

SCOPE OF SERVICES WATER QUALITY MONITORING

LAKE AND RIVER ENHANCEMENT (LARE) PROGRAM INDIANA DEPARTMENT OF NATURAL RESOURCES DIVISION OF FISH AND WILDLIFE

I. Project Purposes:

The purpose of Water Quality Monitoring is to:

1. Describe condition and trends in selected stream(s) and/or lake(s) and its (their) watershed(s)
2. Identify potential nonpoint source water quality problems
3. Prioritize potential water quality improvement projects
4. Propose specific direction for improvement to water quality
5. Predict and assess factors for success of future work

II. Project Tasks:

The scope of services outlined below should be considered a draft that is subject to revision prior to the final contract, based on discussion between the LARE project manager and project sponsor.

A. Hydrology and Lake Habitat Quality

1. Water Budget

A. water budget for the lake must be calculated if not done in a previous study. The hydraulic residence time of the lake(s) should be determined using data available from various sources. Describe how the hydraulic residence time may affect the water quality of the lake(s).

2. Lake Shoreline and Streambank Erosion

B. Map lake shoreline protection and erosion areas from existing engineering information, indicating the approximate extent and distribution of various seawall materials. Describe any water quality or habitat changes that have occurred along eroding areas. Conduct an aerial or ground survey of eroding streambanks along tributaries to the lake and determine a percentage of shoreline that is degraded and the percentage of shoreline that is in good condition.

B. Describe littoral zone of the lake(s) or riparian area of a reach of streams

1. For lakes, describe the littoral zone of the lake: acres, percentage, number of native species (emergent and submergent), and number of invasive species (emergent and submergent). Complete a [QHEI by Ohio EPA](#) for inlet and outlet on the lake.

2. For streams, describe the riparian buffer and bank of the stream: width, composition, undercutting, erosion, meanders, are there significant riffles, pools, and runs. Consider completing a [QHEI by Ohio EPA](#).

C. Model nonpoint source pollution in lakes

Use appropriate models to describe relative contributions to sediment and nutrient loads from identified or predicted sources of nonpoint pollution.

1. Collect samples to determine the relative contribution of nutrients from agricultural/urban runoff, septic tanks, and/or stormwater runoff to the lake(s)/stream(s).
2. Vollenweider nutrient loading figure or similar illustration may be included with an interpretation. Calculate the load reductions needed to achieve water quality standards or targets for nutrients, sediment, and/or *E. coli*. Indicate the potential benefit derived from changes in land use practices.

Various computer modeling methods are available (e.g. STEPL, Region 5 Model) and may be useful in describing changes. Intensive modeling programs may represent a higher level of resolution than is necessary for the purposes of this study. However, there may be smaller areas of particular interest where more intensive models would be appropriate.

D. Analyze trends relating physical, chemical, biological, and habitat factors

Analyze the relationship between water chemistry, habitat and biological community quality data and discuss any correlation. Indicate potential limiting factors. Describe trends in water clarity and quality and compare water quality with similar regional lakes.

E. Prioritize management recommendations

Set reasonable goals for improvement of water quality factors. Prioritize subwatersheds and potential watershed improvement projects that would contribute to decreases in degradation from nonpoint source pollution. Discuss factors related to future success and limitations of recommended projects. Describe unusual physical or social characteristics of the subwatersheds or institutions that may support or challenge future lake or watershed projects. Include cost estimates and recommended timelines for implementation, as well as briefly list potential sources of funding for projects. Include a discussion of eligibility for IDEM 319 funds. Identify motivating factors that would encourage voluntary participation of land users in future programs. Include a detailed action plan for implementation.

F. Create a public information handout

Create and distribute an information handout that addresses factual issues concerning the state of the lake and costs or benefits predicted from the proposed project(s). The format of the handout should be tailored to the specific needs of the local sponsor, such as a 2-page flier, bi-fold brochure or magazine-style article. Recommend methods for keeping the public informed of future watershed management activities.

G. Facilitate a public meeting

Facilitate a public meeting for the purposes of:

- 1) Sharing results of the study, potential impacts of degraded areas, and recommendations to improve water quality.
- 2) Presenting the final report. Document meeting date, attendance, minutes, public comments, and an indication of the level of support for recommending particular implementation projects as an appendix to the report.

