from the AWQMN are described below by major river.

Mississippi River

Until 1999, the Illinois EPA maintained only four active Ambient Water Quality Monitoring Network stations. Three monitoring locations including stations at Fulton (M-04), Elsah (J-05), and Thebes, Illinois (I-84) were initially sampled on a six-week frequency and then switched to quarterly while K-04 at Keokuk, Iowa, was consistently collected nine times per year. Water quality monitoring at the Thebes site has always been conducted by the Missouri USGS for the Agency. Through the Long Term River Monitoring Program (LTRMP) and National Ambient Water Quality Assessment programs, USGS also conducts monitoring on the Mississippi River that overlaps Illinois EPA AWQMN stations. USGS currently has LTRMP stations in Pool 12 (Bellevue, Iowa), Pool 26 (Brighton, Illinois), and an open river station below St. Louis near Cape Girardeau, Missouri. Sampling frequency varies from weekly to monthly with supplemental stratified random samples.

To enhance monitoring coverage on the Mississippi River, the BOW Surface Water Monitoring Section added seven additional ambient monitoring stations on the Mississippi in 1999. The addition of these seven stations placed monitoring locations at approximate 50-mile intervals. Above St. Louis these stations are located at lock and dams while the river below St. Louis is sampled from existing boat access ramps. All stations are currently sampled on a quarterly basis.

Ohio River

The Illinois EPA works in cooperation with the Ohio River Valley Sanitation Commission (ORSANCO) on surface water monitoring activities of the Ohio River mainstem and participates in ORSANCO Monitoring Strategy and Biological Water Quality Subcommittees. Illinois EPA staff participate in the collection of fish community samples from the Ohio River mainstem at the Corps of Engineers Smithland Lock and Dam, the review of Ohio River fish tissue contaminant data and the development of Standard Operating Procedures for biological sampling on the Ohio River.

Wabash River

The Illinois EPA BOW currently samples only one AWQMN station (B-06) on the Wabash River. It is located at the Indiana Route 154 bridge at Hutsonville, Illinois. An additional water quality station is also sampled by ORSANCO at the Illinois Route 141 bridge northeast of New Haven, Illinois.

Appendix B, Table 2. Summary of Illinois EPA laboratory methods for parameters in the AWQMN.

Parameter	Sample Container	Field Preservative	Method of Analysis	Units of Measure
Fecal Coliform Bacteria	120 ml plastic	0.15 m-l0% thiosulfate at 4 °C	SM9222D	no./100ml
Total Suspended Solids	500 ml PE	cooled at 4 °C	USEPA 160.2	mg/L
Total Nitrate+Nitrite-N (NO_3+NO_2-N)	1000 ml HDPE	10 ml 20% H_2SO_4/l at 4 °C	USEPA 353.2	mg/L
Ammonia-N (NH_3+NH_4-N)	1000 ml HDPE	10 ml 20% H_2SO_4/l at 4°C	USEPA 350.1, 350.3	mg/L
Total Kjeldahl Nitrogen	1000 ml HDPE	10 ml 20% H_2SO_4/l at 4°C	USEPA 351.2	mg/L
Total and Dissolved Phosphorus	1000 ml HDPE	10 ml 20% H_2SO_4/l at 4°C	USEPA 365.1	mg/L
Total and Dissolved ICP*:* (Pb, Cu, Fe, Mn, Cd, Cr, Mg, Zn, K, Ba, Be, Co, Ni, Sr, Ca, Na, Al, B, Ag, V, Se)	250 ml PE	cooled at 4°C	USEPA 200.7, 200.8	µg/l
Sulfate (SO_4)	500 ml PE	cooled at 4°C	USEPA 375.2/9036	mg/L
Total Dissolved Solids (TDS)	500 ml PE	cooled at 4°C	USEPA 160.1	mg/L
Cyanide	250 ml PE	5 ml 5N NaOH	USEPA 335.4 / 9014	mg/L
Chloride	500 ml PE	Cooled at 4°C	USEPA 325.2/ 9251	mg/L
Total Alkalinity	500 ml PE	Cooled at 4°C	SM 2320B	mg/L
Total Mercury	500 ml glass	cooled at 4°C	USEPA 1631	µg/l
Total Hardness	500 ml PE	cooled at 4°C	USEPA 200.7	mg/L
Arsenic	250 ml PE	20 ml 50% HNO_3/l cooled at 4°C	USEPA 200.8	mg/L
Fluoride	500 ml PE	cooled at 4°C	USGS 1-4327-85	mg/L
Phenol	250 ml glass	10 ml CuS_4+H_3PO_4/l at 4°C	USEPA 420.4	µg/l

Note Dissolved metals and phosphorus are filtered through a 0.45 µm nitrocellulose membrane filter.

**General use* water quality standards based on Section 302(subpart B) of Title 35*:* Subtitle C*:* Chapter I, Illinois Pollution Control Board. June 1998. H = hardness dependent acute and chronic standards. a = acute, c = chronic

Note that sample containers have changed somewhat over time. For example, the quart polyethylene bottle was replaced by a 500 ml bottle because the smaller bottle contained enough material for analysis and was less expensive to ship to the laboratory.

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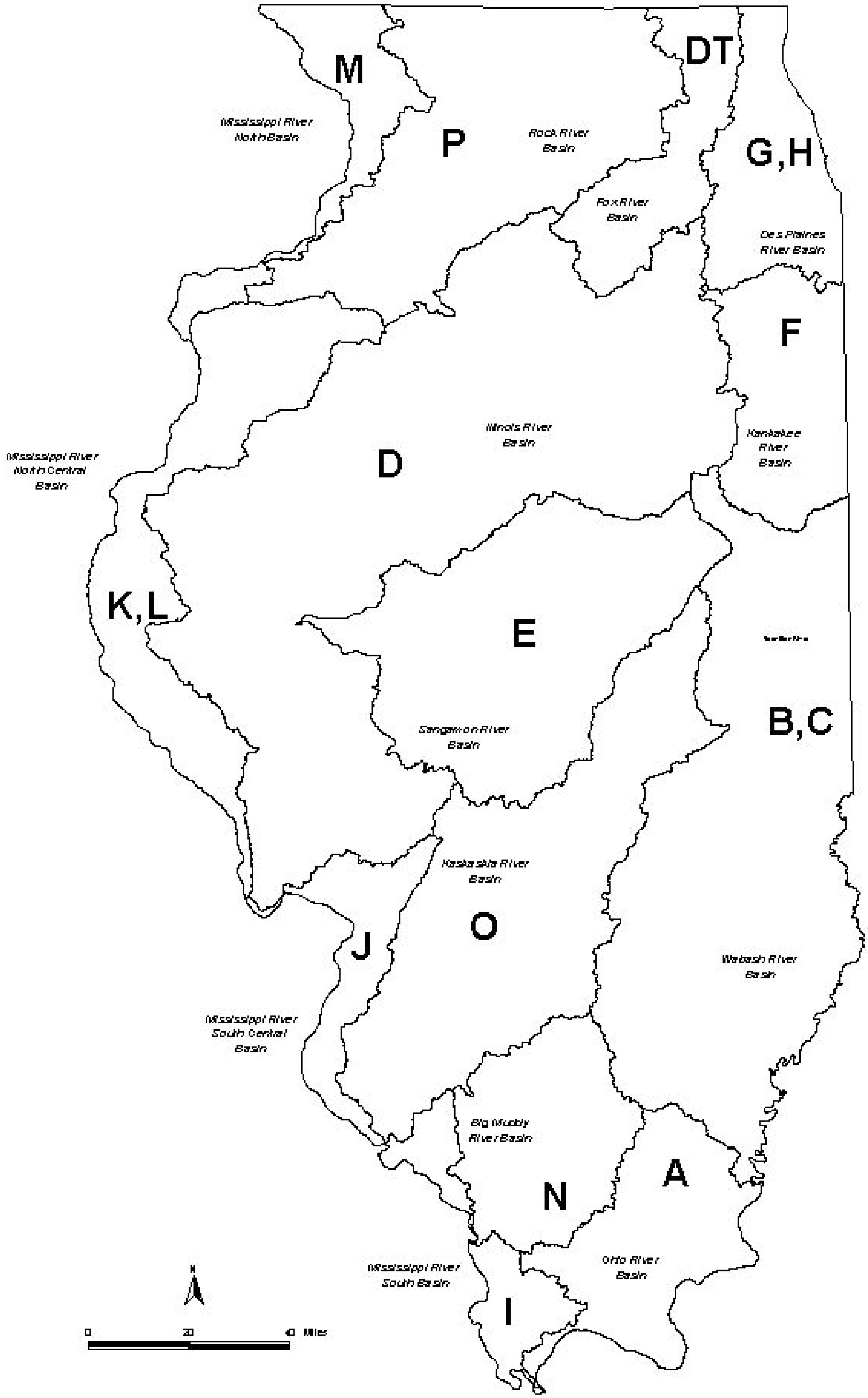
Appendix B, Figure 1. Location of Illinois EPA AWQMN stations for the 2007 water year.

Appendix B, Figure 2. Illinois EPA major basin codes.



Appendix B, Table 3. Ambient Water Quality Monitoring Network Stations

	IEPA STATION CODE	USGS STATION NUMBER	STREAM NAME	DESCRIPTION	COUNTY	LAT.	LONG.
	Ohio River Basin (A)						
*	A-06	03612500	Ohio River	RM 962.6 at Lock and Dam 53, 3 mi NE of Olmsted	Pulaski	37.2028	-89.0414
	AD-02	03612000	Cache River-Post Creek Cutoff	Belknap Rd br, 1 mi NE of Belknap	Johnson	37.3350	-88.9253
	AK-02	03384450	Lusk Creek	Eddyville Rd br, 3 mi SE of Eddyville	Pope	37.4725	-88.5476
	AT-06	03382530	Saline River	Peabody Rd br S of Buckeye Rd, 1 mi E of Gibsonia	Gallatin	37.6478	-88.2412
*	ATF-04	03382325	North Fork Saline River	US 45 br, 1 mi NE of Texas City	Saline	37.8883	-88.3849
	ATF-08		North Fork Saline River	Buffalo Rd br, 2.5 mi SE of Texas City	Gallatin	37.8676	-88.3508
	ATG-03	03382205	Middle Fork Saline River	Ingram Hill Rd br, 3 mi SE of Harrisburg	Saline	37.7077	-88.4919
	ATGC-01	03382185	Bankston Fork	SR 34 br, 2 mi N of Harrisburg	Saline	37.7679	-88.5403
	ATH-02	03382055	South Fork Saline River	Saraville Rd br, 3.5 mi S of Crab Orchard	Williamson	37.6778	-88.8034
	ATH-05	03382100	South Fork Saline River	US 45 br, 4 mi SW of Carrier Mills	Saline	37.6379	-88.6777
	ATHG-01	03382090	Sugar Creek	Stonefort Rd br, 4.5 mi NE of Creal Springs	Williamson	37.6551	-88.7634
	ATHG-05		Sugar Creek	Tyler Bridge Rd br, 3.5 mi NE of Creal Springs and ups Palzo area	Williamson	37.6521	-88.7899
	Wabash River Basin (B,C)						
	B-06	03341920	Wabash River	RM 171.8 at Clover St (1750 N) br, E edge of Hutsonville	Crawford	39.1105	-87.6550
*	B-07	03378500	Wabash River	RM 51.5 at SR 14 br, W edge of New Harmony, IN	White	38.1312	-87.9425
	BC-02	03378000	Bonpas Creek	SR 15 br, 0.5 mi NE of Browns	Edwards	38.3864	-87.9756
	BE-01	03346550	Embarras River	CR 620 N br, 1.5 mi E of Billett	Lawrence	38.6648	-87.6263
	BE-07	03345500	Embarras River	CR 1900 E br (Main St), N edge of Ste. Marie	Jasper	38.9370	-88.0224
	BE-09	03344000	Embarras River	CR 1200 N at Ryan Br, 6 mi NE of Toledo near Diona	Cumberland	39.3453	-88.1711
	BE-14	03343395	Embarras River	CR 1000 N (Main St) br, W edge of Camargo	Douglas	39.7998	-88.1704
	BEF-05	03346000	North Fork Embarras River	CR 1050 N br, 2 mi W of Oblong	Crawford	39.0002	-87.9448
	BF-01	03342050	Sugar Creek	E Franklin St br, 0.25 mi E of Palestine	Crawford	39.0046	-87.5976
	BM-02	03341540	Sugar Creek - North	Terre Haute Rd (CR 4) br, 2 mi SE of Elbridge	Edgar	39.4986	-87.5533
	BN-01	03341414	Brouilletts Creek	IN SR 71 (CR 300W) br, 1 mi N of Blanford	Vermillion, IN	39.6815	-87.5209
	BO-07	03339147	Little Vermilion River	CR 500 N br, 4.5 mi. SE of Georgetown	Vermilion	39.9412	-87.5514
	BP-01	03339000	Vermilion River	CR 1860 E Rd br, 1.5 mi S of Danville	Vermilion	40.0847	-87.5937
	BPG-09	03338780	North Fork Vermilion River	CR 2750 N br, 2 mi W of Bismarck	Vermilion	40.2656	-87.6426
	BPJ-03	03338097	Salt Fork Vermilion River	CR 850 E br, 2 mi S of Oakwood	Vermilion	40.0827	-87.7806
	BPJ-07	03336900	Salt Fork Vermilion River	CR 1850 N br, 2.5 mi N of St. Joseph	Champaign	40.1494	-88.0339
	BPJC-06	03337700	Saline Branch	CR 1900 E (CR 24) br, 1.5 mi N of Mayview	Champaign	40.1332	-88.1050
	BPK-07	03336645	Middle Fork Vermilion River	Kickapoo SP (1855N) Rd br, 2 mi NE of Oakwood	Vermilion	40.1368	-87.7459

