

SCOPE OF SERVICES POST-CONSTRUCTION MONITORING

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

I. Project Purpose:

The purpose of the Post-Construction Monitoring Study is to:

1. Describe the water quality condition and trend in the water body and its subwatersheds after treatment.
2. Assess the success of treatment and predict future trends in water quality.
3. Identify additional potential nonpoint source water quality problems.
4. Propose specific direction for future work.

Because the purpose of this study is to identify indicators of change due to lake or watershed treatment, including construction and conservation practices, most tasks will focus on updating information that has or could be expected to have changed since the diagnostic study was completed. Except for use as a comparison or for setting the general context, information that has not changed significantly from the diagnostic study should not be repeated.

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 regarding cost-effectiveness of proposed services.

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

Compile an annotated bibliography of all studies pertinent to land use and water quality changes in the water body and any subwatersheds that have been conducted since the original diagnostic study was completed, including data from volunteer monitoring. Briefly summarize pertinent information on climate, geologic history, topography, historical trends in land development, unique recreational resources related to the waterway, or riparian areas, and historical status of water quality.

2. List and describe changes in land and water conservation practices

Present maps and briefly describe changes to conditions in the water body and any subwatersheds, including the cost, timing and approximate location of conservation practices that have been instituted since the completion of the diagnostic study. Note that land use information is to be reported at a relatively large resolution, not on a “field-by-field” basis. The written report should not include information that

specifically identifies individual landowners in the text or photographs. All land use information should be collected and discussed with the project sponsor prior to inclusion in draft reports that are circulated for public review.

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

Conduct water quality tests at pertinent sites in the lake and tributaries. Sites should be selected with input from the LARE project manager, DNR Fisheries Biologists and the project sponsor. Consultation with staff of the County Soil and Water Conservation District, the USDA Natural Resources Conservation Service, and the Indiana State Department of Agriculture's Division of Soil Conservation may provide additional insight into potential impacts on land use in the watershed. Collect and analyze data on water quality, biological communities, and habitat, as indicated below.

a. Chemical, biological and physical quality

- 1) Lake sampling: One sample will be taken at the surface and bottom over the deepest part of the lake in late summer (at peak stratification) for purposes of calculating the IDEM Eutrophication Index and Carlson's Trophic State Index (TSI). Parameters include: Secchi depth, light penetration, conductivity, pH, temperature, dissolved oxygen, nitrate+nitrite, organic nitrogen (TKN), ammonia nitrogen, total and dissolved phosphorous, turbidity, plankton, and chlorophyll-a. A vertical profile of temperature and dissolve oxygen at 1 meter intervals will be taken at the same location.
- 2) Tributary sampling: Conduct tests at pertinent tributary sampling sites on physical and chemical water quality, using the same protocols used for pre-treatment evaluation. Parameters must include: pH, temperature, dissolved oxygen, nitrate+nitrite, organic nitrogen (TKN), ammonia nitrogen, total and dissolved phosphorous, turbidity, conductivity, total suspended solids TSS), and discharge. The [Protocol for Macroinvertebrate Sample Collections and Index Calculation](#) may be used to measure changes, if appropriate. Fecal coliform may be sampled at selected sites, if appropriate. Stormflow and baseflow samples will be collected at each tributary site.
- 3) Bacterial sampling: Water quality analyses for fecal coliform and/or fecal streptococcus bacteria must be limited to a single sample at the deepest point of the lake and at each major inlet.
- 4) Quality assurance: Water quality analyses must be conducted by a reputable laboratory and should follow analytical method described in the most recent edition of one of the following publications:
 - a) [Standard Methods for the Examination of Water and Wastewater](#), APHA, AWWA, WPCF.
 - b) [Methods for the Chemical Analysis of Water and Wastes](#), USEPA, Environmental Monitoring and Support Laboratory.

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

| <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 |

The following information must be compiled only if it is likely to have changed significantly since the diagnostic study was completed:

- 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 should be determined using data available from various sources. Describe how hydraulic residence time has or will affect the predicted success of treatment efforts.
- 2) Lake shoreline and streambank erosion: If shoreline or bank erosion was addressed during treatment, map lake shoreline protection and erosion areas from existing engineering information, indicating the approximate extent and distribution of various seawall materials. Describe any changes to water quality or habitat that have occurred along treatment areas. Suggest possible causes of additional treatment that may be recommended.
- 3) Sedimentation: If sedimentation was addressed in lake or watershed treatment, then a lake or channel bottom contour map should be described from an existing engineering study. If the information is not available, mapping should be limited to the immediate area of concern (i.e., mouths of inlets and embayments). Sediment cores with analysis of nutrients and particle size may be included in the study only if they were conducted in the original diagnostic study and were not repeated after construction or dredging. Sediment sampling locations should be limited to one station at each treatment area.

b. Ecological community quality

- 1) Fish and macroinvertebrate communities: Include reports and a brief analysis of surveys, trends, and management recommendations from biological studies conducted in the lake and tributaries since the diagnostic study was completed. Information on the lake's fish community should be obtained from IDNR Fish Management Reports or other sources. Macroinvertebrate data may be available from IDEM Biological Surveys Section or the IDNR Fish and Wildlife Non-game Program. The data

should be presented in the final report if it was not previously presented in the original diagnostic study.

Aquatic plants: Conduct surveys using standard LARE program procedures found in the latest version of the [Tier II Aquatic Vegetation Survey Protocol](#). The number and location of points may be adjusted for special projects, such as monitoring of ecozones or revegetation projects, as determined by LARE project manager. All program guidance may be downloaded from the [LARE Program Manual](#) at: www.in.gov/dnr/fishwild/3302.htm. The location of each survey point should be documented using a GPS unit with not more than 3m resolution. The location should be noted using Latitude and Longitude Coordinates expressed in decimal degrees, using NAD 1983 Datum and by UTM (Universal Transverse Mercator) Coordinates. Curate plants that may be of interest to the IDNR Division of Nature Preserves in accordance with the procedures outlined in the aquatic plant survey protocol.

If wetland construction was conducted as a treatment method, include a general description of the diversity and condition of wetland plants in the structure(s). Where the wetland plant community in the structure has not developed adequately for the intended purposes, make recommendations for improving the plant community.

Plankton samples need only be collected as part of the calculation of the ITSI. Follow the methods specified in the [Calculation of the Indiana Trophic State Index \(ITSI\) for lakes](#) to ensure that the samples are collected and analyzed correctly. A list of plankton species and abundance must be included, based on collections made for calculation of the ITSI.

- 2) Nuisance species: If treatment included control practices for waterfowl, other nuisance wildlife or exotic invasive species (e.g., purple loosestrife, Eurasian water milfoil, zebra mussels), a survey of the current count of distributions of the species should be conducted on a representative day.

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

Use statistical analyses to predict the relationships between physical, chemical, and habitat factors compared to biological quality. Indicate potential limiting factors. Predict the success of the installed and recommended treatments in regard to eutrophication, recreational use, fisheries productivity or other factors related to ecological quality and human uses. Indicate changes since the diagnostic study in water clarity and quality, compare water quality with similar regional lakes that have not received treatment and set a reasonable goal for continued improvement in water quality factors.

4. Model nonpoint source pollution in lakes and subwatersheds

Use appropriate models to describe changes in relative contributions of sediment and nutrient loads from identified or predicted sources of nonpoint pollution. A Vollenweider nutrient loading figure should be included with an interpretation. Indicate the identified and predicted future benefit derived from changes in land use practices. Use of various software programs may be useful in analyzing and describing changes. The intensity and degree of precision required will be case-specific and should be agreed upon by the sponsoring entity in coordination with the LARE project manager before a final agreement is completed.

5. Prioritize management recommendations

List and prioritize any remaining recommendations for watershed land treatment or stream and lake restoration projects that would control degradation from nonpoint source pollution. 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 listing potential sources of funding for projects. Identify motivating factors that would encourage voluntary participation of land users in future programs.

6. Create a public information handout

Create and distribute an information handout that addresses factual issues concerning the state of the lake or watershed, the success of conservation practices that were implemented and costs or benefits predicted from future 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.

7. Facilitate a final public meeting

Facilitate at least one public meeting for the purpose of presenting the final report. Document meeting attendance, minutes, and presentations, comments, questions, and suggestions as an appendix to the report

8. Report project progress

Issue monthly progress reports throughout the duration of the project. Copies of progress reports must be submitted to the project sponsor and to the 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. These 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 review.

9. Complete post construction monitoring study report

This task includes completion of a Post Construction Monitoring study report which should include the following components at a minimum:

- a. Executive Summary
- b. Statement of project purpose.
- c. General overall project description.
- d. Heading and summary for each project task with accompanying appendices, if necessary. 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) All pertinent project correspondence
 - 5) Necessary maps, charts, graphs, computations and computational breakdowns.
 - 6) Pertinent meeting agendas, attendance lists, notes and agreements
- e. Project conclusion.

III. Data Presentation:

1. Where practical, data should be presented clearly and concisely in the form of graphs and tables.
2. 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 program office to aid in the review of the draft report.
3. Figures should be incorporated into the main body of the report and not presented as attachments at the end of the report.
4. Whenever possible, figures should be limited to 8 ½" x 11" in size. In most cases, large-scale blueprint drawings and photos are not necessary.
5. 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 chart with all common and scientific names used in the document.

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. *Note that the draft document may be posted on the LARE website for public comment.*

2. 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.
3. Reports should be reproduced with double-sided pages.
4. The title of the draft report should refer to the report as a "draft" version. Additionally, each page of the draft report and plan sheets should be labeled "Draft - Subject to Revision."
5. To facilitate review of the draft report, a meeting between the project sponsor, the LARE project manager and the consultant, and other agency staff as needed may be held to discuss the review comments in conjunction with the final public meeting. The review process will be coordinated by LARE project manager may take at least eight weeks.
 - a) Upon addressing the review comments, two printed copies and one digital copy (in either MS-Word[®] or Adobe PDF[®] format) of the complete final report and plan sheets, should be provided to the LARE project manager.
6. Follow these guidelines for digital copies:
 - a) Electronic file names must follow this protocol: Name_Water_Body_Post_Const_Monitoring_Study_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 MS-Word[®] or Adobe PDF[®] format as a single digital 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.