H. Report project progress

Issue monthly progress reports during the duration of the project. Copies of progress reports must be submitted to the project sponsor and LARE project manager prior to payment of invoices for the work described in the monthly reports. A listing of completed tasks and percentages in the invoice is not adequate as a monthly report. Progress reports should describe completed tasks, any unusual issues, and whether the anticipated timeline needs any modification along with any other information pertinent for LARE staff.

Complete a Water Quality Monitoring report including the following items at a minimum:

- a. Executive Summary
- b. Statement of project purpose
- c. General overall project description
- d. Heading, summary, discussion and recommendations for each project task
- e. Project conclusion
- f. Appendices should include (if applicable) but are not limited to:
 - 1) All pertinent data, including field sheets
 - 2) Water quality and index calculations
 - 3) Computer model input and output
 - 4) Necessary maps, charts, graphs, computations and computational breakdowns
 - 5) Pertinent meeting minutes, attendance lists and public comments

Information below should be included in the report

1. Summarize historical information on trends in land use and water quality

Indicate the 12-digit Hydrologic Unit Code(s) (HUC) for the study area. Note whether any waterbodies in the watershed are listed as impaired on the 303(d) list. Include historical aerial photos of the watershed if available.

2. Collect and analyze information on water quality, biology, and habitat

Conduct water quality tests at pertinent sites in selected streams and tributaries, as well as one reference site in a high quality similar watershed (approximately 5-10 sites total). Sites will be selected with input from the LARE project manager, the project sponsor,

and other interested agencies or organizations. At each site, collect and analyze data on water quality, biological communities, and habitat, as indicated below.

A. Water quality

- 1) Tributary sampling: Conduct tests at tributary sampling sites on physical and chemical water quality, including: pH, temperature, dissolved oxygen, nitrate+nitrite, organic nitrogen (TKN), ammonia nitrogen, total and dissolved phosphorus, turbidity, conductivity, total dissolved solids (TSS) and discharge. Stormflow and baseflow samples should be collected at each tributary site. Site locations should be well documented on maps, with photos and GPS coordinates. Fecal coliform as *E. coli* should be sampled twice between April and October at lake sites, to complete a 30-day geometric mean.
- 2) Quality assurance: Water quality analyses must be conducted by a reputable laboratory and should follow analytical methods described in the most recent edition of one of the following publications:
 - (a) [*Standard Methods for the Examination of Water and Wastewater*](#), jointly published by the American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF).
 - (b) [*Methods for the Chemical Analysis of Water and Wastes*](#), US EPA, Environmental Monitoring and Support Laboratory (EPA Publication #600/4-79-020, published March 1983).

Water quality analyses must be conducted using detection limits appropriate for the analysis of stream water samples. The following detection limits are suggested for LARE projects:

<u>Parameter</u>	<u>Limits (mg/l)</u>
Total Phosphorus	0.01
Total Orthophosphorus	0.01
Ammonia Nitrogen	0.03
Nitrate Nitrogen	0.10
Total Kjeldahl Nitrogen	0.10
Total Suspended Solids	4

Quality assurance/quality control procedures (QA/QC) must be a part of the sampling and water quality analysis. A copy of the QA/QC plan from the laboratory(s) conducting the water quality analysis must be provided to the LARE project manager.

B. Biological community and habitat quality

- 1) Conduct an assessment of the benthic macroinvertebrate community. Sampling should be conducted using the methods described in the [*Protocol for Macroinvertebrate Sample Collections and Index Calculation*](#), which follows the [*Rapid Bioassessment Protocols for Use in Streams and Wadeable*](#)

Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition (Sampling should use the single-habitat approach and consist of identification at the family level for a 100-organism subsample for the riffle/run sample. Calculate the standard metrics for LARE reports listed in the *Protocol for Macroinvertebrate Sample Collections and Index Calculation*.

