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2024 Lake and Reservoir Monitoring Work Plan

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APPROVAL SIGNATURES

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This work plan is consistent with agency requirements.

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WORK PLAN ORGANIZATION

This work plan is an extension of the existing Indiana Department of Environmental Management (IDEM) Office of Water Quality (OWQ) Watershed Assessment and Planning Branch (WAPB) Quality Assurance Project Plan (QAPP) for Indiana Surface Water Programs (Surface Water QAPP) (IDEM 2023a) and QAPP for Biological Community and Habitat Measurements (IDEM 2020). Per the United States Environmental Protection Agency (U.S. EPA) Guidance on Systemic Planning using the Data Quality Objectives (DQO) Process (U.S. EPA 2006) and the U.S. EPA Guidance for Quality Assurance Project Plans (U.S. EPA 2002), the work plan establishes criteria and specifications pertaining to a specific water quality monitoring project usually described in the following four sections as QAPP elements.

Section I. Project Management

- Project Objective
- Project/Task Organization and Schedule
- Background and Project/Task Description
- Data Quality Objectives (DQOs)
- Training and Staffing Requirements

Section II. Data Generation and Acquisition

- Sampling Procedures
- Analytical Methods
- Sample and Data Acquisition Requirements
- Quality Control (QC) Measures Specific to the Project

Section III. Assessment/Oversight

- External and Internal Checks
- Audits
- Data Quality Assessments (DQAs)
- Quality Assurance/Quality Control (QA/QC) Review Reports

Section IV. Data Validation and Usability

- Data Handling and associated QA/QC activities
- QA/QC Review Reports

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LIST OF ACRONYMS

AIMS	Assessment Information Management System
ASTM	American Society for Testing and Materials
CPR	Cardiopulmonary Resuscitation
CWA	Clean Water Act
DELT	Deformity, Eroded Fin, Lesion, Tumor
DO	Dissolved Oxygen
DQO	Data Quality Objective
ESRL	Earth System Research Laboratory
ha	Hectares
HBI	Hilsenhoff Biotic Index
IAC	Indiana Administrative Code
IBI	Index of Biotic Integrity
IBS	Index of Biotic Sustainability
IC	Indiana Code
IDEM	Indiana Department of Environmental Management
INCLP	Indiana Clean Lakes Program
IN DNR	Indiana Department of Natural Resources
IU SPEA	Indiana University's O'Neill School of Public and Environmental Affairs
MLES	Midwest Lake Electrofishing System
NLA	National Lakes Assessment
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit(s)
OWQ	Office of Water Quality
PFD	Personal Flotation Devices
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QHEI	Qualitative Habitat Evaluation Index
RPD	Relative Percent Difference
SOLAS	Safety of Life at Sea
SOP	Standard Operating Procedure
TMDL	Total Maximum Daily Load
U.S. EPA	United States Environmental Protection Agency
WAPB	Watershed Assessment and Planning Branch

DEFINITIONS

Elutriate	To purify, separate, or remove lighter or finer particles by washing, decanting, and settling.
Impoundment	A body of water confined within an enclosure, such as a reservoir.
Lentic	Referring to a waterbody type -stationary or relatively still water.
Macroinvertebrate	Aquatic animals which lack a backbone, are visible without a microscope, and spend some period of their lives in or around water.
Macrophyte	Plants which are visible without a microscope and occur in or around water.

I. PROJECT MANAGEMENT

Project Objective

The main objective of the Lake and Reservoir Monitoring Project is to collect additional chemical, physical, and biological data to aid in the refinement of the Index of Biotic Integrity (IBI) for littoral fish assemblages for inland warm water lakes in northern and central Indiana (Simon 2001) and the Index of Biotic Sustainability (IBS) developed for fish communities in southern Indiana oxbow lakes and reservoirs (Simon 2002; Simon, Thomas & IV, Thomas 2014) and potentially develop multi-metric indices for aquatic macroinvertebrate and aquatic macrophyte communities. These indices could be used to provide a comprehensive, unbiased assessment of the ability of Indiana's lentic systems (i.e., natural lakes and reservoirs) to support aquatic life. Data collected during lake and reservoir monitoring supports the following purposes:

- Provide water quality and biological data useful for municipal, industrial, agricultural, and recreational decision-making processes, including Total Maximum Daily Load (TMDL) decisions and National Pollutant Discharge Elimination System (NPDES) permit waste load allocations modeling.
- Compile water quality, biological, and habitat data for trend analyses.
- Aid in development of biological water quality criteria for lentic systems.

Project/Task Organization and Schedule

The Indiana Clean Lakes Program (INCLP) is a statewide lake monitoring and education program created through a partnership with Indiana University's O'Neill School of Public and Environmental Affairs (IU SPEA). Each year, the INCLP collects water chemistry, plankton, and chlorophyll *a* data from 70-80 randomly generated publicly accessible natural and man-made lakes to assist IDEM in assessments of lake water quality for U.S. EPA's Clean Water Act (CWA). INCLP sampling is conducted in July and August when worst-case and stable conditions are expected in lakes (IU SPEA 2019). To optimize data collection on a lake, IDEM sampling will be conducted at a subset of INCLP lakes (maximum of 14) during the same sampling year as sampling performed by the INCLP. However, IDEM will collect additional data for habitat, fish, macroinvertebrate, and macrophyte communities between June and November as staffing and resources allow. Laboratory processing and data analysis for the project will continue through the following spring of the sampling year. Table 1 provides a list of potential lakes for sampling in 2024. Small lakes range in size from 20-100 hectares (ha), medium lakes are >100-1,000 ha, and large lakes are >1,000 ha (Simon 2001, 2002; Simon, Thomas & IV, Thomas 2014).

Table 1 Potential Sampling Locations for 2024 Lake and Reservoir Monitoring

LAKE NAME	COUNTY	LOCATION	LAKE TYPE	SIZE CATEGORY
Rockville	Parke	in Rockville	Impoundment	SMALL
Daredevil Pit	Clay	Chinook Public Fishing Area	Strip Mine Lake	SMALL
Patoka Res.	Dubois	3 mi. N of Birdseye	Impoundment	LARGE
Robinson	Whitley	4 mi. NW of Larwill	Natural Lake	SMALL
Celina	Perry	1 mi. N. of Apalona	Impoundment	SMALL
George (Hobart)	Lake	W. Of Hobart in city limits	Impoundment	MEDIUM
Loon	Stueben	4 mi. N. W. of Angola	Natural Lake	SMALL
Dale Reservoir	Spencer	1.5 mi. NE of Dale	Impoundment	SMALL
Buffalo Trace	Harrison	0.5 mi. E. of Palmyra	Impoundment	SMALL
Cedar	Lake	6 mi. S.W. of Crown Point	Natural Lake	SMALL
Delaney Creek Park Lake	Washington	4 mi. N of Salem on SR 135 to Delany Creek Rd.	Impoundment	SMALL
Pretty	LaGrange	3 mi. W. of Stroh	Natural Lake	SMALL
Big Long	LaGrange	3 mi. N.E. of South Milford	Natural Lake	SMALL
Fish (Lower)	LaPorte	3 mi. E. of Stillwell	Natural Lake	SMALL

Fish community sampling will occur once during the sampling season on each waterbody; however, it may take one or two consecutive nights to sample multiple 500-meter stations randomly generated along the shoreline. The number of stations is determined by size category (surface hectares of the waterbody). Two sites in small lakes, four sites in medium lakes, and six sites in large lakes (Simon 2001, 2002; Simon, Thomas & IV, Thomas 2014). Sampling occurs no earlier than one half hour after sunset and lasts no longer than one half hour prior to sunrise. At each station, record the following characteristics for each species:

- Counts,
- Length and weight measurements, and
- Condition of fish observations (deformity, eroded fin, lesion and tumor (DELT) anomalies).

Determine Qualitative Habitat Evaluation Index (QHEI) scoring of each station's fish communities for a maximum of six scores.

Each waterbody macroinvertebrate community sampling period occurs once for one or two consecutive days during daylight hours. Collect a composite sample for each waterbody. Each composite sample consists of samples taken from ten evenly distributed sampling points along the shoreline of the waterbody. Determine QHEI scoring of each macroinvertebrate community sampling point.

Each waterbody macrophyte community sampling period occurs once, during daylight hours, when five composite samples are collected. Sampling transects occur at every other macroinvertebrate community sampling site perpendicular to the shoreline.

Collect water quality measurements (dissolved oxygen (DO), % DO saturation, water temperature, pH, specific conductance, and turbidity) at the beginning and end points of each 500-meter station for fish community sampling, and at each of the 10 macroinvertebrate/macrophyte sampling sites.

Conduct sampling activities in the following timeframes:

- Complete site reconnaissance in March through May of the sampling year. Conduct reconnaissance activities in the office and/or through physical site visits.
- Schedule fish, macroinvertebrate, and macrophyte community sampling during the months of June through November, at up to 12 lakes or reservoirs per year, depending on IDEM-OWQ staff availability.
- Complete chemical measurements and habitat evaluations during each fish and macroinvertebrate community sampling event.

Background and Project/Task Description

The WAPB in IDEM's OWQ operates the Lake and Reservoir Monitoring Project. Other organizations assisting with data preparation, collection, and analysis include INCLP and the Indiana Department of Natural Resources (IN DNR).

The Lake and Reservoir Monitoring Project provides physical, chemical, and biological data used to calibrate the IBI and IBS for fish community samples. After multiple years of sampling, data collected from this project may be used to create a multi-metric index for aquatic macroinvertebrates and possibly aquatic macrophytes. Calibration is accomplished by sampling lakes and reservoirs over several years to characterize overall water quality and biological sustainability. Data from the following parameters are investigated and utilized for lake biological criteria refinement: water chemistry; fish, macroinvertebrate, and macrophyte assemblages; and habitat evaluations.

