Background Information

Grand Lake St. Marys

Grand Lake St. Marys has long been an interest point of western Ohio. Construction for the lake began in early 1837 and was intended to primarily be used as a feeder for the Miami & Erie Canal. The workers constructing the lake basin were paid $0.35 per diem and also were provided with a jigger of whiskey for the prevention of malaria. According to some local historians, the idea that the lake was dug is simply untrue; "the water was already here. They diked up the southern end of the swamp". Many workers were drawn from far and near to work on the project and after completion, a good portion of them remained in the area, settled with their families, and began farming the land. Taking nearly ten years, the basin was completed in 1841 with an original acreage of over 17,000 acres and an estimated cost near $528 million.

The Miami and Erie Canal brought industry to the area, lowered freight prices and supplied the local residents with a thriving income. Deliveries of goods and visitors from both Toledo and Cincinnati were nearly around the clock. However, soon came the railroads and the transportation of both travelers and items was made more rapid and cost effective. The lake was no longer needed as a feeder to the canal. It wouldn't be too long before the lake provided the area with another boom of interest and income.

In the late 1880's oil was discovered near St Marys and on January 24, 1891 in the St Marys Argus it was printed that "It is said that an oil well derrick has this week been put up on the reservoir, three or four hundred feet from the shore at the northeast corner. Verily, the days of the reservoir are numbered". This was the first noted evidence of an offshore oil well and would continue to be so for over 100 years. Not long after the first derrick went up, several more followed, dotting the countryside and taking up farmland. At first, farmers were naïve about leasing the ground to the oilmen and selling the rights. An example of an early lease reads "For the term of 99 years, the consideration $100, to be paid at the expiration of ten years, IF oil was found". It didn't take long before the landowners learned the proper value of the oil leases. For instance leasees were soon being paid approximately $1,000 when drilling began, $1,000 when oil was discovered and up to one third of the oil pulled from the site. Two of the most successful oilmen of the area were averaging over 3,000 barrels of oil per day. All that is left of the oil boom is a small pile of rock at the site where the last producing derrick was located.

Another bit of local folklore surrounding the lake area is the legend of how the lake was named. The lake's name list includes Mercer Reservoir, Celina Lake, Celina Grand Lake, Lake St Marys, Grand Reservoir and finally Grand Lake St Marys. The legend of the area involves two men being selected; one from Celina, the other from St Marys, and given the task of naming the lake. Furthermore, legend has it that the gentleman from St Marys provided mass amounts of alcohol to the gentleman from Celina finally tricking him into agreeing on naming the lake after St Marys. In the end, several local authorities hold that the legend is purely a legend with no truth behind it.

The lake has attracted visitors from throughout the region from the very beginning. These tourists come to enjoy the recreational opportunities, including boating, fishing, and the numerous festivals and events in the lake area. Places in and around the lake have been filled in to better accommodate the recreational aspect of the area. This has led to the massive loss of water acreage estimated to be at least 3,500 acres.

Background Info Continued

Construction of parks and other attractions included dance halls, athletic parks, fishing areas and even small scale water parks. By today's standards, tourism plays a vital role in the economic success of both Auglaize and Mercer counties. For instance, in the year 2004 the travel and tourism industry in Mercer and Auglaize counties had an estimated income of $45,563,119.00 and supported approximately 2,278 jobs.

The Wabash River

The Wabash River begins in Northern Darke County near the Mercer-Darke County Line. The Wabash was first explored in 1669 by a French man named La Salle and was named "Ouabache", for the Indian word meaning "white." This was due to the river's clarity in Huntington County, Indiana where the river bottom is limestone. It had been used prior to La Salle's exploration by the Native Americans and traders between the Great Lakes and the Gulf of Mexico. Once the river was under French control, the river connected many settlements ranging from the lower Great Lakes to the Mississippi River. In the early 1990's, Indiana General Assembly and Indiana Department of Natural Resources worked together to establish the Wabash River Corridor Commission to preserve the Wabash River and promote heritage conservation and proper development.