IEPA STATION CODE	USGS STATION NUMBER	STREAM NAME	DESCRIPTION	COUNTY	LAT.	LONG.
C-09	03379600	Little Wabash River	West Salem-Mt Erie (1850N) Rd br, 0.5 mi S of Bennington	Edwards	38.5184	-88.1321
C-19	03378900	Little Wabash River	Sailor Springs Rd (1150N) br, 0.5 mi NE of Louisville	Clay	38.7757	-88.4910
C-21	03378635	Little Wabash River	US 40 br, 2 mi SW of Effingham	Effingham	39.1040	-88.5941
C-22	03379500	Little Wabash River	Wilcox Bridge Ln (475N) br, 5 mi SE of Clay City	Richland	38.6345	-88.2975
C-23	03381495	Little Wabash River	SR 1 (Main St) br, NE edge of Carmi	White	38.0923	-88.1563
CA-03	03381400	Skillet Fork	CR 1125 E br, 4 mi N of Carmi	White	38.1548	-88.1642
CA-05	03380500	Skillet Fork	SR 15 br, 1 mi N of Wayne City	Wayne	38.3635	-88.5879
CA-06	03380350	Skillet Fork	SR 161 Ext (300N) br, 1 mi E of Union Town and 1 mi NW of Helm	Marion	38.5195	-88.7271
CD-01	03379950	Elm River	CR 2400 E at Price Bridge, 6.5 mi NE of Fairfield	Wayne	38.4406	-88.2581
CH-02	03379560	Fox River	Elbow Lane (500N) br, 7 mi SW of Olney	Richland	38.6417	-88.1549
Illinois River Basin (D)						
D-01	05587060	Illinois River	RM 21.5 at SR 16/100 (Page) br, Hardin	Calhoun	39.1601	-90.6148
D-05	05563800	Illinois River	RM 152.9 at SR 9 (Margaret St) br, Pekin	Tazewell	40.5735	-89.6544
D-09	05558995	Illinois River	RM 189.2 at SR 17 (5th St) br, Lacon	Marshall	41.0256	-89.4171
D-16	05556200	Illinois River	RM 207.6 at Old SR 26 br, Hennepin	Putnam	41.2572	-89.3488
D-23	05543500	Illinois River	RM 246.8 at Main St (CR 2350 E) br, Marseilles	LaSalle	41.3232	-88.7103
D-30	05559900	Illinois River	RM 166.3 at Peoria PWS intake, SR 29 and Lorentz Ave	Peoria	40.7261	-89.5502
D-31	05570520	Illinois River	RM 118.4 at IL Power Company intake, SW edge of Havana	Mason	40.2802	-90.0813
D-32	05586100	Illinois River	RM 61.4 at RR trestle, 0.25 mi E of Valley City	Scott	39.7032	-90.6461
DA-04	05586690	Macoupin Creek	Alton Rd br, 0.5 mi SW of Beaver Dam State Park	Macoupin	39.2009	-89.9798
DA-06	05587000	Macoupin Creek	US 67 br, 3.5 mi NW of Kane	Greene	39.2344	-90.3947
DB-01	05586600	Apple Creek	Eldred-Hillview Rd (400 E) br, 5.5 mi N of Eldred	Greene	39.3696	-90.5466
DD-04	05586040	Mauvaise Terre Creek	McGlasson Rd br, 1.5 mi NE of Merritt	Scott	39.7311	-90.4070
DE-01	05585830	McKee Creek	SR 104 br, E edge of Chambersburg	Pike	39.8177	-90.6537
DF-04	05585275	Indian Creek	W Main St br, W edge of Arenzville	Cass	39.8773	-90.3776
DG-01	05585000	LaMoine River	Old US 24 br on NE edge of Ripley	Brown	40.0248	-90.6317
DG-04	05584500	LaMoine River	SR 61 br, 1 mi SW of Colmar	Hancock	40.3308	-90.8964
DH-01	05583915	Sugar Creek	SR 100 br, 2 mi NE of Frederick	Schuyler	40.0965	-90.4050
DJ-02	05568915	Spoon River	US 150 br, 1.5 mi SE of Dahinda	Knox	40.9078	-90.0868
DJ-06	05568775	Spoon River	SR 17/91 br, 1 mi W of Wyoming	Stark	41.0628	-89.7954
DJ-08	05570000	Spoon River	SR 95 br, 0.5 mi NE of Seville	Fulton	40.4903	-90.3406
DJ-09	05569500	Spoon River	2nd St (900E) br, N edge of London Mills	Fulton	40.7136	-90.2662
DJB-18	05570370	Big Creek	N Gale Rd br, 2 mi SW of Bryant	Fulton	40.4586	-90.1336

	IEPA STATION CODE	USGS STATION NUMBER	STREAM NAME	DESCRIPTION	COUNTY	LAT.	LONG.
	DJBZ-01	05570380	Slug Run	E Girard Rd br, 2.5 mi NW of Bryant	Fulton	40.4732	-90.1437
	DJL-01	05568800	Indian Creek	W Jersey Rd (300N) br, 4 mi SW of Wyoming	Stark	41.0186	-89.8358
	DK-12	05568005	Mackinaw River	Wagonseller Rd (1200E) br, 4 mi SW of Pekin	Tazewell	40.4477	-89.6912
	DK-13	05567510	Mackinaw River	River Rd at Rocky Ford br, 4 mi SE of Deer Creek	Tazewell	40.5865	-89.2784
	DL-01	05563525	Kickapoo Creek	US 24 (Adams St) br, N of Bartonville	Peoria	40.6545	-89.6475
	DQ-03	05556500	Big Bureau Creek	US 6 (W Peru St) br, 1 mi W of Princeton	Bureau	41.3673	-89.4980
	DQD-01	05557000	West Bureau Creek	US 6/34 (Main St) br, E Edge of Wyanet	Bureau	41.3650	-89.5685
	DR-01	05555950	Little Vermilion River	US 6 (5th St) br on SE edge of La Salle	LaSalle	41.3332	-89.0815
	DS-06	05554490	Vermilion River	CR 1400 N br, 0.5 mi. E of Mc Dowell	Livingston	40.8305	-88.5752
	DS-07	05555300	Vermilion River	CR 1251 E br, 3 mi NE of Leonore	LaSalle	41.2085	-88.9303
	DV-04	05542000	Mazon River	SR 113 br, 4 mi W of Coal City	Grundy	41.2861	-88.3604
	DW-01	05541710	Aux Sable Creek	US 6 (9000 N) br, 5 mi NE of Morris	Grundy	41.4170	-88.3479
	DZZP-03	05562010	Farm Creek	Camp St br, NW of Main St in East Peoria	Tazewell	40.6714	-89.5803
	Fox River Basin (DT)						
	DT-01		Fox River	US 6/SR 71 (Norris Dr) br, NE edge of Ottawa	LaSalle	41.3563	-88.8276
	DT-06	05550000	Fox River	SR 62 (Algonquin Rd) br, NE edge of Algonquin	McHenry	42.1659	-88.2899
	DT-09	05551000	Fox River	State St br in South Elgin	Kane	41.9942	-88.2943
	DT-22	05549600	Fox River	SR 176 (Crystal Lake Rd) br, 5 mi NE of Crystal Lake	McHenry	42.2795	-88.2270
	DT-35	05546700	Fox River	SR 173 br, 4 mi W of Antioch	Lake	42.4789	-88.1787
	DT-38	05551540	Fox River	Mill St br in Montgomery	Kane	41.7293	-88.3389
*	DT-46	05552500	Fox River	CR 18 (3103 Rd) abandoned br, NE edge of Dayton	LaSalle	41.3863	-88.7896
	DTB-01	05551995	Somonauk Creek	N 42nd Rd br, 1 mi N of Sheridan	LaSalle	41.5436	-88.6869
	DTD-02	05551700	Blackberry Creek	SR 47 (Bridge St) br on N edge of Yorkville	Kendall	41.6716	-88.4427
	DTG-02	05550500	Poplar Creek	US 20 Business (Villa St) br, SE edge of Elgin	Cook	42.0257	-88.2557
	DTK-04	05548280	Nippersink Creek	Winn Rd br, 0.5 mi W of Spring Grove and NW of fish hatchery	McHenry	42.4437	-88.2475
	Sangamon River Basin (E)						
	E-05	5573650	Sangamon River	CR 600 E br at Lincoln Trail State Park, 5 mi SE of Niantic	Macon	39.7970	-89.1048
	E-06	5573504	Sangamon River	Decatur PWS intake (Lincoln Park Dr) at Lake Decatur Dam	Macon	39.8269	-88.9557
	E-09	5573540	Sangamon River	SR 48 (Fairview Ave) br, S edge of Decatur	Macon	39.8310	-88.9764
	E-16	5573800	Sangamon River	Roby Rd br, 4.5 mi S of Mechanicsburg at Roby	Christian	39.7426	-89.4017
	E-18		Sangamon River	W Bridge St br, W edge of Monticello	Piatt	40.0309	-88.5884

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	E-24	5578000	Sangamon River	SR 123 (Sangamon Ave) br, E edge of Petersburg	Menard	40.0133	-89.8383
	E-25	5583000	Sangamon River	SR 97 br, 2 mi NW of Oakford	Mason	40.1238	-89.9846
	E-26	5576500	Sangamon River	Old SR 36 br, SW edge of Riverton	Sangamon	39.8372	-89.5459
*	E-28	5572125	Sangamon River	Allerton Park br, 3 mi SW of Monticello	Piatt	40.0019	-88.6358
	E-29	5570910	Sangamon River	US 136 br, 1 mi E of Fisher	Champaign	40.3109	-88.3227
	EI-02	5582000	Salt Creek	SR 29 br, 3 mi N of Greenview	Menard	40.1335	-89.7356
	EI-06	5578500	Salt Creek	CR 500 E br, 0.5 mi E of SR 54 and 2 mi NE of Kenney	DeWitt	40.1148	-89.0491
	EID-04	5581500	Sugar Creek	CR 1050E br, 2.5 mi SE of Hartsburg	Logan	40.2221	-89.4029
	EIE-04	5580000	Kickapoo Creek	CR 100 E br, 0.75 mi N of Waynesville	DeWitt	40.2549	-89.1295
	EIE-05	5580500	Kickapoo Creek	1250th Ave br, 0.75 mi N of I-55 and 2 mi N of Lincoln	Logan	40.1920	-89.3603
	EIG-01	5579500	Lake Fork	CR 1100 E br, 0.25 mi N of SR 54 and 1.3 mi NE of Cornland	Logan	39.9518	-89.3856
	EL-01	5577505	Spring Creek	Bruns Lane br, 0.25 mi S of Veterans Pkwy on NW edge of Springfield	Sangamon	39.8209	-89.6872
*	EO-01	5576022	South Fork Sangamon River	SR 29 br, 1.5 mi NW of Rochester	Sangamon	39.7639	-89.5619
	EO-02	5575500	South Fork Sangamon River	SR 104 br, 1 mi E of Kincaid	Christian	39.5784	-89.3924
	EO-03		South Fork Sangamon River	Rochester Rd br, 1.5 mi W of Rochester	Sangamon	39.7539	-89.5661
	EOA-01	5576250	Sugar Creek	SR 29 br, 1 mi SE of Springfield	Sangamon	39.7800	-89.5888
	EOD-01	5575570	Clear Creek	Cascade Rd br, 5 mi E of Edinburg at Lake Sangchris spillway	Sangamon	39.6493	-89.4789
	EOH-01	5574500	Flat Branch	CR 1400 N (Lincoln Trail) br, 1 mi E of Taylorville	Christian	39.5526	-89.2538
	Kankakee River Basin (F)						
*	F-01	5527500	Kankakee River	I-55 br, 3 mi NW of Wilmington	Will	41.3501	-88.1918
	F-02	5520500	Kankakee River	SR 1 (N Dixie Hwy) br, at Momence	Kankakee	41.1600	-87.6626
	F-16		Kankakee River	SR 53 (Baltimore St) br, W edge of Wilmington	Will	41.3054	-88.1514
	FL-02	5526000	Iroquois River	CR 7750 S br, 6 mi SW of St Anne	Kankakee	41.0088	-87.8248
	FL-04	5525000	Iroquois River	US 52 (Main St) br on SE edge of Iroquois	Iroquois	40.8230	-87.5816
	FLI-02	5525500	Sugar Creek	CR 980 N (Jones St) br, 1 mi W of Milford	Iroquois	40.6297	-87.7241
	Des Plaines River - Lake Michigan Basin (G,H)						
	G-07	5528000	Des Plaines River	SR 120 br, 0.25 mi E of Milwaukee Rd (SR 21), SW edge of Gurnee	Lake	42.3437	-87.9410
	G-08	5527800	Des Plaines River	Russel Rd br, 1 mi E of I-95 and 0.75 mi dns WI state line	Lake	42.4892	-87.9260
	G-11	5534050	Des Plaines River	RM 292.1 at W Division St br, SW edge of Lockport	Will	41.5819	-88.0719
	G-15	5530590	Des Plaines River	Irving Park Rd (SR 19) br, E of River Road in Schiller Park	Cook	41.9530	-87.8542
	G-22	5529000	Des Plaines River	E Central Rd br, E of US 45 (River Rd) in Des Plaines	Cook	42.0658	-87.8874
	G-23	5537980	Des Plaines River	RM 288.7 at Ruby St (SR 53) br, Joliet	Will	41.5365	-88.0830