- 2) Each tributary sampling site should be biologically monitored once between July 15 and November 30. Site locations should be well documented on maps, with GPS coordinates and photographs showing representative conditions of each site, including Latitude and Longitude Coordinates expressed in decimal degrees, using NAD 1983 Datum and UTM (Universal Transverse Mercator) Coordinates.
- 3) Evaluate habitat quality at each site, using the *Qualitative Habitat Evaluation Index (QHEI)* as used by the Indiana Department of Environmental Management.
- 4) A voucher collection will be submitted to IDNR Division of Fish and Wildlife at the same time as the draft report is submitted, allowing two months for review by IDNR or outside specialists. The collection will be forwarded to the Department of Entomology, Purdue University. A voucher for each taxon identified at each site will be curated according to Purdue's protocols for specimen handling. Refer to the *Protocol for Macroinvertebrate Sample Collections and Index Calculation* for details.

A *Scientific Purposes License* is not needed to sample aquatic insects. A fishing license or Scientific Purposes License is needed to collect crayfish, depending on the number and manner in which the crayfish will be taken. The only mussels that can be taken or possessed without a Scientific Purposes License are Asiatic clams, quagga mussels and zebra mussels. Individuals should not touch a mussel, or even just a dead shell, unless they know for sure that it is one of these three species listed above. Otherwise, a Scientific Purposes License is required to collect or possess a native mussel or dead shell.

For threatened and endangered species, adhere to the restrictions imposed by the Scientific Purposes License.

- 5) The study should include reports and brief analysis of surveys, trends, and management recommendations from other biological studies conducted in the stream and its tributaries. Information on the stream's fish community may be obtained from IDNR Division of Fish and Wildlife's Fish Management Reports or other sources. Macroinvertebrate data for selected Indiana streams is available from the Biological Studies Section of the Assessment Branch in IDEM's Office of Water Quality. This data and a discussion of its significance for resource management should be included in the report as an indication of water quality trends in the study area.

III. Data Presentation:

1. Where practical, the data should be presented clearly and concisely in the form of graphs and tables.
2. Figures should be incorporated into the main body of the report and not presented as attachments at the end of the report. Whenever possible, figures should be limited to 8 1/2" x 11" in size. In most cases, large-scale maps and photos are not necessary.
3. Present data in English units with metric units in parentheses. Example: 5 ft. (1.5m). Similarly, use common names for species with scientific names in parentheses or include a table with all common and scientific names used in the document.
4. Raw data sheets need not be bound into each copy of the report. However, at a minimum, one set of all laboratory and field data sheets must be forwarded to the LARE project manager to aid in the review of the draft report.

IV. Review Process:

1. Two printed copies and one digital copy (in either MS-Word© or Adobe PDF© format) of the draft report must be provided to the project sponsor and pertinent agencies. One printed copy and one digital copy of the draft report must be provided to the LARE project manager for review by the LARE staff at least two weeks prior to the final public meeting. *Note that the draft document may be posted on the LARE website for public comment.*

Upon addressing the review comments, two printed copies of the complete final report should be provided to the LARE project manager. In addition a digital copy of the full report including appendices, figures, maps and photos in either MS-Word® or Adobe PDF® format should be provided to the LARE project manager. Do not submit multiple files that need to be merged into one file for web posting. Two printed copies and one digital copy of the final report must also be provided to the project sponsor and pertinent agencies.

2. Reports should be reproduced with double-sided pages.
3. The title of the draft report should refer to the report as a "draft" version. Additionally, each page of the draft report should be labeled "Draft - Subject to Revision."
4. To facilitate review of the draft report, a meeting between the project sponsor and the LARE project manager, the consultant, and other agency staff as needed may be held to discuss the review comments in conjunction with the final public meeting. The entire review process will be coordinated by LARE project manager and may take up to at least eight weeks.

5. Upon addressing the review comments, two printed copies of the final report, should be provided to the LARE project manager as well as one digital copy of the full report including appendices, figures, maps and photos in either MS-Word© or Adobe PDF© format.

6. Reports must be reproduced with two-sided pages for hard copies and as a single digital file in MS-Word© or Adobe PDF© format, suitable for posting to the LARE website.

Follow these guidelines for electronic copies:

- a) Electronic file names must follow this protocol: Name_Water_Body_Water_Quality_Monitoring_Project_Name_County_Month_Year.pdf or .doc
- b) All digital copies must contain the complete digital copy of the full report including appendices, figures, maps and photos in either Microsoft Word© or Adobe PDF© format as a single electronic file. Do not prepare multiple files that need to be merged into one file for web posting.
- c) Keep file sizes as small as possible to facilitate email exchange and downloading by adjusting pixel size on graphics, compressing photos, or exporting GIS files to pdf or jpeg formats.