Data Quality Objectives (DQOs)

The DQO process (U.S. EPA 2006) is a data collection activity planning tool. The following seven steps identify the DQO planning process for the Lake and Reservoir Monitoring Project:

1. State the Problem

Assessments: Indiana is required to assess all waters of the state to determine their designated use attainment status. Indiana narrative biological criteria [327 IAC 2-1-3] states that "all waters, except as described in subdivision (5)," (i.e., limited use waters) "will be capable of supporting" a "well-balanced, warm water aquatic community". The water quality standard definition of a "well-balanced aquatic community" is "an aquatic community that: (A) is diverse in species composition; (B) contains several different trophic levels; and (C) is not composed mainly of pollution tolerant species" [327 IAC 2-1-9]. This project gathers in-situ field measurements (water temperatures, DO, and other characteristics); INCLP's water chemistry, plankton, and chlorophyll *a* data; fish, macroinvertebrate, and macrophyte community data; and habitat evaluation data for the purpose of developing an assessment methodology for aquatic life use in lakes and impoundments.

2. Identify the Goals of the Study

The goals of this study are to gather additional chemical, physical, and biological data at INCLP lakes:

- to refine the IBI and IBS developed for Indiana by Dr. Thomas Simon (Simon 2001, 2002; Simon, Thomas & IV, Thomas 2014).
- investigate the development of a multi-metric index for aquatic macroinvertebrates in lentic systems.
- and potentially develop a multi-metric index for aquatic macrophyte communities in lakes.

The data collected will assist with calibration of indices so future waterbodies can be assessed for aquatic life use support and eventually be included in future updates of Indiana's Integrated Water Monitoring and Assessment Report to U.S. EPA.

3. Identify Information Inputs

Biological community sampling (fish, macroinvertebrate, and macrophyte communities); instantaneous field parameters (DO, % DO saturation, water temperature, pH, specific conductance, and turbidity); and QHEI scoring occur as one-time sampling events at stations within the potential waterbodies listed in Table 1. Water chemistry, plankton, and chlorophyll *a* data are collected by the INCLP as a one-time sampling event following the QAPP for INCLP (IU SPEA 2019). All information collected assists with the recalibration of the IBI and IBS with the use of new and existing data and future development of multi-metric indices for aquatic macroinvertebrate and aquatic macrophyte communities. Collection procedures for field measurements, biological, and habitat data are described in detail under Section II. DATA GENERATION AND ACQUISITION.

4. Define the Boundaries of the Study

See Table 1 for the list of potential sampling locations. See Figures 1 and 2 for detailed maps of a representative fish community sampling effort. See Figure 3 for a detailed map of a representative aquatic macroinvertebrate and macrophyte sampling effort.

Figure 1 Example of a waterbody shoreline divided into 500-meter stations for fish community sampling

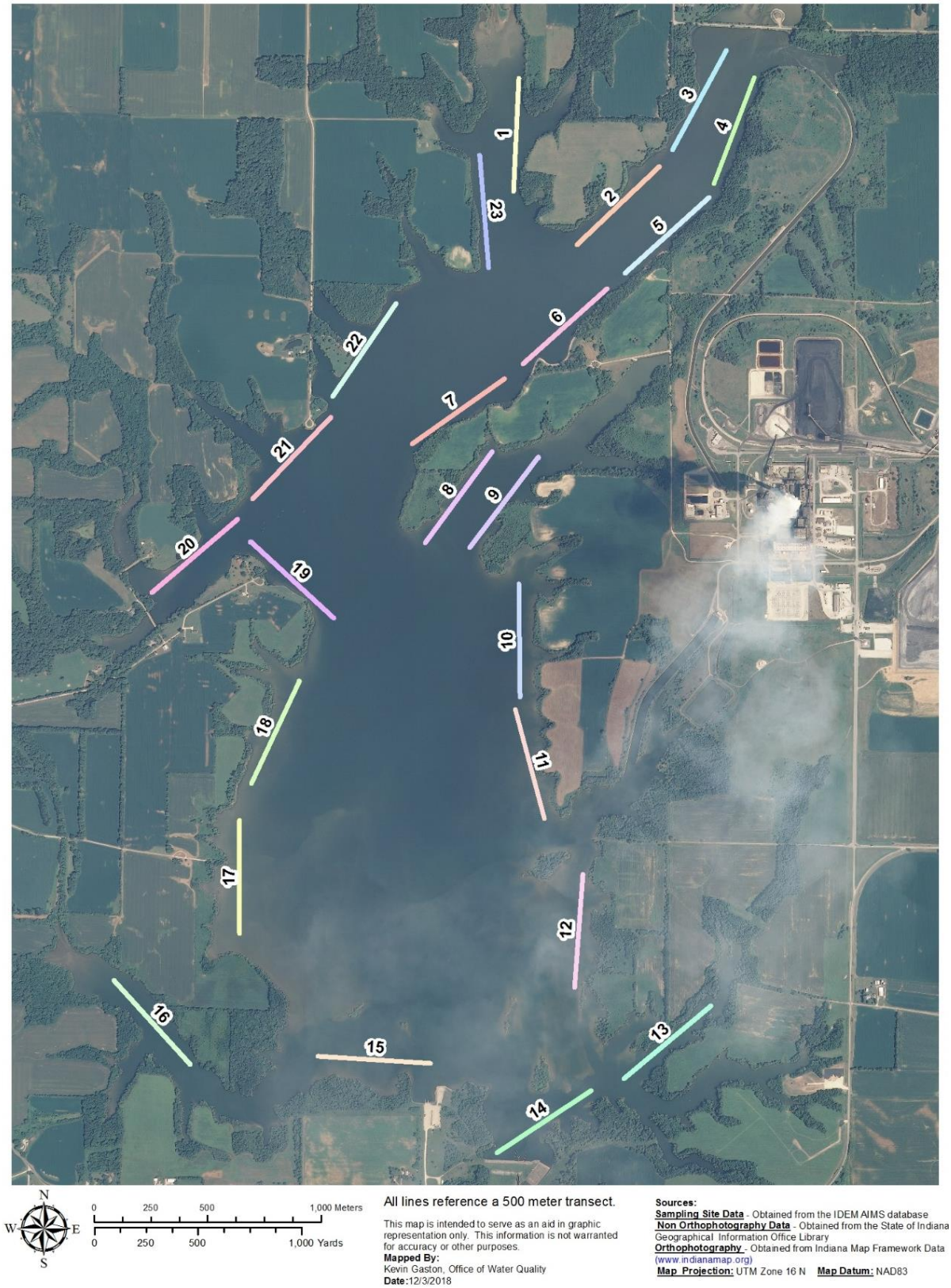


Figure 2 Example of selected stations for fish community sampling

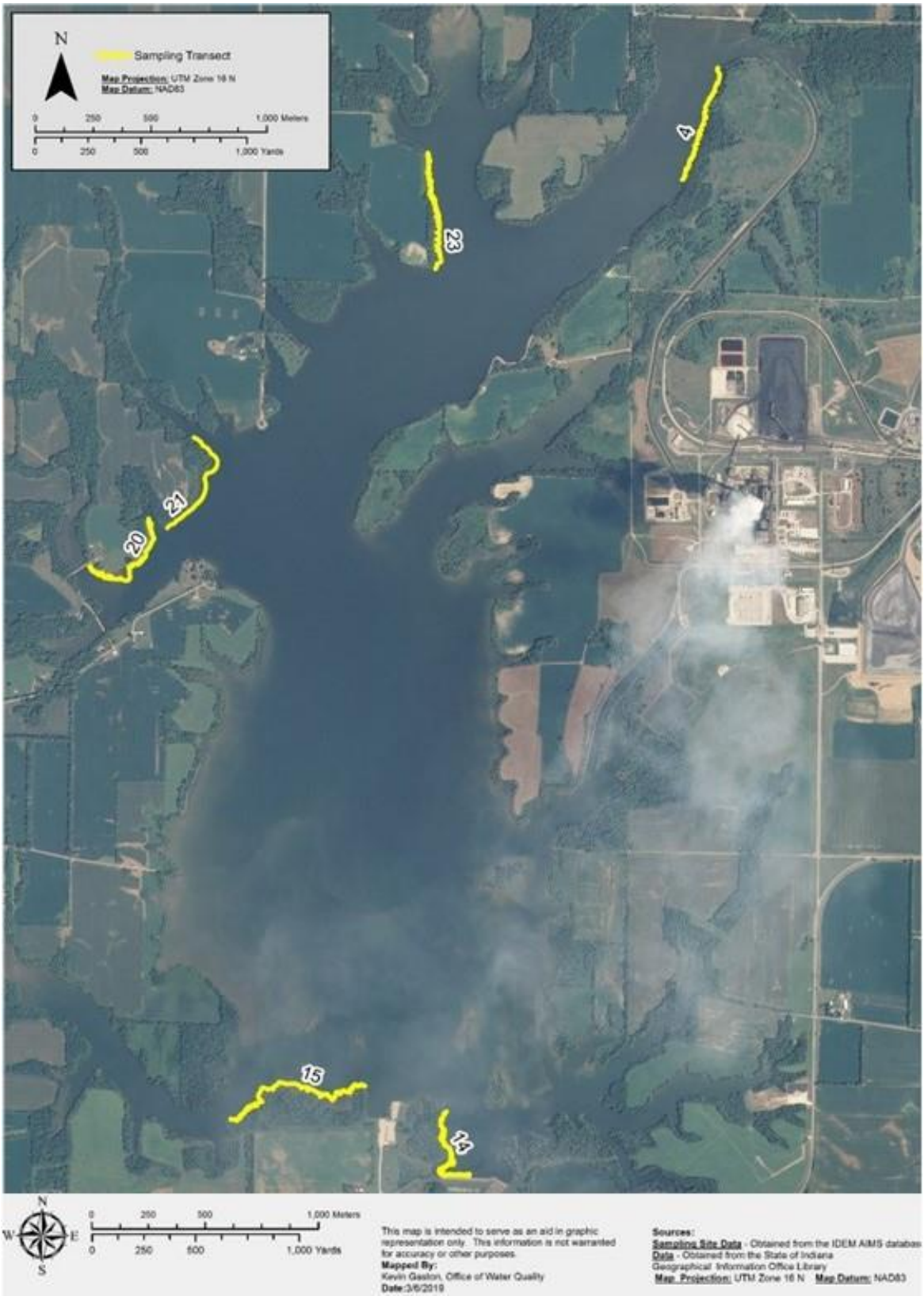
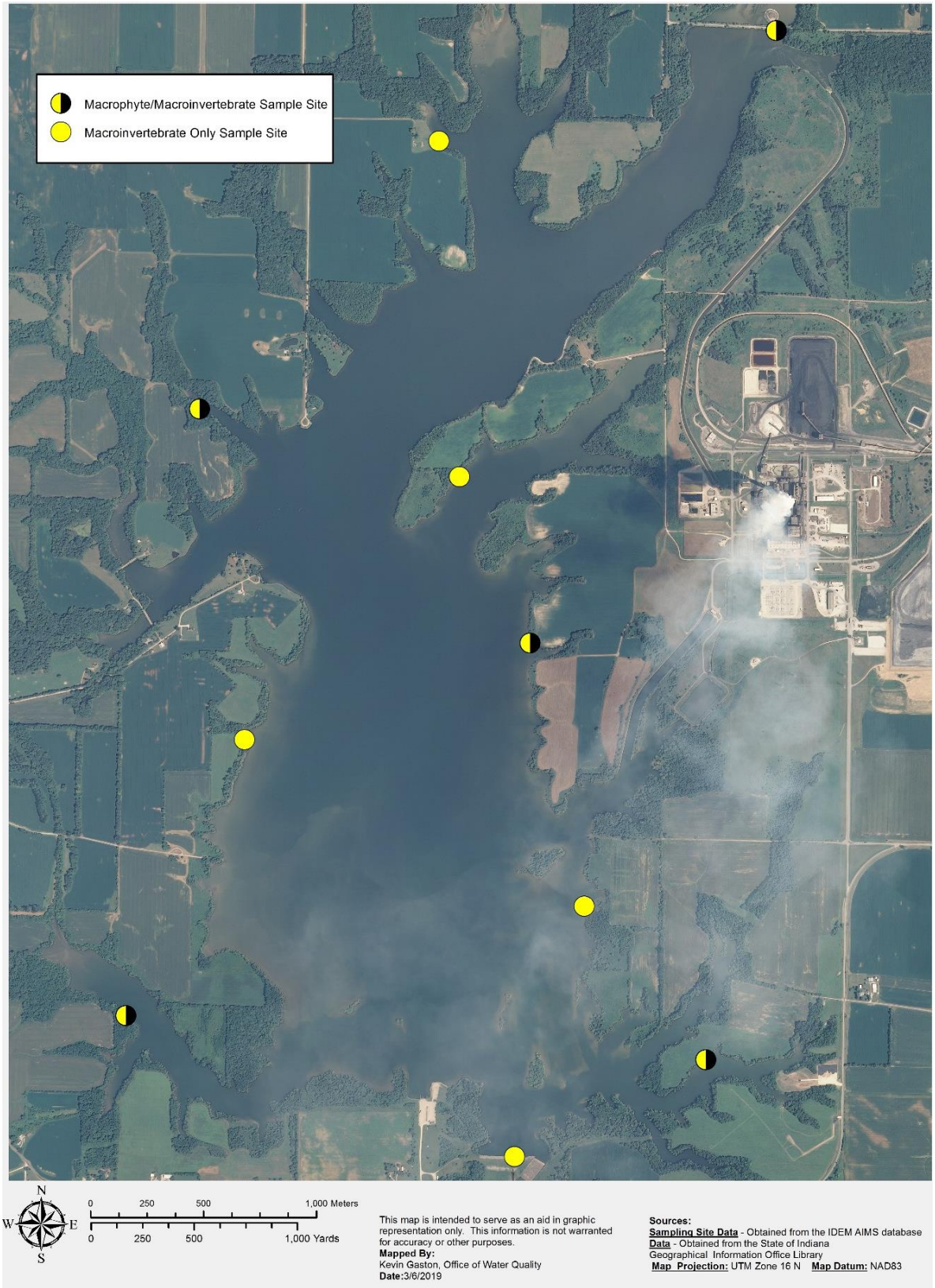


Figure 3 Example site location for macroinvertebrate and macrophyte sampling



5. Develop the Analytical Approach

Water Quality Data: Collect water quality field measurements (DO, % DO saturation, temperature, pH, specific conductance, and turbidity) at a depth of 0.5 meters below the surface of the water at:

- Both the beginning and end of each 500-meter fish community station sampled within the lake or impoundment.
- With each macroinvertebrate community sample.

Fish community census occurs in multiple 500-meter stations across the waterbody. Compile a waterbody macroinvertebrate community census from a composite sample consisting of samples from 10 evenly spaced shoreline plots measuring 10 meters by 15 meters. Macrophyte community census occurs at five evenly spaced transects perpendicular to the shoreline. INCLP water chemistry samples are collected during a one-time sampling event.

For assessment purposes, evaluate the fish assemblage at each site using the IBI or IBS (Simon 2001, 2002; Simon, Thomas & IV, Thomas 2014). Evaluate macroinvertebrate communities using the U.S. EPA National Lakes Assessment (NLA) macroinvertebrate multimetric index (MMI) (U.S. EPA 2017). Evaluate all data meeting IDEM's data quality requirements for a lake for potential use in assessments (IDEM 2024a).

6. Specify Performance or Acceptance Criteria

Good quality data are essential for minimizing decision error. By minimizing errors in the sampling design; measurement; and laboratory for physical, chemical, and biological parameters; more confidence can be placed in aquatic life use assessments.

Site specific aquatic life use assessments include program specific controls to minimize the introduction of errors and requirements for staff training (Table 2). Program specific controls include data sonde calibrations, field equipment checks, biological site revisits or duplicates, and laboratory controls through verification of species identifications as described in field procedure manuals and standard operating procedures (IDEM 2020, 2023a, 2023b, 2023c, 2023d, 2023e; IU SPEA 2019; U.S. EPA 2012a, 2012b).

The QA/QC process detects deficiencies in the data collection as set forth in the Surface Water QAPP (IDEM 2023a) and Biological and Habitat QAPP (IDEM 2020). Criteria for acceptance or rejection of results as well as application of data quality flags is presented in the Surface Water QAPP, Table 28: Data Flags, page 106 (IDEM 2023a) and Biological and Habitat QAPP, pages 32-36 (IDEM 2020). Precision and accuracy goals with acceptance limits for applicable analytical methods are provided in the Surface Water QAPP, Table 3: Performance, Acceptance, and Decision Criteria for this Study, page 37; and Table 14: Field Parameters, page 92 (IDEM 2023a). Further investigation will be conducted in response to consistent "rejected" data in determining the source of error. Field techniques used during sample collection and preparation, along with laboratory procedures will be subject to evaluation by both the WAPB QA manager and project manager in troubleshooting error introduced throughout the entire data collection process. Corrective actions will be implemented once the source of error is determined per the QAPP (IDEM 2020, IDEM 2023a).

Table 2 Project Roles, Experience, and Training

Role	Required Training/Experience	Responsibilities	Training References
Project Manager	-Database experience -Experience in project management and QA/QC procedures -Review the National Lakes Assessment Field and Lab Manuals	-Establish project in the Assessment Information Management System (AIMS) II database. -Oversee development of project work plan. -Oversee entry and QC of field data. -Querying data from AIMS II to determine results not meeting water quality criteria.	-AIMS II Database User Guide -IDEM 2020, 2022, 2023a, 2023f, 2024a -U.S. EPA 2006, 2012a, 2012b
Field Crew Chief-Biological Community Sampling	-At least one year of experience in sampling methodology and taxonomy of aquatic communities in the region -Annually review the Principles and Techniques of Electrofishing -Review the National Lakes Assessment Field Manual -Annually review relevant safety procedures -Annually review relevant SOP documents for field operations	-Complete field data sheets. -Taxonomic accuracy. -Sampling efficiency and representation. -Track voucher specimens. -Overall field crew operation. -Adherence to safety and field SOP procedures by crew members. -Ensure weekly data sonde calibrations, field sampling equipment functions properly, and all equipment is loaded into vehicles prior to field sampling activities.	-IDEM 2010, 2019, 2020, 2021, 2023a, 2023b, 2023c, 2023d, 2023e, 2024b, 2024c -Simon 2001, 2002 -Simon and Dufour 2005 -Simon, Thomas & IV, Thomas 2014 -U.S. EPA 2012 -YSI 2017, 2020
Field Crew Staff-Biological Community Sampling	-Complete hands-on sampling methodology training prior to field sampling activities -Review the Principles and Techniques of Electrofishing -Review the National Lakes Assessment Field Manual -Review relevant safety procedures -Review relevant field operation SOPs	-Follow all safety and SOP procedures while engaged in field sampling activities. -Follow direction of Field Crew Chief while conducting field sampling activities. -Entry and QC of field data.	-IDEM 2010, 2019, 2021, 2023b, 2023c, 2023d, 2024b, 2024c -U.S. EPA 2012 -YSI 2017, 2020
Laboratory Supervisor Biological Community Sample Processing	-At least one year of experience in taxonomy of aquatic communities in the region -Review the National Lakes Assessment Lab Manual -Annually review relevant safety procedures -Annually review relevant SOP documents for laboratory operations	-Ensure laboratory staff's adherence to safety and SOP procedures. -Assist with identification of biological specimens. -Verify samples' taxonomic accuracy. -Track voucher specimens. -Check data for completeness. -QC calculations on the data. -Ensure correct data entry in AIMS II. -Ensure QA/QC performed on data.	-IDEM 2010,2019, 2020, 2021, 2022, 2023d, 2023e, 2024b, 2024c -U.S. EPA 2012 -AIMS II Database User Guide