	G-39	5532500	Des Plaines River	Barrypoint Rd br ups of Lyons dam, Riverside	Cook	41.8212	-87.8219

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	GB-10	5540290	DuPage River	Plainfield-Naperville Rd br, at Boughton Rd on NW edge of Bolingbrook	Will	41.6902	-88.1663
	GB-11	5540500	DuPage River	US 52 (Jefferson St) br, 0.25 mi W of I-55 in Shorewood	Will	41.5215	-88.1953
*	GB-16		DuPage River	Furguson Rd (119th St) br E of SR 59, 3 mi NE of Plainfield	Will	41.6664	-88.1829
	GBK-05	5540095	West Branch DuPage River	SR 56 (Butterfield Rd) br, 1.5 mi NE of SR 59 on N edge of Warrenville	DuPage	41.8252	-88.1796
	GBK-09	5539900	West Branch DuPage River	St Charles Rd br, 0.1 mi N of SR 64 on NE edge of West Chicago	DuPage	41.9128	-88.1797
	GBL-10	5540210	East Branch DuPage River	US 34 (Ogden Ave) br, 0.25 mi W of SR 53 in Lisle	DuPage	41.8006	-88.0814
*	GG-02	5539000	Hickory Creek	Washington St br, 0.5 mi E of US 6 on E edge of Joliet	Will	41.5243	-88.0638
	GG-22		Hickory Creek	Joliet St br, 0.25 mi W of SR 53 br on S edge of Joliet	Will	41.5077	-88.0839
*	GI-01	5536995	Chicago Sanitary and Ship Canal	RM 296.2 at 135th St/Romeo Rd br, 1 mi E of Romeoville	Will	41.6405	-88.0601
	GI-02	5537000	Chicago Sanitary and Ship Canal	RM 292.1 at Division St br, SW edge of Lockport	Will	41.5825	-88.0688
	GL-09	5531500	Salt Creek	Wolf Rd br, 0.5 mi N of Ogden Ave (SR34) in Western Springs	Cook	41.8257	-87.9002
	GLA-02	5532000	Addison Creek	Washington Blvd br, 0.75 mi E of Mannheim Rd (US 12,20,45) in Bellwood	Cook	41.8818	-87.8689
	H-01	5536700	Cal-Sag Channel	RM 304.2 at SR 83/171 (Archer Ave) br, 0.5 mi N of Sag Bridge	Cook	41.6962	-87.9365
	HB-42	5536195	Little Calumet River South	Hohman Ave br, 0.25 mi E of IN State line in Munster, IN	Lake, IN	41.5773	-87.5223
	HBD-04	5536275	Thorn Creek	Thornton Rd br, 1.5 mi W of Calumet Expy (SR 394) in Thornton	Cook	41.5680	-87.6082
	HCC-07	5536000	North Branch Chicago River	Touhy Ave br, 0.25 mi W of Milwaukee Ave in Niles	Cook	42.0122	-87.7956
	HCCC-02	5534500	Mid Fork N. Branch Chicago R.	Lake-Cook Rd br, 1 mi W of Edens Expy in Deerfield	Cook	42.1524	-87.8183
	Mississippi River South Basin (I)						
	I-05		Mississippi River	RM 111.0 at boat ramp, 1 mi upstream of SR 150 br in Chester	Randolph	37.9108	-89.8536
	I-84	7022000	Mississippi River	RM 44.0 in Thebes at ferry landing, 0.75 mi W of SR 3	Alexander	37.2165	-89.4660
	II-03	5595540	Marys River	Wine Hill Rd br, 0.3 mi E of Welge	Randolph	37.9562	-89.7062
	IX-04	5600150	Cache River	Sandusky Rd br, 0.7 mi E of Sandusky and SR 127	Pulaski	37.2032	-89.2583
	Mississippi River South Central Basin (J)						
*	J-05	5587555	Mississippi River	RM 214.6 near Elsah, 5 mi ups Piasa Creek boat launch	Jersey	38.9520	-90.3701
	J-36		Mississippi River	RM 162.2 ups of power line and 1.25 mi ups Meramec River	Monroe	38.4007	-90.3232
*	J-83	5587550	Mississippi River	RM 202.7 at Alton Marina, Riverfront Park in Alton	Madison	38.8851	-90.1807
	J-98		Mississippi River	RM 200.8 at Mel Price L & D 26, 1 mi S of Alton	Madison	38.8703	-90.1523
	JMAC-02	5589785	Harding Ditch	Lake Dr (SR 111) br in Frank Holten St Pk, East St. Louis	St. Clair	38.5946	-90.0888
	JN-02	5589490	Cahokia Creek	Sand Prairie Rd br near Cahokia Mounds SP and 0.2 mi ups Canteen Creek	Madison	38.6669	-90.0657
	JNA-01	5589510	Canteen Creek	Sand Prairie Rd br near Cahokia Mounds SP, NE of Fairmont City	Madison	38.6660	-90.0657
	JQ-05	5587900	Cahokia Creek	SR 143 (Main St) br, NW edge of Edwardsville	Madison	38.8243	-89.9745

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	JR-02	5587700	Wood River	SR 3 br at Broadway St and St. Louis Ave, East Alton	Madison	38.8843	-90.1224
	Mississippi River North Central Basin (K,L)						
*	K-04	5474500	Mississippi River	RM 363.2, Keokuk city boat ramp on Mississippi Dr, 0.75 mi dns US 136 br	Lee, IA	40.3868	-91.3881
	K-17		Mississippi River	RM 324.9 at L & D 21, 0.75 mi SW of Quincy	Adams	39.9046	-91.4280
	K-21		Mississippi River	RM 273.5 at L & D 24, Clarksville, MO	Pike, MO	39.3749	-90.9067
	K-22		Mississippi River	RM 364.0 at dns end of L & D 19 in Keokuk, IA	Lee, IA	40.3922	-91.3760
	KCA-01	5513000	Bay Creek	Vin Fiz Rd (CR 10) br, NW edge of Nebo	Pike	39.4435	-90.7957
	KI-02	5495500	Bear Creek	CR 903 E br, 2.5 mi NE of Marcelline	Adams	40.1429	-91.3373
	L-04		Mississippi River	RM 437.0 at L & D 17, 3.5 mi NW of New Boston	Mercer	41.1923	-91.0585
	LD-02	5469000	Henderson Creek	SR 94 br, 1 mi S of Bald Bluff	Henderson	41.0018	-90.8537
	LF-01	5466500	Edwards River	SR 17 br, 2 mi NE of New Boston	Mercer	41.1871	-90.9677
	Mississippi River North Basin (M)						
	M-02		Mississippi River	RM 482.9 at L & D 15, Arsenal Island in Rock Island	Rock Island	41.5190	-90.5632
*	M-04	5420500	Mississippi River	RM 520 at SR 136 (14th St) br in Fulton	Whiteside	41.8646	-90.1728
	M-12		Mississippi River	RM 522.5 at L & D 13 on Lock Rd, 1.5 mi N of Fulton	Whiteside	41.8983	-90.1553
	M-13		Mississippi River	RM 583.0 at L & D 11, 2 mi NE of Dubuque	Dubuque, IA	42.5405	-90.6454
	MJ-01	5420100	Plum River	US 52/SR 64 br on NE edge of Savanna	Carroll	42.0982	-90.1267
	MN-03		Apple Creek	US 20 br, 1.5 mi W of Elizabeth	JoDaviess	42.3187	-90.2544
	MQ-01	5416000	Galena River	US 20/SR 84 (Spring St) br, S edge of Galena	JoDaviess	42.4105	-90.4310
	Big Muddy River Basin (N)						
	N-06		Big Muddy River	SR 14 (Main St) br, 3 mi W of Benton	Franklin	37.9939	-88.9770
	N-08	5595700	Big Muddy River	SR 15 br, 2 mi W of Mt Vernon	Jefferson	38.3098	-88.9886
*	N-10	5595950	Big Muddy River	Rend Lake Dam Rd br, 2.5 mi NW of Benton	Franklin	38.0377	-88.9565
	N-11	5597000	Big Muddy River	SR 149 br, 0.5 mi W of Plumfield	Franklin	37.8915	-89.0200
	N-12	5599500	Big Muddy River	SR 127 br, SE edge of Murphysboro	Jackson	37.7579	-89.3276
	NA-01	5599565	Cedar Creek	SR 127 br, 3 mi N of Pomona	Jackson	37.6707	-89.3223
*	NB-01	5599540	Kincaid Creek	Dns Lake Kincaid dam off Circle Dr, 5.5 mi WNW of Murphysboro	Jackson	37.7740	-89.4503
	NC-07	5599200	Beaucoup Creek	Beaucoup Rd br, 2 mi W of Vergennes	Jackson	37.9080	-89.3753
	ND 01	5598245	Crab Orchard Creek	Dillinger Rd br, 3 mi NE of Carbondale	Jackson	37.7724	-89.1791
*	ND-02	5598050	Crab Orchard Creek	Spillway Rd br below Crab Orchard Lake dam, 3 mi E of Carbondale	Williamson	37.7142	-89.1514
	ND-04	5597500	Crab Orchard Creek	SR 13 br, 0.2 mi E of Main St on E edge of Marion	Williamson	37.7319	-88.8885
	NE-05	5597280	Little Muddy River	Royalton Rd br, 1.5 mi SE of Elkville	Jackson	37.9009	-89.2087

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	NG-02	5597040	Pond Creek	SR 37 br, 0.5 mi S of West Frankfort	Franklin	37.8848	-88.9318
	NH-06	5596400	Middle Fork Big Muddy River	Deering Rd br, 2.5 mi SE of Benton	Franklin	37.9492	-88.9001
	NJ-07	5595830	Casey Fork	SR 37 br, 0.3 mi S of I-64 and 2 mi S of Mt Vernon	Jefferson	38.2695	-88.8988
	NK-01	5595730	Rayse Creek	CR 600 E (Hall Ln) br, 3 mi N of Waltonville	Jefferson	38.2541	-89.0404
	Kaskaskia River Basin (O)						
	O-02	5591200	Kaskaskia River	Cooks Mills Rd (300E) br at Cooks Mills	Coles	39.5831	-88.4135
	O-07	5593010	Kaskaskia River	SR 127 br, 2.5 mi S of Carlyle	Clinton	38.5745	-89.3695
	O-08	5592500	Kaskaskia River	US 40/51 (Gallatin St) br on SE edge of Vandalia	Fayette	38.9604	-89.0884
	O-10	5592100	Kaskaskia River	SR 128 br, 1.5 mi SE of Cowden	Shelby	39.2302	-88.8423
	O-11	5592000	Kaskaskia River	SR 16 (Main St) br at Shelbyville below Lake Shelbyville dam	Shelby	39.4058	-88.7837
	O-15	5591300	Kaskaskia River	SR 121 br, 1 mi N of Allenville	Moultrie	39.5724	-88.5324
	O-20	5594100	Kaskaskia River	SR 177 br, 4.5 mi NW of Okawville near Venedy Station	Clinton	38.4508	-89.6278
	O-30	5595400	Kaskaskia River	Roots Rd br, 3 mi W of Ellis Grove	Randolph	38.0167	-89.9568
	O-31	5590420	Kaskaskia River	CR 1450 N br, 4.5 mi W of Hayes	Douglas	39.8647	-88.3646
	OC-04	5595200	Richland Creek	SR 156 br, 2 mi NE of Hecker	St. Clair	38.3238	-89.9710
	OD-06	5594450	Silver Creek	US 40 br, 3 mi SE of Troy	Madison	38.7164	-89.8292
	OD-07	5594800	Silver Creek	SR 15 br, 2 mi SE of Freeburg	St. Clair	38.4063	-89.8742
	OH-01	5594090	Sugar Creek	SR 161 br, 0.5 mi W of Albers	Clinton	38.5413	-89.6267
	OI-07		Shoal Creek	CR 275 N br, 1.5 mi NW of Panama	Montgomery	39.0403	-89.5510
	OI-08	5594000	Shoal Creek	Old US 50 br, 1.5 mi E of Breese	Clinton	38.6096	-89.4946
*	OI-09	5593785	Shoal Creek	CR 475 N abandoned br, 2.5 mi NW of Panama	Montgomery	39.0632	-89.5455
	OJ-07	5593505	Crooked Creek	Odin Rd (500 E) br, 3.5 mi S of Odin	Marion	38.5639	-89.0503
	OJ-08	5593520	Crooked Creek	Hoffman Rd br, 2.5 mi SW of Hoffman	Washington	38.5070	-89.2735
	OK-01	5592900	East Fork Kaskaskia River	US 51 br, 5.5 mi N of Sandoval	Marion	38.6910	-89.1002
	OKA-01	5592930	North Fork Kaskaskia River	Willet St (250 E) br, 1.5 mi N of Patoka	Marion	38.7738	-89.0959
	OL-02	5592800	Hurricane Creek	SR 140 br, 1.5 mi E of Mulberry Grove	Fayette	38.9224	-89.2370
	ON-01	5592600	Hickory Creek	CR 1150 E br, 3 mi S of Bluff City	Fayette	38.9251	-89.0391
	OO-01		Ramsey Creek	Old US 51 br, 3 mi S of Ramsey	Fayette	39.1020	-89.0887
	OQ-01	5592195	Becks Creek	CR 3300 N br, 2 mi W of Herrick on county line	Shelby	39.2157	-89.0204
	OT-02	5591700	West Okaw River	CR 22.00 N br , 1.5 mi NW of Lovington	Moultrie	39.7219	-88.6626
	OU-01	5591400	Jonathon Creek	SR 121 br, 3 mi E of Sullivan	Moultrie	39.6007	-88.5462
	OZC-01	5595280	Plum Creek-South	Baldwin Rd (2000 E) br, 2.5 mi S of Baldwin	Randolph	38.1464	-89.8433
	OZZT-01	5591500	Asa Creek	Hamblin Rd (1100 E) br, 1 mi N of Sullivan	Moultrie	39.6201	-88.6048

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Rock River Basin (P)						
P-04	5446500	Rock River	SR 92 (38th Ave) br, 2 mi E of Joslin	Rock Island	41.5558	-90.1853
P-06	5443500	Rock River	US 30 (Rock Falls Rd) br, 2 mi W of Rock Falls	Whiteside	41.7722	-89.7458
P-14	5440700	Rock River	SR 72 (Union St) br on S edge of Byron	Ogle	42.1219	-89.2552
P-15	5437500	Rock River	SR 75 (Blackhawk Blvd) br on S edge of Rockton	Winnebago	42.4499	-89.0725
P-20	5442200	Rock River	SR 2 br, 0.5 mi SW of Grand Detour	Ogle	41.8899	-89.4202
PB-02	5447100	Green River	SR 40 (Hoover Rd) br, 1 mi S of Deer Grove	Whiteside	41.5945	-89.6893
PB-04	5447500	Green River	SR 82 br, 2 mi N of Geneseo	Henry	41.4887	-90.1581
PE-05	5446100	Rock Creek	Moline Rd br, 3 mi NE of Erie	Whiteside	41.6797	-90.0261
PH-16	5444000	Elkhorn Creek	Pilgrim Rd (2200N) br, 2 mi NW of Penrose	Whiteside	41.9027	-89.6964
PL-03	5442020	Kyte River	Honey Creek Rd br, 1 mi E of Daysville at Watertown	Ogle	41.9859	-89.2941
PQ-02	5438600	Kishwaukee River	Perryville Rd br, 1.5 mi S of Perryville and ups South Branch	Winnebago	42.2016	-88.9801
PQ-10	5438201	Kishwaukee River	Garden Prairie Rd br, 0.5 mi N of Garden Prairie	Boone	42.2610	-88.7253
PQ-12	5440000	Kishwaukee River	Blackhawk Rd br, E of Mulford Rd and 2 mi SW of Perryville	Winnebago	42.1944	-88.9995
PQB-02	5440520	Killbuck Creek	SR 251 br, 4 mi S of Rockford and 2 mi S of New Milford	Winnebago	42.1600	-89.0761
PQC-06	5439500	South Branch Kishwaukee River	Irene Rd br, 2 mi NE of Fairdale	DeKalb	42.1102	-88.9006
PQF-07	5438250	Coon Creek	Harmony Rd br, 1 mi SW of Riley	McHenry	42.1823	-88.6413
PW-01	5435800	Pecatonica River	SR 75 (Freeport Rd) br at Harrison	Winnebago	42.4274	-89.1957
PW-08	5435500	Pecatonica River	SR 75 (Stephenson St) br on NE edge of Freeport	Stephenson	42.3003	-89.6153
PWN-01	5435680	Yellow Creek	Hollywood Rd br, 0.3 mi ups US 20 and 1.5 mi SE of Freeport	Stephenson	42.2785	-89.5784

ACTIVE STATIONS = 213

* INACTIVE STATIONS (n=18)

APPENDIX C

Intensive Basin Survey Program

Illinois Environmental Protection Agency
Bureau of Water
Springfield, IL

Illinois Intensive Basin Survey Program

Background

Since 1981, the Illinois Environmental Protection Agency, Bureau of Water, in cooperation with the Illinois Department of Natural Resources (IDNR), has conducted basin-specific surveys to characterize the chemical, physical and biological conditions of Illinois' streams.

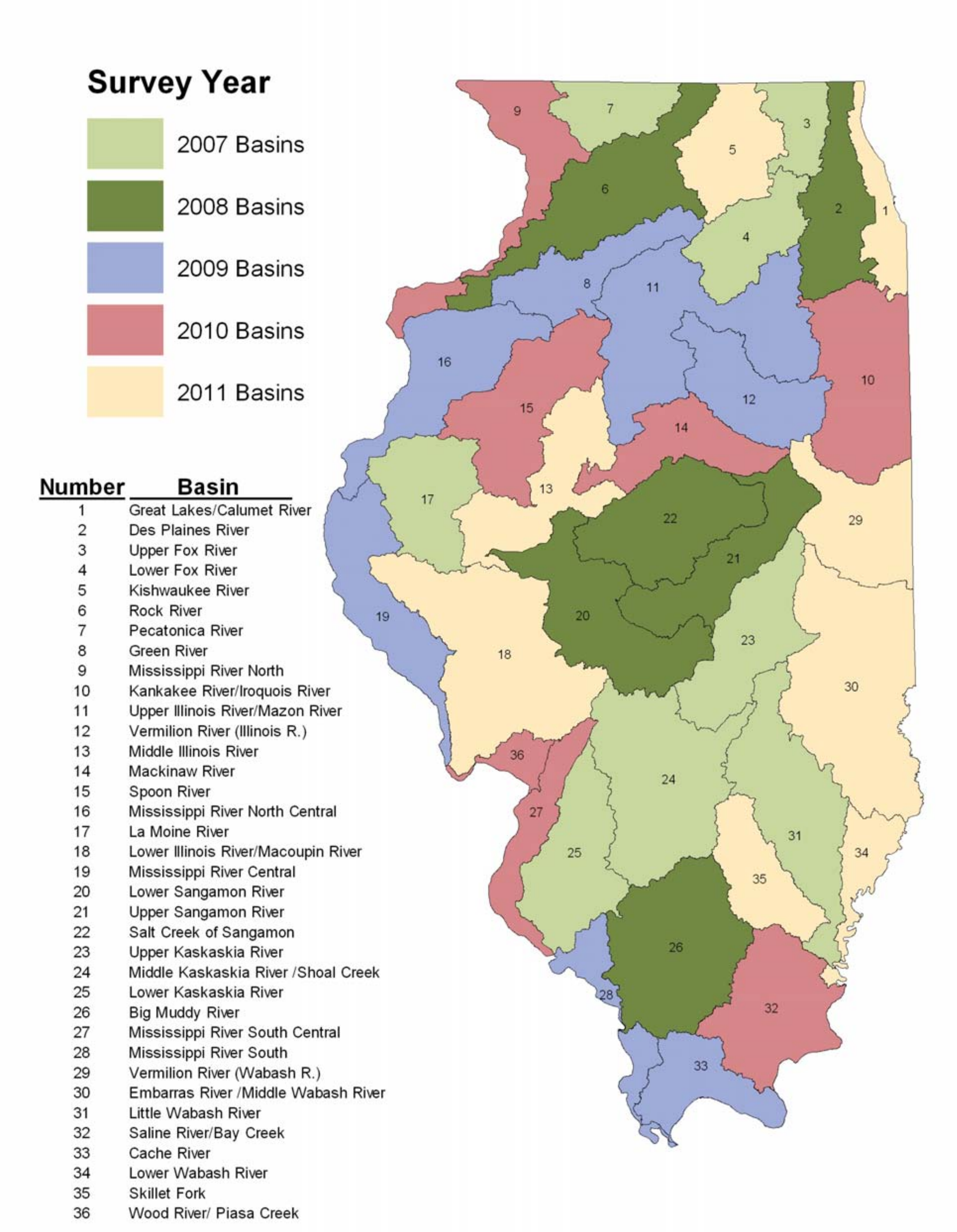
Samples and information collected include: water and sediment chemistry, instream physical habitat, fish and macroinvertebrate assemblages, and fish tissue samples. Data collected from these surveys are used primarily to:

- assess attainment of *aquatic life* use and other designated uses in Illinois streams and identify potential causes and sources of use impairment,
- determine the success of water pollution control programs in achieving the aquatic life goals of the Clean Water Act,
- determine the presence of contaminants in fish tissue to facilitate the development of fish consumption advisories for applicable Illinois streams,
- determine the potential for sport fishing opportunities and fisheries management, assess the status of river fisheries resources of Illinois, identify where those resources exist, and determine the need for legislation for their protection and,
- establish an aquatic resource database for agencies with regulatory authority and responsibility for environmental management and focus greater emphasis on the importance of Illinois aquatic resources in part through Biological Stream Characterization system (Bertrand et al. 1996) activities.

Station Information

Each year, two or three of the thirty-three major watersheds in Illinois are sampled by each Surface Water Section regional office in the Bureau of Water. Under this cooperative agreement with IDNR, more than 100 stations are monitored annually for biological, chemical and physical indicators of water resource quality. This schedule, which allows each of the State's major watersheds to be sampled on a five-year rotational basis, is provided in Appendix C, Figure 1.

Appendix C, Figure 1. Intensive Basin Surveys 2007-2011 Monitoring Schedule



Intensive basin survey monitoring stations are routinely located at Illinois EPA Ambient Water Quality Monitoring Network stations and IDNR fish monitoring locations. The number of stations per basin is dependent on the size of the watershed. Historically, the number of stations sampled for all constituents (water, sediment, habitat and biology) range from approximately ten to thirty per basin. However, additional stations may be added to provide adequate spatial coverage of the watershed. Criteria for selecting stations include: a sampling area representative of the stream, flowing water at the time of sampling, suitable instream habitat, and accessibility for crew and equipment (see Section D, IEPA 1994).

Station codes are based on the Illinois EPA's alphanumeric coding system consisting of one to eight alphabetic characters and two numeric characters. The alpha characters indicate the stream and the numeric characters represent the specific station location on the stream. This coding system provides a uniform method of identifying station locations throughout the state. For additional information on the coding system used for station identification, please refer to Appendix B (Illinois EPA Ambient Stream Water Quality Monitoring Network) of this document.

Sample Collection and Analysis

Water and sediment chemistry, physical habitat, biological (macroinvertebrate and fish) assemblages, and fish tissue samples are collected to assess stream quality. One round of biological and habitat sampling is conducted at each station, typically during summer low flow conditions. Three water samples are collected at each survey station; one prior to biological sampling, one on the day of biological sample collection and one post-biological sampling in late summer/early fall. Instream surficial sediment is collected at each station to screen for toxic substances. Fish tissue samples are taken from fish assemblage collections (typically those stations known to support sport fishing) to screen for toxic substances. In order to minimize sample variability and enhance data comparability across time, all samples are collected within a June to mid-October time period.

Water Chemistry:

Water chemistry samples are collected at each station and composited into a splitter churn before being transferred into the appropriate collection bottle. Typically, parameters analyzed include: a full spectrum of total and dissolved nutrients and metals. Dissolved parameters are collected after filtering through a 0.45µm filter. Instream physiochemical parameters (pH, DO, conductivity, and temperature) are recorded at the time of water sample collection. A full list of water chemistry parameters and sampling methods is found in Illinois EPA's *Quality Assurance and Field Methods Manual* (IEPA 1994). Chemical results are compared to existing State water quality standards to determine compliance.

