

# SCOPE OF SERVICES WATERSHED DIAGNOSTIC STUDY

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

### **I. Project Purposes:**

The purposes of the Watershed Diagnostic Study are to:

1. Describe condition and trends in selected stream(s) and its (their) watershed(s)
2. Identify potential nonpoint source water quality problems
3. Prioritize potential watershed improvement projects
4. Propose specific direction for future work
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 with the LARE staff, sponsoring local organization and local county Soil and Water Conservation Districts (SWCDs) regarding cost-effectiveness of proposed services.

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. Compile an annotated bibliography of all previous studies pertinent to land use and water quality changes in the watershed, including data from volunteer monitoring. The Indiana Water Monitoring Council ([www.inwmc.org/Default.aspx?pageId=319840](http://www.inwmc.org/Default.aspx?pageId=319840)) maintains an inventory of water monitoring locations in Indiana that may be useful. Briefly summarize pertinent information on climate, geologic history, topography, trends in land development, unique recreational resources related to the waterway or riparian areas, and water quality. 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. Map and describe current watershed conditions

Present maps and describe current conditions in the stream's subwatersheds. Maps and descriptions should include the following:

- a. General location maps including watershed boundaries and the associated 12 digit HUC (Hydrologic Unit Code) as well as the location of the outlet or lowest elevation in the watershed within the project's proposed bounds noting Latitude and Longitude Coordinates expressed in decimal degrees, using NAD 1983 Datum.
- b. Map showing subwatershed boundaries, table of subwatershed acreages;
- c. Soil type descriptions and maps of Highly Erodible Land (HEL) and hydric soils;

- d. Current and historic extent of wetlands (from National Wetland Inventory) and potential wetland restoration sites;
- e. Floodplain management areas (identified on FEMA floodplain map) and condition of riparian zones indicating any significant locations possessing or requiring unusual bank protection;
- f. Significant natural areas;
- g. General locations of known state and federally listed species;
- h. Priority areas for conservation, restoration, and acquisition, based on results of the Indiana Biodiversity Initiative's Conservation Tool, land use development models that may be available for that area (e.g., LUCI), and any other tools, as appropriate;
- i. State-owned land and easements that may be available for resource conservation and public access purposes; and
- j. Land use information, such as:
  - 1) land use categories by acreage and percent of watershed area
  - 2) map of broad land use categories
  - 3) development trends (changes in land use over time)
  - 4) history of pursuit of public access sites
  - 5) location of point source dischargers, including permit compliance information (LUST, NPDES discharge data available from IDEM)
  - 6) location of any hazardous waste or Superfund sites
  - 7) location of large septic fields or industry
  - 8) "hot spots" of damaging land use practices
  - 9) number and type of animals in confined animal feeding operations (CFO's, CAFO's)
  - 10) tillage transect data/trends in the county(ies)
- k. Visual assessment of the watershed based on a windshield survey.

Note that land use information is to be reported at a relatively large resolution, not on a "field-by-field" basis. The 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 sponsoring organization and the local county SWCD, the local staff of the USDA Natural Resources Conservation Service (NRCS) and ISDA Division of Soil Conservation in the watershed 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 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 staff of the LARE program, the local sponsor, participating SWCDs, the USDA NRCS, the ISDA Division of Soil Conservation, affected municipalities, and IDNR District Fisheries and Nongame Biologists. 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, and discharge. Fecal coliform as *E. coli* should be sampled at these sites, if appropriate. Stormflow and baseflow samples should be collected at each tributary site. Site locations should be well documented on maps, with photos and GPS coordinates.
- 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) (<http://www.standardmethods.org/>)

(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). Available at <http://nepis.epa.gov/EPA/html/Pubs/pubtitleORD.htm>, search for #600/4-79-020.

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 program office in Indianapolis.

#### 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 *LARE Protocol for Macroinvertebrate Sample Collections and Index Calculations*, which follows the *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish*, Second Edition (US EPA publication number EPA 841-B-99-002, [www.epa.gov/owow/monitoring/rbp/](http://www.epa.gov/owow/monitoring/rbp/)). 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 *LARE Protocol for Macroinvertebrate Sample Collections and Index Calculations*.

- 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.
- 3) Evaluate habitat quality at each site, using the Qualitative Habitat Evaluation Index (QHEI) as used by the Indiana Department of Environmental Management (available at <http://monitoringprotocols.pbworks.com/f/IDEM+QHEI+SOP.pdf>).
- 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 *LARE Protocol for Macroinvertebrate Sample Collections and Index Calculations* 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.

C. 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 quality and compare water quality with similar regional streams.

#### 4. Model nonpoint source pollution in subwatersheds

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

#### 5. Assess institutional resources

Describe the availability of watershed management and leadership resources, both human resources and existence of planning documents or land use management ordinances. Identify existing or recommend potential volunteer monitoring groups. Establish contacts with producer groups, environmental groups, developers, and land managers at public properties. Where possible, include brief summaries of pertinent reports on land use and water quality from these and other land management organizations in the watershed.

#### 6. 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 watershed projects. Include cost estimates and recommended timelines for implementation, as well as briefly list potential sources of funding for projects. To assist with implementation of future priority projects the Region 5 model should be utilized to list reductions in soil and nutrient loss for each specific project. 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.

#### 7. Create a public information handout

Create and distribute an information handout that addresses factual issues concerning the state of the watershed 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.

## 8. Facilitate meetings

Facilitate at least two public meetings for the purposes of: 1) identifying stakeholders, introducing the study, and obtaining public input and concerns, and 2) presenting the final report. Document meeting dates, attendance, minutes, public comments, and an indication of the level of support for recommending particular implementation projects as an appendix to the report. As an option at the request of the sponsoring organization a steering committee can be established to help guide the planning process. An established number of steering committee meetings would be facilitated by the contractor to help create a consensus driven plan and provide input throughout the process.

## 9. Report project progress

Issue monthly progress reports during the duration of the project. Copies of progress reports are must be submitted to the project sponsor and LARE program staff 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 review.

## 10. Complete watershed diagnostic study report

Complete a Watershed Diagnostic Study 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

### **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 program office to aid in the review of the draft report.

#### **IV. Review Process:**

1. Five printed copies and three digital copies of the draft report must be provided to the LARE program office for review by the LARE staff, SWCDs, and pertinent agencies and organizations at least two weeks prior to the final public meeting. The LARE staff will forward copies for review by other persons and agencies. *Note that the draft document will be posted on the LARE website for public comment.*

2. Both the draft and final 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 a representative of the local sponsor organization, consultant, LARE staff, 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 staff and normally takes at least eight weeks.

5. Upon addressing the review comments, five bound printed copies of the complete final report, plus an additional copy for each participating SWCD office, should be provided to the LARE office for distribution to each SWCD and other participants involved in the watershed project. In addition, one unbound printed copy shall be provided to the LARE office, along with three digital copies of the full report including appendices, figures, maps and photos in either Microsoft Word© or Adobe PDF© format. Do not submit multiple files that need to be merged into one file for web posting.

## IDNR Checklist for Review of LARE Watershed Diagnostic Studies

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 watershed and county
- Title page provides name of company, name and contact information for local sponsor (e.g., watershed group), 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
- Description of the steering committee and list of stakeholder concerns if applicable

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

- Annotated bibliography of all previous studies
- Briefly summarize pertinent information on climate, geologic history, development, population, etc.

### 7. Map and describe current watershed conditions

- Watershed boundaries and the associated 12-digit HUC codes. Latitude and Longitude Coordinates expressed in decimal degrees, using NAD 1983 Datum.
- Table of subwatershed acreages
- Soil type descriptions and maps of Highly Erodible Land (HEL) and hydric soils.
- Current extent of wetlands and potential wetland restoration sites.
- Floodplain management areas and condition of riparian zones.
- Significant natural areas.
- General locations of known state and federally listed species.
- Priority areas for conservation, restoration, and acquisition.
- State-owned land and easements.
- Land use information, including development trends, "hot spots", CFOs, etc. Location of point sources (NPDES, LUST), including permit compliance information.
- Land use information reported at a relatively large resolution and discussed with local sponsor, SWCD and NRCS.
- Windshield survey of watershed completed.

**8. 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.

**9. 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.

**10. 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.

**11. 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

**12. Assess institutional resources**

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

**13. Prioritize management recommendations**

- Set reasonable goals for water quality improvement
- List and prioritize potential watershed 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

**14. Project Conclusion**

- Summarizes results of study and recommendations

**15. Create a public information handout**

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

**16. Facilitate meetings**

- Hold a minimum of two public meetings, evenly distributed throughout the watershed
- Hold contractual number of steering committee or other stakeholder meetings if applicable
- Identify and invite interested parties (user groups, local government, state and federal agencies)
- 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

**17. 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

**18. 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

**19. Format**

Draft document: Five hard copies and one electronic copy

Draft submitted at least two weeks prior to the final public meeting

Double-sided pages with color figures as appropriate

Title and each page labeled "Draft - Subject to Revision"

***Comments:***