Role	Required Training/Experience	Responsibilities	Training References
Laboratory Staff Biological Community Sample Processing	-Complete hands-on training for laboratory sample processing methodology prior to laboratory sample processing activities -Review the National Lakes Assessment Lab Manual -Annually review relevant safety procedures -Annually review relevant SOP documents for laboratory operations	-Adhere to safety and SOP procedures. -Follow Laboratory Supervisor direction while processing samples. -Identify biological specimens. -Complete laboratory data sheets. -Perform necessary calculations on data. -Enter lab data. -Assist with QC on data.	-IDEM 2010, 2019, 2020, 2021, 2022, 2023d, 2023e, 2024b, 2024c -U.S. EPA 2012 -AIMS II Database User Guide
Quality Assurance Officer	-Familiarity with QA/QC practices and methodologies -Familiarity with the Surface Water QAPP and QAPP for Biological and Habitat Data -Review the National Lakes Assessment QAPP	-Ensure adherence to QA/QC requirements of QAPPs. -Evaluate data collected by sampling crews for adherence to project work plan. -Review data collected by field sampling crews for completeness and accuracy. -Perform a data quality analysis of data generated. -Assign data quality levels based on the data quality analysis. -Import data into the AIMS database. -Ensure that field sampling methodology audits are completed according to WAPB procedures.	-IDEM 2020, 2022, 2023a, 2023f -U.S. EPA 2006, 2012c -AIMS II Database User Guide
All staff (safety and reference manuals)	-Basic first aid and cardiopulmonary resuscitation (CPR) -Familiarity with PPE Policy -Familiarity with the Personal Flotation Devices (PFD) WAPB internal memorandum regarding use of approved PFDs and [IC 14-8-2-27]	-Must complete a minimum of 4 hours of in-service training provided by WAPB (IDEM 2010). -Must follow the policy when working. -When in a watercraft, must wear a PFD at all times when working on boundary waters, as defined by Indiana Code (IC) [IC 14-8-2-27] and between sunset and sunrise on any waters of the state must wear a high intensity whistle and Safety of Life at Sea (SOLAS) certified strobe light.	Personal Protective Equipment (PPE) Policy (IDEM 2024c) Personal Flotation Devices (PFD) February 29, 2000 internal WAPB memorandum -[IC 14-8-2-27]
Staff lacking 4 hours of in-service training or appropriate certification	Same as all staff and must be accompanied by WAPB staff, meeting health and safety training requirements at all times in the field	-Always follow trained staff directions.	WAPB staff meeting health and safety training requirements

7. Optimize the Plan for Obtaining Data

Sampling locations in this project have been selected based on the waterbodies that will be sampled by the INCLP. The INCLP randomly selects 160 sites in a 2-year cycle from a list comprised of approximately 400 waterbodies with depth greater than a meter and public access across Indiana. From the 160 sites selected, 70-80 are sampled annually. As the WAPB is trying to coordinate its sampling events with the INCLP, the sampling location priority could change within a few weeks of actual sampling events. WAPB staff flexibility is pertinent to adjusting sampling locations in concert with the INCLP 's sampling schedule.

II. DATA GENERATION AND ACQUISITION

Sampling Sites/Sampling Design

Lakes proposed for sampling in this project are a subset of lakes selected for water chemistry and algae sampling by the INCLP. Sites are selected by the INCLP based on the following criteria:

- A minimum surface area of five acres
- A usable boat ramp

Public lakes are generally targeted in the INCLP as they have public access, resulting in a list of approximately 400 candidate lakes in Indiana (IU SPEA 2019). Since 2010, 70-80 lakes are sampled annually over the course of a 2-year cycle, resulting in 160 lakes being sampled per cycle (IU SPEA 2019). Sampling in conjunction with the INCLP allows for potential analysis of relationships between chemical and physical parameters, and biotic communities.

Site reconnaissance activities are conducted in-house and through physical site visits. In-house activities include preparation and review of site maps and aerial photographs. Physical site visits include verification of accessibility, safety considerations, equipment needed to properly sample the site, and property owner consultations, if required. All information is recorded on the IDEM Site Reconnaissance Form (Attachment 1) and entered into the AIMS II database. Final coordinates for each site are determined during the physical site visits or at the beginning of the sampling phase of this project using a Trimble® R1 Global Navigation Satellite System (GNSS), with an accuracy of under five meters (IDEM 2023b). Final coordinates are entered into the AIMS II database.

Table 1 provides a list of the possible lakes and impoundments scheduled for sampling by the INCLP in 2024. Figures 1 through 3 provide an example overview of the various sampling site locations and sampling points within each waterbody.

Sampling Methods and Sample Handling

Field Parameters Measurements

Data sonde measurements of DO, pH, water temperature, specific conductance, and DO percent saturation are taken during each sampling event, regardless of the media type collected. The field parameters, respective test methods, and sensitivity limits are identified in Table 3. Field parameter measurements are collected at the beginning and

end of each 500-meter fish community station, and at each macroinvertebrate sampling point.

Measurement procedures and operation of the data sonde shall be performed according to the manufacturers' manuals (YSI 2017, 2020; IDEM 2023c). Turbidity is measured with a Hach™ turbidity kit, and the meter number written in the comments under the field parameter measurements. If a Hach™ turbidity kit is not available, record the data sonde turbidity measurement. Record all field parameter measurements and weather codes on the IDEM Stream Sampling Field Data Sheet (Attachment 2) along with other sampling observations. Take a digital photo of the site (e.g., each 500-meter fish community station, macroinvertebrate/macrophyte sampling point), during each sampling event.

Table 3 Field Parameters showing method and IDEM quantification limits

Parameters	Method (SM=Standard Method)	IDEM Quantification Limit
DO (data sonde optical)	ASTM[1] D888-09	0.05 mg/L
DO (data sonde)	SM 4500-OG	0.03 mg/L
DO % Saturation (data sonde optical)	ASTM[1] D888-09	0.05 %
DO % Saturation (data sonde)	SM 4500-OG	0.01 %
pH (data sonde)	U.S. EPA 150.2	0.10 S.U.
pH (field pH meter)	SM 4500H-B [2]	0.10 S.U.
Specific Conductance (data sonde)	SM 2510B	1.00 µmhos/cm
Temperature (data sonde)	SM 2550B(2)	0.1 Degrees Celsius (°C)
Temperature (field meter)	SM 2550B(2) [2]	0.1 Degrees Celsius (°C)
Turbidity (Hach™ turbidity kit)	U.S. EPA 180.1	0.05 NTU [3]

[1] American Society for Testing and Materials (ASTM)
[2] Method used for Field Calibration Check
[3] NTU = Nephelometric Turbidity Unit(s)

Fish Community Measurements

Perform fish community sampling using boat-based electrofishing equipment. Perform fish assemblage assessments at stations consisting of 500 meters of shoreline or a maximum of 45 minutes, whichever comes first. For each 500-meter station, maintain all fish counts for each segment on a separate data sheet. Fish community sampling occurs no earlier than 30 minutes after sunset and no later than 30 minutes before sunrise as determined by the National Oceanic and Atmospheric Administration (NOAA) Earth System Research Laboratory (ESRL) Sunrise/Sunset Calculator (https://www.esrl.noaa.gov/gmd/grad/solcalc/sunrise.html)

Try to sample all available habitat types within the station to ensure adequate representation of the fish community present at the time of the sampling event. The list of electrofishers possibly utilized include: the Smith-Root Type 6A electrofisher assembled in a 16-foot Jon boat with a spherical dropper anode or with two array dropper anodes, or the Midwest Lake Electrofishing System (MLES) Infinity Box assembled in a 16-foot Jon boat with two array dropper anodes (IDEM 2023d).

Sample collections during high water levels or turbid conditions will be avoided due to 1) low collection rates which result in non-representative samples and 2) safety considerations for the sampling team. Sample collections during late autumn and seasonal cold temperatures will be avoided due to the lack of responsiveness to the electrical field by some species that can also result in samples not representative of the lakes fish assemblage (IDEM 2023d).

Fish are collected using dip nets with fiberglass handles and netting of 1/8-inch bag mesh. Fish collected in the sampling station are sorted by species into baskets and buckets. Larval and young-of-the year fish less than 20 millimeters (mm) total length will not be retained in the community sample (IDEM 2023d).

Prior to processing fish specimens and completion of the fish community datasheet, one to two individuals per species may be preserved in 3.7% formaldehyde solution for future reference if there are more than 10 individuals for that species collected in the sampling station, the specimens can be positively identified, the individuals for preservation are small enough to fit in a 2000 mL jar, and it is the first time that the species has been collected by the crew leader. If, however, few individuals are captured or the specimens are too large to preserve, a photo of key characteristics is taken for later examination. Also, should a crew chief collect a species for the first time during the field season, a photo is taken for later verification. Taxonomic characteristics for possible species encountered in the basin of interest are reviewed prior to field work. Fish specimens should also be preserved if individuals cannot be positively identified in the field (especially those that co-occur like the Striped and Common Shiners); appear to be hybrids; have unusual anomalies; are dead specimens that are taxonomically valuable for undescribed taxa (like the Red Shiner or Jade Darter); life history studies; or research projects. The OWQ Chain of Custody Form (Attachment 3) is completed for preserved fish specimens.

Data for non-preserved fish is recorded on the Fish Collection Data Sheet (Attachment 4) consisting of the following: number of individuals, minimum and maximum total length (millimeters), mass weight (grams), and number of individuals with deformities, eroded fins, lesions, tumors, and other anomalies (DELTs). After recording data, specimens are released within the sampling station, if possible. Data for preserved fish specimens will be recorded on the Fish Collection Data Sheet following taxonomic identification in the laboratory.

Macroinvertebrate Community Measurements

Macroinvertebrate community sampling occurs at ten evenly spaced points along the shoreline (Figure 3). At each sampling point, a 10m x 15m plot is established. The plot is sampled following methods presented in the 2012 NLA Field Operations Manual (U.S. EPA 2012a).

A D-frame net with 500 µm mesh is used to sample the dominate substrate. Sampling consists of a sweep through one linear meter of the dominant substrate at a single location within the designated plot, ensuring disturbance of the substrate to dislodge organisms. If the substrate is rocky, cobble, or large woody debris, the sample collector may need to exit the boat and use feet to disturb the substrate. After the sample is collected, all organisms and debris are removed from the D-frame net and placed into a bucket (U.S. EPA 2012a).

After ten sampling points have been collected, the contents of all the buckets are combined to create a composite sample for the waterbody. The composite sample is then elutriated into a sieve with 500 µm mesh using clean lake water. Remove any large objects and wash the remaining contents into a large jar. Completely fill the jar with 95% ethanol to properly preserve the organisms (U.S. EPA 2012a). Place a waterproof label containing site information (i.e., site ID, collector's initials, waterbody name, date collected, number of stations sampled, etc.) into the jar prior to replacing the cap. Once collected, process each sample in a laboratory setting.

Samples from each waterbody will be subsampled in-house following procedures presented in the 2012 NLA Laboratory Operations Manual (U.S. EPA 2012b; IDEM 2023e). Subsampling consists of placing the sample on a gridded tray and processing at least 10% of the grids or until 300 organisms have been collected (U.S. EPA 2012b; IDEM 2023e). Organisms collected will be identified to lowest possible taxonomic level (IDEM 2023e). Data for subsampled organisms will be recorded on the OWQ/WAPB Macroinvertebrate Community Assessment MHAB Bench Sheet (Attachment 5). Data recorded consists of taxon identification, count, notes, and Hilsenhoff Biotic Index (HBI) tolerance.

Macrophyte Community Measurements

Macrophyte community sampling will occur at five evenly distributed transects perpendicular from the shoreline and ending halfway across the waterbody. A minimum of three points within each transect stratified by water depth (e.g., 0.5m, 1m, 2m, etc.) will be sampled moving away from the shoreline at one-meter intervals. Sampling continues for each transect until one of the following conditions occur:

1) Ten samples have been collected along a transect.
2) Three consecutive sampling points result in empty samples, indicating that the depth of the waterbody has reached a level where aquatic vegetation cannot grow.

If field crews have sampled halfway across the waterbody and conditions 1 or 2 are not met, samplers must turn the boat around 180 degrees and distribute the remaining number of points evenly while heading back towards the shoreline.

During sampling at each point, a "rake-on-a-rope" sampler will be lowered down to the sediment surface. One linear meter will be sampled by dragging the sampler with short tugs on the rope. Once completed, the sampler will be raised to the surface in one continuous motion until back on the boat. At each sampling point within a transect, depth, density of plants on the rake, density of filamentous algae on the rake, and plant growth forms will be recorded on the "NLA 2012 Macrophyte Assemblage Characterization Form" (Attachment 6, U.S. EPA 2012a). Any invasive plants collected

during sampling with be noted on the "NLA 2012 Invasive Plants and Invertebrates Checklist" (Attachment 7, U.S. EPA 2012a)

Habitat Assessments

Habitat assessments will be completed immediately following fish community sample collections for each 500-meter station and macroinvertebrate sampling at every sampling point using the Ohio EPA Lake/Lacustuary (Lentic) QHEI (Ohio EPA 2010, Attachment 8). For lakes with surface areas less than 100 hectares, habitat assessments performed at macroinvertebrate sampling points will be restricted to every other point (five points).

Quality Control and Custody Requirements

Quality assurance protocols will follow part B5 of the Surface Water QAPP (IDEM 2023a, page 91) and B.5 of the Biological and Habitat QAPP (IDEM 2020, page 27).

Fish Community Data

The IDEM OWQ Chain of Custody Form is used to track samples from the field to the laboratory (Attachment 3). Fish taxonomic identifications made by IDEM staff in the laboratory may be verified by regionally recognized non-IDEM freshwater fish taxonomists (e.g., Brant Fisher, Nongame Aquatic Biologist, IN DNR). All raw data are: 1) checked for completeness; 2) utilized to calculate derived data (i.e., total weight of all specimens of a taxon), which is entered into the AIMS II database; and 3) checked again for data entry errors.

Field Instrument Testing and Calibrations

The data sonde will be calibrated immediately prior to each week's sampling (IDEM 2023c). The dissolved oxygen component of the calibration procedure will be conducted using the air calibration method. Calibration results and drift values will be recorded, maintained, stored, and archived in the calibration laboratories at the Shadeland facility. The drift value is the difference between two successive calibrations. Field parameter calibrations will conform to the procedures described in the instrument user's manuals (YSI 2017, 2020). The unit is field checked for accuracy once during the week by comparison with a YSI DO meter, as well as Hach™ turbidity, pH, and temperature meters. Weekly calibration verification results will be recorded on the stream sampling field data sheets (Attachment 2) and entered into the AIMS II database. A YSI DO meter will also be used at sites where the DO concentration is 4.0 mg/L or less.

Field Measurement Data

In-situ water chemistry field data is collected at a depth of 0.5 meters (i.e., surface of the water) in the field using calibrated or standardized equipment. During collection, the depth at which the field data is collected is noted on the field data sheet (Attachment 2). Calculations may be done in the field or later at the office. Analytical results, which have limited QC checks, are included in this category. Detection limits have been set for each analysis (Table 3). QC checks (such as duplicate measurements, measurements of a secondary standard, or measurements using a different test method or instrument) which are performed on field or laboratory data are usable for estimating precision, accuracy, and completeness for the project.

III. ASSESSMENT AND OVERSIGHT

Field performance and system audits will be conducted to ensure good quality data. The field performance checks include precision measurements by relative percent difference (RPD) of field measurements and completeness measurements by the percent of planned samples that are collected, analyzed, reported, and usable for the project (IDEM 2023a, pages 128-146).

For biological and habitat measurements, field performance measurements include completeness (IDEM 2020, pages 10-11, 14, 17), examination of fish IBI and IBS score differences and the RPD for number of fish species at the revisit stations (IDEM 2020, pages 9-10), RPD for number of taxa for macroinvertebrate duplicate samples (IDEM 2020, page 13), and RPD between two total QHEI scores at the same station (IDEM 2020, page 18). Lab performance measurements include Percent Taxonomic Disagreement for fish (IDEM 2020, page 12), macroinvertebrates (IDEM 2020, pages 15-16); as well as Percent Difference Enumeration and Percent Sorting Efficiency for macroinvertebrates (IDEM 2020, pages 14-16).

Field audits will be conducted biannually by staff of the IDEM WAPB to ensure that sampling activities adhere to approved SOPs. Audits are systematically conducted by WAPB QA staff to include all WAPB personnel that engage in field sampling activities. WAPB field staff involved with sample collection and preparation will be evaluated by QA staff trained in the associated sampling SOPs, and in the processes related to conducting an audit. QA staff will produce an evaluation report documenting each audit for review by those field staff audited, as well as WAPB management. Corrective actions will be communicated to, and implemented by, field staff as a result of the audit process (IDEM 2020 page 31; IDEM 2023a, page 109).

For macroinvertebrate verifications by an external lab, the lab is required to maintain Society for Freshwater Science taxonomic certifications for their taxonomists. Genus level taxonomic certifications are required for 1. Eastern General Arthropods, 2. Eastern Ephemeroptera, Plecoptera and Trichoptera, 3. Chironomidae, and 4. Oligochaeta.

Data Quality Assessment Levels

The samples and various types of data collected by this program are intended to meet the QA criteria and DQA Levels as described in the Surface Water QAPP (IDEM 2023a, pages 104-108) and the Biological and Habitat QAPP (IDEM 2020, pages 34-35).

IV. DATA VALIDATION AND USABILITY

QA reports to management and data validation and usability are also important components of the QAPP which ensures good quality data for this project. A QA audit report will be submitted to the QA Manager and PM for review for this project should problems arise and need to be investigated and corrected. Data are reduced by converting from raw analytical data into final results in proper reporting units, validated by qualifying based on the performance of field and laboratory QC measures incorporated into the sampling and analysis procedures, and reported by describing so as to completely document the calibration, analysis, QC measures, and calculations.

These steps allow users to assess the data to ensure it meets the project data quality objectives.

Quality Assurance/Data Qualifiers and Flags

The various data qualifiers and flags used for QA and validation of the data are found on pages 106-107 of the Surface Water QAPP (IDEM 2023a) and pages 33-34 of the Biological and Habitat QAPP (IDEM 2020).

Data Usability

The environmental data collected and its usability are qualified per each field result obtained and classified into one or more of the four categories: Screening Data, Field Analysis Data, Laboratory Analytical Data, and Enforcement Data as described on pages 107-108 of the Surface Water QAPP (IDEM 2023a) and page 35-36 of the Biological and Habitat QAPP (IDEM 2020).

Information, Data, and Reports

Data collected will be recorded in the AIMSII database. All site folders are maintained at the WAPB facility. All data and reports will be made available to public and private entities which may find the data useful for municipal, industrial, agricultural, and recreational decision-making processes (i.e. 303(b) & (d) assessments, TMDL development, NPDES permit modeling, watershed restoration projects, water quality criteria refinement, etc.).

Laboratory and Estimated Cost

Project laboratory analysis and data reporting should comply with the Surface Water QAPP (IDEM 2023a), Biological and Habitat QAPP (IDEM 2020), and the IDEM 2023 Quality Management Plan (IDEM 2023f). All fish, macroinvertebrate, and macrophyte samples will be collected and analyzed by IDEM staff. An outside contractor (IDEM 2020) will verify 10% of macroinvertebrate samples.

REFERENCES

(U.S. EPA 2002). Guidance for Quality Assurance Project Plans. EPA QA/G-5. EPA/240/R02/009. U.S. EPA, Office of Environmental Information, Washington, D.C.

(U.S. EPA 2006). Guidance on Systematic Planning Using the Data Quality Objectives Process. EPA QA/G-4. EPA/240/B-06/001. U.S. EPA, Office of Environmental Information, Washington D.C.

(U.S. EPA 2012a). 2012 National Lakes Assessment Field Operations Manual. EPA 841-B-11-003. U.S. EPA, Office of Water, Washington D.C.

(U.S. EPA 2012b). 2012 National Lakes Assessment Laboratory Operations Manual. EPA 841-B-11-004. U.S. EPA, Office of Water, Washington D.C.

(U.S. EPA 2017). National Lakes Assessment 2012: Technical Report. EPA 841-R-16-114. U.S. Environmental Protection Agency, Washington, D.C.

(U.S. EPA 2022). National Lakes Assessment 2022. Field Operations Manual. Version 1.2. EPA 841-B-16-011. U.S. Environmental Protection Agency, Washington, DC.

(U.S. EPA 2022). National Lakes Assessment 2022. Laboratory Operations Manual. V.1.1. EPA 841-B-21010. U.S. Environmental Protection Agency, Washington, DC.

(IC 14-8-2-27) Indiana Code, Title 14 Natural and Cultural Resources, Article 8 General Provisions and Definitions.

[327 IAC 2] Indiana Administrative Code, Title 327 Water Pollution Control Division, Article 2. Water Quality Standards. Last updated May 8, 2024.

(IDEM 2010). IDEM Health and Safety Training Policy, revised October 1, 2010. A-030-OEA-10-P-R2. IDEM, Indianapolis, Indiana.*

(IDEM 2019). IDEM Hazard Communication (HazCom) Plan. IDEM, Office of Program Support, Indianapolis, Indiana.*

(IDEM 2020). Quality Assurance Project Plan for Biological Community and Habitat Measurements. B-003-OWQ-WAP-XXX-20-Q-R0. Indiana Department of Environmental Management, Office of Water Quality, Watershed Assessment and Planning Branch, Indianapolis, Indiana.

(IDEM 2021). Office of Water Quality Watershed Assessment and Planning Branch Laboratory Safety Plan. IDEM, Office of Program Support, Indianapolis, Indiana.*

(IDEM 2022). AIMS II Database User Guide. IDEM, Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.*

(IDEM 2023a). Quality Assurance Project Plan for Indiana Surface Water Programs, Revision 5. B-001-OWQ-WAP-XX-23-Q-R5. Indiana Department of Environmental Management, Office of Water Quality, Watershed Assessment and Planning Branch, Indianapolis, Indiana.

(IDEM 2023b). Global Navigational Satellite System (GNSS) R1 Unit User Instructions. B-055-OWQ-WAP-XXX-23-T-R0. Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.

(IDEM 2023c). Calibration of YSI Multiparameter Data Sondes B-014-OWQ-WAP-XXX-23-T-R1. Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.*

(IDEM 2023d). Fish Community Field Collection Procedures. B-009-OWQ-WAP-XXX-23-T-R1. Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.

(IDEM 2023e). Processing and Identification of Macroinvertebrate Samples. B-061-OWQ-WAP-XXX-23-T-R0. Office of Water Quality, Watershed Assessment and Planning Branch. Indianapolis, Indiana.

(IDEM 2023f). IDEM Quality Management Plan. IDEM, Indiana Government Center North, 100 N. Senate Ave., Indianapolis, Indiana, 46204.

(IDEM 2024a). Indiana's Integrated Water Monitoring and Assessment Report to the U.S. EPA (Revised), Appendix G: IDEM's 2024 Consolidated Assessment and Listing Methodology (CALM). Office of Water Quality, Indiana Department of Environmental Management, Indianapolis, Indiana.

(IDEM 2024b). IDEM Injury and/or Illness Resulting from Occupational Exposure Policy, revised January 4, 2024. A-034-AW-24-P-R4. Indiana Department of Environmental Management, Office of Program Support, Indianapolis, Indiana.

(IDEM 2024c). IDEM Personal Protective Equipment Policy, revised January 4, 2024. A-059-AW-24-P-R1. Indiana Department of Environmental Management, Office of Program Support, Indianapolis, Indiana.

(IU SPEA 2012). Indiana Lake Water Quality Assessment Report for 2009-2011. School of Public and Environmental Affairs, Indiana University, Bloomington, IN.

(IU SPEA 2019). Quality Assurance Project Plan for Indiana Clean Lakes Program. Indiana University O'Neill School of Public and Environmental Affairs, Bloomington, IN.

(Ohio EPA 2010). Methods of Assessing Habitat in Lake Erie Shoreline Waters Using the Qualitative Habitat Evaluation Index (QHEI) Approach (Version 2.1.). Ohio EPA, Division of Surface Water, Northeast District Office, Twinsburg, OH.

(Simon 2001). Simon, T.P. 2001. Development, calibration, and validation of an index of biotic integrity for littoral fish assemblages for inland warm water lakes in northern and central Indiana. State of Indiana, Department of Environmental Management, Indianapolis, IN.*

(Simon 2002). Simon, T.P. 2002. Development, calibration, and validation of an index of biological sustainability for oxbow lakes and reservoirs in southern Indiana. State of Indiana, Department of Environmental Management, Indianapolis, IN.*

(Simon, Thomas & IV, Thomas). 2014. Development, calibration, and validation of an index of biological sustainability for Midwestern reservoirs. Environmental Indicators. 8. 15-35.

(Simon and Dufour 2005). Simon, T.P. and Dufour, R.L. 2005. Guide to appropriate metric selection for calculating the Index of Biotic Integrity (IBI) for Indiana Large and Great Rivers, Inland Lakes, and Great Lakes nearshore. U.S. Department of the Interior, Fish and Wildlife Service, Bloomington Field Office, Bloomington, Indiana.

(YSI 2017) YSI Incorporated. 2017, EXO User Manual, revision g. Yellow Springs, Ohio.

(YSI 2020) YSI Incorporated. 2020, ProDigital User Manual, revision H. Yellow Springs, Ohio.

*Documents may be inspected at the Watershed and Assessment Branch office, located at 2525 North Shadeland Avenue, Indianapolis, IN.

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Attachment 1 IDEM Site Reconnaissance Form

IDEM

Site Reconnaissance Form

EPA Site Identifier	Rank
Recon #: Trip #:	

Site Number: Stream: County:

Location Description:

Reconnaissance Data Collected

Recon Date | Crew Members

Avg. Width (m) | Avg. Depth (m) | Max. Depth (m) | Nearest Town

Water Present? | Site Wadeable? | Riffle/Run Present? | Road/Public Access Possible?

Site Impacted by Livestock? | Collect Sediment? | Gauge Present?

Landowner/Contact Information

First Name | Last Name

Street Address

City | State | Zip

Telephone | E-Mail Address

Pamphlet Distributed? | Please Call in Advance? | Results Requested?

Rating, Results, Comments, and Planning

Site Rating By Category (1=easy, 10=difficult)
Access Route
Safety Factor
Sampling Effort

Reconnaissance Decision

Pre-Recon
Recon in process
Approved Site
No, Landowner denied access
No, Dry
No, Stream channel missing
No, Physical barriers
No, Impounded stream
No, Marsh/Wetland
No, Bridge gone or not accessible
No, Unsafe due to traffic or location
No, Site impacted by backwater
No, Other

Equipment Selected

Circle Equipment Needed

Backpack
Boat
Towbarge
Longline
Scanoe
Seine
Weighted Handline
Waders
Gill Net

Comments

Sketch of Stream & Access Route – Indicate Flow, Direction, Obstacles, & Land Use (Use Back of Page, if Necessary)

Attachment 2 IDEM Stream Sampling Field Data Sheet

IDEM Stream Sampling Field Data Sheet

Analysis Set #	EPA Site ID	Rank

Sample #	Site #	Sample Medium	Sample Type	Duplicate Sample #

Stream Name: | River Mile: | County:

Site Description:

Survey Crew Chief	Sample Collectors 1	2	3	4	Sample Collected Date	Time	Hydrolab #	Water Depth/Gage Ht (ft)	Water Flow (cf/sec)	Flow Estimated?	Algae?	Aquatic Life?
										☐	☐	☐

Sample Taken?	Aliquots	Water Flow Type	Water Appearance	Canopy Closed %
☐ Yes ☐ No; Frozen	☐ 1 ☐ 2 ☐ 3 ☐ 4	☐ Riffle ☐ Dry ☐ Stagnant	☐ Clear ☐ Green ☐ Sheen	☐ 0-20% ☐ 60-80%
☐ No; Stream Dry ☐ No; Other	☐ 6 ☐ 8 ☐ 12 ☐ 24	☐ Pool ☐ Run ☐ Flood	☐ Murky ☐ Black ☐ Other	☐ 20-40% ☐ 80-100%
☐ No; Owner refused Access	☐ 48 ☐ 72 ☐ AS-Flow	☐ Glide ☐ Eddy ☐ Other	☐ Brown ☐ Gray (Septic/Sewage)	☐ 40-60%

Special Notes:

Field Data:

Date (m/d/yy)	24-hr Time (hh:mm)	D.O. (mg/l)	pH	Water Temp (°C)	Spec Cond (µohms/cm)	Turbidity (NTU)	% Sat.	Chlorine (mg/l)	Chloride (mg/l)	Chlorophyll (mg/l)	Weather Codes SC	WD	WS	AT
Comments														
Comments														
Comments														
Comments														
Comments														
Comments														

Measurement Flags	
<	< Min. Meter Measurement
>	> Max. Meter Measurement
E	Estimated (See Comments)
R	Rejected (See Comments)

Weather Code Definitions

SC Sky Conditions		WD Wind Direction	WS Wind Strength	AT Air Temp
1 Clear	8 Rain	00 North (0 degrees)	0 Calm	1 < 32
2 Scattered	9 Snow	09 East (90 degrees)	1 Light	2 33-45
3 Partly	10 Sleet	18 South (180 degrees)	2 Mod./Light	3 46-60
4 Cloudy		27 West (270 degrees)	3 Moderate	4 61-75
5 Mist			4 Mod./Strong	5 76-85
6 Fog			5 Strong	6 > 86
7 Shower			6 Gale	

Field Calibrations:

Date (m/d/yy)	Time (hh:mm)	Calibrator Initials	Calibrations Type	Meter #	Value	Units

Calibration Type: pH, DO, Turbidity

Preservatives/Bottle Lots:

Group: Preservative	Preservative Lot #	Bottle Type	Bottle Lot #

Groups: Preservatives		Bottle Types	
GC	General Chemistry: Ice	2000P	2000mL Plastic, Narrow Mouth
Nx	Nutrients: H2SO4	1000P	1000mL Plastic, Narrow Mouth
Metals	Metals: HNO3	500P	500mL Plastic, Narrow Mouth
CN	Cyanide: NaOH	250P	250mL Plastic, Narrow Mouth
O&G	Oil & Grease: H2SO4	1000G	1000mL Glass, Narrow Mouth
Toxics	Toxics: Ice	500G	500mL Glass, Wide Mouth
Ecoli	Bacteriology: Ice	250G	250mL Glass, Wide Mouth
VOA	Volatile Organics: HCl & Thiosulfate	125G	125mL Glass, Wide Mouth
Pest	Pesticides: Ice	40GV	40mL Glass Vial
Phen	Phenols: H2SO4	120PB	120ml Plastic (Bacteria Only)
Sed	Sediment: Ice	1000PF	1000mL Plastic, Coming Filter
Gly	Glyphosate: Thiosulfate	500PF	500mL Plastic, Coming Filter
Hg	Mercury(1631): HCl	60P	60mL Plastic
Cr6	Chromium VI(1636): NaOH	250T	250mL Teflon
MeHg	Methyl Mercury(1630): HCl	500T	500mL Teflon
		125T	125mL Teflon

Data Entered By: _____ QC1: _____
QC2: _____

Stream Sampling Field Data Sheet

Attachment 3 IDEM OWQ Chain of Custody Form

Indiana Department of Environmental Management

OWQ Chain of Custody Form

Project:
OWQ Sample Set or Trip #:

I Certify that the sample(s) listed below was/were collected by me, or in my presence. Date:_____

Signature:_____ Section:_____

Sample Media (☐ Water, ☐ Algae, ☐ Fish, ☐ Macro, ☐ Cyanobacteria/Microcystin, ☐ Sediment)

Lab Assigned Number / Event ID	IDEM Control Number	Sample Type	ID	1000 ml P.N.M.	1000 ml G.N.M.	40 ml Vial	120 ml P (Bact)	2000 ml Nalgene	250 ml Nalgene	125 ml Glass	Date and Time Collected		One check per bottle present
											Date	Time	
P = Plastic	G = Glass	N.M. = Narrow Mouth		Bact = Bacteriological Only							Should samples be iced?	Y	N
M = MS/MSD	B = Blank	D = Duplicate		R = Revisit									

Carriers

I certify that I have received the above sample(s).

Signature	Date	Time	Seals Intact		Comments
Relinquished By:			Y	N	
Received By:					
Relinquished By:			Y	N	
Received By:					
Relinquished By:			Y	N	
Received By:					
IDEM Storage Room #					

Lab Custodian

I certify that I have received the above sample(s), which has/have been recorded in the official record book. The same sample(s) will be in the custody of competent laboratory personnel at all times, or locked in a secured area.

Signature:_____ Date:_____ Time:_____

Lab:_____ Address:_____

Revision Date: 4/27/2016

Attachment 4 IDEM Fish Collection Data Sheet (front)

IDEM
OWQ-WATERSHED ASSESSMENT AND PLANNING BRANCH

Event ID_____ Voucher jars_____ Unknown jars_____ Equipment_____ Page _____ of _____
Voltage_____ Time fished (sec)_____ Distance fished (m)_____ Max. depth (m)_____ Avg. depth (m)_____
Avg. width (m)_____ Bridge in reach_____ Is reach representative_____ If no, why_____
Elapsed time at site (hh:mm)____:____ Comments_____

Museum data: Initials_____ ID date_____ Jar count_____ Fish Total_____

Coding for Anomalies: D – deformities E – eroded fins L – lesions T – tumor M – multiple DELT anomalies O – other (A – anchor worm C – leeches W – swirled scales Y – popeye S – emaciated F – fungus P – parasites) H – heavy L – light (these codes may be combined with above codes)

TOTAL # OF FISH	WEIGHT (s) (mass g)	(length mm)	ANOMALIES
		Min length	D E L T M O
		Max length	
V P			
		Min length	D E L T M O
		Max length	
V P			
		Min length	D E L T M O
		Max length	
V P			
		Min length	D E L T M O
		Max length	
V P			
		Min length	D E L T M O
		Max length	
V P			
		Min length	D E L T M O
		Max length	
V P			

KRW: Rev/09.26.18 Calculation:_____ QC1 + Entry_____ QC 1 _____ QC 2_____

Attachment 4 (cont.) IDEM Fish Collection Data Sheet (back)

Event ID______________ Page _____ of ______

								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												
								Min length	D	E	L	T	M	O
								Max length						
V		P												

KRW: Rev/09.26.18

Attachment 5 OWQ/WAPB Macroinvertebrate Community Assessment MHAB Bench Sheet

IDEM

OWQ/WAPB Macroinvertebrate Community Assessment MHAB Bench Sheet

Sample #	Macro Event #	Macro Sample Type	*Stream Name / Location*	*County*

☐ 100-Organism Sub Sample
☑ 15-minute Sub Sample
☐ 100-Organism (Lab Dup)

Sample Date	# of Vials

☑ *Sub Sample Completed*		
Sorter	*Sort Date*	*# Squares*

☐ *Phase 1 Completed*	
Identifier	*ID Date*

☐ *Phase 2 Completed*	
Identifier	*ID Date*

☐ ***Insufficient Count: Rejected*** ***QC Initials:*** ____

Taxon	Count	Notes	HBI Tolerance

6/2/2022 6:45:49 AM OWQ Biological Studies: MHAB Report, Page 1 of 1

Attachment 6 NLA 2012 Macrophyte Assemblage Characterization (front)

Reviewed by (initial):______

NLA 2012 MACROPHYTE ASSEMBLAGE CHARACTERIZATION (Front)

Site ID: ____________________ Date: ___ / ___ / _______

Phab Plot	Point	Depth	Plant Rake Density	Fil. Algae Density	Macrophyte Growth Form E	FL	FF	SB	SC	SF	SW	Fill if MDC reached	Comments
	1		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	2		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	3		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	4		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	5		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	6		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	7		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	8		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	9		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	10		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	11		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	12		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	1		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	2		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	3		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	4		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	5		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	6		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	7		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	8		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	9		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	10		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	11		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	12		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	1		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	2		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	3		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	4		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	5		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	6		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	7		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	8		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	9		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	10		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	11		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	12		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	

04/16/2012 NLA Macrophyte Assemblage Characterization 2132293877

Attachment 6 (cont.) NLA 2012 Macrophyte Assemblage Characterization (back)

Reviewed by (initial):_____

NLA 2012 MACROPHYTE ASSEMBLAGE CHARACTERIZATION (Back)

Site ID: _____ Date: ____ / ____ / ____

Phab Plot	Point	Depth	Plant Rake Density	Fil. Algae Density	Macrophyte Growth Form							Fill if MDC reached	Comments
					E	FL	FF	SB	SC	SF	SW		
	1		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	2		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	3		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	4		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	5		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	6		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	7		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	8		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	9		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	10		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	11		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	12		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	1		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	2		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	3		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	4		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	5		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	6		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	7		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	8		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	9		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	10		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	11		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	
	12		0 1 2 3	0 1 2 3	O	O	O	O	O	O	O	O	

Deepest Part of Lake: _____ (m)

Plants observed O Y O N
If Yes, stop, lake is 100% littoral

	Depth at which plants observed	Direction:
MDC 1		
MDC 2		
MDC 3		
MDC 4		
MDC 5		

04/16/2012 NLA Macrophyte Assemblage Characterization

8704293878

Attachment 7 NLA 2012 Invasive Plants and Invertebrates Checklist (front)

NLA 2012 INVASIVE PLANTS AND INVERTEBRATES (Front) Reviewed by (initial): _____

Site ID: _____ Date: ___ / ___ / _____

STATIONS	A		B		C		D		E		F	
SPECIES	Mark if observed	FLAG	Mark if observed	FLAG	Mark if observed	FLAG	Mark if observed	FLAG	Mark if observed	FLAG	Mark if observed	FLAG
NONE OBSERVED	O		O		O		O		O		O	
Curlyleaf pondweed	O		O		O		O		O		O	
Common reed	O		O		O		O		O		O	
Eurasian watermilfoil	O		O		O		O		O		O	
Purple loosestrife	O		O		O		O		O		O	
Russian-olive	O		O		O		O		O		O	
Reed canarygrass	O		O		O		O		O		O	
Canada thistle	O		O		O		O		O		O	
Multiflora rose	O		O		O		O		O		O	
Narrowleaf cattail	O		O		O		O		O		O	
Brazilian waterweed	O		O		O		O		O		O	
Brittleleaf naiad	O		O		O		O		O		O	
Parrot feather milfoil	O		O		O		O		O		O	
Mimosa	O		O		O		O		O		O	
Hydrilla	O		O		O		O		O		O	
Water starwort	O		O		O		O		O		O	
Water hyacinth	O		O		O		O		O		O	
Yellow floatingheart	O		O		O		O		O		O	
European pepperwort	O		O		O		O		O		O	
Alligatorweed	O		O		O		O		O		O	
European waterstarwort	O		O		O		O		O		O	
Giant salvinia	O		O		O		O		O		O	
Water fern	O		O		O		O		O		O	
Water-chestnut (European)	O		O		O		O		O		O	
Tamarisk	O		O		O		O		O		O	
Deeprooted sedge	O		O		O		O		O		O	
Japanese or giant knotweed	O		O		O		O		O		O	
Miramar weed	O		O		O		O		O		O	
Brazilian peppertree	O		O		O		O		O		O	
Zebra or quagga mussel	O		O		O		O		O		O	
Asian clam	O		O		O		O		O		O	
Rusty crayfish	O		O		O		O		O		O	
OTHER (Note in comments)	O		O		O		O		O		O	

Flag	Comments

Flag codes: U = Suspect measurement or observation; F1, F2, etc. = misc. flags assigned by field crew. Explain all flags in comments section.

04/16/2012 NLA Invasive Plants and Invertebrates 8998518154

Attachment 7 (cont.) NLA 2012 Invasive Plants and Invertebrates Checklist (back)

NLA 2012 INVASIVE PLANTS AND INVERTEBRATES (Back) Reviewed by (initial): _____

Site ID: _____ Date: ___ / ___ / _____

STATIONS	G		H		I		J					
SPECIES	Mark if observed	FLAG	Mark if observed	FLAG	Mark if observed	FLAG	Mark if observed	FLAG	Mark if observed	FLAG	Mark if observed	FLAG
NONE OBSERVED	O		O		O		O		O		O	
Curlyleaf pondweed	O		O		O		O		O		O	
Common reed	O		O		O		O		O		O	
Eurasian watermilfoil	O		O		O		O		O		O	
Purple loosestrife	O		O		O		O		O		O	
Russian-olive	O		O		O		O		O		O	
Reed canarygrass	O		O		O		O		O		O	
Canada thistle	O		O		O		O		O		O	
Multiflora rose	O		O		O		O		O		O	
Narrowleaf cattail	O		O		O		O		O		O	
Brazilian waterweed	O		O		O		O		O		O	
Brittleleaf naiad	O		O		O		O		O		O	
Parrot feather milfoil	O		O		O		O		O		O	
Mimosa	O		O		O		O		O		O	
Hydrilla	O		O		O		O		O		O	
Water starwort	O		O		O		O		O		O	
Water hyacinth	O		O		O		O		O		O	
Yellow floatingheart	O		O		O		O		O		O	
European pepperwort	O		O		O		O		O		O	
Alligatorweed	O		O		O		O		O		O	
European waterstarwort	O		O		O		O		O		O	
Giant salvinia	O		O		O		O		O		O	
Water fern	O		O		O		O		O		O	
Water-chestnut (European)	O		O		O		O		O		O	
Tamarisk	O		O		O		O		O		O	
Deeprooted sedge	O		O		O		O		O		O	
Japanese or giant knotweed	O		O		O		O		O		O	
Miramar weed	O		O		O		O		O		O	
Brazilian peppertree	O		O		O		O		O		O	
Zebra or quagga mussel	O		O		O		O		O		O	
Asian clam	O		O		O		O		O		O	
Rusty crayfish	O		O		O		O		O		O	
OTHER (Note in comments)	O		O		O		O		O		O	

Flag	Comments

Flag codes: U = Suspect measurement or observation; F1, F2, etc. = misc. flags assigned by field crew. Explain all flags in comments section.

04/16/2012 NLA Invasive Plants and Invertebrates 8578518158

Attachment 8 Ohio EPA Lake/Lacustuary (Lentic) QHEI Field Sheet (front)

Lake / Lacustuary (Lentic) QHEI Field Sheet Ohio Environmental Protection Agency QHEI Score: ☐

RIVERCODE_____ RIVERMILE _____ WATERBODY _____ DISTANCE ASSESSED (m): _____
DATE _____ LOCATION _____
SCORER_____ LAT. _____ LONG. _____ COMMENT _____

1] SUBSTRATE (Check *ONLY* Two Substrate TYPE BOXES; Estimate % or note every type present); LAKE:_____ LACUSTUARY:_____

TYPE	SHORE	BOTTOM		SHORE	BOTTOM
☐☐-BLDR/SLABS [7]			☐☐-HARDPAN [4]		
☐☐- BOULDER [10]			☐☐- BEDROCK [3]		
☐☐- COBBLE [8]			☐☐- DETRITUS [3]		
☐☐- GRAVEL [7]			☐☐- SILT [2]		
☐☐- SAND [6]			☐☐- MUCK [2]		

NOTE: Ignore sludge that originates from point-sources; score on natural substrates
NUMBER OF SUBSTRATE TYPES: ☐- 5 or More [2] ☐- 4 or Less [0]

SUBSTRATE ORIGIN Check ONE (or 2 & *AVERAGE*)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS [1]
☐-LACUSTUARINE [1]
☐-SANDSTONE [1]
☐-RIP/RAP [1]
☐-HARDPAN [0]
☐-SHALE [-1]
☐-COAL/ORE [-2]

SILT

SILT ORIGIN:

SUBSTRATE QUALITY Check ONE (or 2 & *AVERAGE*)
☐-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☐-SILT NORMAL [0]
☐-SILT FREE [1]
☐-CLAY [-2]
☐-INDUSTRIAL [-1]
☐-ORGANIC [1]
☐-NONE [1]

Substrate ☐ Max 20

COMMENTS: _____

2] COVER TYPES **TYPE:** (Check All That Apply)

☐-OFF-SHORE SAND BARS [4]	☐-DEEPWATER > 1 M [1]	☐-WETLAND POOLS [1]
☐-OVERHANGING VEGETATION [1]	☐-ROOTWADS [1]	☐-SUBMERGED AQUATIC VEG. [4]
☐-SHALLOWS (ON BEACH) [1]	☐-BOULDERS [1]	☐-LOGS OR WOODY DEBRIS [1]
☐-ROOTMATS [1]	☐-SAND BEACH [1]	☐-GRAVEL BEACH [1]

AMOUNT (Check *ONLY* One or check2 and AVERAGE)
☐-EXTENSIVE > 75% [9]
☐-MODERATE 25-75% [7]
☐-SPARSE 5-25% [3]
☐-NEARLY ABSENT < 5% [1]

Cover ☐ Max 20

COMMENTS: _____

3] SHORELINE MORPHOLOGY (Check *ONLY* one PER category or check 2 and *AVERAGE*)

SHORE SINUOSITY
☐-HIGH [2]
☐-MODERATE [4]
☐-LOW [3]
☐-NONE [1]

DEVELOPMENT
☐-EXCELLENT [6]
☐-GOOD [5]
☐-FAIR [3]
☐-POOR [1]

MODIFICATION
☐-NONE [7]
☐-RECOVERED [5]
☐-RECOVERING [3]
☐-RECENT OR NO RECOVERY [1]

STABILITY
☐-HIGH [3]
☐-MODERATE [2]
☐-LOW [1]

SHORE to BOTTOM SLOPE MORPHOLOGIES
☐-SLOPE < 15 deg. [0] ☐- SLOPE > 45 deg. [2]
☐-SLOPE < 25 deg. [1] ☐-SLOPE 90 deg. [0]
☐-SLOPE > 25 deg. [3]

AVERAGE DEPTH (of 5 measures)
☐- < 50 cm [0] ☐- > 400 – 500 cm [4]
☐- 50 - <100 cm [1] ☐- > 500 - 900 cm [2]
☐- ≥100 - 200 cm [2] ☐- >900 cm [1]
☐- >200 -4 00 cm [3]

MODIFICATIONS OF SAMPLED SHORELINE
☐- CEMENTED [-1] ☐- STEEL BULKHEADS [-2]
☐-RIP RAPPED [1] ☐-ISLANDS [1]
☐-RAILROAD TIES [-1] ☐-DIKES [-1]
☐-DREDGED [-1] ☐-BANK SHAPING [-1]
☐-TWO SIDE CHANNEL MODIFICATIONS [-1] ☐-WOOD PILINGS [1]
☐-SHIP CHANNEL [-2]

Shore Line ☐ Max 20

COMMENTS: _____

★ Shore Right Looking East or South on Lake ★
★ Shore Right Looking Toward Lake in Lacustuary ★

4] RIPARIAN ZONE AND BANK EROSION (Check *ONE* box PER bank or 2 and *AVERAGE*)

RIPARIAN WIDTH L R (Per Bank)
☐☐-WIDE > 50 m [4]
☐☐-MODERATE 10-50 m [3]
☐☐-NARROW 5-10 m [2]
☐☐-VERY NARROW < 5 m [1]
☐☐-NONE [0]

SHORE LINE QUALITY (PAST 100 FOOT RIPARIAN) L R (Most Predominant Per Bank)
☐☐-FOREST, WETLAND, LAKE [3]
☐☐- SHRUB OR OLD FIELD [2]
☐☐-VINEYARD, ORCHARD [2]
☐☐-FENCED PASTURE [1]
☐☐-RESIDENTIAL, PARK, NEW FIELD [1]
☐☐-CONSERVATION TILLIAGE [1]
☐☐-URBAN OR INDUSTRIAL [0]
☐☐-OPEN PASUTRE, ROWCROP [0]
☐☐-MINING/CONSTRUCTION [0]
☐☐- DIKED WETLAND [0]

BANK EROSION L R (Per Bank)
☐☐-NONE/LITTLE [3]
☐☐-MODERATE [-1]
☐☐-HEAVY/SEVERE [-3]

Riparian ☐ Max 10

COMMENTS: _____

5] AQUATIC VEGETATION QUALITY: PLANT SPECIES OBSERVED (Sum All Scores)
(Score all for observed abundance: ABUNDANT = [3]; COMMON = [5]; FEW = [1]; UNCOMMON = [0]) _____NO AQUATIC VEGETATION = 0

____-Pond Lilies (NYMPHAEA) ____-Sedge (CYPERACEAE) ____-Wild Celery (VALLISNERIA)
____-Pond Weed (POTAMOGETON) ____-Bulrush (SCIRPUS) ____-Waterweed (ELODEA) ____-Wild Rice (ZIZANIA)

(Score all for observed abundance: ABUNDANT = [-2]; COMMON = [-1]; FEW = [0])

____-Purple Loosestrife ____-Reed Grass ____-Eurasian Milfoil ____-Cattails ____-Algae (mats) ____-Algae (planktonic)

Vegetation ☐ Max 30

COMMENTS: _____

June 2010

Attachment 8 (cont.) Ohio EPA Lake/Lacustuary (Lentic) QHEI Field Sheet (back)

Is the Sampling Reach Representative of Area Habitat? (Y/N)___ If Not, Explain: _____

Depth measures: | | | | | |

Zebra Mussel/Quagga Mussel Coverage ☐-->60% ☐-60-->25% ☐-25-->10% ☐-<10-->1% ☐-1–0%

	Gear	Distance	Water Clarity	Wave Height
First Sampling Pass:	_____	_____	_____	_____
Second Sampling Pass:	_____	_____	_____	_____
Third Sampling Pass:	_____	_____	_____	_____

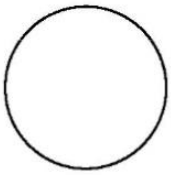
☐ Subjective Rating (1–10) ☐ Aesthetic Rating (1–10)

Photos: _____

WATERBODY MEASUREMENTS: AVERAGE WIDTH: _____ AVERAGE DEPTH: _____ Maximum Depth: _____

DRAWING OF SITE:

North Arrow:



June 2010