Sediment Chemistry:

Instream surficial sediment samples are collected once at all stations during the survey. Sediments are collected at multiple locations from surface deposits within the sampling reach. These sediments are composited and then wet-sieved through a 63µm stainless steel sieve. Sieving samples assures comparability across stations by standardizing sample particle size submitted to the laboratory for analysis and also eliminates sand and other coarse materials for the sample. All equipment used for sediment sampling are either stainless steel or glass and are cleaned prior to use at each station in accordance with Section F of the *Illinois EPA Quality Assurance and Field Methods Manual* (IEPA 1994). Sediment chemistry analysis results are used to screen for contaminants and bioaccumulative chemicals that are not detected in routine water samples. There are no standards in Illinois for sediment concentrations. Results are compared against a statistical classification developed for Illinois sediments based on 14 years of statewide sieved sediment data (Short 1997).

Biological Populations:

An Index of Biotic Integrity (IBI) is used in Illinois to provide a simple and easily communicated measure of biological health of fish and macroinvertebrate assemblages. Multi-metric IBI's are commonly used worldwide to define biological populations. Because stream biological structures are extremely complex, a single attribute (e.g., number of native fish species) will not provide an accurate indication of conditions. However, by examining multiple attributes of the population and assigning an appropriate metric score for each attribute a more accurate picture emerges. After a biological sample is collected and the individuals identified and counted, these data are converted to a score representing each specific metric. The sum of the individual metric scores represents the IBI score for that population sample representing the stream station. Development of an IBI (selecting the appropriate population attributes and assigning metric scores) requires significant statistical analysis of historical biological populations and expert knowledge and judgment by the biologists utilizing the index.

Macroinvertebrates:

Macroinvertebrate population samples have been used as water quality indicators by the Illinois EPA since its inception. Macroinvertebrates are well suited for biological assessment strategies because of their short life cycles, often producing several generations within a year, and they remain in the general area of propagation. Macroinvertebrates are generally abundant and because of their size are relatively easy to see and collect. Aquatic insects are found in almost all streams and their sensitivity to water quality and habitat impacts make them effective indicators of stream impairment. Since 1983 the Illinois EPA has utilized the Macroinvertebrate Biotic Index (MBI) to provide a rapid measure of stream quality. This single metric index has proven effective for investigating point source (specifically de-oxygenizing) waste related studies. However, due to the increased importance of nonpoint and instream habitat issues in recent years, Illinois EPA contracted with Tetra Tech in 1998 to develop a new multi-metric macroinvertebrate biotic index (mIBI) for Illinois' wadeable streams. As part of this effort, field collection and laboratory sorting procedures were modified.

Since 2001, macroinvertebrates have been collected at each intensive basin wadeable station using the 20-jab semi-quantitative sampling effort (Barbour et al. 1999). Allocation of the collection jabs are based on approximate proportions of major macroinvertebrate habitat types in both bottom and bank zones. Numbers of jabs in each of these zones is based on the mean stream width of the sample reach. Samples are preserved in ethanol in the field. A 300-organism sub-sample is obtained in the laboratory and organisms are identified and counted by either Illinois EPA biologists or a contractor. Macroinvertebrate results are interpreted by analysis of community structure to determine relative quality of the stream. The new multi-metric index developed by Tetra Tech, which includes seven metrics scored 0 – 100, was designed to be sensitive primarily to nonpoint/habitat related disturbances. This new index will be used for the first time in the 2008 Integrated Report. Macroinvertebrate collections at non-wadeable stream stations are still accomplished using Hester-Dendy artificial substrates because the macroinvertebrate IBI has not yet been calibrated for unwadeable stations. These samples are generally not sub-sampled and are currently evaluated with the MBI.

Fish:

Illinois EPA has used the Index of Biotic Integrity (Karr, 1986) for evaluating attributes of fish populations as an indication of stream quality for over 20 years. In 2000, in cooperation with the Illinois Department of Natural Resources (IDNR), Illinois EPA completed a project to refine the IBI and revise regional expectations of stream quality based on development of new IBI regions. This modification of the IBI included development of new metrics and scoring procedures to ensure the new index (fish IBI or fIBI) adequately depicts stream quality on a statewide basis.

Fish are collected by two methods. In wadeable streams, a portion of the stream is sectioned off with block nets and an electric seine is used to sample fish. The seine is moved upstream and three netters capture fish as they are stunned by the electric current. Sample effort is approximately 30 minutes per station. At unwadeable stations, a boat-mounted AC electrofishing unit is used. Sample effort is approximately one hour and is supplemented with seine hauls in shallow areas. Collections are sorted; weighed, length measured, identified, and counted in the field. Fish not readily identified in the field are preserved in formalin and later identified by IDNR staff. A fish population survey results in a fIBI score ranging from 12 - 60 and represents very poor to excellent community conditions.

Habitat:

Since 2005, instream habitat has been evaluated using the Qualitative Habitat Evaluation Index (QHEI) as developed by the Ohio EPA. This index is based on six metrics including information on substrate composition, cover type, channel morphology, riparian zone, and riffle and pool quality. Stream discharge measurements using standard USGS methods are also completed at all wadeable stations.

Fish Contaminant Monitoring:

Fish accumulate contaminants and are thus a good indicator for determining water quality. In Illinois, contaminant levels in fish are routinely monitored via a cooperative program with Illinois EPA, Illinois Department of Natural Resources (IDNR), Illinois Department of Public Health, and the Illinois Department of Agriculture. At Intensive Basin Survey stations the IDNR Fisheries staff is responsible for collection of fish tissue samples. Composite fillet samples of five individual fish from each of the target species (predatory-bass, omnivorous-catfish, and bottom feeder-carp) are obtained. Fish contaminant data are assessed for compliance with risk based criteria adopted by the cooperating agencies/departments or U.S. Food and Drug Administration action levels for issuing sport fish consumption advisories. The current draft of the Fish Contaminant Monitoring Procedure is found in Appendix E of this document.

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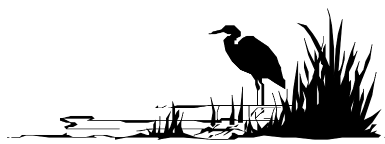
APPENDIX D

Ambient Lake Monitoring Program

Illinois Environmental Protection Agency
Bureau of Water
Springfield, IL

Illinois Ambient Lake Monitoring Program



Illinois has over 91,000 inland lakes and ponds. These include approximately 3,256 inland lakes over six acres in size and the remainder are referred to as ponds (less than six acres). These bodies of water serve multiple purposes including: municipal, industrial, and agricultural water supply, cooling water, flood control, and recreation, such as swimming, boating, skiing, fishing, and hunting.

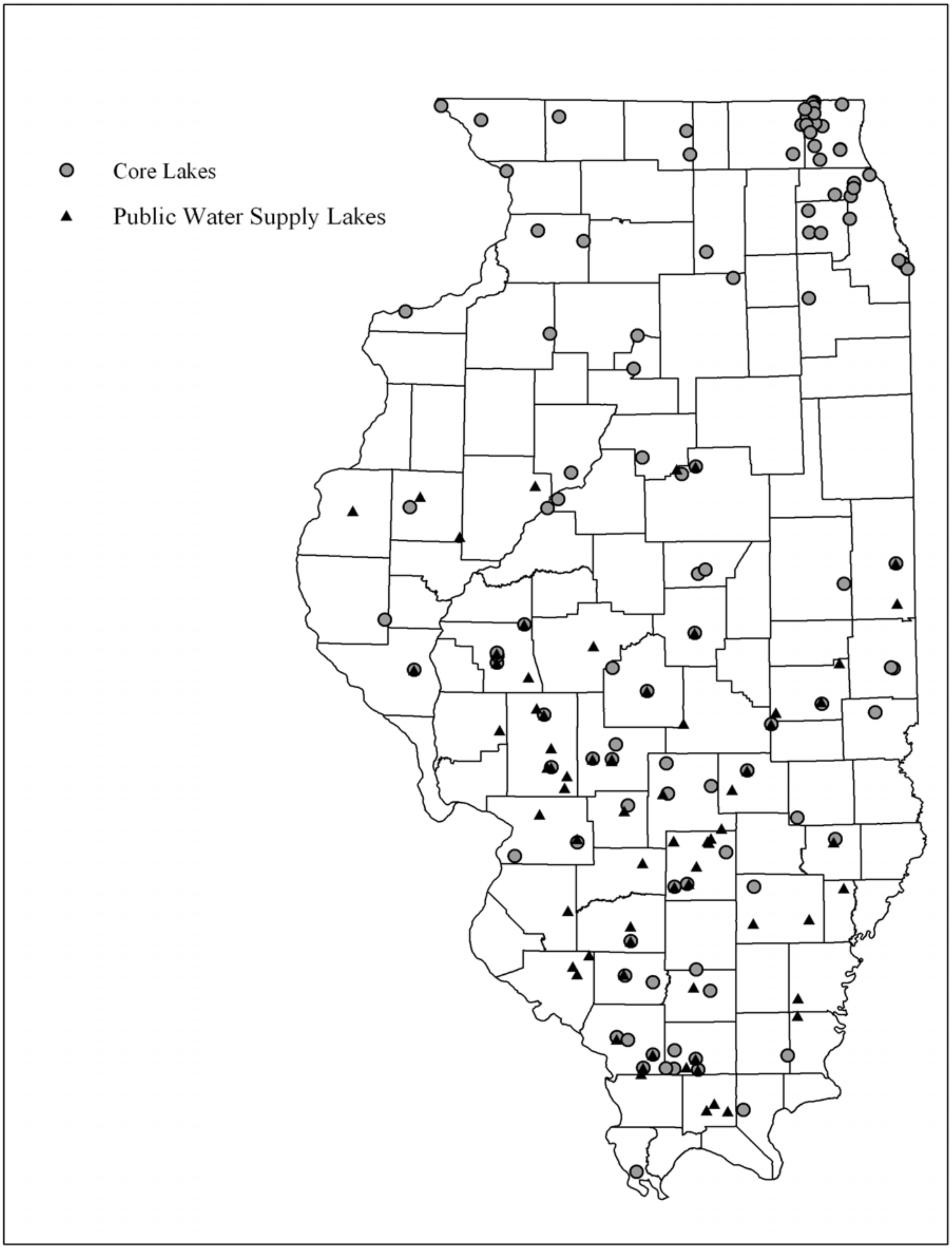
The Illinois Ambient Lake Monitoring Program (ALMP) was established in 1977 by the Illinois Environmental Protection Agency (Illinois EPA) to gather fundamental information on the quality of Illinois inland lakes. Historically, approximately 20 to 30 lakes were sampled annually as part of the ALMP. On June 29, 1995, a major natural resource protection bill titled Conservation 2000 was signed into law by Governor Jim Edgar. This bill provided funding to the Illinois EPA to expand the ALMP and to create the Illinois Clean Lakes Program (ICLP). Starting in 1996, Illinois EPA biologists began monitoring approximately 50 lakes annually pursuant to the ALMP, thus increasing the number of lakes monitored in Illinois annually by 67%.

Because of Illinois' diverse geology, lakes throughout the state differ vastly in size, origin, morphometry, and quality. Lakes range is size from small northeastern glacial lakes to major central and southern Illinois reservoirs several thousand acres in size. Each lake that is monitored as part of the ALMP is sampled five times per year: once during the spring runoff/overturn period (April or May), three times during the summer (June, July and August), and once during the fall overturn (October). The larger or more significant lakes are referred to as "Core Lakes". Core lakes are sampled every three years (Appendix D, Table 1 and Appendix D, Figure 1), while other lakes are monitored on a less frequent basis.

Appendix D, Table 1. Illinois EPA Ambient Lake Monitoring Program List of Core Lakes.

Northern Illinois		Central Illinois		Southern Illinois	
Lake Name	**County**	**Lake Name**	**County**	**Lake Name**	**County**
Grass	Lake	Lou Yaeger	Montgomery	Sam Dale	Wayne
Fox	Lake	Otter	Macoupin	Vandalia	Fayette
Petite	Lake	Decatur	Macon	Governor Bond	Bond
Pistakee	Lake	Clinton	DeWitt	Highland Silver	Madison
Marie	Lake	Sangchris	Christian	Horseshoe	Madison
Bluff	Lake	Taylorville	Christian	Crab Orchard	Williamson
Channel	Lake	Weldon Springs	DeWitt	Little Grassy	Williamson
Catherine	Lake	Glenn Shoals	Montgomery	Kinkaid	Jackson
Long	Lake	Vermilion	Vermilion	Cedar	Jackson
Round	Lake	Mill Creek	Clark	Devils Kitchen	Williamson
Nippersink	Lake	Sara	Effingham	Raccoon	Marion
Wolf	Cook	Charleston SCR	Coles	Stephen A Forbes	Marion
Powderhorn	Cook	Evergreen	McLean	Newton	Jasper
Busse Woods	Cook	Bloomington	McLean	Lake of Egypt	Williamson
Skokie Lagoons	Cook	Paris Twin East	Edgar	Horseshoe	Alexander
Shabbona	DeKalb	Paris Twin West	Edgar	Pinckneyville	Perry
Pierce	Winnebago	Homer	Champaign	Glen O. Jones	Saline
Le-Aqua-Na	Stephenson	Mattoon	Shelby	Centralia	Marion
Carlton	Whiteside	Argyle	McDonough	Olney East Fork	Richland
Johnson Sauk Trail	Henry	Jacksonville	Morgan	Washington	Washington
George	Rock Island	Siloam Springs	Adams	Glendale	Pope
		Pittsfield	Pike	Murphysboro	Jackson
		North & South Spring	Tazewell		
		Springfield	Sangamon		
		Eureka	Woodford		
		Mauvaise Terre	Morgan		

Appendix D, Figure 1. Core and Public Water Supply Lakes of the Ambient Lake Monitoring Program.