IDNR Checklist for Review of LARE Water Quality Monitoring

Watershed Name:

(HUC ____)

Sponsor:

County:

Contractor:

DNR Reviewers:

Review Date:

Other Reviewers:

The following is a checklist of the minimum elements required to establish eligibility for LARE implementation funding. Comments on specific elements have been added in *italics*.

1. Title Page

- Title includes name of lake(s), stream(s), and/or watershed and county
- Title page provides name of company, name and contact information for local sponsor, and date submitted

2. Executive Summary

- Provides clear and concise overview as a stand-alone summary

3. Acknowledgements

- As needed to reflect contributions

4. Table of Contents

- Complete and accurate

5. Introduction

- Statement of project purpose
- General overall project description

6. Summarize historical information on trends in land use and water quality

- Briefly summarize pertinent information on climate, geologic history, development, population, etc.

7. Collect and analyze information on water quality

- Tests at tributary sampling sites on physical and chemical water quality (stormflow and baseflow).
- Water quality analyses conducted by a reputable laboratory.

8. Biological Community Quality

- Conduct a Bioassessment Protocol for benthic macroinvertebrates
- Conduct a habitat evaluation using the QHEI.
- Surveys are conducted within appropriate sampling windows.
- Macroinvertebrate voucher collection submitted to IDNR or Purdue.
- Fisheries and macroinvertebrate results from other studies are analyzed for trends.
- Information on waterfowl, other nuisance wildlife or exotic invasive species.

9. Analyze trends relating physical, chemical, biological, and habitat factors

- Analyze relationship between water chemistry, habitat and biological community quality data and discuss correlations.
- Indicate potential limiting factors.
- Describe trends, compare with similar regional streams.

10. Model nonpoint source pollution in subwatersheds

- Use appropriate models to describe relative contributions to sediment and nutrient loads
- Calculate the load reductions needed to achieve water quality standards or targets for

nutrients, sediment, and/or *E. coli*.

- Indicate the potential benefit derived from changes in land use practices (load reduction)
- Use more intensive models in smaller areas of particular interest, as needed

11. Assess institutional resources

- Describe the availability of watershed management and leadership resources
- Identify existing or recommend potential volunteer monitoring groups

12. Prioritize management recommendations

- Set reasonable goals for water quality improvement
- List and prioritize potential watershed water quality improvement projects
- Describe unusual physical or social characteristics of the subwatersheds or institutions
- Predict the success of the recommended treatments
- Include cost estimates and recommended timelines for implementation
- Briefly list potential sources of funding for projects
- Identify motivating factors that would encourage voluntary land user participation
- Include detailed action plan for implementation

13. Project Conclusion

- Summarizes results of study and recommendations

14. Create a public information handout

- Addresses factual issues concerning the state of water quality within the watershed and costs or benefits of proposed projects
- Format tailored to the specific needs of the local sponsor

15. Facilitate meetings

- Hold a public meeting
- Document and summarize public meetings in report (date, attendance, comments, etc)
- Document public concerns gathered at meetings or through personal communication in report
- Recommend methods to keep the public informed

16. Include Appendices, as needed:

- All pertinent data, including field and laboratory data sheets
- Water quality and index calculations
- Computer model input and output
- Necessary maps, charts, graphs, computations and computational breakdowns
- Pertinent meeting minutes, attendance lists, public comments

17. Data presentation

- Data presented clearly and concisely in the form of graphs and tables
- All tables and figures cited in the text
- All citations provided in standard bibliographic format
- Figures incorporated into the main body of the report, not as attachments
- Figures limited to 8 1/2" x 11" in size (higher resolution may be provided electronically)
- Data presented in English units with metric units in parentheses
- Used common name with scientific names in parentheses or listed in a table

18. Format

- Draft document: Five hard copies and one electronic copy
- Draft submitted at least two weeks prior to the public meeting
- Double-sided pages with color figures as appropriate
- Title and each page labeled "Draft - Subject to Revision"

Comments: