Grand Lake St. Marys/Wabash River Watershed Alliance

Qualified Data Collector Guide

Approving Officials

- _____ Date: 7-22-09
- Laura Walker, Watershed Coordinator
- Nicole D. Hawk Date: 7-22-09
- Nicole Hawk, District Administrator/QA Officer
- _____ Date: 7-22-09
- Tom Harrod, Chairman of GLWWA
- _____ Date: _____
- EPA project manager
- _____ Date: _____
- EPA QA Officer

This guide includes quality assurance and study plan information.

GRAND LAKE ST. MARYS/WABASH RIVER WATERSHED ALLIANCE (GLWWA)

Date: 7/17/2009

Contact information for Grand Lake St. Marys/Wabash River Watershed Alliance Monitoring Project Leader:

- Qualified Data Collector #103
- Watershed Coordinator Laura Walker
- Email: laura.walker@mercercountyohio.org
- Phone: 419-586-3289
- Fax: 419-586-9599
- Office address: Mercer County Soil and Water Conservation District
  220 West Livingston Street, Suite 1
  Celina, OH 45822

- Additional Joint Board Members

Auglaize County Soil and Water Conservation District
110 Industrial Drive, Suite F
Wapakoneta, OH 45895-4782
Phone: 419-738-4016
Fax: 419-738-4782

Darke County Soil and Water Conservation District
1117 South Towne Court
Greenville, OH 45331
Phone: 937-548-2410 ext. 3
Fax: 937-548-2925

Participating Qualified Data Collectors:

#292 - Abbey Tobe
#114 - Al Watson
#108 - Allen Imwalle
#112 - Bill Ringo
#295 - Bruce Hays
#107 - Dave Dennis
#109 - David Meyer
#111 - Frances Springer
#165 - John Kopec
#104 - Matt Walker
#233 - Mike Short
#106 - Paula Bollenbacher
#110 - Ralph Pottkotter
#113 - Ron Stapleton
#095 - Theresa Howick
#174 - Deborah Hoersting

Table of Contents

Project Management **Page #**

Partner/Distribution List.....6
Project Organization.....7
Project Background.....8
Project Objectives.....9
Project Schedule.....10
QDC Status - Experience & Training Requirements.....11

Measurement/Data Acquisition

Sampling Objectives and Areas.....14
Sampling Equipment.....20
Sampling Parameters.....21
Documentation and Records.....22
Sampling Methods.....36
Sample Handling and Custody Requirements.....55
Quality Control Requirement.....55
Instrument/Equipment Testing, Inspection and Maintenance Requirements.....55
Instrument Calibration and Frequency.....55
Inspection/Acceptance Requirements for Supplies.....56
Data Acquisition Requirements.....56
Data Management.....56

Assessment and Oversight

Assessment and Response Actions.....57
Reports.....57

Data Validation and Usability

Data Review, Validation and Verification Requirements.....57
Validation and Verification Methods.....57
Reconciliation with Data Quality Objectives.....57

Appendix

Background Information.....61
QDC Documentation.....69
Credible Data Review.....71
Laboratory Information.....75
Scientific Collector's Permit.....77

Table of Contents Continued

Appendix Continued...

Page #

CLAM Handbook.....79
Sample Location Information Statement.....93
Digital Photo Statement.....94
Voucher Statement.....95
Trespassing Certification.....96
Field Sheets.....101
Site Locations.....114
Parameters.....115
References.....117

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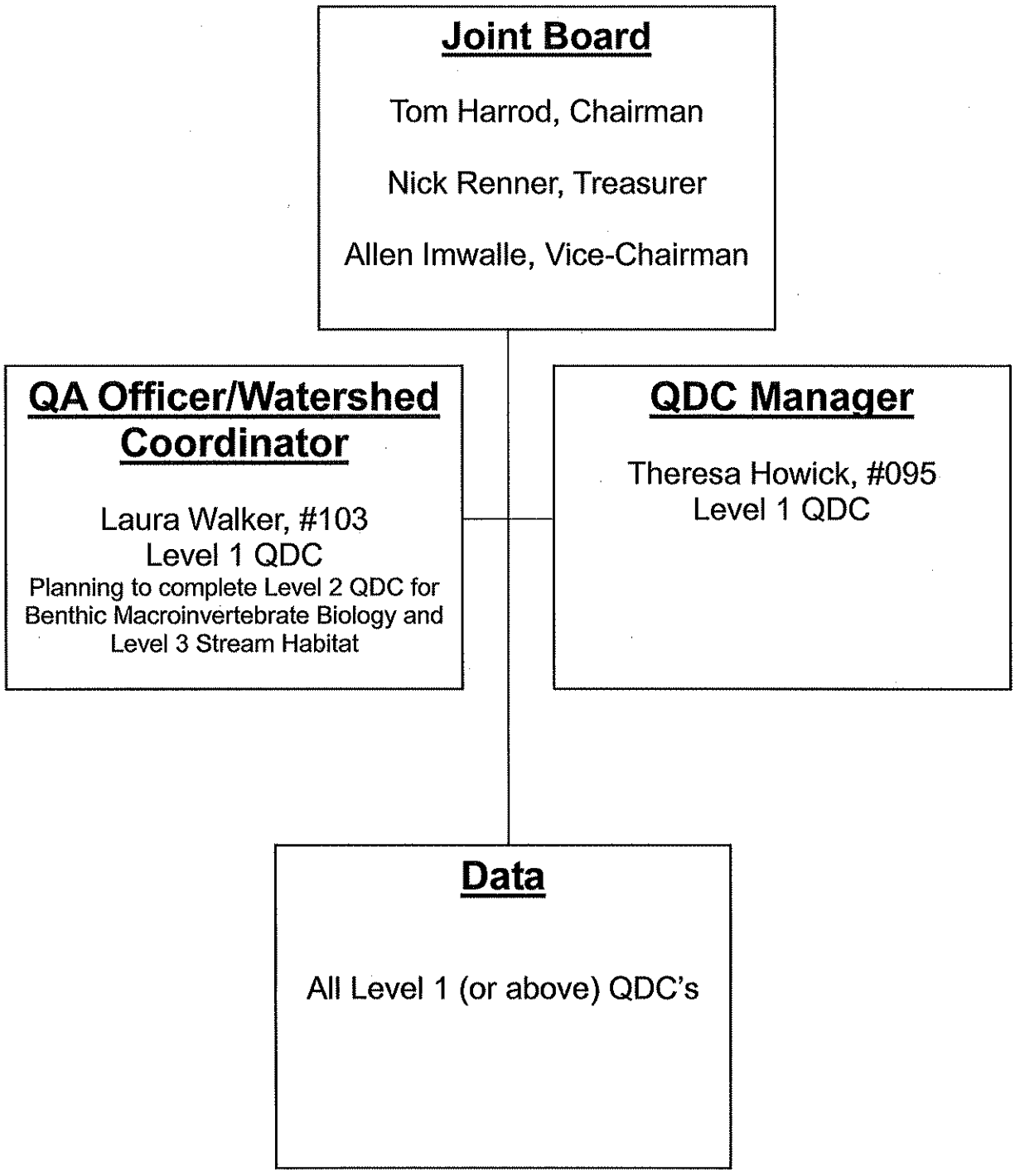
Partner/Distribution List

Auglaize County Commissioners
Auglaize County Health Department
Auglaize County Pheasants Forever
Auglaize County Soil and Water Conservation Distict
Celina Water Treatment Plant
City of Celina
City of St. Marys
Community Development Services
Darke County Commissioners
Darke County Health Department
Darke County Soil and Water Conservation District
East Bank Marina
GLMC
Grand Lake St. Marys Consortium
Grand Lake St. Marys State Park
Lake Development Committee
Lake Improvement Association
Mercer County Builder's Association
Mercer County Commissioners
Mercer County Farm Bureau
Mercer County Farm Service Agency
Mercer County Health Department
Mercer County Pheasants Forever
Mercer County Sanitary Department
Mercer County Soil and Water Conservation District
Mercer Energy
Mercer-Auglaize Convention of Visitor's Bureau
Natural Resources Conservation Service
Northwood Homeowner's Association
Ohio Division of Parks
Ohio Division of Watercraft
Ohio Division of Wildlife
Ohio State University Extension
St. Marys Boat Club
Top of Ohio RC&D
United States Department of Agriculture
Wabash River Conservancy
Wright State University

Project Organization



Project Background

Grand Lake St. Marys and Wabash River Watersheds have the same problems and characteristics. A Watershed Action Plan (WAP) for this area is in the final stages of endorsement. The WAP contains 15 Objectives. The objectives include agriculture and residential best management practices. As more stakeholders become aware of the problems and solutions, more BMP's will be implemented. As these BMPs are implemented, there should be changes in the water quality.

Volunteer monitors were active in the Grand Lake St. Marys watershed in 2001 and 2002. A rejuvenation of this program is necessary to show trends in water quality. The Grand Lake St. Marys/Wabash Watershed Alliance (GLWWA) wants to know the changes in water quality as they meet objectives of the WAP. Another goal of the monitoring program is to show enough change to request a new Total Maximum Daily Load (TMDL) study by the Environmental Protection Agency (EPA).

The goal of this Qualified Assurance Plan (QAP) is to utilize EPA-certified data collecting methods of levels 2 and 3 to observe changes in water quality for the Grand Lake/Wabash River Watersheds. Data collection will begin with the implementation of level 1 methods, but then proceed to level 2 as monitors obtain higher level training and certification.

For more information on the history of these watersheds, see "Background Information" in the appendix. The full WAP can be viewed by contacting the watershed coordinator.

Water Quality monitoring can also be used for educational purposes. The monitoring program will fit into any school curriculum; ranging from pre-school to college classes. More information can be obtained by contacting the watershed coordinator.

Overall the watersheds are considered eutrophic, with the lake being hypereutrophic. All problems are considered to be non-point source pollution. The land is predominately agriculture, with a high concentration of livestock and conventional tillage. This contributes to the sediment and nutrient loading. As the WAP is implemented, there may be changes in the management practices of the land. It is known that these changes will not occur overnight. Therefore this monitoring project must be continued over a long period of time.

Project Objectives

The objective of this water quality monitoring project in the Grand Lake St. Marys and Wabash River watersheds include showing changes in water quality at a level of credible data that will be recognized by the Ohio Environmental Protection Agency. Some of these changes will be small and others may be large. Below are overall project objectives. Site specific objectives are described in each site section.

Overall project objectives are to show changes in:

- Water Temperature
- Turbidity
- Weather Conditions: including air temperature, wind direction, recent rainfall, cloud cover and time
- Site Conditions: including amount of debris, vegetation, water color, flow and wildlife
- Level of pH
- Phosphorous Level
- Nitrate Level
- Dissolved Oxygen Level
- E-coli
- Macroinvertebrate Diversity
- QHEI and HHEI Score

Data for this project will be collected using techniques described in:

- Hoosier River Watch, Volunteer Water Quality Monitoring
- Ohio Lake Management Society (OLMS)
- Citizen Lake Awareness and Monitoring (CLAM) Quality Assurance Plan
- Hach Test Kits and Instructions
- "Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)," (Ohio EPA/E. Rankin, 2006)
- "Field and Laboratory Methods for using the MAIS (Macroinvertebrate Aggregated Index for Streams) in Rapid Bioassessment of Ohio Streams" (Johnson, K.S. 2007)
- "Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition" (Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999)
- "Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams," (Ohio EPA, 2002)

Project Schedule

Beginning

The monitoring project will begin as soon as the Quality Assurance Plan is in place. There are trained qualified data collectors waiting to start reporting data for this project.

Qualified data collectors will sample at monitoring sites beginning on a monthly basis from May through September with the hope to expand to a collecting schedule from February through November as the monitoring program expands. All data will be submitted to the EPA annually in December.

Continuation

As the monitoring project expands, trained qualified data collectors will proceed to collect data at sampling sites once per month from February through November, with a bi-monthly sampling schedule through the months of May through September.

This project will require funding and the willingness of volunteers to continue. Funding will be needed to replace monitoring supplies. Volunteers must be trained QDCS to participate. There are several organizations around the watershed area that have participants who are willing to support this project financially and do the data collection.

Loss of the watershed coordinator grant would not put a stop to this project. The project can be run out of the Mercer County Soil and Water Conservation District if the watershed coordinator position is eliminated.

Minimum

Sampling will occur at monitoring sites from May through September on a monthly schedule with data being submitted after every sampling.

At a minimum this project will be run for five years, with the potential to be continued. The watershed action plan (WAP) was endorsed on May 14, 2008 and the project is being completed in attempts to show changes in the water quality due to completion of objectives in the WAP. Most objectives in the WAP are to be completed within five years of WAP endorsement. The WAP is revised at the end of each year, making it an ongoing working document. Typically this revision consists of updates in format and status of objectives. It is important that water monitoring continue past the five year window with the cooperation of volunteers as stated in the "Continuation" section.

Revision

When the WAP is reviewed at the annual Advisory Board Meeting in December, this Quality Assurance Plan will also be reviewed. This review is to see what needs updated or changed. This review will ensure the document is adequate to be used in the following year. All updates will be sent to the OEPA annually.

QDC Status - Experience & Training Requirements

Qualified data collector (QDC) criteria is set by the Ohio Revised Code. The detailed code can be seen at http://www.epa.state.oh.us/dsw/rules/04-05.pdf.

This summary was derived from that webpage:

All data submitted to the director for consideration as credible data shall originate from studies and samples collected by, or under the supervision of, a QDC. An individual seeking to become a QDC shall submit an application to the director. The applicant may request status as a QDC for one or more levels and, within level 2 and level 3.

The applicant must have successfully completed training offered through an acceptable educational monitoring program or an acceptable volunteer monitoring program. QDC certifications must remain current for data to be recognized.

Qualified Data Collector Level 1

Level 1 QDCs have a basic knowledge of the concepts and are capable of collecting quality data. By working under a level 2 QDC, their data can be considered credible. This level is very beneficial for students and teachers who are working on learning projects. In this study plan it is organized that Level 1 QDCs may meet quality control/quality assurance requirements to have credible data, see page 10 for more information.

Qualified Data Collector Level 2

An individual seeking to become a QDC for level 2 credible data shall submit an application requesting QDC status in one or more of the following specialties and must meet the criteria listed here:

- **Stream habitat assessment**: The level 2 QDC must demonstrate a general knowledge of stream and riverine physical forms and habitat features and within the last five years, attended training and achieved a passing mark in qualitative habitat evaluation index testing offered by Ohio EPA or a person authorized pursuant to this chapter to provide such training.

- **Benthic macroinvertebrate biology**: The level 2 QDC must demonstrate that he or she has a general knowledge of stream and riverine physical forms and habitat features, knowledge of and the ability to accurately use macroinvertebrate taxonomic references and dichotomous keys to identify midwestern aquatic macroinvertebrates to the level of family, within one hundred eighty days prior to submission of a level 2 QDC application, achieved a passing mark in a macroinvertebrate taxonomic identification examination administered by Ohio EPA or a person authorized under this chapter to administer such an examination, college-level course credit in aquatic invertebrate zoology or practical experience in the identification of aquatic macroinvertebrates, completed and achieved passing marks in undergraduate core course work in limnology, aquatic biology, environmental sciences or a related discipline, or has two years practical experience in environmental assessment work and two years of practical experience involving work in developing biological water quality sampling and analysis plans, quality assurance plans, and data quality objectives processes.

QDC Status - Experience and Training Requirements Cont.

- **Chemical water quality assessment**: The level 2 QDC must demonstrate that he or she has a general knowledge of stream and riverine physical forms and habitat features, completed and achieved passing marks in undergraduate core course work in a biological, chemical, natural or physical science, or has two years of pertinent laboratory experience performing water quality testing and analysis, or has two years of pertinent experience in chemical water quality data analysis, interpretation and report writing, two years of practical experience involving work in developing chemical water quality sampling and analysis plans, quality assurance plans, and data quality objectives processes, and two years of practical experience involving water quality sampling techniques and water quality sampling equipment.

Qualified Data Collector Level 3

Application requirements are more rigorous than the level 2 requirements. Level 3 requirements can be viewed on the Ohio Environmental Protection Agency website.

Documentation of QDC certification is in the appendix of this document.

If QDCs upgrade or renew certification, these records will maintained in the watershed coordinator or program manager's office at Mercer County Soil and Water Conservation District.

Qualified Data Collector Certification

All QDCs will complete an OEPA approved water quality monitoring training and submit a QDC Application to OEPA. When OEPA issues a certification number and the GLWWA has record of this certification number, the QDC will be able to participate in this study plan. Before being released to monitor, the QDC must meet with the project manager and complete an Annual Approval. This will ensure that all QDCs will be utilizing the proper data collection methods at a level appropriate for credible data.

As QDCs become more involved in water monitoring, they will be offered more training opportunities. As training is completed, it is possible for the QDC to obtain higher levels of certification.

A QDC can choose to stay at a level 1 certification. Regardless of certification, all QDCs will be required to attend at least one refresher course annually. Details of this refresher course can be viewed on the next page.

QDC Status - Experience and Training Requirements Cont.

Data submitted by a QDC must meet the requirements below to be accepted as level 2 credible data:

- Adherence to the study plan.
- Use of appropriate test methods.
- All laboratories that perform analysis under a level 2 study plan must implement a quality assurance program and must document all elements of the program in a quality assurance manual (QAM) or quality assurance plan (QAP).
- Data reporting. QDCs choosing to submit their data to Ohio EPA must submit all collected data.
- Laboratory quality assurance and quality control plans must be reported.
- Data must meet approval of the project manager and director.
- Annual approval of monitoring by project manager.

Annual Approval by Project Manager will include:

- Project manager witnessing a complete monitoring site visit for every QDC.
- Site visit will include QDC's completing the preparation and monitoring of the site.
- Credible data review, see Appendix for question list.
- Project manager reviewing any faulty or insufficient actions until QDC can complete action correctly.
- Details of this annual approval are listed in the Appendix.

Documentation and Records

- Documentation of QDC status and training records of current QDC's is maintained at the watershed coordinator's office.

Refresher Course Details

The refresher course will be held in the fall and spring of each year. This course will be modeled after OEPA certification courses. This course may be held in conjunction with the quarterly GLWWA Advisory Board Meetings. The course will include review of the QAP and study plan. Refresher course topics may include: importance of quality assurance, precision, accuracy, accurate data collection, scientific data collection, data collection methods, study results, data entry techniques, invasive plant identification, macroinvertebrate identification and more. The goal of the refresher course is to ensure that all QDCs will be obtaining high quality data by using the same techniques.

Sampling Objectives & Areas

Sampling Objectives

Sampling objectives are to show changes in:

- Water Temperature
- Turbidity
- Weather Conditions: including air temperature, wind direction, recent rainfall, cloud cover and time
- Site Conditions: including amount of debris, vegetation, water color, flow and wildlife
- pH Level
- Phosphorous Level
- Nitrate Level
- Dissolved Oxygen Level
- E-coli , if funds allow
- Macroinvertebrate Diversity
- QHEI & HHEI Scores

Objectives Expanded

The Grand Lake St. Marys/Wabash River Watersheds have many water quality issues. This ranges from destruction of habitat to high concentration of livestock to nutrient and sediment runoff to encouraging dredging in Grand Lake St. Marys. In 2004, USEPA finalized a Total Maximum Daily Load Study (TMDL) for the Wabash River watershed area. In 2007, OEPA finalized a TMDL for the Grand Lake St. Marys watershed area. In 2008, OEPA released additional information for the Wabash River watershed area TMDL. All of these studies show the areas to have similar problems and very far from attaining their designated use status. In 2008, OEPA and ODNR endorsed a Watershed Action Plan (WAP) for the Grand Lake St. Marys/Wabash River Watersheds. This plan states 15 objectives. These objectives range from cover crops to construction site best management practices to securing banks of Grand Lake St. Marys.

It is necessary to have water quality monitoring throughout the watersheds, to show if these objectives are making a change in the water quality. The objectives will be accomplished over time and it is expected that the water quality will not change quickly.

Sampling Objectives were selected because they are expected to show changes in the water quality. The TMDL studies can be used as a baseline for several of the objectives. The City of Celina also has some data for the Grand Lake St. Marys watershed. This data can also be used to create a baseline for some objectives. Those objectives not included in the TMDL or City of Celina data, will have a baseline created during the first year of monitoring.

Overall Sampling Area

The overall sampling area for this project is the Grand Lake St. Marys and Wabash River Watersheds in Ohio. These watersheds are identified by the following hydorologic codes 05120101-010-010, 05120101-020, 05120101-030, 05120101-040, and 05120101-050.

The predominate land use of this area is agriculture. Auglaize, Mercer and Darke County were ranked in the top 20 in almost all areas of agriculture in the state of Ohio. The watersheds

Sampling Objectives & Areas Continued

include one small city and several incorporated and unincorporated villages. The City of Celina uses the Grand Lake St. Marys watershed for drinking water. All other water departments in the watersheds utilize wells. Details of each subwatershed can be read in the Watershed Action Plan (WAP). The WAP can be read by contacting the watershed coordinator. Total Maximum Daily Load Studies have been completed for the watersheds. These documents can be located online or by contacting the watershed coordinator.

Landcover in the Grand Lake/Wabash River Watersheds is predominately agricultural in use with several local municipalities located throughout the watersheds. As such, a majority of runoff that enters the waterways is due to non-point source regions where no definitive effluent sources can be identified. The few point source regions in the watersheds include areas such as local water treatment plants, in which definitive outlets are utilized.

Sampling sites will be identified using a naming system specific to the Grand Lake/Wabash River Watersheds. Sites will be named based upon location within the watersheds: the Grand Lake Watershed (GL), the Wabash River Watershed (WR) and in Grand Lake St. Marys (Lake). Each site will then be numbered based upon date of entry into the project.

Future sites will be chosen based upon specific projects, objectives, or subwatershed regions that have need for water monitoring. Monitoring can incorporate an entire watershed or focus on a particular creek or ditch. For example, a new site would be assessed and monitored as part of a stream restoration project.

Site Examples

- **[GL-1] Elks Club of Mercer County, 3242 US Route 127, Celina, Ohio, 45822 (W 084° 57.217, N 40° 44.520)** — A QDC who is a member of the Elks will monitor at the north and south property lines. The club grounds includes a golf course, ponds and trees. The golf course is a potential source for non-point source pollution. Land surrounding the club grounds is agriculture. The stream is approximately 3,138 feet long over the estimated 141 acre property. This stream is in the Beaver Creek subwatershed, 05120101-020-020.

- **[GL-2] Near Ron Niekamp's home at 8103 Mercer County Road 219A, Celina, Ohio, 45822 (W 084° 48.566, N 40° 48.839)** — This stream site is east of the Niekamp home and west of Botkins Road in Franklin Township. This is part of Chickasaw Creek, the largest subwatershed in the Grand Lake St. Marys watershed. This site is surrounded by farm fields, which may contribute to sedimentation and nutrient runoff.

Sampling Objectives & Areas Continued

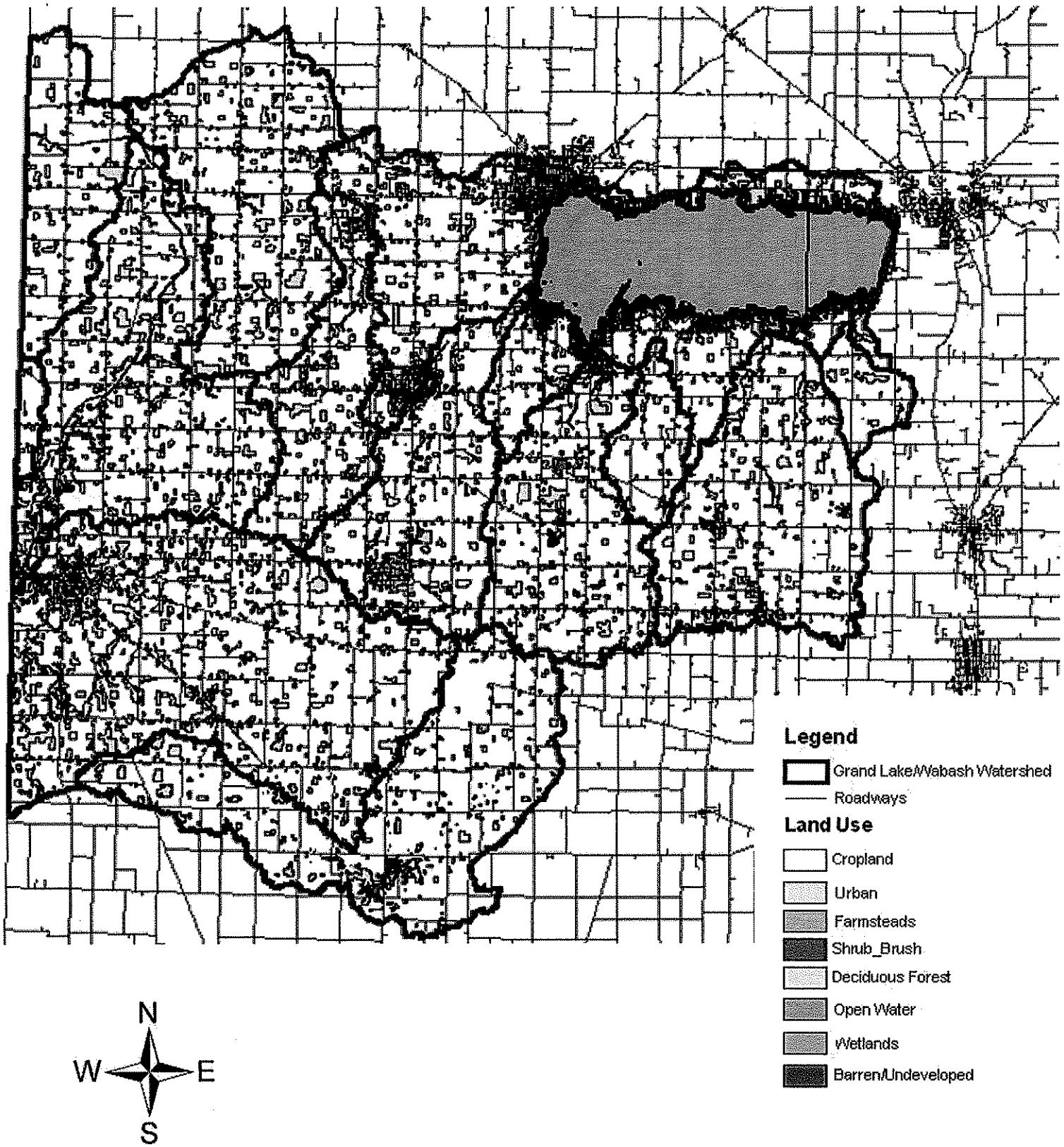
- **[GL-3] Kittle Road, Celina, Ohio, 45822 (W 084.52103, N 40.48915)** — Franklin Township owns property on the east side of Kittle Road. Prairie Creek runs through this property. This site is located between State Route 219 and Mercer County Road 219A. Prairie Creek is a subwatershed of Grand Lake St. Marys. This area is surrounded by agriculture fields, many of which are no-till fields. This may limit the sedimentation.

- **[GL-4] Little Chickasaw Creek at the corner of Mercer County Road 219A, Celina, Ohio, 45822 (W 084.48566, N 40.48839)** — This site is on Ron Niekamp's property in the Little Chickasaw Creek. This site is between Dicke Road and the Mercer Auglaize County Line. This site is in the Chickasaw Creek watershed. This site has more meanders and more trees than majority of the other streams in the watershed. This condition may lead to a higher water quality at this site.

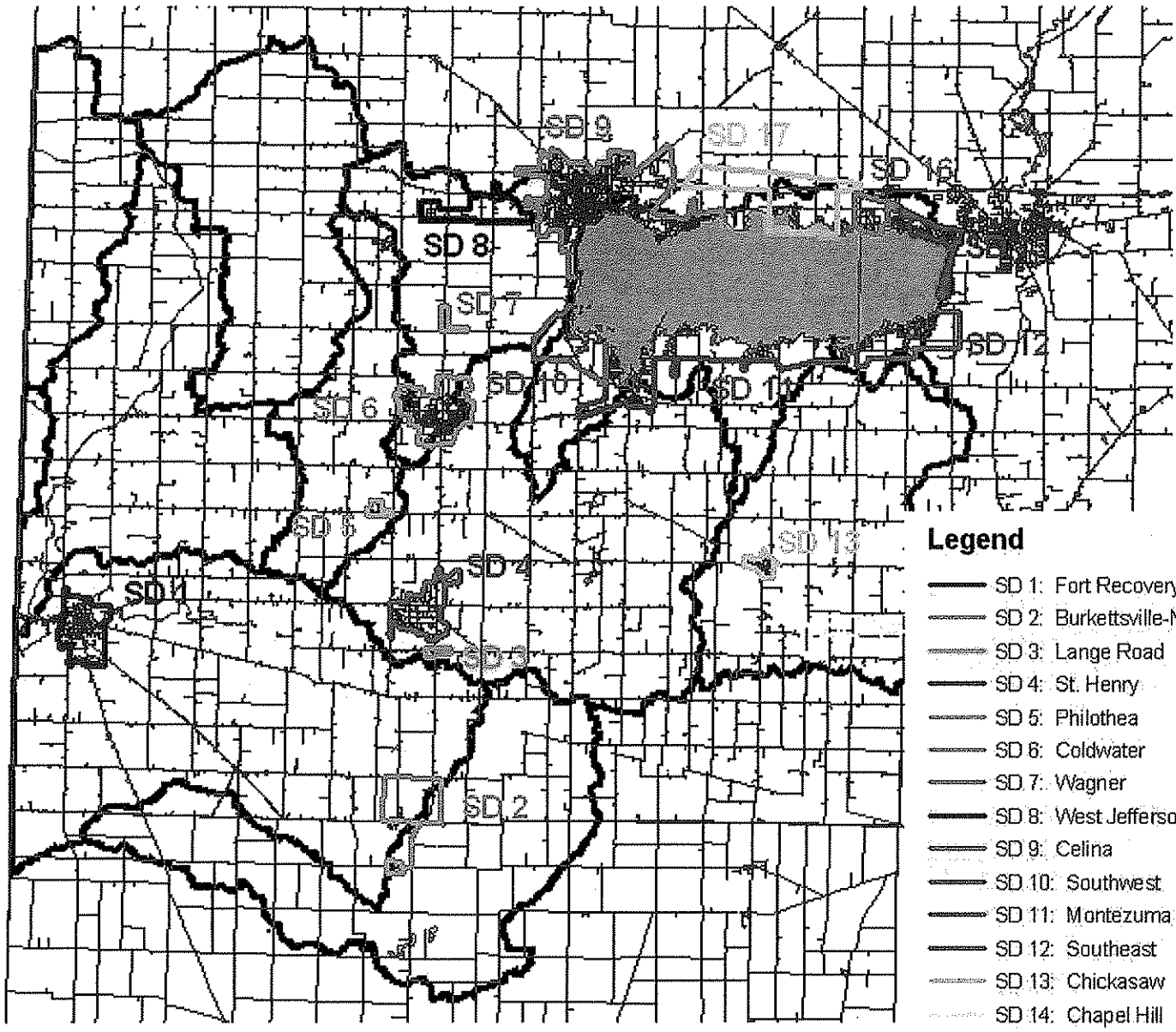
- **[GL-5] Mercer County Sanitary Sewer Treatment Plant, Cassella-Montezuma Road, Celina, Ohio, 45822 (W 084.53849, N 40.44485)** — This sampling location includes two sites at the edge of Franklin Township and Mercer County property. Beaver Creek runs along Guadalupe Road, under Cassella-Montezuma Road and north towards Grand Lake St. Marys. An unnamed tributary enters Beaver Creek, just east of Cassella-Montezuma Road. The main water source for the unnamed tributary is effluent from the wastewater treatment plant. There is access to both sites at this location. This location is in the Beaver Creek subwatershed, approximately 1 mile from Montezuma Bay in Grand Lake St. Marys. The wastewater treatment plant tests the effluent, so it is not expected that the unnamed tributary will have water quality concerns. Beaver Creek's watershed is all agricultural land. It has a less than 10' riparian corridor and the creek bottom is heavily sedimented. There are many non-point pollution sources upstream of this sampling site.

- Additional sites, including lake sites, will be added as volunteers are trained and permission is secured.

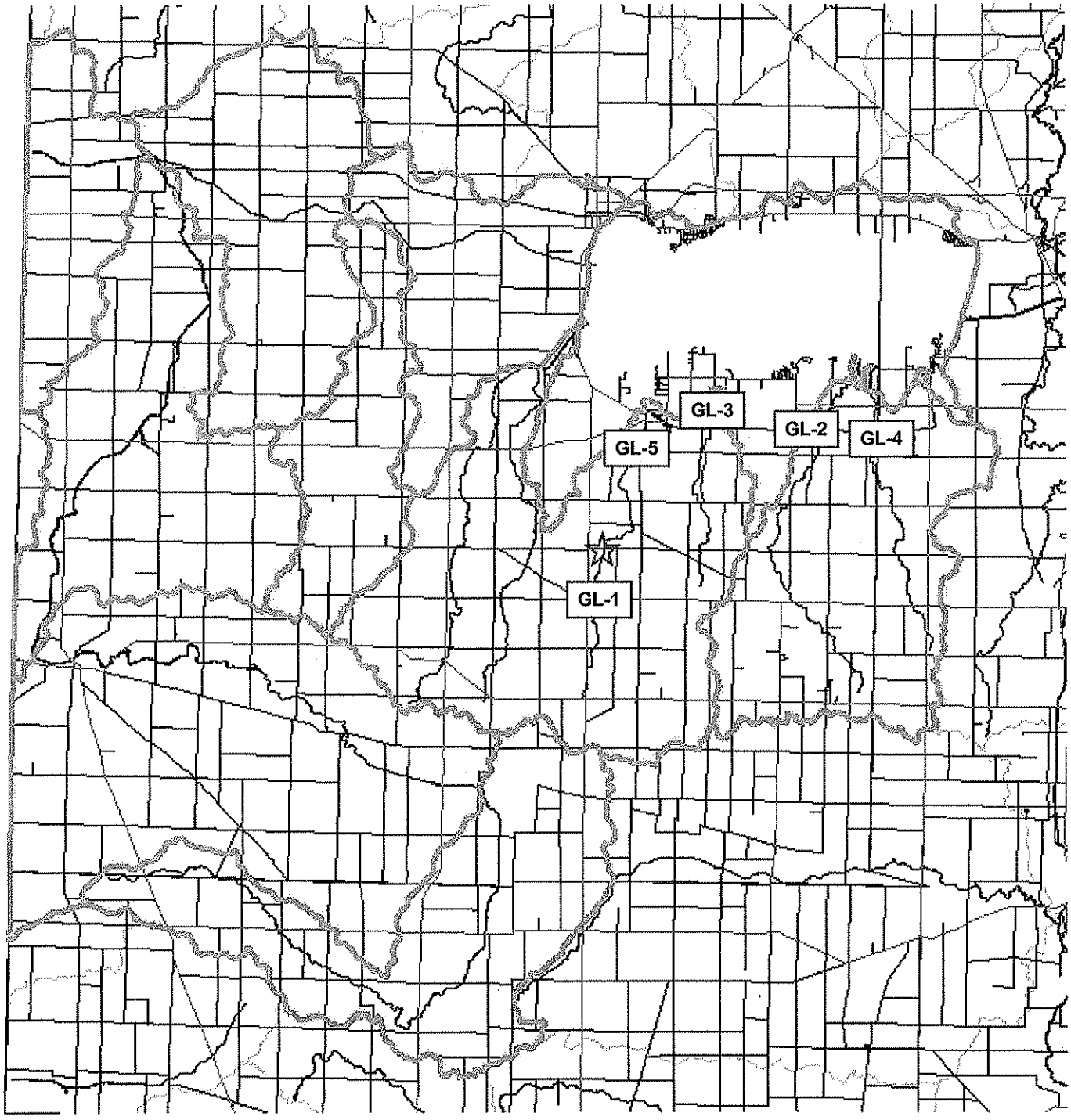
Landuse/Landcover Map - Non-point Source Regions



Sewer Districts Map - Point Source Regions



Sampling Area Map



Star indicates second portion of site GL-1. They will be monitoring at both ends of their property. The boxes are monitoring site locations.

Teal line indicates Grand Lake St. Marys/Wabash River watershed.

Sampling Equipment

Item
Model #, Cat. #, Manufacturer

The Ohio Sediment Stick
Lake County Soil and Water Conservation District

Secchi Disk
Approved by the Ohio State University Extension, Model specified in the CLAM Quality Assurance Plan

http://www.olms.org/pdf/quality_assurance.pdf

Nitrate Test Kit
Model NI-11, Cat. No. 1468-03, Hach Company

Phosphate, Ortho Test Kit
Model PO-19, Cat. No. 2248-00, Hach Company

Surface Water Test Kit
No Model #, Cat. 25598-00, Hach Company

Contains tests for ammonia, chlorine (free & total), nitrate, dissolved oxygen, pH, phosphorous, and temperature.

Kick Seine
Plans and models from Hoosier Riverwatch and *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Microinvertebrates, and Fish, Second Edition.*

http://www.epa.gov/owow/monitoring/rbp/ch07main.html

D-net
Plans and models from Hoosier Riverwatch and *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Microinvertebrates, and Fish, Second Edition.*

http://www.epa.gov/owow/monitoring/rbp/ch07main.html

White Ice Cube Tray
Any white plastic model suffices.

Clipboard, laminated forms and grease pencil
No specific model or manufacturer.

Pocket Pal Ph Meter
Model 4435001, Hach Company

Boots or Waders
Any model that fits the QDC.

Parameters

The following parameters will be recorded at each site on every visit:
- Macroinvertebrate Pollution Tolerance Index
- Water Temperature
- Air Temperature
- pH Level
- Dissolved Oxygen
- Turbidity by secchi disk and/or The Ohio Sediment Stick
- Estimated Flow
- Digital Picture upstream and downstream of site
- Phosphorous Levels
  - -Total Phosphate
  - -Orthophosphate
- Nitrogen Levels
  - -Nitrate
  - -Ammonia Nitrogen
- Site description
- Signs of animal activity
- Type of vegetation in and around water

The following parameters will be recorded at each site annually:
- Qualitative Habitat Evaluation Index (QHEI) Scoring
- Headwater Habitat Evaluation Index (HHEI) Scoring where applicable
- Global Positioning System Point

The following parameters may be added to each site visit, if funds allow:
- E-coli
- Chlorine Level
- Chlorophyll Level
- Algae Count
- Algae Types
- Bacteria Count
- DNA tracking
- Dissolved Organic Oxygen
- Phosphorous Levels
  - -Metaphosphate
  - -Organic Phosphate

Parameters can be adjusted for use at specific sampling sites should particular concerns need addressed. Identified waterways of interest would be tested upstream and downstream of the site for changes in water quality.
When parameters are added, a section will be added to the Appendix.

Record sheets are located on the next pages and in the Appendix.

Recording Forms

Recording Form — Page

Level 1 Field Sheets
Macroinvertebrate Pollution Tolerance Index..... 23
Record Sheet..... 24
Test Site GPS Points..... 26

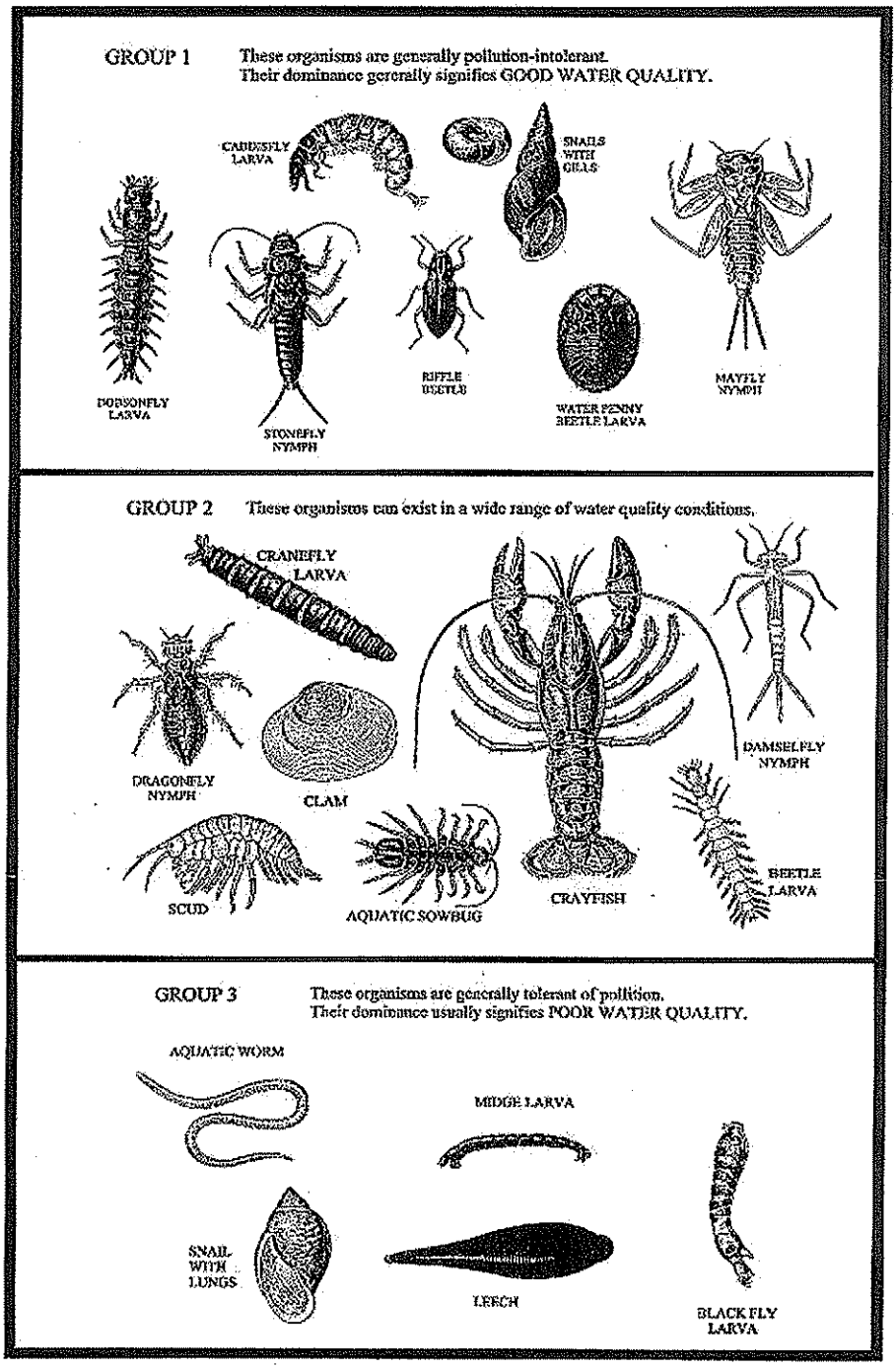
Level 2 Field Sheets
Qualitative Habitat Evaluation Index***..... 25
QHEI, page 2***..... 26
Primary Headwater Habitat Evaluation Form***..... 27
HHEI, page 2***..... 28
HHEI, page 3***..... 29
Physical Characterization/Water Quality Field Data Sheet..... 30
Benthic Macroinvertebrate Field Data Sheet..... 32
Benthic Macroinvertebrate Sample Log-in Sheet..... 33
Habitat Assessment Field Data Sheet..... 34

***(may also be used for Level 3 Data)

MACROINVERTEBRATE TAXA GROUPS

Macroinvertebrate grouping for calculating the Pollution Tolerance Index.

Level 1



NUMBER OF SPECIES

____ X 3 = _____

NUMBER OF SPECIES

____ X 2 = _____

NUMBER OF SPECIES

____ X 1 = _____

TOTAL POINTS _____

MULATIVE INDEX - VALUE

STREAM QUALITY ASSMENT

EXCELLENT (> 22) ☐ GOOD (17 - 22) ☐

FAIR (11 - 16) ☐ POOR (< 11) ☐

Record Sheet

Site: _____

QDC: _____ Safety Officer: _____

Date:_____ Time: _____ Observers: _____

Level 1

Weather at site: _____

48 hour weather events: _____

Air Temperature: _____ + _____ + _____ = _____ ÷ 3 = _____

Water Temperature: : _____ + _____ + _____ = _____ ÷ 3 = _____

Wind conditions: _____

Flow conditions: None Low Moderate High Flood

Algae observations: _____

Water color: _____ Signs of animal activity: _____

Water odor or unusual observations: _____

pH (units): _____ + _____ + _____ = _____ ÷ 3 = _____

Total Suspended Solids (mg/L):
_____ + _____ + _____ = _____ ÷ 3 = _____

Dissolved Oxygen (mg/L): _____ + _____ + _____ = _____ ÷ 3 = _____

Nitrates (mg/L): _____ + _____ + _____ = _____ ÷ 3 = _____

Phosphorous (mg/L): _____ + _____ + _____ = _____ ÷ 3 = _____

If you have questions or problems contact the local Soil and Water Conservation District.
Mercer 419-586-3289 Auglaize 419-738-4016 Darke 937-548-1715 ext. 3
For Emergencies Dial 911

Levels 2 & 3

OhioEPA Qualitative Habitat Evaluation Index and Use Assessment Field Sheet

QHEI Score: ☐

Stream & Location: _____ **RM:** _ _ _._ **Date:** _ _/_ _/_ _

Scorers Full Name & Affiliation: _____

River Code: _ _ - _ _ _ - _ _ _ **STORET #:** _ _ _ _ _ _ **Lat / Long.:** (NAD 83 - decimal °) _ _ . _ _ _ _ /8_ . _ _ _ _ Office verified location ☐

1] *SUBSTRATE* Check *ONLY* Two substrate *TYPE BOXES*; estimate % or note every type present. Check ONE (*Or* 2 & average)

BEST TYPES	POOL	RIFFLE	OTHER TYPES	POOL	RIFFLE
☐☐ BLDR/SLABS [10]	____	____	☐☐ HARDPAN [4]	____	____
☐☐ BOULDER [9]	____	____	☐☐ DETRITUS [3]	____	____
☐☐ COBBLE [8]	____	____	☐☐ MUCK [2]	____	____
☐☐ GRAVEL [7]	____	____	☐☐ SILT [2]	____	____
☐☐ SAND [6]	____	____	☐☐ ARTIFICIAL [0]	____	____
☐☐ BEDROCK [5]	____	____	(Score natural substrates; ignore sludge from point-sources)		

NUMBER OF BEST TYPES: ☐ 4 or more [2] ☐ 3 or less [0]

ORIGIN		QUALITY	
☐ LIMESTONE [1]	SILT	☐ HEAVY [-2]	Substrate
☐ TILLS [1]		☐ MODERATE [-1]	
☐ WETLANDS [0]		☐ NORMAL [0]	
☐ HARDPAN [0]		☐ FREE [1]	
☐ SANDSTONE [0]	EMBEDDEDNESS	☐ EXTENSIVE [-2]	
☐ RIP/RAP [0]		☐ MODERATE [-1]	Maximum 20
☐ LACUSTURINE [0]		☐ NORMAL [0]	
☐ SHALE [-1]		☐ NONE [1]	
☐ COAL FINES [-2]			

Comments

2] *INSTREAM COVER* Indicate presence 0 to 3: 0-Absent; 1-Very small amounts or if more common of marginal quality; 2-Moderate amounts, but not of highest quality or in small amounts of highest quality; 3-Highest quality in moderate or greater amounts (e.g., very large boulders in deep or fast water, large diameter log that is stable, well developed rootwad in deep / fast water, or deep, well-defined, functional pools.

			AMOUNT (Check ONE (*Or* 2 & average))
____ UNDERCUT BANKS [1]	____ POOLS > 70cm [2]	____ OXBOWS, BACKWATERS [1]	☐ EXTENSIVE >75% [11]
____ OVERHANGING VEGETATION [1]	____ ROOTWADS [1]	____ AQUATIC MACROPHYTES [1]	☐ MODERATE 25-75% [7]
____ SHALLOWS (IN SLOW WATER) [1]	____ BOULDERS [1]	____ LOGS OR WOODY DEBRIS [1]	☐ SPARSE 5-<25% [3]
____ ROOTMATS [1]			☐ NEARLY ABSENT <5% [1]

Comments

Cover Maximum 20 ☐

3] *CHANNEL MORPHOLOGY* Check ONE in each category (*Or* 2 & average)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY
☐ HIGH [4]	☐ EXCELLENT [7]	☐ NONE [6]	☐ HIGH [3]
☐ MODERATE [3]	☐ GOOD [5]	☐ RECOVERED [4]	☐ MODERATE [2]
☐ LOW [2]	☐ FAIR [3]	☐ RECOVERING [3]	☐ LOW [1]
☐ NONE [1]	☐ POOR [1]	☐ RECENT OR NO RECOVERY [1]	

Comments

Channel Maximum 20 ☐

4] *BANK EROSION AND RIPARIAN ZONE* Check ONE in each category for *EACH BANK* (*Or* 2 per bank & average)

River right looking downstream

EROSION (L R)	RIPARIAN WIDTH (L R)	FLOOD PLAIN QUALITY (L R)	
☐☐ NONE / LITTLE [3]	☐☐ WIDE > 50m [4]	☐☐ FOREST, SWAMP [3]	☐☐ CONSERVATION TILLAGE [1]
☐☐ MODERATE [2]	☐☐ MODERATE 10-50m [3]	☐☐ SHRUB OR OLD FIELD [2]	☐☐ URBAN OR INDUSTRIAL [0]
☐☐ HEAVY / SEVERE [1]	☐☐ NARROW 5-10m [2]	☐☐ RESIDENTIAL, PARK, NEW FIELD [1]	☐☐ MINING / CONSTRUCTION [0]
	☐☐ VERY NARROW < 5m [1]	☐☐ FENCED PASTURE [1]	*Indicate predominant land use(s) past 100m riparian.*
	☐☐ NONE [0]	☐☐ OPEN PASTURE, ROWCROP [0]	

Comments

Riparian Maximum 10 ☐

5] *POOL / GLIDE AND RIFFLE / RUN QUALITY*

MAXIMUM DEPTH (Check ONE (ONLY))	CHANNEL WIDTH (Check ONE (*Or* 2 & average))	CURRENT VELOCITY (Check ALL that apply)	
☐ > 1m [6]	☐ POOL WIDTH > RIFFLE WIDTH [2]	☐ TORRENTIAL [-1]	☐ SLOW [1]
☐ 0.7-<1m [4]	☐ POOL WIDTH = RIFFLE WIDTH [1]	☐ VERY FAST [1]	☐ INTERSTITIAL [-1]
☐ 0.4-<0.7m [2]	☐ POOL WIDTH < RIFFLE WIDTH [0]	☐ FAST [1]	☐ INTERMITTENT [-2]
☐ 0.2-<0.4m [1]		☐ MODERATE [1]	☐ EDDIES [1]
☐ < 0.2m [0]		*Indicate for reach - pools and riffles.*	

Recreation Potential
Primary Contact
Secondary Contact
(circle one and comment on back)

Comments

Pool / Current Maximum 12 ☐

Indicate for functional riffles; Best areas must be large enough to support a population of riffle-obligate species: Check ONE (*Or* 2 & average). ☐ NO RIFFLE [metric=0]

RIFFLE DEPTH	RUN DEPTH	RIFFLE / RUN SUBSTRATE	RIFFLE / RUN EMBEDDEDNESS
☐ BEST AREAS > 10cm [2]	☐ MAXIMUM > 50cm [2]	☐ STABLE (e.g., Cobble, Boulder) [2]	☐ NONE [2]
☐ BEST AREAS 5-10cm [1]	☐ MAXIMUM < 50cm [1]	☐ MOD. STABLE (e.g., Large Gravel) [1]	☐ LOW [1]
☐ BEST AREAS < 5cm [metric=0]		☐ UNSTABLE (e.g., Fine Gravel, Sand) [0]	☐ MODERATE [0]
			☐ EXTENSIVE [-1]

Comments

Riffle / Run Maximum 8 ☐

6] *GRADIENT* (ft/mi) ☐ VERY LOW - LOW [2-4] ☐ MODERATE [6-10] ☐ HIGH - VERY HIGH [10-6]

DRAINAGE AREA (mi²)

%POOL: ☐ %GLIDE: ☐ %RUN: ☐ %RIFFLE: ☐

Gradient Maximum 10 ☐

QHEI, page 2

Levels 2 & 3

A] SAMPLED REACH Check ALL that apply

Comment RE: Reach consistency/ Is reach typical of steam?, *Recreation/* Observed - Inferred, *Other/* Sampling observations, Concerns, Access directions, etc.

METHOD
- ☐ BOAT
- ☐ WADE
- ☐ L. LINE
- ☐ OTHER

STAGE

1st -sample pass-	2nd
☐ HIGH	☐
☐ UP	☐
☐ NORMAL	☐
☐ LOW	☐
☐ DRY	☐

DISTANCE
- ☐ 0.5 Km
- ☐ 0.2 Km
- ☐ 0.15 Km
- ☐ 0.12 Km
- ☐ OTHER

_____ meters

CLARITY

1st --sample pass--	2nd
☐ < 20 cm	☐
☐ 20-<40 cm	☐
☐ 40-70 cm	☐
☐ > 70 cm/ CTB	☐
☐ SECCHI DEPTH	☐

CANOPY
- ☐ > 85%- OPEN
- ☐ 55%-<85%
- ☐ 30%-<55%
- ☐ 10%-<30%
- ☐ <10%- CLOSED

1st _____ cm
2nd _____ cm

C] RECREATION AREA DEPTH
POOL: ☐ >100ft² ☐ >3ft

B] AESTHETICS
- ☐ NUISANCE ALGAE
- ☐ INVASIVE MACROPHYTES
- ☐ EXCESS TURBIDITY
- ☐ DISCOLORATION
- ☐ FOAM / SCUM
- ☐ OIL SHEEN
- ☐ TRASH / LITTER
- ☐ NUISANCE ODOR
- ☐ SLUDGE DEPOSITS
- ☐ CSOs/SSOs/OUTFALLS

D] MAINTENANCE Circle some & *COMMENT*
PUBLIC / PRIVATE / BOTH / NA
ACTIVE / HISTORIC / BOTH / NA
YOUNG-SUCCESSION-OLD
SPRAY / SNAG / REMOVED
MODIFIED / DIPPED OUT / NA
LEVEED / ONE SIDED
RELOCATED / CUTOFFS
MOVING-BEDLOAD-STABLE
ARMOURED / SLUMPS
ISLANDS / SCOURED
IMPOUNDED / DESICCATED
FLOOD CONTROL / DRAINAGE

E] ISSUES
WWTP / CSO / NPDES / INDUSTRY
HARDENED / URBAN / DIRT&GRIME
CONTAMINATED / LANDFILL
BMPs-CONSTRUCTION-SEDIMENT
LOGGING / IRRIGATION / COOLING
BANK / EROSION / SURFACE
FALSE BANK / MANURE / LAGOON
WASH H_20 / TILE / H_20 TABLE
ACID / MINE / QUARRY / FLOW
NATURAL / WETLAND / STAGNANT
PARK / GOLF / LAWN / HOME
ATMOSPHERE / DATA PAUCITY

F] MEASUREMENTS
- $\bar{x}$ width
- $\bar{x}$ depth
- max. depth
- $\bar{x}$ bankfull width
- bankfull $\bar{x}$ depth
- W/D ratio
- bankfull max. depth
- floodprone x^2 width
- entrench. ratio

Legacy Tree:

Stream Drawing:

Level 1

Test Site GPS Points

Site GPS Points:

Site: _____

_____ degrees _____ minutes _____ seconds

Map Site:

OhioEPA Primary Headwater Habitat Evaluation Form

HHEI Score (sum of metrics 1, 2, 3) : ☐

SITE NAME/LOCATION _____

_____ SITE NUMBER _____ RIVER BASIN _____ DRAINAGE AREA (mi²) _____

LENGTH OF STREAM REACH (ft) _____ LAT. _____ LONG. _____ RIVER CODE _____ RIVER MILE _____

DATE _____ SCORER _____ COMMENTS _____

NOTE: Complete All Items On This Form - Refer to "Field Evaluation Manual for Ohio's PHWH Streams" for Instructions

STREAM CHANNEL MODIFICATIONS: ☐ NONE / NATURAL CHANNEL ☐ RECOVERED ☐ RECOVERING ☐ RECENT OR NO RECOVERY

Levels 2 & 3

1. SUBSTRATE (Estimate percent of every type of substrate present. Check *ONLY* two predominant substrate *TYPE* boxes (Max of 32). Add total number of significant substrate types found (Max of 8). Final metric score is sum of boxes A & B.

TYPE		PERCENT	TYPE		PERCENT
☐☐	BLDR SLABS [16 pts]	_____	☐☐	SILT [3 pt]	_____
☐☐	BOULDER (>256 mm) [16 pts]	_____	☐☐	LEAF PACK/WOODY DEBRIS [3 pts]	_____
☐☐	BEDROCK [16 pt]	_____	☐☐	FINE DETRITUS [3 pts]	_____
☐☐	COBBLE (65-256 mm) [12 pts]	_____	☐☐	CLAY or HARDPAN [0 pt]	_____
☐☐	GRAVEL (2-64 mm) [9 pts]	_____	☐☐	MUCK [0 pts]	_____
☐☐	SAND (<2 mm) [6 pts]	_____	☐☐	ARTIFICIAL [3 pts]	_____

Total of Percentages of Bldr Slabs, Boulder, Cobble, Bedrock _____ (A) ☐ (B) ☐

SCORE OF TWO MOST PREDOMINATE SUBSTRATE TYPES: **TOTAL NUMBER OF SUBSTRATE TYPES:**

HHEI Metric Points

Substrate Max = 40 ☐

A + B

2. Maximum Pool Depth ***(Measure the maximum pool depth within the 61 meter (200 ft)*** evaluation reach at the time of evaluation. Avoid plunge pools from road culverts or storm water pipes) (Check *ONLY* one box):

☐ > 30 centimeters [20 pts]
☐ > 22.5 - 30 cm [30 pts]
☐ > 10 - 22.5 cm [25 pts]
☐ > 5 cm - 10 cm [15 pts]
☐ < 5 cm [5 pts]
☐ NO WATER OR MOIST CHANNEL [0 pts]

COMMENTS _____ **MAXIMUM POOL DEPTH (centimeters):** ☐

Pool Depth Max = 30 ☐

3. BANK FULL WIDTH (Measured as the average of 3-4 measurements) **(Check *ONLY* one box):**

☐ > 4.0 meters (> 13') [30 pts]
☐ > 3.0 m - 4.0 m (> 9' 7" - 13') [25 pts]
☐ > 1.5 m - 3.0 m (> 9' 7" - 4' 8") [20 pts]
☐ > 1.0 m - 1.5 m (> 3' 3" - 4' 8") [15 pts]
☐ ≤ 1.0 m (≤ 3' 3") [5 pts]

COMMENTS _____ **AVERAGE BANKFULL WIDTH (meters)** ☐

Bankfull Width Max=30 ☐

This information must also be completed

RIPARIAN ZONE AND FLOODPLAIN QUALITY ☆NOTE: River Left (L) and Right (R) as looking downstream☆

RIPARIAN WIDTH L	R	(Per Bank)	FLOODPLAIN QUALITY L	R	(Most Predominant per Bank)	L	R	
☐	☐	Wide >10m	☐	☐	Mature Forest, Wetland	☐	☐	Conservation Tillage
☐	☐	Moderate 5-10m	☐	☐	Immature Forest, Shrub or Old Field	☐	☐	Urban or Industrial
☐	☐	Narrow <5m	☐	☐	Residential, Park, New Field	☐	☐	Open Pasture, Row Crop
☐	☐	None	☐	☐	Fenced Pasture	☐	☐	Mining or Construction

COMMENTS _____

FLOW REGIME *(At Time of Evaluation)* (Check *ONLY* one box):

☐ Stream Flowing
☐ Subsurface flow with isolated pools (Interstitial)
☐ Moist Channel, Isolated pools, no flow (Intermittent)
☐ Dry channel, no water (Ephemeral)

COMMENTS _____

SINUOSITY (Number of bends per 61 m (200 ft) of channel) (Check *ONLY* one box):

☐ None ☐ 0.5 ☐ 1.0 ☐ 1.5 ☐ 2.0 ☐ 2.5 ☐ 3.0 ☐ >3

STREAM GRADIENT ESTIMATE

☐ Flat (0.5 ft/100 ft) ☐ Flat to Moderate ☐ Moderate (2 ft/100 ft) ☐ Moderate to Severe ☐ Severe (10 ft/100 ft)

HHEI, page 2

Levels 2 & 3

ADDITIONAL STREAM INFORMATION (This Information Must Also be Completed):

QHEI PERFORMED? - ☐ Yes ☐ No QHEI Score _____ (If Yes, Attach Completed QHEI Form)

DOWNSTREAM DESIGNATED USE(S)

☐ WWH Name: _____ Distance from Evaluated Stream _____
☐ CWH Name: _____ Distance from Evaluated Stream _____
☐ EWH Name: _____ Distance from Evaluated Stream _____

MAPPING: ATTACH COPIES OF MAPS, INCLUDING THE ENTIRE WATERSHED AREA. CLEARLY MARK THE SITE LOCATION

USGS Quadrangle Name:_____ NRCS Soil Map Page:_____ NRCS Soil Map Stream Order _____

County: _____ Township / City:_____

MISCELLANEOUS

Base Flow Conditions? (Y/N):_____ Date of last precipitation:_____ Quantity:_____

Photograph Information: _____

Elevated Turbidity? (Y/N): _____ Canopy (% open): _____

Were samples collected for water chemistry? (Y/N): _____ (Note lab sample no. or id. and attach results) Lab Number:_____

Field Measures: Temp (°C)_____ Dissolved Oxygen (mg/l) _____ pH (S.U.) _____ Conductivity (µmhos/cm) _____

Is the sampling reach representative of the stream (Y/N)_____ If not, please explain:_____

_____

Additional comments/description of pollution impacts:_____

_____

BIOTIC EVALUATION

Performed? (Y/N): _____ (If Yes, Record all observations. Voucher collections optional. NOTE: all voucher samples must be labeled with the site ID number. Include appropriate field data sheets from the Primary Headwater Habitat Assessment Manual)

Fish Observed? (Y/N)_____ Voucher? (Y/N)_____ Salamanders Observed? (Y/N)_____ Voucher? (Y/N)_____
Frogs or Tadpoles Observed? (Y/N)____ Voucher? (Y/N)____ Aquatic Macroinvertebrates Observed? (Y/N)____ Voucher? (Y/N)____

Comments Regarding Biology:_____

_____

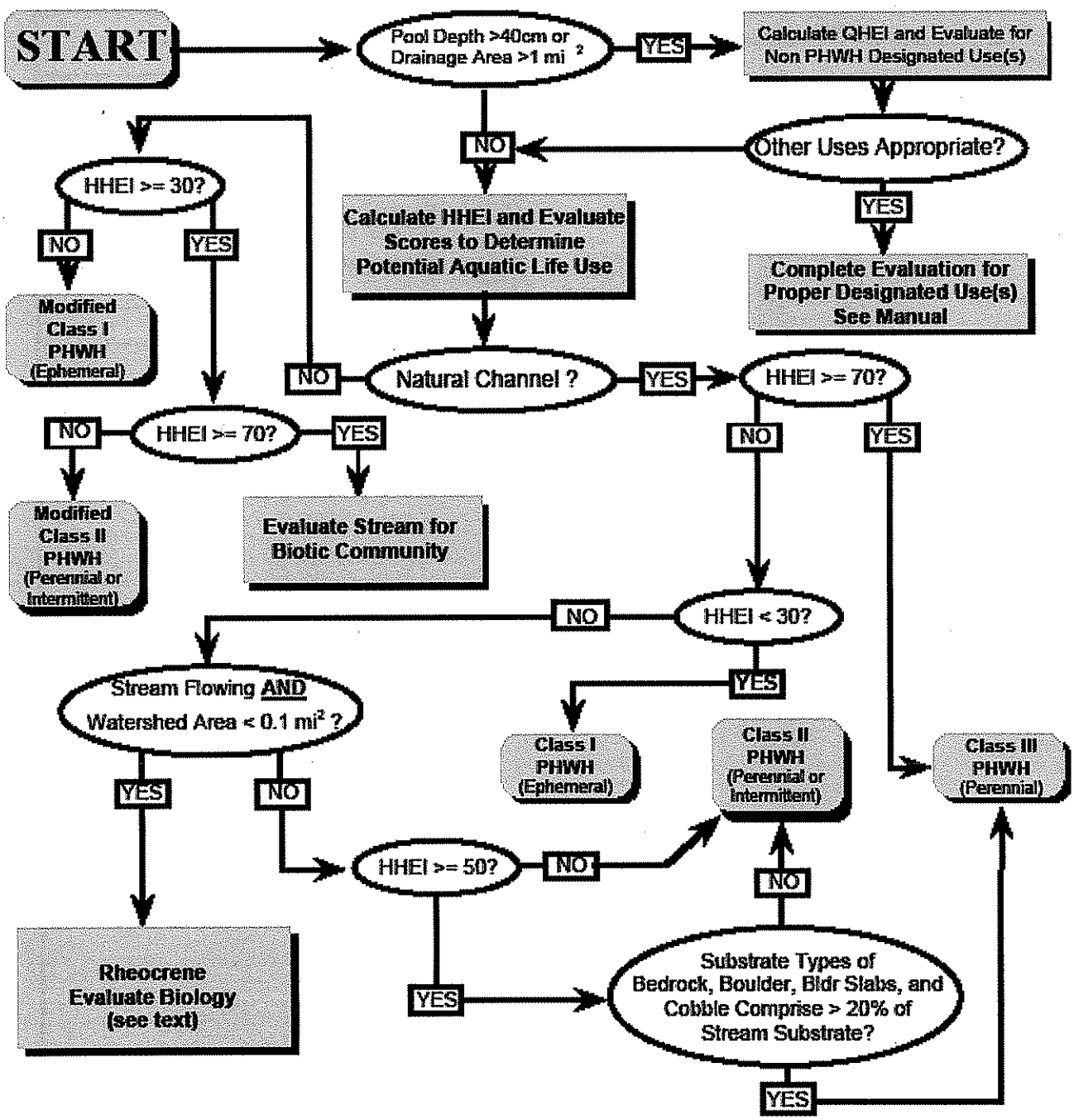
_____

DRAWING AND NARRATIVE DESCRIPTION OF STREAM REACH (This must be completed):

Include important landmarks and other features of interest for site evaluation and a narrative description of the stream's location

FLOW ➜

HHEI, page 3


START
Pool Depth >40cm or Drainage Area >1 mi 2
YES
Calculate QHEI and Evaluate for Non PHWH Designated Use(s)
NO
Other Uses Appropriate?
YES
Complete Evaluation for Proper Designated Use(s) See Manual
HHEI >= 30?
NO
YES
Modified Class I PHWH (Ephemeral)
Calculate HHEI and Evaluate Scores to Determine Potential Aquatic Life Use
NO
Natural Channel ?
YES
HHEI >= 70?
NO
YES
HHEI >= 70?
NO
YES
Modified Class II PHWH (Perennial or Intermittent)
Evaluate Stream for Biotic Community
NO
HHEI < 30?
YES
Stream Flowing AND Watershed Area < 0.1 mi2 ?
YES
NO
Class I PHWH (Ephemeral)
Class II PHWH (Perennial or Intermittent)
Class III PHWH (Perennial)
HHEI >= 50?
NO
NO
Rheocrene Evaluate Biology (see text)
YES
Substrate Types of Bedrock, Boulder, Bldr Slabs, and Cobble Comprise > 20% of Stream Substrate?
YES
Levels 2 & 3

Levels 2 & 3

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME	LOCATION	
STATION #_____ RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY	DATE _____ TIME _____ AM PM	REASON FOR SURVEY

WEATHER CONDITIONS

Now		Past 24 hours
☐	storm (heavy rain)	☐
☐	rain (steady rain)	☐
☐	showers (intermittent)	☐
____%☐	%cloud cover	☐____%
☐	clear/sunny	☐

Has there been a heavy rain in the last 7 days? ☐ Yes ☐ No

Air Temperature_____° C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

STREAM CHARACTERIZATION

Stream Subsystem
☐ Perennial ☐ Intermittent ☐ Tidal

Stream Type
☐ Coldwater ☐ Warmwater

Stream Origin
☐ Glacial
☐ Non-glacial montane
☐ Swamp and bog
☐ Spring-fed
☐ Mixture of origins
☐ Other_____

Catchment Area_____km²

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES

Predominant Surrounding Landuse
☐ Forest ☐ Commercial
☐ Field/Pasture ☐ Industrial
☐ Agricultural ☐ Other _____
☐ Residential

Local Watershed NPS Pollution
☐ No evidence ☐ Some potential sources
☐ Obvious sources

Local Watershed Erosion
☐ None ☐ Moderate ☐ Heavy

RIPARIAN VEGETATION (18 meter buffer)

Indicate the dominant type and record the dominant species present
☐ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous

dominant species present _____

INSTREAM FEATURES

Estimated Reach Length _____m

Estimated Stream Width _____m

Sampling Reach Area _____m^2

Area in km^2 (m^2x1000) _____km^2

Estimated Stream Depth _____m

Surface Velocity _____m/sec
(at thalweg)

Canopy Cover
☐ Partly open ☐ Partly shaded ☐ Shaded

High Water Mark m

Proportion of Reach Represented by Stream Morphology Types
☐ Riffle_____% ☐ Run_____%
☐ Pool_____%

Channelized ☐ Yes ☐ No

Dam Present ☐ Yes ☐ No

LARGE WOODY DEBRIS

LWD _____m^3

Density of LWD _____m^2/km^2 **(LWD/ reach area)**

AQUATIC VEGETATION

Indicate the dominant type and record the dominant species present
☐ Rooted emergent ☐ Rooted submergent ☐ Rooted floating ☐ Free floating
☐ Floating Algae ☐ Attached Algae

dominant species present _____

Portion of the reach with aquatic vegetation _____%

WATER QUALITY

Temperature_____° C

Specific Conductance_____

Dissolved Oxygen _____

pH _____

Turbidity _____

WQ Instrument Used _____

Water Odors
☐ Normal/None ☐ Sewage
☐ Petroleum ☐ Chemical
☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Gloss ☐ Flecks
☐ None ☐ Other_____

Turbidity (if not measured)
☐ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

SEDIMENT/ SUBSTRATE

Odors
☐ Normal ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Anaerobic ☐ None
☐ Other_____

Oils
☐ Absent ☐ Slight ☐ Moderate ☐ Profuse

Deposits
☐ Sludge ☐ Sawdust ☐ Paper fiber ☐ Sand
☐ Relict shells ☐ Other_____

Looking at stones which are not deeply embedded, are the undersides black in color?
☐ Yes ☐ No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

Levels 2 & 3

Levels 2 & 3

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME	LOCATION	
STATION # _____ RIVERMILE _____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS		LOT NUMBER
FORM COMPLETED BY	DATE _____ TIME _____ AM PM	REASON FOR SURVEY

HABITAT TYPES	**Indicate the percentage of each habitat type present** ❑ Cobble_____% ❑ Snags_____% ❑ Vegetated Banks_____% ❑ Sand_____% ❑ Submerged Macrophytes_____% ❑ Other (_____)_____%
SAMPLE COLLECTION	**Gear used** ❑ D-frame ❑ kick-net ❑ Other _____ **How were the samples collected?** ❑ wading ❑ from bank ❑ from boat **Indicate the number of jabs/kicks taken in each habitat type.** ❑ Cobble_____ ❑ Snags_____ ❑ Vegetated Banks_____ ❑ Sand_____ ❑ Submerged Macrophytes_____ ❑ Other (_____)_____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3= Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3= Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Staidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

page ___ of ___

BENTHIC MACROINVERTEBRATE SAMPLE LOG-IN SHEET

Date Collected	Collected By	Number of Containers	Preservation	Station #	Stream Name and Location	Date Received by Lab	Lot Number	Date of Completion		
								sorting	mounting	identification

Serial Code Example: B0754001(1)
B = Benthos (F = Fish; P = Periphyton) ■ 0754 = project number ■ 001 = sample number ■ (1) = lot number (e.g., winter 1996 =1; summer 1996 = 2)

Levels 2 & 3

Levels 2 & 3

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME	LOCATION	
STATION #_____ RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS		
FORM COMPLETED BY	DATE _____ TIME _____ AM PM	REASON FOR SURVEY

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 3 to 7), variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable, 30-60% of bank in reach has areas of erosion; high erosion potential during floods	Unstable, many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score _____

Levels 2 & 3

Sampling Techniques

Digital Picture

Every time a QDC goes out into the field to do monitoring a digital picture will be taken. At stream sites two pictures will be taken, one facing up stream and one facing down stream. Pictures should include specific sampling location and general land use of surrounding area. A specific camera does not need to be used and it can be borrowed from the Mercer County Soil and Water Conservation District. For lake sites four pictures will be taken, one facing north, east, south and west. Pictures are to be submitted with data.

Kick Seine Sampling Method (QDC Level 1)

This method is derived from Hoosier River Watch's Volunteer Stream Monitoring Training Manual, Spring 2008 Edition. (http://www.in.gov/dnr/nrec/HR05_Chapter5_1.pdf)

This method is only as good as the sampling technique. Two or three people must work together to perform the method properly.

1. Locate a "typical riffle." Such a riffle is a shallow, faster moving mud-free section of stream with a stream bed composed of material ranging in size from one-quarter inch gravel or sand to ten-inch cobbles. The water ranges in depth from approximately two inches to a foot, with a moderately swift flow. Avoid riffles located in an area of a stream that has been recently disturbed by anything, including construction of a pipeline crossing or roadway.

2. Once the riffle has been located, select an area measuring 3 feet by 3 feet that is typical of the riffle as a whole. Avoid disturbing the stream bed upstream from this area.

3. Examine the net closely and remove any organisms remaining from the last time it was used.

4. **Approach the sampling area from downstream!**

5. Have one person place the net at the downstream edge of the sampling area. (It may take two people to hold it in place.) The net should be held perpendicular to the flow, but at a slight (45 degree) downstream angle. Stretch the net approximately three feet, being certain that the bottom edge is lying firmly against the bed. If water washes beneath or over the net you will lose organisms.

6. Another person comes upstream of the net. **Stand beside, not within the sampling area.** Remove all stones and other objects two inches or more in diameter from the sampling area. Hold each one below the water as you brush all organisms from the rock into the net. You can also place rocks on the bottom edge of the net to help hold it in place against the stream bottom.

Sampling Techniques Continued

7. When all materials two inches or larger have been brushed, step into the upstream edge of the sampling area 3 feet from the net and kick the stream bed vigorously until you have disturbed the entire sampling area. Kick from the upstream edge toward the net. Try to disturb the bed to a depth of at least two inches. You can also use a small shovel to disturb the bed. Kick for approx. 3 minutes.

8. Carefully remove the net with a forward upstream scooping motion. DO NOT allow water to flow over the top of the net or you may lose organisms.

9. Carry the seine to a flat area on the stream bank. Place it on a large white sheet, plastic table cloth, to check your white ground cover for any creatures attempting to escape. If you happen to collect live mussels (native or exotic) in your net, please see page 69 for further instruction.

10. Perform steps 1-9 a total of three times at different locations within your 200' site. Your goal is to collect at least 200 organisms.

11. Sort all the organisms collected from the three samples according to body shape using ice cube trays or petri dishes. Record the number of each type of organism (if more than 100; record >100).

Kick Seine Sampling Method (QDC Level 2)

This method is derived from the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition. (http://www.epa.gov/owow/monitoring/rbp/wp61pdf/ch_07.pdf)

1. A 100 m reach representative of the characteristics of the stream should be selected. Whenever possible, the area should be at least 100 meters upstream from any road or bridge crossing to minimize its effect on stream velocity, depth, and overall habitat quality. There should be no major tributaries discharging to the stream in the study area.

2. Before sampling, complete the physical/chemical field sheet (see page 30 or Appendix) to document site description, weather conditions, and land use. After sampling, review this information for accuracy and completeness.

3. Draw a map of the sampling reach. This map should include in-stream attributes (e.g., riffles, falls, fallen trees, pools, bends, etc.) and important structures, plants, and attributes of the

Sampling Techniques Continued

bank and near stream areas. Use an arrow to indicate the direction of flow. Indicate the areas that were sampled for macroinvertebrates on the map. Estimate "river mile" for sampling reach for probable use in data management of the water resource agency. If available, use hand-held Global Positioning System (GPS) for latitude and longitude determination taken at the furthest downstream point of the sampling reach.

4. All riffle and run areas within the 100-m reach are candidates for sampling macroinvertebrates. A composite sample is taken from individual sampling spots in the riffles and runs representing different velocities. Generally, a minimum of 2 m^2 composited area is sampled for RBP efforts.

5. Sampling begins at the downstream end of the reach and proceeds upstream. Using a 1 m kick net, 2 or 3 kicks are sampled at various velocities in the riffle or series of riffles. A kick is a stationary sampling accomplished by positioning the net and disturbing one square meter upstream of the net. Using the toe or heel of the boot, dislodge the upper layer of cobble or gravel and scrape the underlying bed. Larger substrate particles should be picked up and rubbed by hand to remove attached organisms. If different gear is used (e.g., a D-frame or rectangular net), a composite is obtained from numerous kicks.

6. The jabs or kicks collected from different locations in the cobble substrate will be composited to obtain a single homogeneous sample. After every kick, wash the collected material by running clean stream water through the net 2 to 3 times. If clogging does occur, discard the material in the net and redo that portion of the sample in a different location. Remove large debris after rinsing and inspecting it for organisms; place any organisms found into the sample container. Do not spend time inspecting small debris in the field.

7. Transfer the sample from the net to sample container(s) and preserve in enough 95 percent ethanol to cover the sample. Forceps may be needed to remove organisms from the dip net. Place a label indicating the sample identification code or lot number, date, stream name, sampling location, and collector name into the sample container. The outside of the container should include the same information and the words "preservative: 95% ethanol". If more than one container is needed for a sample, each container label should contain all the information for the sample and should be numbered (e.g., 1 of 2, 2 of 2, etc.). This information will be recorded in the "Sample Log" at the biological laboratory (see page 33 or Appendix).

8. Complete the top portion of the "Benthic Macroinvertebrate Field Data Sheet" (see page 32 or Appendix), which duplicates the "header" information on the physical/chemical field sheet.

9. Record the percentage of each habitat type in the reach. Note the sampling gear used, and comment on conditions of the sampling, e.g., high flows, treacherous rocks, difficult access to stream, or anything that would indicate adverse sampling conditions.

Sampling Techniques Continued

10. Document observations of aquatic flora and fauna. Make qualitative estimates of macroinvertebrate composition and relative abundance as a cursory estimate of ecosystem health and to check adequacy of sampling.

11. Perform habitat assessment (see page 34 or Appendix) after sampling has been completed; walking the reach helps ensure a more accurate assessment. Conduct the habitat assessment with another team member, if possible.

12. Return samples to laboratory and complete log-in form.

Dip Net Sampling Method (QDC Level 1)

(Modified from the Miami Conservancy District Volunteer Stream Monitoring Training Manual to be user friendly for volunteer data collectors.)

If there are no riffles at your stream site to perform the kick seine sampling method, then you should use the dip net to perform your biological monitoring. Take a total of twenty jabs in a variety of habitats. One dip net "jab" involves forcing the dip net against the stream bottom repeatedly, starting close to your body and finishing with arms fully outstretched. However, sampling technique differs depending on habitat conditions.

- **Leaf Pack**: Shake the leaf pack in the water to release organisms, and then quickly scoop up the net, capturing both the organisms and the leaves.

- **Tree Roots, Snags (accumulations of debris), and Submerged Logs:** Select an area approximately 3 by 3 feet in size. Scrape the surface of roots, logs, or debris with the net, a large stick, or your hand or foot. Be sure the net is positioned downstream so that dislodged material floats into it.

- **Undercut Banks:** Place the net below the overhanging vegetation. Move the net in a bottom-up motion, jabbing at the bank several times to loosen organisms.

- **Sediments** (sand/mud): If there is not much flow, jab the net into the bottom with a sweeping motion. If flow is good, stand upstream of the net holding it against the bottom of the stream and kick in front of the net so that the flow washes organisms into the net. To rinse, keep the opening of the net at least 1-2 inches above the surface of the water, and move it back and forth to wash small particles out of the net. After two or three jabs with one net, dump the collected materials into a shallow white container (a dishpan works well). The materials in the bin may be quite muddy and turbid (depending upon your stream habitat). When you find macroinvertebrates, place them into another container (white pan, petri dish, bug board, ice

Sampling Techniques Continued

cube tray) with clear water for easier identification.

Dip Net Sampling Method (QDC Level 2)

This method is derived from the Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition. (http://www.epa.gov/owow/monitoring/rbp/wp61pdf/ch_07.pdf)

Streams in many states vary from high gradient, cobble dominated to low gradient streams with sandy or silty sediments. Therefore, a method suitable to sampling a variety of habitat types is desired in these cases. The method that follows is based on Mid-Atlantic Coastal Streams Workgroup recommendations designed for use in streams with variable habitat structure (MACS 1996) and was used for statewide stream bioassessment programs by Florida DEP (1996) and Massachusetts DEP (1995). This method focuses on a multihabitat scheme designed to sample major habitats in proportional representation within a sampling reach. Benthic macroinvertebrates are collected systematically from all available instream habitats by kicking the substrate or jabbing with a D-frame dip net. A total of 20 jabs (or kicks) are taken from all major habitat types in the reach resulting in sampling of approximately 3.1 m^2 of habitat. For example, if the habitat in the sampling reach is 50% snags, then 50% or 10 jabs should be taken in that habitat. An organism-based subsample (usually 100, 200, 300, or 500 organisms) is sorted in the laboratory and identified to the lowest practical taxon, generally genus or species.

Combination Sampling Method

If your 200' site has a variety of habitats, including riffles, then you may perform a combination of sampling methods. Record the equipment used and the types of habitats sampled on the Biological Monitoring Data Sheet.

Water Temperature

1. At monitoring site leave thermometer in water for at least 5 minutes.
2. Record temperature.

- At lake sites hang the thermometer over the side of the boat. The thermometer should be at approximately the same level as the secchi disk reading.
- At stream sites the thermometer should be placed in an area that resembles the overall area.
- Do not take water temperature in the bottom of a pool or in a riffle as the only reading.
- If the site has a riffle, run, pool scenario a reading should be taken in each area and recorded. The water temperature will then be an average of these three readings.

Air Temperature

1. At monitoring site hang thermometer in air for at least 5 minutes.
2. Record temperature.

Sampling Techniques Continued

pH Level taken with Hach Pocket Pal Meter

1. Fill open container half full with sample water.
2. Remove cap from meter.
3. Swirl meter in sample water until meter reads.
4. Record measurement.
5. Return sample to body of water. Instructions continued on next page.
6. Repeat steps 1-5 for two more trials.
7. Average the three trial results and record average.

The following is the Hach Company Dissolved Oxygen Test Kit Instructions adapted from The Bear Creek Watershed Education Partners.

The following instructions were adapted to be more user-friendly for volunteer data collectors.

1. Fill the Dissolved Oxygen bottle (round bottle with glass stopper) with water to be tested by allowing the water to overflow the bottle for two (2) to three (3) minutes.
2. To avoid trapping air bubbles, incline the bottle slightly and insert the stopper quickly. If bubbles are trapped in the bottle, start over.
3. Open one (1) each of the Dissolved Oxygen 1 and 2 powder pillows. Add the contents of each carefully to the bottle. Stopper the bottle carefully to exclude air bubbles.
4. Grip the bottle and the stopper firmly; shake vigorously to mix. A flocculant precipitate will be formed.
5. Allow the sample to stand until the floc has settled half-way, leaving the upper half clear (in very cold water, or salt-water, the floc will not settle as easily. Allowing it to stand for five (5) minutes assures and accurate test in these conditions.)
6. Shake the bottle again vigorously. Again, let it stand.
7. Open one (1) Dissolved Oxygen 3-powder pillow. Add the contents to the sample and carefully restopper the bottle. Shake to mix; the flox will dissolve and a yellow color will develop if oxygen is present.
8. Fill the plastic measuring tube level full of the prepared sample. Pour this into the square-mixing bottle.
9. Add Sodium Thiosulfate Solution drop by drop into the square bottle with the sample, counting each drop and swirling to mix after each drop. Hold the dropper vertically above

Sampling Techniques Continued

the bottle and continue until the yellow almost disappears.

10. Each drop used to bring about color change in Step 6 is equal to 1 mg/L of Dissolved Oxygen (DO).

11. Dump bottles into disposal bottles, rinse all glassware with creek water, put trash into trash ziplock, and return materials neatly to the kit.

Secchi Disk Technique

Secchi Disk techniques will be done according to the CLAM Handbook. This handbook is located in the Appendix.

Adapted from the Fieldsheet for The Ohio Sediment Stick

Developed with a citizen's action mini-grant from Ohio DNR Division of Soil & Water Conservation

I. Taking a Sample

Either walk up stream to a point of regular flow or position the sample collecting person along the streambank. Hold the stick halfway between the surface and bottom. When the tube is oriented with it's open end upstream, it will fill with water. If high flow conditions exist, consider using a bucket that you lower from a bridge of safe overhang to collect a sample that can be poured into the Sediment Stick. Continue to keep sample in bucket stirred.

II. Reading the Stick

Holding the stick in your shadow and perpendicular to the ground, pour out water until you can just see the 0.4 inch black dot target on the tube bottom. Rock the tube as needed to keep material suspended. Read the height of the water column from the markings on the stick to the nearest 1/4" (inch). Disregard the color of the water (it may be greenish or brownish); it is the suspended soil material that will affect your view of the target. Repeat this procedure once more. Use the averaged height to estimate total suspended solids (TSS).

III. Estimating Turbidity

Ohio EPA research indicates that Ohio Sediment Stick readings predict a laboratory analysis of TSS at 90%. This is not perfect, but accurate enough to estimate changing sedimentation rates in streams that may be attributed to problems in the upper watershed. Repeated monitoring with the stick establishes how sedimentation rates in your stream are changing due to problems in the upper watershed.

IV. Water Rating

You can estimate water quality quickly by using the Stick readings. The conversion table on this field sheet is followed by the water quality scale based on analysis of unimpacted stream data

Sampling Techniques Continued

for the state of Ohio.

V. Total Suspended Solids: Estimating Total Suspended Solids: TSS (Turbidity)
Use this table to convert Stick readings to an estimate of the weight of solids suspended in the water column. Table is based on research by Anderson and Davic, 2001, in preparation.

Stick (in)	TSS (mg/l)	Stick (in)	TSS (mg/l)	Stick (in)	TSS (mg/l)	Stick (in)	TSS (mg/l)	Stick (in)	TSS (mg/l)
0.5	1750.5	4.5	96.7	12.0	26.5	20.0	13.5	28.0	8.6
1.0	702.1	5.0	84.1	13.0	23.8	21.0	12.6	29.0	8.2
1.5	411.4	6.0	66.1	14.0	21.6	22.0	11.9	30.0	7.9
2.0	281.6	7.0	54.0	15.0	19.7	23.0	11.2	31.0	7.6
2.5	209.8	8.0	45.3	16.0	18.1	24.0	10.6	32.0	7.2
3.0	165.0	9.0	38.7	17.0	16.7	25.0	10.0	33.0	6.9
3.5	134.6	10.0	33.7	18.0	15.5	26.0	9.5	34.0	6.7
4.0	112.9	11.0	29.7	19.0	14.4	27.0	9.1	35.0	6.4
								≥36.0	<6.2

VI. Water Quality
This scale is based on Ohio statewide reference site data published by Brown, 1988.

_____Excellent	TSS < 10mg/l = excellent water quality
_____Normal	TSS 10-28mg/l = normal water quality
_____Impaired	TSS 29-133mg/l = impaired stream
_____Severely Impaired	TSS > 133mg/l = severely impacted stream

VII. Estimating Stream Flow: Q

Step 1: Estimate stream flow velocity in feet per second (f/s).

Measure a length of 10 feet in a straight section of stream channel. Record the time it takes a float to move that 10 feet in the area of deepest flow. To get a reliable estimate, make three readings and take the average.

Sampling Techniques Continued

Reading 1: 10ft ÷ _____seconds = _____ft/s

Reading 2: 10ft ÷ _____seconds = _____ft/s

Reading 3: 10ft ÷ _____seconds = _____ft/s

Total = _____ft/s ÷ 3 trials = _____ft/s average velocity

Step 2: Find the stream cross-sectional area in square ft (ft^2).

In a straight section of stream, measure the width at the water's surface and bottom channel. For averaged depth, take measurements at one-foot intervals and divide by the number of readings.

$(W^s + W^b) \div 2 \times D$ = Area:

_____ft + _____ft =_____ft ÷ 2 = _____ft x _____ft =_____ft^2

surface bottom avg. width depth area (sq. ft.)

Step 3: Find the rate of flow in cubic feet per second (cfs).

Velocity [step 1] X area [step 2] = rate OR _____f/s X _____ft^2 = _____cfs

velocity area (sq. ft.) rate

VIII. Estimating Stream Load of Soil Sediment: lbs/day

Step 4: Convert total suspended solids reading to pounds of sediment per day (lbs/day)

TSS reading X conversion factor X rate (cfs) [step 3] = pounds per day

_____TSS (mg/l) ´X 5.39 = _____ x _____ cfs = _____

turbidity rate load lbs/day

The following is the Nitrate Test Kit Instructions from the Hach Company:

Measuring Hints and General Test Information

- Samples containing more than 50 mg/L nitrate nitrogen can be tested by diluting the sample before testing. A 1:5 dilution is made by using 1 mL of sample water and 4 mL of Deionized Water (Cat. No. 272-42, not included in this kit. Use the calibrated dropper provided in this kit for the dilution. Multiply the test results by 5 to obtain the correct mg/L nitrate nitrogen. The

Sampling Techniques Continued

results of other dilutions will follow a similar procedure; for example, the results of a 1:3 dilution would be multiplied by 3 to obtain the correct mg/L nitrate nitrogen.

- Wash all labware between tests. Contamination may alter test results. Clean with a non-abrasive detergent or a solvent such as isopropyl alcohol. Use a soft cloth for wiping or drying. Do not use paper towels or tissue on plastic tubes as this may scratch them. Rinse with clean water (preferably deionized water).
- Rinse all viewing tubes thoroughly with the sample water before testing.

To open PermaChem® Powder Pillows:

1. Tap the bottom of the pillow on a hard surface.

2. Tear open the pillow along the dashed line.

3. Open the pillow and form a spout by squeezing the side edges.

4. Pour the contents into the sample.

Accuracy is not affected by undissolved powder.

Hach strongly recommends that, for optimum test results, reagent accuracy be checked with each new lot of reagents. Use the standard solution included in this kit. Follow the instructions included with each standard solution.

• Procedure

1. Fill a viewing tube to the first (5-mL) line with sample water. This is the blank.

2. Place this tube in the top left opening of the color comparator.

3. Fill another viewing tube to the first (5-mL) line with sample water.

4. Add the contents of one NitraVer® 5 Nitrate Reagent Powder Pillow to the second tube.

5. Cap the tube and shake vigorously for exactly one minute. Allow this sample to sit undisturbed for one minute. An amber color will develop if nitrate is present.

6. Place the second tube in the top right opening of the color comparator.

7. Hold comparator up to a light source such as the sky, a window or a lamp. Look through the openings in front.

Sampling Techniques Continued

8. Rotate the color disc until the color matches in the two openings.

9. Read the mg/L nitrate nitrogen in the scale window.

The following is the Orthophosphate Test Kit Instructions from the Hach Company:

Low Range, 0-1 mg/L Phosphate

1. Fill the square mixing bottle to the 20-mL mark with the water to be tested.
2. Open one PhosVer® 3 Phospate Reagent Powder Pillow. Add contents of the pillow to the bottle, and swirl to mix as shown in Figure 1. Allow at least two but not more than 10 minutes for color development. If phosphate is present, a blue violet color will develop.
3. Insert the lengthwise viewing adapter into the comparator as illustrated in Figure 2.
4. Fill one sample tube to the line underlining "Cat. 1730-00" with the prepared sample. If not using 1730-00 tubes, this will be the line found approximately 1 inch below the top of the tube.
5. Place the tube containing the prepared water sample into the comparator opening labeled "Prepared Sample Position" in Figure 2.
6. Fill the other sample tube with untreated water or a reagent blank to the line as described in Step 4. Insert this tube into the comparator opening labeled "Clear Sample Position" in Figure 2.
7. Orient the comparator with tube tops pointing to a window or light source as in Figure 2a. View through the opeingins in the front of the comparator. When viewing, use care not to spill samples from unstoppered tubes.
8. Rotate disc to obtain a color match. Read the concentration of the measured parameter through the scale window.
9. Divide the reading from the scale window by 50 to obtain the mg/L phosphate (PO_4). To obtain the value as mg/L phosphorous (P), divide by three.

Medium Range, 0-5 mg/L Phosphate

1. Perform Steps 1 and 2 of the Low Range Procedure.
2. Fill one of the color viewing tubes to the lowest mark with the prepared sample (approx. 5 mL). Insert it into the right top opening of the color comparator (Prepared Sample Position in Figure 4).
3. Fill the other tube to the lowest mark with the untreated sample (approx. 5 mL). Insert this tube into the left top opening of the color comparator (Untreated Sample Position in Figure 4)

Sampling Techniques Continued

4. Hold the comparator up to a light such as the sky, a window, or lamp and view through the openings in front. Rotate the disc to obtain a color match. Divide the reading from the scale window by 10 in order to obtain the mg/L phosphate.
5. To obtain the value as mg/L phosphorus (P), divide by 3 the value obtained in Step 4.

High Range 0-50 mg/L Phosphate

1. Rinse the square mixing bottle with demineralized water.
2. Add 2.0 mL of the wter to be tested by twice filling the droppert to the 1 mL mark with the sample and discharging the contents into the mixing bottle.
3. Add demineralized water to the mixing bottle to the 20-mL mark. Swirl to mix as shown in Figure 1.
4. Open one PhosVer® 3 Phospate Reagent Powder Pillow . Add contents of the pillow to the bottle and swirl to mix. Allow at least two minutes but no more than 10 minutes for color development. If phosphate is present a blue-violet color will develop.
5. Follow steps 2 and 3 of the Medium Range Procedure.
6. Hold the comparator up to a light source such as the sky, a window or lamp and view through the openings in front. Rotate the disc to obtain a color match. Read the mg/L phosphate (PO_4) from the scale window.
7. To obtain the value as mg/L phosphorous (P), divide by 3 the value obtained in Step 6.

Meta (Poly) Phosphate

In the test for orthophosphate, meta (or poly) phosphate will not register. To determine the amount of meta (or poly) phosphate, one test is made for total inorganic phosphate (ortho plus meta) and another for orthophosphate alone. The orthophosphate value is subtracted from the total inorganic phosphate value, and the difference is the mg/L meta (or poly) phosphate.

The meta (or poly) phosphate is hydrolyzed to orthophosphate by heating with acid and then is determined as orthophosphate (PO_4).

1. Fill the mixing bottle to the 20-mL mark with the water to be tested. Pour the sample into a clean 50-mL Erlenmeyer flask.
2. Add 2.0 mL of 5.25N Sulfuric Acid Solution by twice filling the dropper exactly to the 1.0 mL mark and discharging into the flask. Swirl to mix.
3. Set up the boiling apparatus as shown in Figure 3. The use of a boiling aid is recommended to prevent violent boiling of the sample.
4. Boil the sample for 10 minutes, adding a little demineralized water occasionally to keep the volume near 20 mL. Do not bring the volume above the 20-mL mark near the end of the 10

Sampling Techniques Continued

minute period. Do not boil to dryness.

5. Allow to cool.
6. Add 2.0 mL of 5.0N Sodium Hydroxide Solution by twice filling the dropper to the 1.0 mL mark and discharging into the flask. Swirl to mix.
7. Return the sample to the square mixing bottle with the 20-mL mark. If the volume is less than 20 mL, add demineralized water to return the volume to 20 mL.
8. Proceed with the orthophosphate test of the appropriate range, except read the mg/L phosphate as total inorganic phosphate (PO_4).
9. If only the mg/L meta (poly) phosphate is required, subtract the value obtained in the orthophosphate test from the value obtained for total inorganic phosphate.

Phosphate, Organic

The total phosphate (inorganic and organic) in a sample is determined by an acid oxidation to orthophosphate. It has been determined that mere acid treatment of organic phosphate does not give a quantitative determination, so the acid-persulfate method is used. The organic phosphate is determined by the difference and the total inorganic determination.

Total Phosphate

1. Fill the square mixing bottle to the 20 mL mark with the water to be tested. Pour the sample into a clean 50-mL Erlenmeyer flask.
2. Open one Potassium Persulfate Powder Pillow. Add the contents of the pillow to the flask. Swirl to mix.
3. Add 2.0 mL of 5.25N Sulfuric Acid Solution by twice filling the dropper to the 1.0mL mark and discharging the contents into the flask. Swirl to mix.
4. Set up the boiling apparatus as shown in Figure 3. The use of a boiling aid is recommended to prevent boiling of the sample.
5. Boil the sample for 30 minutes. Add a little demineralized water occasionally to keep the volume near 20 mL. Do not bring the volume above the 20 mL mark near the conclusion of the 30 minute period. Do not boil to dryness.
6. Allow the sample to cool.
7. Add 2.0 mL of 5.0N Sodium Hydroxide Solution by twice filling the dropper to the 1.0 mL mark and discharging the contents into the flask.
8. Return the sample to the square mixing bottle. If the volume is less than 20 mL, add demineralized water to return the volume to 20 mL.
9. Proceed with the orthophosphate test of the appropriate range, except read the mg/L

Sampling Techniques Continued

phosphate as total phosphate (PO_4).

10. At this point three values are known: ortho, total inorganic, and total phosphate. Other values may be obtained as follows: total phosphate less total inorganic phosphate equals organic phosphate; total inorganic phosphate less orthophosphate equals meta (poly) phosphate.

Testing boiler or other turbid waters

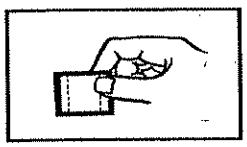
A considerable amount of turbidity often is present in the sample when testing boiler water. This must be removed to obtain test results for soluble phosphate.

A funnel, filter paper and two square bottles are provided for filtering the sample. Often the turbidity in the sample is so fine that it cannot be removed by direct filtration. If this is the case, a bottle of Filtration Aid Solution is included in this kit.

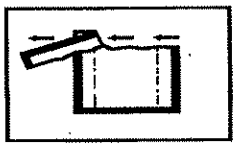
One exception to the above comments is the organic phosphate determination because much organic phosphate may be insoluble.

Filtration Procedure

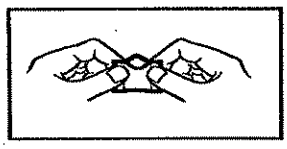
1. Fill a square mixing bottle with the water to be tested.
2. Add one Drop of Filtration Aid Solution to the bottle and swirl to mix.
3. Set up the funnel on the other square mixing bottle. Insert a piece of folded filter paper into the funnel.
4. Pout the water sample into the filter paper. As the sample filters, collect it in the other square mixing bottle. The resulting clear sample should be used as the sample to be tested.



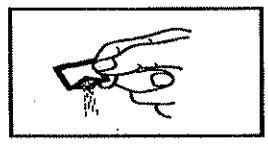
1. Tap



2. Tear



3. Push



4. Pour

Sampling Techniques Continued

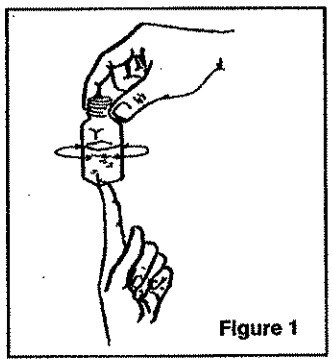


Figure 1

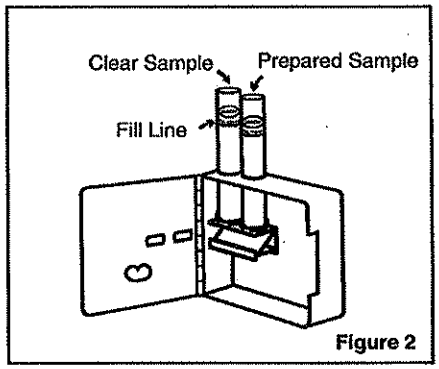


Figure 2

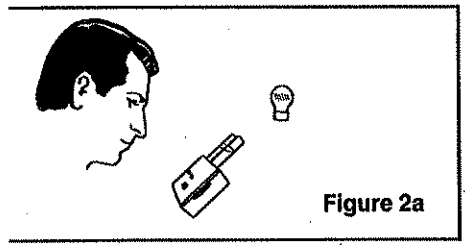


Figure 2a

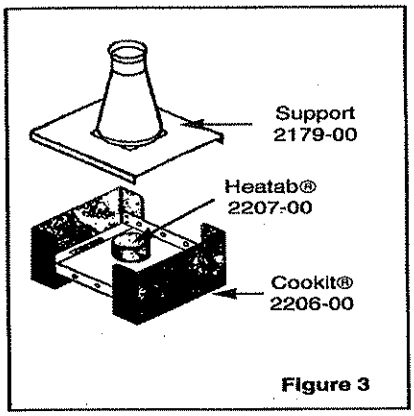


Figure 3

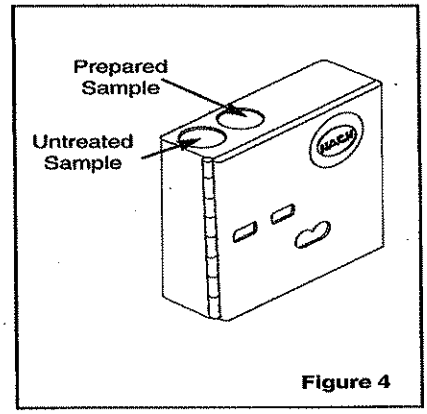


Figure 4

The following is the Nitrate Test Kit Instructions from the Hach Company.

Measuring Hints and General Test Information

- Samples containing more than 50 mg/L nitrate nitrogen can be tested by diluting the sample before testing. A 1:5 dilution is made by using 1 mL of sample water and 4 mL of Deionized Water. Use the calibrated dropper provided in this kit for the dilution. Multiply the test results by 5 to obtain the correct mg/L nitrate nitrogen. The results of other dilutions will follow a similar procedure; for example, the results of a 1:3 dilution would be multiplied by 3 to obtain the correct mg/L nitrate nitrogen.

- Wash all labware between tests. Contamination may alter test results. Clean with a non-abrasive detergent or a solvent such as isopropyl alcohol. Use a soft cloth for wiping or drying. Do not use paper towels or tissue on plastic tubes as this may scratch them. Rinse with clean water (preferably deionized water).

Sampling Techniques Continued

- Rinse all viewing tubes thoroughly with the sample water before testing.

- To open PermaChem® Powder Pillows:

1. Tap the bottom of the pillow on a hard surface.
2. Tear open the pillow along the dashed line.
3. Open the pillow and form a spout by squeezing the side edges.
4. Pour the contents into the sample.

- Accuracy is not affected by undissolved powder.

- Hach strongly recommends that, for optimum test results, reagent accuracy be checked with each new lot of reagents. Follow the instructions included with each standard solution.

• Procedure •

1. Fill a viewing tube to the first (5-mL) line with sample water. This is the blank.

2. Place this tube in the top left opening of the color comparator.

3. Fill another viewing tube to the first (5-mL) line with sample water.

4. Add the contents of one NitraVer® 5 Nitrate Reagent Powder Pillow to the second tube.

5. Cap the tube and shake vigorously for exactly one minute. Allow this sample to sit undisturbed for one minute. An amber color will develop if nitrate is present.

6. Place the second tube in the top right opening of the color comparator.

7. Hold comparator up to a light source such as the sky, a window or a lamp. Look through the openings in front.

8. Rotate the color disc until the color matches in the two openings.

9. Read the mg/L nitrate nitrogen in the scale window.

Note: *Multiply the mg/L nitrate nitrogen value by 4.4 to obtain the mg/L nitrate.*

On the next page is the Ammonia Nitrogen Test Kit instructions from the Hach Company, 2006:

Ammonia Nitrogen

0 to 2.5 mg/L as NH_3–N

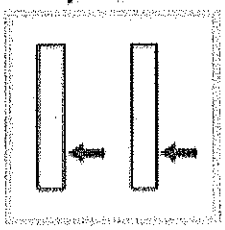
For test kit 2428700 (NI-SA) DOC326.98.00007

Test information

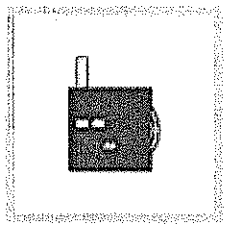
- Assemble the color comparator by placing the color disc on the center pin with the lettering facing out.
- Rinse viewing tubes with the sample water before testing. Rinse with deionized water after testing.
- Use sunlight or a lamp as a light source when matching colors with the color comparator.
- To check accuracy, use a standard solution in place of the sample (see Optional items).
- This test is very sensitive to contamination. If results are unusually high or inconsistent, run the test twice. Rinse the tubes thoroughly with fresh sample before the second test. The reagents will clean the tubes during the first test. A lower result on the second test indicates contamination during the first test.
- This test kit is designed for seawater. If used for brackish or fresh water, this kit will give a reading that is slightly higher than the actual value. The error in brackish water will in most cases be less than 10%. The error in low salinity or fresh water can be as high as 16%.
- The upper range of this test can be extended to 5 mg/L NH_3–N by diluting the sample before beginning the test procedure. Use a 3-mL syringe to add 2.5 mL sample and 2.5 mL deionized water to each tube. Follow the test procedure and multiply the result by 2 to obtain the result in the undiluted sample.

CAUTION: Handle chemical standards and reagents carefully. Review Material Safety Data Sheets for safe handling, storage and disposal information.

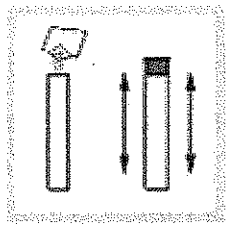
Test procedure



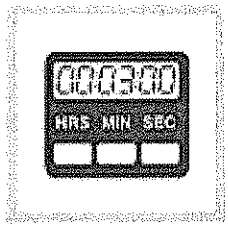
1. Fill two tubes to the first (5-mL) line with sample.



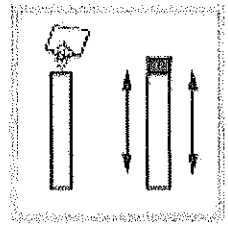
2. Insert one tube into the left opening of the comparator.



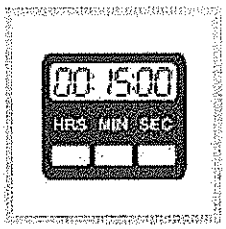
3. Add one ammonia salicylate powder pillow to the other tube. Cap and shake until all powder is dissolved.



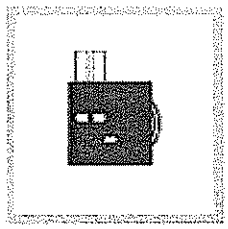
4. Wait 3 minutes.



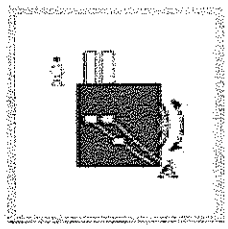
5. Add one ammonia cyanurate powder pillow to the same tube. Cap the tube and shake until all powder is dissolved.



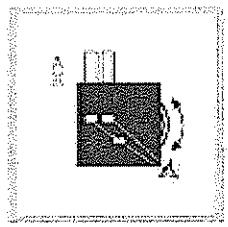
6. Wait 15 minutes.



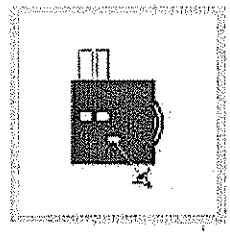
7. Insert the tube into the right opening of the comparator.



8. Hold the comparator so that a light source is directly behind the tubes.



9. Rotate the color disk until the colors in the front windows match.



10. Read the result (in mg/L) in the scale window.

Required items

Description	Unit	Catalog no.
Color Comparator Box	each	173200
Color Disk, ammonia salicylate, 0–3.0 mg/L	each	2393800
Color Viewing Tube, glass	6/pkg	173006
Stoppers, for glass viewing tubes 1730-06	6/pkg	173106
Ammonia Salicylate Reagent Powder Pillows	100/pkg	2395266
Ammonia Cyanurate Reagent Powder Pillows	100/pkg	2395466

Optional items

Description	Unit	Catalog no.
Ammonia Standard Solution, 1.0 mg/L as NH_3–N	500 mL	189149
Deionized Water	500 mL	27249
Syringe, 3-mL	each	4321300

Ammonia exists in water in two forms, un-ionized ammonia (NH_3) and the ammonium ion (NH_4^+). NH_3 is toxic to fish, while NH_4^+ is nontoxic (except at extremely high levels). At a neutral pH and ambient temperature, almost all of the ammonia exists as NH_4^+. As the pH and temperature increase, the proportion of NH_3 increases (see Table 1). This test kit measures both ammonia forms as ammonia nitrogen (NH_3–N). Use Table 1 and equations (1) and (2) to determine the amount of NH_3 and NH_4^+ in the sample.

Table 1 Percent NH_3 at different pH and temperature values

	Temperature °C								
pH	16	18	20	22	24	26	28	30	32
7.0	0.29	0.34	0.39	0.45	0.52	0.60	0.69	0.80	0.91
7.2	0.46	0.54	0.62	0.82	0.83	0.96	1.10	1.26	1.44
7.4	0.73	0.85	0.98	1.14	1.31	1.50	1.73	1.98	2.26
7.6	1.16	1.34	1.55	1.79	2.06	2.36	2.71	3.10	3.53
7.8	1.82	2.11	2.44	2.81	3.22	3.70	4.23	4.82	5.48
8.0	2.85	3.30	3.81	4.38	5.02	5.74	6.54	7.43	8.42
8.2	4.45	5.14	5.90	6.76	7.72	8.80	9.98	11.29	12.72
8.4	6.88	7.90	9.04	10.31	11.71	13.26	14.95	16.78	18.77
8.6	10.48	11.97	13.61	15.41	17.37	19.50	21.78	24.22	26.80
8.8	15.66	17.73	19.98	22.41	25.00	27.74	30.62	33.62	36.72
9.0	22.73	25.46	28.36	31.40	34.56	37.83	41.16	44.53	47.91
9.2	31.80	35.12	38.55	42.04	45.57	49.09	52.58	55.99	59.31
9.4	42.49	46.18	49.85	53.48	57.02	60.45	63.73	66.85	69.79
9.6	53.94	57.62	61.17	64.56	67.77	70.78	73.58	76.17	78.55
9.8	64.99	68.31	71.40	74.28	76.92	79.33	81.53	83.51	85.30
10.0	74.63	77.35	79.83	82.07	84.08	85.88	87.49	88.92	90.19
10.2	82.34	84.41	86.25	87.88	89.33	90.60	91.73	92.71	93.58

To determine the amount of toxic ammonia in the sample, use equation (1):

$$(1)\quad \frac{\text{mg/L } NH_3\text{–N} \times \text{value from Table 1}}{100} \times 1.2 = \text{mg/L } NH_3$$

To determine the amount of ammonium ion in the sample, use equation (2):

$$(2)\quad \frac{\text{mg/L } NH_3\text{–N} \times (100 - \text{value from Table 1})}{100} \times 1.3 = \text{mg/L } NH_4^+$$

Sampling Techniques Continued

Free Chlorine or Total Chlorine (Mid Range) Test

1. Fill a viewing tube to the bottom (5-mL) line with sample. This is the sample blank.
2. Place this tube in the top left opening of the color comparator.
3. Fill the square bottle to the 25-mL mark with sample.
4. Add the contents of one DPD Free Chlorine Reagent Powder Pillow ***or*** one DPD Total Chlorine Reagent Powder Pillow to the bottle. Swirl to mix.
5. Fill another viewing tube to the bottom (5-mL) line with the prepared sample.
6. Place this tube in the top right opening of the color comparator.
7. Hold comparator up to a bright light and look through the openings in front.
8. Rotate the color disc until the colors match.
9. Read the mg/L free ***or*** total chlorine in the scale window.

Note: If testing Free Chlorine, complete the test and read the result within one minute of adding the reagent. If testing Total Chlorine, read the test result after three minutes but before six minutes of adding the reagent.

Qualitative Habitat Evaluation Index (QHEI) Scoring

QDC filling out QHEI will be certified by OEPA and following steps learned at training provided by OEPA. This will be completed once a year, unless regular monitoring shows a significant change

Headwater Habitat Evaluation Index (HHEI) Scoring

QDC filling out HHEI will be certified by OEPA and following steps learned at training provided by OEPA. This will be completed once a year, unless regular monitoring shows a significant change

Global Positioning System (GPS) Point for location

This will be completed once a year, unless the monitoring site would be moved to ensure the monitor's safety. Garmin model GPSmap 76 will be used to take these points. If this model is not available, a comparable or better model will be used to ensure the point is accurate.

Measurement/Data Acquisition Info

Sample Handling and Custody Requirements

At this time there are no samples being transported to a laboratory for testing. If a funding source is secured to do laboratory testing, a proper chain of custody will be installed.

Flow Measurement

Flow measurement will be completed during turbidity monitoring. Steps for flow measurement are included in the Fieldsheet for The Ohio Sediment Stick portion of the Techniques Section.

Quality Control Requirement

This quality assurance plan includes several quality control measures. These include: taking an average of three samples, training of all qualified data collectors by OEPA and OSU Extension (or equivalent instructors), project manager site visits, credible data review (see appendix for questions), approval of data by project manager and director, and submission of all data to the SWIMS system and OEPA.

Instrument/Equipment Testing, Inspection and Maintenance Requirements

At this time there is very little testing, inspection and maintenance required for the program. Before each site visit the QDC will visually check all equipment for defects. The pH meter sensors are kept damp, ensuring they are functioning properly.

Instrument Calibration and Frequency

The pH Pocket Pal

A pH meter should be calibrated using two buffer solutions. pH 4 and pH 7 buffers are suggested if a sample is expected to be below a pH of 7. A sample above a pH of 7 should be calibrated using pH 7 and pH 10 buffers. Calibration should occur in a clean beaker with all buffer solutions discarded after use. Excess buffer solution should never be poured back into the bottle.

Testing Kits from Hach Company

Labware used in the testing kits should be washed before and between uses. Any sample needing dilution should properly follow given dilution instructions and should utilize the calibration dropper provided in the specified testing kit. All viewing tubes should be thoroughly rinsed with the sample water before testing. Hach Company strongly recommends that reagent accuracy be checked with the supplied standard solutions for each new lot of reagents to ensure optimum test results.

Measurement/Data Acquisition Info Continued

Macroinvertebrate Equipment

Macroinvertebrate equipment such as kick seines and dip nets must be thoroughly cleaned before and after every use to ensure that no contamination of organisms or organic matter between sampling sites can occur.

Inspection/Acceptance Requirements for Supplies

Supplies are currently purchased from the Hach Company. A letter stating their competency is included in the Appendix. Supplies will be received by the project manager and inspected before distribution.

Data Acquisition Requirements

ALL DATA obtained by QDC's will be submitted to OEPA and the SWIMS (Soil and Water Information Management System) module with the Ohio Department of Natural Resources. When monitoring equipment is returned data will be collected. If equipment is not borrowed, data will be dropped off or submitted by email. This data will be submitted within one week of the monitoring.

Data Management

As stated above all data will be submitted to OEPA and SWIMS. Both of these systems will manage the data. The SWIMS module is searchable by Soil and Water Conservation District employees. A hard copy of all data will be kept at the Mercer County Soil and Water Conservation District Office or the office of the project manager or watershed coordinator.

Assessment, Oversight, Data Validation & Usability

Assessment and Response Actions

If a QDC encounters a monitoring site which appears to be in violation of water quality standards they will follow proper water quality complaint procedures. This procedure starts with a written and signed complaint to the Soil and Water Conservation District or a telephone call to the local Sheriff's Office. From this point the matter will be out of the QDC's control. The official complaints will be handled just as any other official complaints would be handled.

Reports

There will be an annual QDC report given at the Grand Lake St. Marys/Wabash River Watershed Alliance Advisory Board meeting in December. Other reports can be built as needed and data can be obtained from the SWIMS module or OEPA data.

Data Review, Validation and Verification Requirements

Before data is entered into SWIMS or submitted to OEPA, it will be reviewed by the watershed coordinator or QDC manager. After data is reviewed it will be considered valid. The annual site review of each QDC will verify the data collection technique and quality.

Validation and Verification Methods

Before data is entered into SWIMS or submitted to OEPA, it will be reviewed by the watershed coordinator or QDC manager. This review will include questioning the QDC, if data seems out of the ordinary. Provided the QDC has passed their annual site review and answers all questions sufficiently, the data will be considered valid. If data reveals a violation in water quality, the official complaint procedure will begin. This procedure is summarized in Assessment and Response Actions.

Reconciliation with Data Quality Objectives

The objective of the QDC's is to show trends. With the proper techniques, certification and review for validity, it is expected that the QDC can accomplish this task. It is understood that OEPA will not accept trend data from anyone less than a Level 2 QDC. As the QDC's progress, with time and experience, this will happen.

LAST PAGE OF BODY

LAST PAGE OF BODY

Appendix

Appendix Page **Page #**

Background Information.....61
QDC Documentation..... 69
Credible Data Review..... 71
Laboratory Information.....75
Scientific Collector's Permit.....77
CLAM Handbook.....79
Sample Location Information Statement.....93
Digital Photo Statement..... 94
Voucher Statement..... 95
Trespassing Certification.....96
Field Sheets..... 101
Site Locations..... 114
Parameters..... 115
References..... 117

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