Illinois lakes are monitored for a variety of chemical and biological parameters indicative of resource quality and trophic status. Each lake is typically sampled at three locations: Site 1 is located near the dam or deepest area of the lake; Site 2 is established at mid-lake; and the third station, Site 3, is normally positioned in the upper end of the lake or arm where the largest tributary enters. A near-surface water sample is collected at all three lake sites. Additionally, a near-bottom water sample is collected at Site 1 and an intake-depth water sample is collected at the intake site in lakes or reservoirs serving as public water supplies.

For each lake site, field measurements taken include*:* pH, conductivity, temperature/dissolved oxygen profiles, Secchi disk transparency, and alkalinity. A water sample is collected at each lake site for chlorophyll a, b, c, and pheophytin analyses. Near-surface, near-bottom and intake water samples are collected for analysis of nutrients (nitrogen and phosphorus) and total and volatile suspended sediments. For water samples that are collected at the intake depth, analyses for metals and common organic pesticides are also conducted. Samples are also collected for the identification and enumeration of phytoplankton (algae) at a subset of the lakes sampled to evaluate community structure and lake trophic status. Special investigations of shoreline erosion problems and lake macrophytes (aquatic plants) are also routinely conducted to assess lake quality and impairment of designated uses.

Objectives of the ALMP

- Characterize and define trends in the condition of significant lakes;
- Diagnose lake problems, determine causes/sources of problems, and provide a basis for identifying alternative solutions;
- Evaluate success of pollution control/restoration programs;
- Judge effectiveness of applied protection/management measures and determine applicability/transferability to other lakes;

Importance of Monitoring Illinois Inland Lakes

Analyzed data are stored in a national database called STORET. Data are used for many important program activities such as*:* determining attainment of designated uses, which drives the 303(d) list and TMDL process (reported in the *Illinois Integrated Water Quality Report and Section 303(d) List – 2006*), Illinois Clean Lakes Program Grants, and Priority Lake and Watershed Implementation Grants to name a few. With this valuable monitoring data, Illinois EPA can help attain the stated ALMP objectives and help protect and restore Illinois' valuable natural resources for future generations to enjoy and use.

Glossary of lake terms

The Illinois EPA ALMP provides in-depth studies and analyses of Illinois inland lakes. There are several water quality parameters that the Illinois EPA analyzes as part of the ALMP to help assess the water quality of lakes, including:

Trophic status: Refers to the productivity of a lake as measured by the nutrient content, particularly phosphorus, and generally includes three major categories: Oligotrophic (low productivity, low concentrations of plant nutrients), Mesotrophic (moderate productivity, moderate concentrations of plant nutrients), and Eutrophic (high productivity, high concentrations of plant nutrients).

Eutrophication: The aging of a lake through nutrient enrichment and sedimentation. Natural eutrophication refers to the process in which a lake slowly becomes enriched with nutrients and gradually fills in with organic matter or sediment. Cultural eutrophication is the acceleration of the lake aging process attributable to the activities of man including agriculture, mining, urbanization and construction.

Fall Overturn: Mixing of the water column due to declining air temperatures and winds in the fall. The air temperature cools the surface of the waters so that its temperature and density get closer and closer to that of the bottom waters. Eventually they will be similar enough so that a strong wind will penetrate the thermocline (region of greatest change in temperature and density) and mixing will occur all the way to the bottom. Complete mixing soon results in uniform temperatures, dissolved oxygen levels and densities from top to bottom.

Spring Overturn: Before the ice cover melts in the spring, the temperature at the interface of the water and ice is 0^0 C (32^0 F). The water temperature at the bottom of the lake is 4^0 C (39.2^0 F), because water at this temperature is denser than at any other temperature it will sink to the bottom. When the ice melts and the temperature of the surface water begins to rise above 0^0 C, it becomes denser and sinks, to be replaced by cooler water from below. This process continues until the entire lake is 4^0 C from top to bottom. Winds blowing across the surface create currents that are forced all the way to the bottom. The entire volume of the lake is mixed thoroughly at this time, using the energy of the wind.

ALMP Parameters Analyzed and What They Mean

The Illinois EPA ALMP provides in-depth studies and analyses of Illinois inland lakes. There are several water quality parameters that the Illinois EPA analyzes under the ALMP to help assess the water quality of lakes including:

- *Transparency:* the primary measurement taken to determine lake water clarity is the Secchi disk transparency or Secchi depth. The Secchi disk is simply a weighted circular disk about eight inches in diameter with four alternating black and white sections. Analyses of the Secchi disk measurements provide an indication of the general water quality condition of the lake, as well as the amount of usable habitat available for fish and other aquatic life. Microscopic plants and animals (phytoplankton and zooplankton respectively), watercolor, and suspended solids are factors that interfere with light penetration through the water column and decrease the Secchi disk depth. Approximately two times the Secchi depth is considered the lighted or euphotic zone of the lake. In this region of the lake there is enough light to allow plants to grow and photosynthesize, thus producing the oxygen needed by most aquatic life to survive;

- *Total suspended solids (TSS):* is a measure of all material (including algae and sediment) suspended in the water;

- *Volatile suspended solids (VSS):* is a measure of organic solids such as algae, detritus and other organisms (non-volatile suspended solids are inorganic solids such as sediment);

- *Turbidity:* is a measure of the opaqueness of the water due to light scattering and absorption. Clay, silt, organic matter, plankton and microorganisms contribute to turbidity;

- *Chlorophyll a:* is the green photosynthetic pigment found in the cells of all algae, and is used to estimate algae biomass;

- *Chlorophyll b:* is a type of chlorophyll found in green algae and diatoms, and is used to estimate the biomass of these types of algae;

- *Chlorophyll c:* is a type of chlorophyll found in brown algae, and is used to estimate the biomass of this type of algae;

- *Nitrate-nitrite nitrogen (NO_2, NO_3):* is a measure of the nitrogen compounds which are oxidized and readily available for algae to use for nutrients;

- *Total ammonia nitrogen (NH_3, NH_4):* is a normal decompositional end product of nitrogenous organic matter. NH_3 can be extremely toxic to aquatic organisms;

- *Total Kjeldahl nitrogen (TKN):* is a measurement of both the ammonia and organic nitrogen forms and is important in assessing the nitrogen available for biological activities;

- *Total phosphorus (TP):* is a measurement of the total phosphorus concentration, dissolved and particulate forms. Phosphorus is used by aquatic plants (algae and macrophytes) and organisms, and plays a vital role in energy transfer during metabolism;

- *Dissolved phosphorus (DP):* is a measurement of the dissolved phosphorus fraction which is most readily available for plant and organism uptake;

- *Conductivity:* is a numerical expression of the ability of an aqueous solution to carry an electrical current;

- *Total alkalinity:* is a measurement of the waters acid-neutralizing capacity. Total alkalinity is determined by the amount of acid needed to bring natural water to a pH of 4.5;

- *Phenolphthalein alkalinity:* is determined by the amount of acid needed to bring the water to a pH of 8.3;

- *pH:* is a measurement of the hydrogen ion concentration of the water, and measures acid (below 7) or alkaline (above 7) conditions. pH influences solubility, chemical forms and toxicity of many substances and strongly influences composition of plant and animal communities;

- *Chemical oxygen demand (COD):* is a measurement of the amount of oxygen required to chemically oxidize organic and oxidizable inorganic matter in water;

- *Dissolved oxygen (DO):* is a measurement of the quantity of oxygen present in water in a dissolved state. Indicates the degree of biological activity and the fitness of the water as an environment; and

- *Temperature:* is among the most important factors determining lake water quality. Seasonal trends are characterized by summer and winter stratification periods and spring and fall circulation periods.

- *Metals* (for public water supply lake intake site only)*:* Parameters analyzed include the following (totals only)*:* arsenic, calcium, magnesium, sodium, potassium, aluminum, barium, boron, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, silver, strontium, vanadium, and zinc.

- *Organic pesticides* (for public water supply lake intake site only)*:* Parameters analyzed include the following: dalapon, dicamba, 2,4-D, pentachlorophenol, Silvex, dinoseb, picloram, acifluorfen, trifluralin, hexachlorobenzene, alpha-BHC, atrazine, gamma-BHC, heptachlor, acetochlor, alachlor, aldrin, metolachlor, metribuzin, pendimethalin, heptachlor epoxide, gamma-chlordane, cyanazine, alpha-chlordane, p,p'-DDD, p,p'-DDT, methoxychlor, total alpha & gamma chlordane, total DDT, toxaphene, EPTC, butylate, phorate, terbufos, diazinon, simazine, fonofos, methyl parathion, chlorpyrifos, malathion, and ethyl parathion.

APPENDIX E

Fish Contaminant Monitoring Program

Illinois Environmental Protection Agency
Bureau of Water
Springfield, IL

FISH CONTAMINANT MONITORING SOP

1.0 Objectives and Scope

In Illinois, contaminant levels in fish are monitored via a cooperative program with the Illinois Environmental Protection Agency (Illinois EPA), Illinois Department of Natural Resources (IDNR), Illinois Department of Public Health (IDPH), and the Illinois Department of Agriculture (IDOA). The objectives of the Illinois Fish Contaminant Monitoring Program (FCMP) are:

1.1 To investigate and detect the presence and build-up of toxic and potentially hazardous substances in fish, encompassing both fish toxicity and public health implications.

1.2 To determine the impact of fish contaminants upon the suitability of aquatic environments for supporting abundant, useful, and diverse communities of fish life in streams and impoundments of Illinois.

1.3 To aid in the location of sources of toxic material discharges and evaluate long-term effects of source controls and land use changes.

2.0 Data Usage

The data generated by this program will be used to achieve the above objectives in the following ways:

2.1 The comparison of composite filet data for compliance with either risk-based criteria adopted by the FCMP or action levels set by the U.S. Food and Drug Administration (U.S. FDA). The risk-based criteria or U.S. FDA action levels regulating commercial fisheries are the criteria adopted at the state level for Illinois in the issuing of sport fish consumption advisories. The list of parameters and the risk-based criteria or U.S. FDA action levels used for this comparison are as follows:

Parameter	U.S. FDA Action Level	Lab Detection Limits
Dieldrin	0.3 ppm	0.01
DDT and analogs	5.0 ppm	0.01
Aldrin	0.3 ppm	0.01
Endrin	0.3 ppm	0.01
Methoxychlor	**	0.01
Heptachlor	0.3 ppm	0.01
Heptachlor epoxide	0.3 ppm	0.01
Lindane	**	0.01
Benzene hexachloride (BHC)	0.5 ppm	0.01
Toxaphene	5.0 ppm	1.00
Mirex	0.1 ppm	0.05
Hexachlorobenzene (HCB)	**	0.01

**No established U.S. FDA Action level in fish

Risk-Based Criteria for

Parameter	Unlimited Consumption	1 meal/wk	1 meal/ mo	6 meals/yr	No Consumption	Lab Detection Limits
Polychlorinated Biphenyls (PCBs)	0-0.05 ppm	0.06-0.22 ppm	0.23-0.95	0.96-1.9	>1.9	0.10
Chlordane	0-0.15 ppm	0.16-0.65 ppm	0.66-2.8	2.9-5.6	>5.6	0.01
Mercury (women of childbearing age and children ≤ 15)	0-0.05 ppm	0.06-0.22 ppm	0.23-0.99	--	≥0.99	0.10
Mercury (men over 15 and women beyond childbearing age	0-0.15 ppm	0.16-0.65 ppm	0.66-2.8	2.9-5.6	>5.6	0.10

2.2 Whole fish data will be used primarily for detecting trends and new contaminants not routinely analyzed for. As new contaminants are identified and trends in the concentration of routine contaminants are defined, the program shall adjust its sampling to meet these changes. (IJC, 1982)

2.3 Whole or composite fillet data will be used to identify lakes and streams with significant fish contaminant problems requiring more intensive investigation. These follow-up investigations will be designed to assess in greater detail, (a) the extent of the contamination, (b) the potential sources of the contamination, and (c) the development of a mitigation strategy.

3.0 Monitoring Network Design and Rationale

The statewide monitoring network consists of the following components:

3.1 Lake Michigan - Samples of Chinook or Coho salmon, lake, rainbow, and brown trout, yellow perch, rainbow smelt, bloater chubs, and alewives are collected annually from the open waters of Lake Michigan, according to the size ranges specified in Section 5.1.2 for salmon and trout and as available for the other species. In addition, selected harbors and tributaries are sampled for representative predators, omnivores, and bottom feeders as needed.

3.2 Basin Surveys - A minimum of one complete sample (i.e., 2 bottom feeders, 1 omnivore, and 1 predator) is collected from each basin scheduled for an intensive survey each year. Additional samples shall be collected at the discretion of the field sampling team where it is known or anticipated that the public can regularly fish in the water body (for example, presence of a boat launch, evidence of fishing activity such as discarded bait containers, etc.). Such samples shall focus on the species and sizes of fish known or anticipated to be sought by anglers. The FCMP may also request that the field sampling team attempt to obtain samples from specific water bodies within a basin scheduled for an intensive survey, for example in response to requests from the public or local officials.

3.3 Follow-up Samples - Specific numbers and sizes of one or more species (often 2 sizes of bottom feeders, omnivores, and predators, plus 1 pan fish and any other species regularly targeted by anglers) may be requested by the FCMP in order to follow up on bodies of water where previous samples have indicated that one or more species have contaminants above a level of concern (either risk-based or U.S. FDA criteria). Such samples shall also be requested by the FCMP on a regular basis in order to evaluate the continued need for an existing advisory or a species or modifications of the existing advisory.

3.4 Lower Priority Samples - Bodies of water from which no species have been found to have contaminants above a level of concern (either risk-based or U.S. FDA criteria) are assigned a lower priority for sampling frequency. Such bodies shall be re-sampled on a recurring basis (for example, every 5 to 10 years), as permitted by budgetary and laboratory capacity constraints.

3.5 Special Samples - As necessitated by special circumstances, such as investigations of spills, fish kills, and toxic chemical cleanup sites, the FCMP may request specific numbers and sizes of selected fish or other aquatic species be collected by field sampling teams or other personnel. Such samples may be designated as high priority for analysis by the Illinois EPA or other designated laboratory. Costs for collection and analysis of such samples shall be paid by the party(ies) responsible for the special circumstance to the maximum extent possible.

4.0 Monitoring Parameters and Their Frequency of Collection

A total of 20 pesticide/PCB analyses are performed on all composite fillet samples. These analyses comprise the 14 parameters, including related isomers, listed on page 128. The percent lipid or fat content is also determined for each sample. In addition to the 20 pesticide/PCB analyses on whole fish, a gas chromatography/mass spectrometry "wide scan" analysis may be performed on whole fish samples as the need arises. The "wide scans" include up to 50 additional parameters, including both volatile and semi-volatile constituents. Their purpose is to aid in the identification of new contaminants of potential concern. Based on this information, it may be necessary at some point in the future, to expand or revise the list of parameters being analyzed routinely.

Additional analyses for mercury will be performed for all predator species samples and may be performed for other species on a selected or as needed basis. Other heavy metals are not routinely analyzed in fish tissue. Even though metal complexes may be present in fish tissue, metallic ions rarely accumulate in fish tissue to high levels, and are more readily observed and monitored in water and sediment (IJC, 1982.)

5.0 Sampling Procedures/Quality Control

The Illinois Department of Natural Resources - Division of Fisheries is responsible for the collection and preparation of all fish samples from those stations identified by the FCMP. Composite fillet and whole fish samples are collected and processed during the course of scheduled annual stream and lake fish population sampling, and follow the guidelines below.

5.1 Collection of Composite Fillet Samples

A minimum of 3 and preferably 5 or more fish of a single species of roughly similar size and weight comprise each composite fillet sample. The smallest fish in the composite sample must be at least 75% of the length of the largest fish in the sample. For example, if the largest fish is 20 inches, the smallest fish in the sample must be at least 0.75 x 20 = 15 inches. A minimum of 4 composite fillet samples are obtained at each station using the following species groups:

5.1.1 Inland Lakes and Streams

Composite 1

Predatory Species	Size
Largemouth bass	2 lbs. and larger
Walleye or sauger	2 lbs. and larger
Northern pike	2 lbs. and larger
White bass	1-2 lbs. and larger
Crappie (white, black)	3/4 lbs. and larger

Composite 2

Omnivorous Species	Size
Channel catfish	2 lbs. and larger
Blue catfish	2 lbs. and larger
Flathead catfish	2 lbs. and larger
Bullhead (species)	1 lb. and larger
Bluegill	1/4 lbs. and larger

Composite 3 and 4

Bottom Feeder Species	Size
Carp	3 lbs. and larger
Buffalo (species)	3 lbs. and larger
Carpsuckers	3 lbs. and larger

A replicate composite fillet sample is collected from the bottom feeders' group, resulting in the 4 composite fillet samples required at each station. The first species in each group should be used if available; other species are substituted according to the size requirement.

Additional composite fillet samples may be collected and submitted for analysis at the discretion of the District or Project biologist. For example, if white bass are important components of the creel in a given lake, the biologist may wish to submit a white bass composite fillet sample in addition to the largemouth bass sample, etc. Only during basin or special surveys, it is acceptable to use smaller fish.

5.1.2 Lake Michigan Species

Composite fillet samples from Lake Michigan are obtained for a minimum of 5 lake species: Coho salmon, Chinook salmon, rainbow trout, brown trout, and lake trout. Additional samples of other species may be submitted at the discretion of the IDNR Lake Michigan Program Manager. Four composite fillet samples for each species are prepared based upon the ranges of size at the time of collection. A composite fillet sample from Lake Michigan consists of at least 5 fish per size group. Samples are to be grouped according to the indicated length ranges by species.

Species	length ranges in inches			
	1	2	3	4
Coho salmon	<21	21-24	25-27	>27
Chinook salmon	<25	25-30	31-35	>35
Rainbow trout	10-15	16-20	21-25	>25
Brown trout	10-15	16-20	21-25	>25
Lake trout	<20	21-25	>25	--

5.2 Preparation and Identification of Composite Fillet Samples

IDNR biologists collecting the samples are to complete the following field information on the Field/Lab form. (Appendix E, Figure 1)

5.2.1 Station code
5.2.2 Location description (i.e. specific place on lake, town, county etc.)
5.2.3 Water body name
5.2.4 Collection date
5.2.5 Collection time

5.2.6 Collector's name
5.2.7 Individual lengths and weights of fish in sample
5.2.8 Average lengths and weights
5.2.9 Sample type (whole, fillet or egg)
5.2.10 Number of individuals
5.2.11 Check appropriate fish species
5.2.12 Materials check list for whole and fillet fish sampling

1) Fillet knife
2) Sharpening stone
3) Aluminum foil
4) Cookie sheet or cutting board
5) Cooler with ice or ice packs
6) Plastic bags
7) Proper labeling material

The composite fillet samples are prepared by removing the scales and leaving the skin on the fish. Then, fillet to remove bones. If the fillet is too large, select a section from the anterior, middle and posterior portion of the fillet and place them in the composite sample. The total weight of the composite sample (all 5 fish) must range from 1 to 5 pounds. Keep the sample as clean as possible to avoid contamination. Composite fillet samples from catfish are prepared by removing skin and then filleting the fish to remove bones. The size of the composite sample must range from 1 to 5 pounds. Each composite fillet sample is securely wrapped in aluminum foil and labeled with a pre-printed, adhesive label (Figure 2). There are two pre-printed labels with the same sample number. One label is placed on the outside of each fish sample, and the other placed on the accompanying Field/Lab form in the area designated. This is essential so that the laboratories completing the analysis can identify each composite sample with the correct station. All composite samples collected from a sampling station are placed in an airtight plastic bag; this will help prevent contamination of samples and loss of identification numbers on pre-printed labels. The Field/Lab forms are <u>not</u> to be placed inside the plastic bags with the fish samples. The samples are then kept on ice or dry ice during field sampling and frozen as soon as possible upon completion of field sampling.

5.3 Collection of Whole Fish Samples

IDNR biologists collect whole fish samples from specified contaminant stations. One whole fish sample is provided for each of the 4 composite fillet samples, with the whole fish sample being representative of the individual fish that comprise the composite fillet sample.

5.4. Preparation and Identification of Whole Fish Samples

The IDNR biologist completes the same field information on the Field/Lab form as described earlier for composite fillet samples. Securely wrap each whole fish sample in aluminum foil and label with the pre-printed, adhesive labels. Again, as with the composite sample, place one label on the outside of each whole fish, and the other label with the same pre-printed number on the appropriate Field/Lab forms in the area designated. All whole fish from a sampling station are placed in an airtight plastic bag and kept on ice, or dry ice, during field sampling. The samples are frozen as soon as possible upon completion of field sampling.

6.0 Follow-up and Special Requests/Studies

6.1 Follow-up Studies - These studies are designed to provide more extensive data results in those areas where potential fish contaminant problems exist and will be conducted on an "as needed" basis. Sample analyses will be performed by Illinois EPA laboratories to insure as much consistency as possible with data generated from the routine network stations. Collection of these samples may include either IDNR and/or Illinois EPA biologists. Sample collections from additional sources (i.e., other States on boundary waters, U.S. Army Corp of Engineers, U.S. Fish and Wildlife Service, or local government such as Metropolitan Water Reclamation District of Greater Chicago) may be utilized in follow-up studies if the sampling protocols and field quality assurance (QA) procedures documented in this agreement are used.

6.2 Commercial Requests - These samples are collected by IDNR at waterbodies which have been requested to be opened for commercial fishing. IDNR will contact Illinois EPA for assignment of station codes and documentation of sampling locations prior to the collection of these samples. In addition, the words COMMERCIAL FISH REQUEST should appear across the top of the Field/Lab sample sheet to clearly distinguish these samples from routine ones. These samples will be analyzed by the Illinois EPA laboratory.

6.3 Special Studies - The special studies provide a wide range of additional data and information which cannot normally be provided by the routine network data. For example, these studies may involve further addressing seasonal and species variability concerns which will add to the overall knowledge and understanding of contaminant levels in fish. They may also involve remedial investigation work at the request of Illinois EPA, Division of Land Pollution Control. The Illinois EPA laboratory will provide the analytical needs for these studies in the support of the overall Fish Contaminant Monitoring Program. It is this laboratory or Private Contract Laboratories that will determine the necessary laboratory capabilities, as well as any other laboratory considerations, at the time of the design of such studies.

7.0 Sample Chain of Custody Procedures

7.1 Delivery of Samples to Illinois EPA

All whole and fillet samples collected from the network are delivered directly to Illinois EPA, Division of Water Pollution Control, Surface Water Section. The address and contacts are as follows:

Illinois Environmental Protection Agency
BOW/Surface Water Section
4500 South Sixth Street
Springfield, IL 62703
Contact: Bill Ettinger or Jim Hefley
Phone - 217/786-6892

Transportation of samples to the Surface Water Section is routinely coordinated between the IDNR biologists and Illinois EPA regional staff. The contacts mentioned above should be notified prior to any delivery.

When custody of fish samples is transferred to Surface Water Section staff, the following quality assurance checks are implemented:

7.1.1 Insure all whole fish samples are wrapped in aluminum foil and placed in plastic bags per sampling guidelines.

7.1.2 Matching I.D. tags are firmly affixed to both the Field/Lab form and each whole fish sample. (I.D. tags on fish sample should be taped.)

7.1.3 Each Field/Lab form has all the necessary field information required.

7.1.4 Insure the whole fish samples targeted for "wide scan" analyses are prepared in the following manner:

The stations in which whole fish samples will be analyzed by GC/MS "wide scan" procedures are identified below:

The wide scan analysis will be performed on the whole fish representing the bottom feeders group from these stations. Usually this species will be carp. One whole fish from this group, plus a replicate whole fish may be collected by IDNR. Therefore, additional samples are not necessary; the 2 whole fish representing the bottom feeders from the selected stations are targeted for wide scan analysis plus the 14 routine parameters.

Upon completion of these QA checks, the Field/Lab form is signed and dated in the appropriate space by the person transporting the sample. All fish samples delivered are checked onto a sample log maintained by Illinois EPA quality assurance staff. Samples remain frozen until delivery to Illinois EPA laboratories, at which time the laboratory-receiving agent initials the data form and date of sample receipt.

7.2 Prioritizing Analyses to Laboratory

Priority of analyses to laboratory will be coordinated by the FCMP and/or DWPC Surface Water Section.

7.3 Delivery of Fish Samples to Tissue Bank

Tissue banking is of value for retrospective analyses of contaminant levels and past human exposure (IJC, 1982). All whole and composite fillet samples analyzed by the participating laboratories are to be inventoried into the tissue bank. The laboratories are to provide a 250-gram ground subsample, from whole or composite fillet samples which have been analyzed, to be stored. Illinois EPA is responsible for the storage, transportation, and maintenance of the tissue bank samples. Each bottle containing a tissue bank sample needs to have the corresponding lab I.D. number issued to each Field/Lab form clearly written on the outside of the bottle in permanent ink. This will insure proper identification of the sample.

The tissue bank is located at:

Humphreys Market
1821 S 15th Street
Springfield, IL
217/544-7445

For the inventory list of fish in the tissue bank, and transportation arrangements contact:

Illinois Environmental Protection Agency
BOW/Surface Water Section
4500 South Sixth Street
Springfield, IL 62703

Contact: Bill Ettinger or Jim Hefley
Phone - 217/786-6892

8.0 Laboratory Calibration Procedures and Quality Control

8.1 Illinois EPA Laboratory

All calibration and quality control procedures used in the fish analyses by the Illinois EPA laboratory are referenced in standard operating procedures (SOPs) maintained by the Illinois EPA Division of Laboratories. Copies of the documented procedures can be made available upon request. The Illinois EPA laboratory, will participate in QA/QC efforts with other States and Federal Agencies as needed. An internal QA/QC program consisting of duplicates and blanks QC samples comprising 1 of every 10 analyses (10%), will insure precision and accuracy. In addition, the Illinois EPA laboratory will maintain participation in the U.S. FDA spike sample-testing program. (See Performance and Systems Audit).

9.0 Data Dissemination

9.1 Data Handling of Composite Fillet Samples

All fish are taken by Surface Water Section Staff to the Illinois EPA laboratory. When the Illinois EPA laboratory has completed the analysis and entered the data into LIMS (Laboratory Information Management System), the completed field/lab forms are returned to Surface Water Section Staff. This information is then ready for entry into STORET (STORage and RETrieval). For any data that shows excursions, Illinois EPA staff will forward copies of the field/lab forms to IDNR and IDPH.

9.2 Data Handling for Whole Fish Samples

All laboratory results for whole fish samples analyzed by Illinois EPA labs are forwarded to the Surface Water Section staff where the same procedures outlined above for composite fillet samples are implemented.

10.0 DATA MANAGEMENT QUALITY CONTROL

The Field/Lab forms received by Illinois EPA data management personnel are checked in on a program checklist and reviewed for missing or illegible values, station code errors, etc. These forms are held until the fish contaminant data are printed from LIMS each week by ISD (Information Systems Division) to a pre-edit report for verification against these forms. Fish contaminant data are then transferred by ISD into a STORET dataset. The data sets are printed out and compared with the original format to assure transfer of all data. Preliminary data editing is performed to correct errors discovered through the %store procedure. When error-free, the data sets are stored final. The data are then accessed to see if the storage run was successful. The data retrieved are verified from original lab forms and data printouts. Any errors are corrected, missing data added, etc. The corrections are checked and the procedure repeated as necessary until an error-free copy is obtained.

10.1 Data Representativeness; Comparability; Completeness

Data comparability must be assured by a) frequent interagency communication and review of sampling, analytical and assessment methodologies, and b) implementation of a quality assurance program which includes field, laboratory and data management quality control (IJC, 1982). Data representativeness and completeness needs to be assured through an established evaluation process of the monitoring program, altering the program as required (IJC, 1982). At a minimum, an annual meeting of the participating agencies will be conducted where these quality assurance characteristics are addressed.

10.2 Data Validation

The validation of data for the Fish Contaminant Monitoring Program is the prime responsibility of each participating Agency's quality assurance personnel. This process includes checks for internal consistencies, inter-agency consistencies, proper sample identification, sample delivery errors, etc.

10.3 Performance and System Audits

Spiked fish flesh samples obtained from U.S. Food and Drug Administration are utilized as a performance audit for the participating laboratories. The procedures used are as follows

10.3.1 Each participating laboratory receives 125 grams of fish composite and an ampoule containing a spiking solution from U.S. FDA.

10.3.2 The ampoule is weighed and compared to the weight recorded on the enclosed weight sheet. Any deviations greater than 25 mg are reported to Joseph Washer, U.S. FDA, phone 612/349-3934.

10.3.3 The fish composite is thawed and mixed.

10.3.4 To 50 grams of the fish in a blender, 5.0 ml of spiking solution is added.

10.3.5 The 50 grams of spiked fish, along with a 50 gram inspect portion, are analyzed for chlorinated pesticides.

10.3.6 Results for <u>both</u> of these samples, worksheets, and chromatograms are sent to:

Illinois Environmental Protection Agency
Bureau of Water, Surface Water Section
1340 North Ninth Street
Springfield, IL 62702
Attention: Missy Cain
217/782-3362

10.3.7 The results of these samples from all of the participating laboratories are statistically summarized. Each laboratory is assigned an I.D. number known only to their laboratory, for comparison with other participants' results.

10.4 Advisories/News Releases and Reports

Review of data results for purposes of issuing sport fish consumptive advisories will be accomplished through an inter-Agency committee. Draft advisories, prior to release by IDPH, will be forwarded to Illinois EPA, Surface Water Section and IDNR with adequate time for comments and review prior to final approval by the Inter-Agency Committee. After a committee review, and at such other times as deemed necessary or advisable by IDPH, IDPH will issue news releases and advisories in the performance of duties in protecting the public health.

IDPH will have the primary responsibility for responding to public and media inquiries regarding advisories, IDNR and Illinois EPA will also be available to assist with these inquiries.

IDNR will annually publish a list of those waterbodies where consumption advisories exist in the "Guide to Illinois Fishing Regulations." This guide is available when purchasing fishing licenses. In addition, IDPH may publish and distribute additional outreach materials as needed. The data results will be published once every five years by Illinois EPA in the *Illinois Integrated Water Quality Report and Section 303(d) List.* This report will also periodically include information relating to observed trends in contaminant concentrations. It is the Illinois EPA's responsibility to update and revise this document.

Literature Cited

International Joint Commission. 1982. Proceedings of the roundtable on the surveillance and monitoring requirements for assessing human health hazards posed by the contaminants in the Great lakes Basin ecosystem.

KEY TERMS/DEFINITIONS

Accuracy - Conformance with a known value.

Composite Fillet Sample - Fish sample prepared by removing the scales and bones from the edible portion of the fish.

Field/Lab Form - Sample sheet used in the Fish Contaminant Monitoring Program which records field, lab analysis, and computer coded information.

New Contaminants - Parameters which are not analyzed on a regular basis as part of the Fish Contaminant Monitoring Program.

Non-Permanent Stream Station -A site location where fish are collected which varies yearly, depending on station locations in the Illinois EPA/IDNR Basin Assessment Program.

Performance Audit - Independently collected measurement data using performance evaluation samples (i.e., spiked fish flesh samples).

Permanent Stream Station - A site location which remains fixed in the same river reach where fish are collected.

Precision - The reproducibility of repeated measurements.

Pre-Printed Adhesive Labels - I.D. tags used for fish samples.

Quality Assurance - A term used to describe programs and the sets of procedures including, but not limited to quality control procedures, which are necessary to assure data reliability.

Quality Control - A term used to describe the routine procedures used to regulate measurements and produce data of satisfactory quality.

Routine Contaminants - The 14 parameters which are analyzed in every fish sample. (See Section 2.1)

Significant Fish Contaminant Problem - For general purposes, a sample set of fish collected from a given water body which contain 30% or greater samples requiring “No consumption” advisories using risk-based criteria, or 30% or greater excursions of USFDA action levels for any given parameter.

STORET - USEPA storage and retrieval database used for fish data generated by the Fish Contaminant Monitoring Program in Illinois.

Systems Audit - A review of the total production process which includes, on-site reviews of field and laboratory's operational systems and physical facilities for sampling, calibration, and measurement protocols.

Tissue Bank - Storage for separate fish samples, for which analysis values have been determined from a sub-sample, used for retrospective analyses of contaminant levels and past human exposures.

U.S. FDA Action Level - Concentration of a particular chemical which cannot be exceeded in fish sold for human consumption.

Wide Scan Analysis - Illinois EPA laboratory procedure used to identify contaminants not routinely analyzed.

Appendix E, Figure 1. Request of laboratory analysis-fish tissue sample

Sample-Group Number (For Laboratory Use Only): ______________________

Request for Laboratory Analysis/
Fish-Tissue Sample
(Illinois EPA/Bureau of Water/Surface Water Section)

Station Code: ______________________
Sample Depth (ft): 1
Location Description: ______________________

Waterbody Name: ______________________
Surface-Water Monitoring Program: Fish Contaminant
Sample Medium: Biological

Collection Date: ___ ___/___ ___/___ ___ ___ ___
(mm) (dd) (yyyy)

Collection Time: (24-hr.: hh:mm) _____ : _____

Collected By:

Funding Code: WP06

Fish Length (mm)	Fish Weight (g)
________	________
________	________
________	________
________	________
________	________

Trip ID: FT Visit No.: 1

Average of Indiv. Lengths (mm): ________

Fillet__ Whole___ Egg___ Count of Indiv.: _____ Replicate No.: _______

Average of Indiv. Weights (g): __________

Fish Code	Check One	Fish Common Name	Fish Code	(cont.)	Fish Common Name
ALE		Alewife	PUD		Pumpkinseed
BCF		Blue Catfish	RAS		Rainbow Smelt
BGB		Bigmouth Buffalo	RBT		Rainbow Trout
BHC		Bighead Carp	ROB		Rock Bass (Hg)
BKB		Black Buffalo	RVC		River Carpsucker
BLB		Black Bullhead	SAB		Smallmouth Buffalo
BLC		Black Crappie (Hg)	SAR		Sauger (Hg)
BLG		Bluegill	SCP		Silver Carp
BLO		Bloater	SMB		Smallmouth Bass (Hg)
BRT		Brown Trout	SPB		Spotted Bass (Hg)
CAP		Common Carp	ULL		Quillback
CCF		Channel Catfish	WAE		Walleye (Hg)
CHN		Chinook Salmon	WHB		White Bass (Hg)
CHO		Coho Salmon	WHC		White Crappie (Hg)
FCF		Flathead Catfish (Hg)	YEB		Yellow Bullhead
FRD		Freshwater Drum	YEP		Yellow Perch
GZS		Gizzard Shad	YLB		Yellow Bass (Hg)
LAT		Lake Trout			Other (specify):
LMB		Largemouth Bass (Hg)			

FOR OFFICE USE	Run	Parameter	Method
		Organics	ORL018-02-0900
		Mercury	INL029-01-0802

Contact Info:
Name: Jim Hefley
Telephone: 217/786-6892
Email: Jim.Hefley@epa.state.il.us

LABORATORY INFORMATION

Date Received ____ /____ /_______ Time Received ____:____ (24 hr.: *hh:mm*)

Samples Received By: ______________________

Sample Receipt Temperature °C: ________ Date Forwarded ____ /____ /

PLEASE RETURN THIS SHEET TO:
Illinois Environmental Protection Agency
Surface Water Section #15
1021 N. Grand Ave. East, P.O. Box 19276
Springfield, IL 62794-9276

Illinois Department of Public Health
STICKER

Appendix E, Figure 2. Pre-printed Illinois Department of Public Health adhesive labels

Pre-Printed Adhesive Labels

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
OFFICE OF HEALTH REGULATION
DIVISION OF FOOD, DRUGS AND DAIRIES

A replicate sample was submitted for laboratory evaluation.

Sample No. 30752 DATE ____________, 19 ___ Inspector ______________________
Firm
Sample of ______________________ Representative ______________________

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
OFFICE OF HEALTH REGULATION
DIVISION OF FOOD, DRUGS AND DAIRIES

Sample No. 30752 DATE ____________, 19 ___ Inspector ______________________
Firm
Sample of ______________________ Representative ______________________

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
OFFICE OF HEALTH REGULATION
DIVISION OF FOOD, DRUGS AND DAIRIES

A replicate sample was submitted for laboratory evaluation.

Sample No. 30753 DATE ____________, 19 ___ Inspector ______________________
Firm
Sample of ______________________ Representative ______________________

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
OFFICE OF HEALTH REGULATION
DIVISION OF FOOD, DRUGS AND DAIRIES

Sample No. 30753 DATE ____________, 19 ___ Inspector ______________________
Firm
Sample of ______________________ Representative ______________________

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
OFFICE OF HEALTH REGULATION
DIVISION OF FOOD, DRUGS AND DAIRIES

A replicate sample was submitted for laboratory evaluation.

Sample No. 30754 DATE ____________, 19 ___ Inspector ______________________
Firm
Sample of ______________________ Representative ______________________

ILLINOIS DEPARTMENT OF PUBLIC HEALTH
OFFICE OF HEALTH REGULATION
DIVISION OF FOOD, DRUGS AND DAIRIES

Sample No. 30754 DATE ____________, 19 ___ Inspector ______________________
Firm
Sample of ______________________ Representative ______________________