The Wabash River (excluding its tributaries) flows only approximately 43 miles within Ohio, where it enters Indiana and travels approximately 500 miles to the Ohio River. The Wabash flows from its beginning in west-central Ohio to the state of Indiana where it crosses nearly the entire state. The Wabash then enters the Ohio River near southwest Indiana, just south of Evansville.

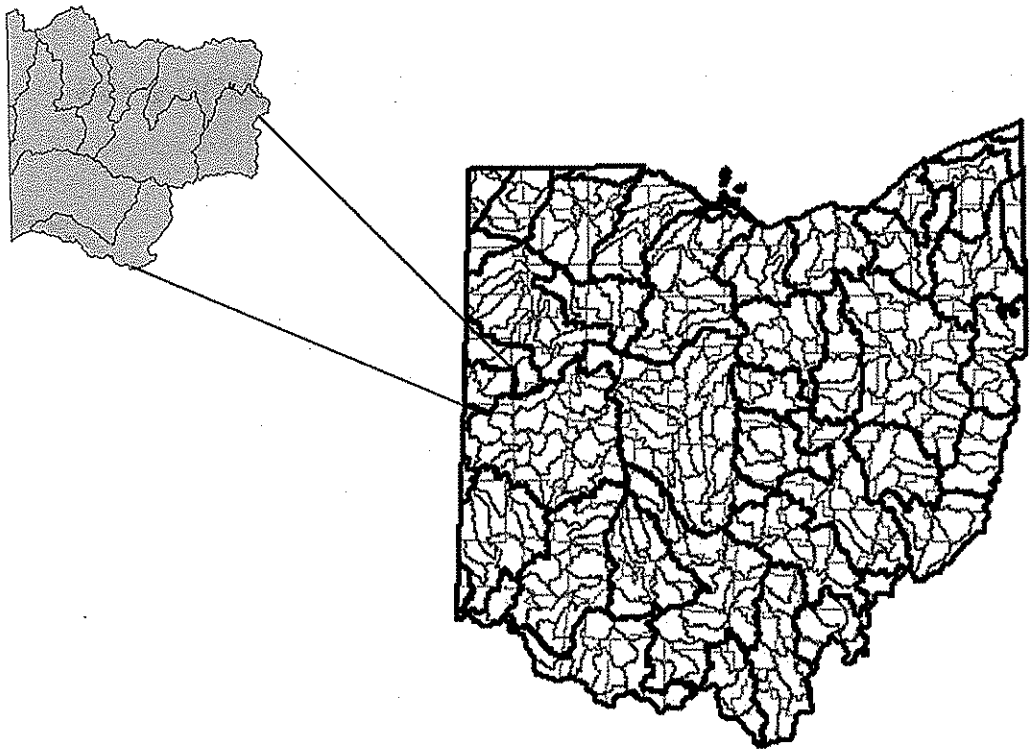
From the earliest settlers in the area, agriculture has been a mainstay in every portion of the watershed. As more and more people settled in the area due to completion of Grand Lake St Marys, success of the canal system or the discovery of oil, families were started and continued in the farming lifestyle. Agriculture still proves to be social, cultural, and economic staple in the watershed and very important when dealing with water quality and the protection of the water resources.

Administrative Boundaries

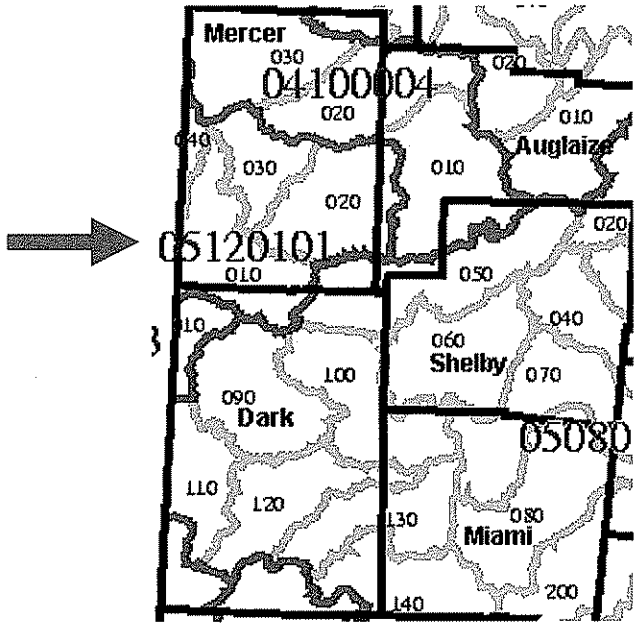
The Grand Lake/Wabash watershed consists of nearly 13,500 acres of lake and approximately 193,000 acres of land which primarily drains to the Ohio River. The watershed spans portions of Auglaize (10%), Darke (10%) and Mercer (80%) counties and can be considered as a tributary to both the Ohio River drainage Basin and the Lake Erie drainage Basin. Outflow from Grand Lake St. Marys' west spillway drains to Beaver Creek and then to the Wabash River. The outflow from the east embankment sluice gate drains to the St. Marys River via the Miami & Erie canal system. This outflow has been estimated at or below 20% thus, the Grand Lake St. Marys watershed is administered as a portion of the Wabash River Hydrologic Unit Code (HUC) 05120101 at both federal and state levels. The following maps indicate the HUC 8, HUC 11 and HUC 14 codes for associated drainage units in the Grand Lake/Wabash watershed.

Background Info Continued

Wabash River 8-Digit Hydrologic Unit Code Location



Wabash River 8-Digit and 11-Digit HUC Location



11-Digit HUC Map

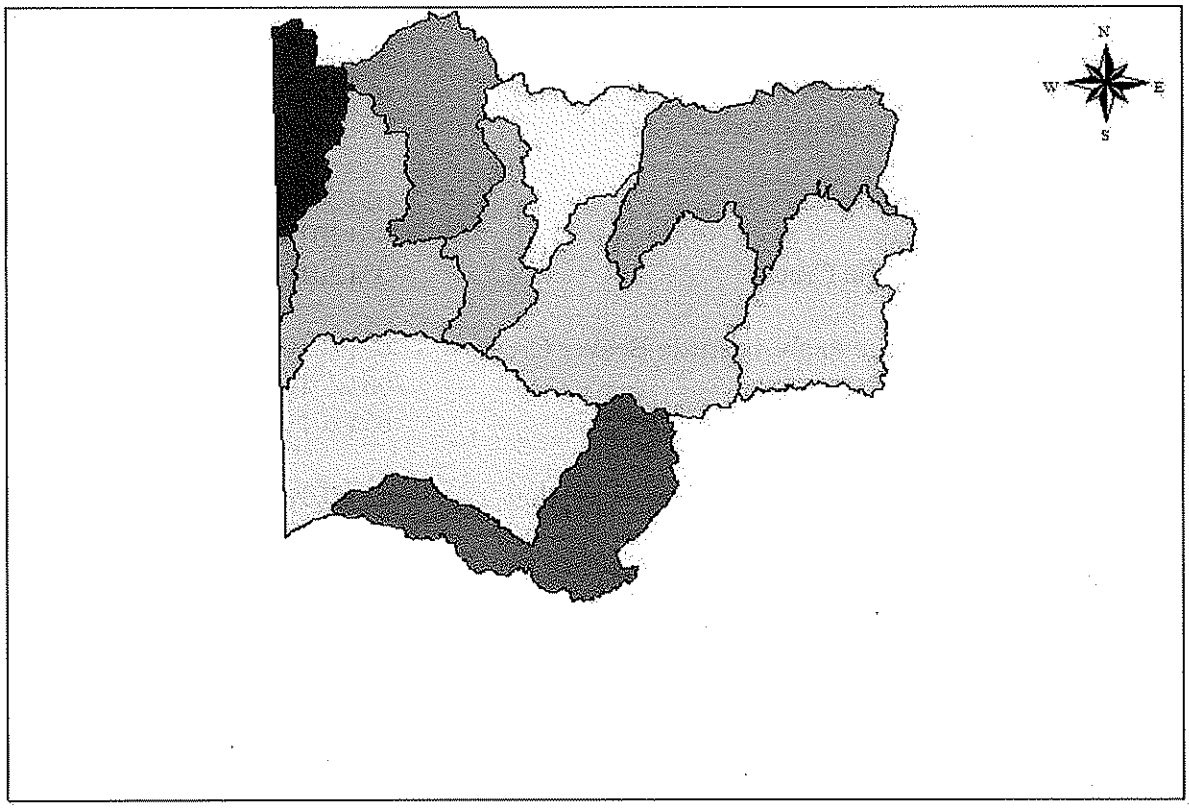
U.S. DEPARTMENT OF AGRICULTURE

NATURAL RESOURCES CONSERVATION SERVICE

Ohio 11-digit Watershed Boundaries

NRCS GIS 9/10/99

14-Digit HUC Map



- Wabash Headwaters to below Bear Creek
- Wabash R above Bear Cr below Stony Cr
- Wabash R below Stony Cr above Beaver Cr
- Chickasaw & Barnes Crs
- Coldwater & Beaver Crs
- N Shore/Lake/Grassy & Monroe/Up Prairie Cr Up Barnes Cr
- Beaver Cr from Grand Lake to above Little Beaver Cr
- Little Beaver Creek
- Beaver Cr below Little Beaver to Wabash R
- Wabash R below Beaver to New Corydon
- Limberlost Cr Headwaters to below Bull Cr (IN)

Grand Lake/Wabash River Watershed 14 Digit HUCs

14-digit HUC Codes & Village Info

Wabash Headwaters to below Bear Creek	05120101-010-010
Wabash River above Bear Cr below Stony Creek	05120101-010-020
Wabash River below Stony Cr above Beaver Creek	05120101-010-030
Chickasaw and Barnes Creeks	05120101-020-010
Coldwater and Beaver Creeks	05120101-020-020
N Shore/Grassy Monroe/ Prairie Creeks	05120101-020-030
Beaver Creek from Grand Lake to above Little Beaver Creek	05120101-030-010
Little Beaver Creek	05120101-030-020
Beaver Creek below Little Beaver to Wabash River	05120101-030-030
Wabash River below Little Beaver Creek to New Corydon	05120101-040-010
Limberlost Creek Headwaters to below Bull Creek	05120101-050-050

The Grand Lake/Wabash watershed contains numerous levels of local governments, including portions of Butler, Franklin, Gibson, Granville, Hopewell, Liberty, Marion, Jefferson, Recovery, and Washington townships in Mercer County. Small portions of German, Jackson, Noble, and St. Marys townships in Auglaize County and Allen, Mississinawa, and Wabash townships in Darke County are also included in the watershed. The Grand Lake/Wabash River watershed also contains a portion of the City of Celina and the City of St. Marys.

Several villages located entirely in the watershed are: Chickasaw, Coldwater, Ft. Recovery, Montezuma, and St. Henry. Several non-incorporated areas include: Carthagena, Cassella, Cranberry, Durbin, Macedon, Maria Stein, Philothea, Sebastian, Sharpsburg, St. Anthony, St. Johns, St. Joseph, St. Peter, St. Rose, Wabash and Wendelin.

The Auglaize portion of the watershed has no sizeable cities, villages, or non-incorporated areas. However, the City of St. Marys, and the Villages of New Bremen and Minster are located just outside of the eastern watershed border. Burkettsville and New Weston are the two Darke County villages that are located within the boundaries of the watershed.

Economic Information

The Grand Lake/Wabash Watersheds are largely effected by two types of income: tourism and agriculture. The Economic Impact chart was provided by Donna Grube, Auglaize/Mercer Convention and Visitors Bureau. The agricultural industry is another major component of the economic base for the watershed. As detailed below the value of the food and agricultural industry affects more that those that farm. The Agriculture chart was provided by Farm Bureau.

Economic Impact of Tourism in Auglaize & Mercer Counties

Years	*2003*	*2004*	*2005*	*2006*	*2007*
Total Room Sales	$4,156,990	$4,933,655	$5,144,802	$5,370,339	$4,996,937
Gasoline, Oil, Auto Repairs, Auto Sales	$12,470,970	$14,800,965	$15,434,406	$16,111,017	$14,990,811
Restaurants & Clubs	$14,549,465	$17,267,792	$18,006,807	$18,796,186	$17,489,279
Entertainment & Recreation	$3,367,162	$3,996,260	$4,167,289	$4,349,975	$4,047,518
General Retail Purchases	$5,029,958	$5,969,722	$6,225,220	$6,498,110	$6,046,293
Total Tourism Income	**$39,574,545**	**$46,968,394**	**$48,978,524**	**$51,125,626**	**$47,570,838**
Jobs Supported by Tourism Dollars	1,978	2,348	2,448	2,556	2,378

Ecomonic Information Continued

Auglaize County	Darke County	Mercer County
Agriculture contributes $477.5 million in output and employs nearly 5,000 people in Auglaize County.	Agriculture contributes $598.6 million in output and employs 6,400 people in Darke County.	Agriculture contributes $621.7 million in output and employs 6,500 people in Mercer County.
Crop production represents 51% of production agriculture in Auglaize County.	Livestock and poultry production represents over 67% of production agriculture in Darke County.	Livestock and poultry production represents over 78% of production agriculture in Mercer County.
Dannon, G A Wintzer & Son, and *Hoge Lumber Company* are major food and forestry processors located in Auglaize County.	*Creative Cabinet Systems, Keller Grain & Feed, Weaver Brothers, and Whiteford Food Products* are major food and forestry processing businesses located in Darke County.	*Basic Grain Products, Cooper Farms, and Fort Recovery Equity Exchange* are food processing businesses located in Mercer County.
212,000 acres of land are farmed in Auglaize County.	346,000 acres of land are farmed in Darke County.	273,000 acres of land are farmed in Mercer County.
Auglaize County Farmers produce over 3.5 million bushels of corn, 2.5 million bushels of soybeans, 20,500 cattle, 41,300 hogs, and 92.6 million pounds of milk.	Darke County farmers produce over 7.8 million bushels of corn, 4.1 million bushels of soybeans, 27,500 cattle, 126,500 hogs, and 138.8 million pounds of milk.	Mercer County farmers produce over 4.4 million bushels of corn, 2.9 million bushels of soybeans, 41,900 cattle, 145,200 hogs, and 314.5 million pounds of milk.
Among Ohio's counties, Auglaize ranks 8th in hogs, 11th in wheat harvested, 13th in milk production, and 17th in cattle.	Among Ohio's counties, Darke ranks 2nd in hogs, 5th in soybean production and processed tomatoes, 6th in cattle, 7th in corn harvested, and 8th in milk production.	Among Ohio's counties, Mercer ranks 1st in hogs, 2nd in cattle and milk production, 8th in oats harvested, and 12th in wheat production.
Cash receipts from marketing of farm commodities totaled nearly $85 million.	Cash receipts from marketing of farm commodities totaled over $226.3 million.	Cash receipts from marketing of farm commodities totaled over $282.5 million.
In Auglaize County, food and forestry processing accounted for $313.2 million in total output.	In Darke County, food and forestry processing accounted for $128.2 million in total output.	In Mercer County, food and forestry processing accounted for $171 million in total output.

QDC Documentation

All QDC's must be certified by OEPA before participating in this program. Safety officers do not have to be a certified QDC to participate. The following is an example of the QDC certifications filed with OEPA. All certificates are kept on file with the Project Manager.

Ohio EPA
State of Ohio Environmental Protection Agency

STREET ADDRESS:
Lazarus Government Center
50 W. Town St., Suite 700
Columbus, Ohio 43215

TELE: (614) 644-3020 FAX: (614) 644-3184
www.epa.state.oh.us

MAILING ADDRESS:
P.O. Box 1049
Columbus, OH 43216-1049

Effective Date: 7/13/2007
Expiration Date: None

I certify this to be a true and accurate copy of the official documents as filed in the records of the Ohio Environmental Protection Agency.

By: _____ Date: 7/13/07

CERTIFIED MAIL

RECEIVED DIRECTOR'S JOURNAL
JUL 13 2007
OHIO E.P.A.

Theresa Howick
Mercer County SWCD
7531 State Route 197
Celina, Ohio 45822

Re: Qualified Data Collector Approval, Surface Water Volunteer Monitoring Program

Dear Theresa:

The Division of Surface Water Volunteer Monitoring (Credible Data) Program has reviewed your Qualified Data Collector (QDC) application. Pursuant to Ohio Revised Code (ORC) 6111.53 and Ohio Administrative Code (OAC) 3745-4-03, you are approved as a QDC for the following level and specialty:

QDC Level: 1
QDC number: 095

Please use this QDC number on all correspondence, study plans, etc. submitted to Ohio EPA.

As noted at the top of this letter, this status is effective as of the date of this letter and does not expire. You may now submit study plans to the Volunteer Monitoring Program.

As a reminder, your status is contingent upon the absence of any trespassing violation (within the previous five years) by you or any person sampling under your supervision. Always obtain land owner permission prior to sampling.

Additionally, collection (and retention) of aquatic biological samples (this includes fish, macroinvertebrates, mollusks, and shells) requires a collector's permit from the Ohio Department of Natural Resources/Division of Wildlife. Obtain this permit prior to collection of any biological samples.

QDC Documentation Continued

QDC numbers on file at this time include:

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

Credible Data Review

The following questions will be asked at the QDC annual approval:

- **Why is quality assurance important?**
- If there is no quality assurance then the data is no good. QA is important to ensure credible data.

- **Why is quality control important?**
- If something is not being completed correctly it must be stopped and corrected in order to have credible data.

- **Give an example of quality control in site monitoring:**
- An example of quality control would be sitting at the same spot every time to do stream site drawing; taking samples from the same area each time; using the steps listed on the card every time; and always taking an average of 3 samples. Quality control is essentially error control.

- **Explain the importance of quality control sampling:**
- "QC samples help you identify when and how contamination might occur. For most projects, there is no set number of field or laboratory QC samples which must be taken. The general rule is that 10% of samples should be QC samples. When the project is over, determine data quality by evaluating the results of all the QC samples and determining precision and accuracy. The decision to accept data, reject it, or accept only a portion of it is should be made after analysis of all QC data." ~Monitor's Guide to Quality Assurance Project Plans

- **Define precision:**
- "Precision is the degree of agreement among repeated measurements of the same characteristic on the same sample or on separate samples collected as close as possible in time and place. It tells you how consistent and reproducible your field or laboratory methods are by showing you how close your measurements are to each other. It does not mean that the same results actually reflect the "true" value, but rather that your sampling and analysis are giving consistent results under similar conditions." ~Monitor's Guide to Quality Assurance Project Plans
- Precision may be expressed as a coefficient of variation such as range, standard deviation, or mean of the measurements and is addressed by the parameters table on page 74.
- The Ohio EPA recommends a frequency of 10% of the total samples taken at a site be duplicated to ensure proper precision in sample measurements. Should a difference in data exceed 20%, the EPA advises another duplicate sample be taken and further study into the cause of the data variations.

- **Define bias:**
- Bias is "the systematic or persistent distortion of a measurement process that causes errors in one direction." ~Guidance for Quality Assurance Project Plans

Credible Data Review Continued

- **Define accuracy:**
- "Accuracy is a measure of confidence in a measurement. The smaller the difference between the measurement of a parameter and its "true" or expected value, the more accurate the measurement." ~Monitor's Guide to Quality Assurance Project Plans
- It is recommended that at least 10% of samples taken be duplicated in order to ensure the accuracy of tests used. At least 10% of the samples being taken will be duplicated and taken to a certified laboratory.

- **Define representativeness:**
- "Representativeness is the extent to which measurements actually depict the true environmental condition or population you are evaluating." ~Monitor's Guide to Quality Assurance Project Plans
- Representativeness ensures that samples taken are accurate, precise and properly characterize the environment or condition being studied. ~Guidance for Quality Assurance Project Plans
- Initial testing locations within the Grand Lake/Wabash Watershed represent the various subwatersheds. Sites, the closer in location to Grand Lake, best represent the sum total of the activities and pollutant outputs in their specified subwatersheds.

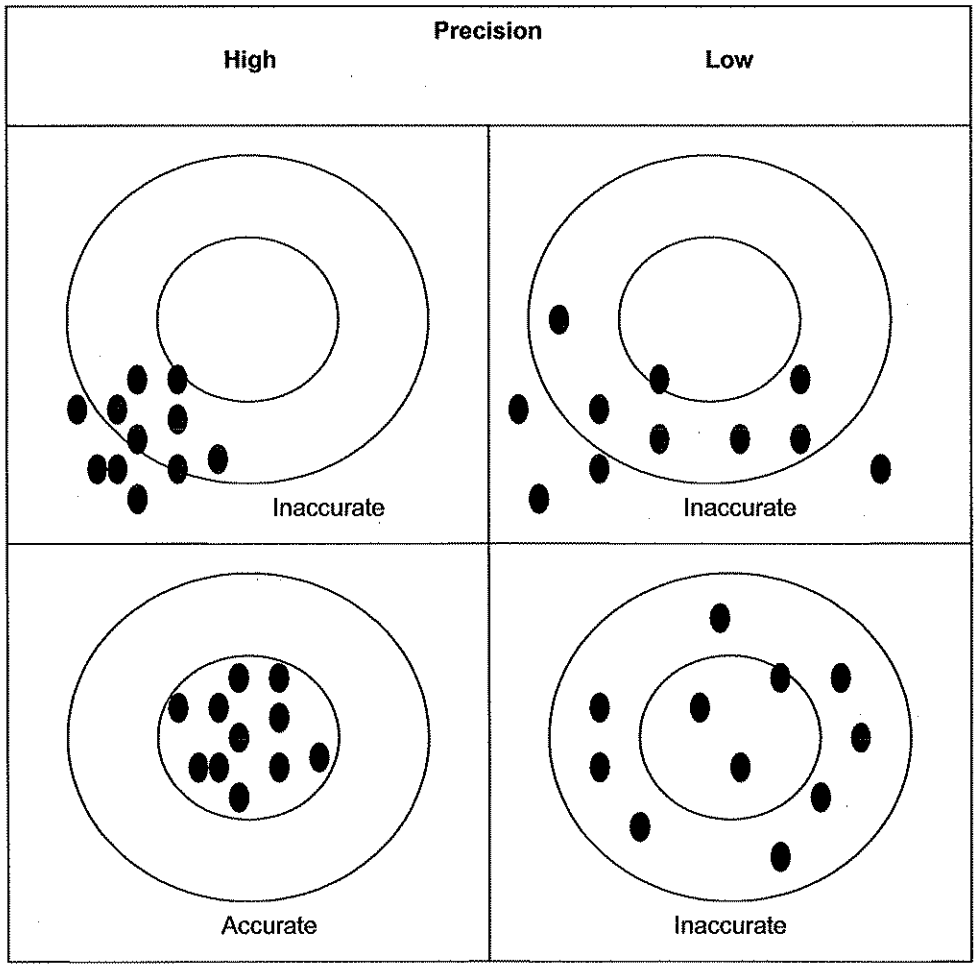
- **Define completeness:**
- "Completeness is the number of samples you must take to be able to use the information as compared to the number of samples you originally planned to take." ~Monitor's Guide to Quality Assurance Project Plans
- QDCs are encouraged to test at sampling sites from March through November to ensure a high completeness rate, with an expected bimonthly testing period from May to September.

- **Define comparability:**
- "Comparability is the extent to which data from one study can be compared directly to either past data from the current project or data from another study." ~Monitor's Guide to Quality Assurance Project Plans
- QDCs will utilize the same testing kits and tools and will follow the same procedures as instructed to them by this plan. All analytical and laboratory methods will be consistent and use sophisticated testing methods.

- **Define sensitivity:**
- "Detection Limit is defined as the lowest concentration of a given pollutant your methods or equipment can detect and report as greater than zero." ~Monitor's Guide to Quality Assurance Project Plans
- All testing instruments have a limited range of detection, which can be found on the parameters table on page 74.

Credible Data Review Continued

- **Define range:**
- "Measurement range is the range of reliable measurements of an instrument or measuring device." ~Monitor's Guide to Quality Assurance Project Plans



Credible Data Review Continued

Parameter	Technique	Accuracy	Range
Macroinvertebrate Pollution Tolerance Index	Kick Seine Net	NA	NA
	Dip Net	NA	NA
	Combination Sampling	NA	NA
Water Temperature	Liquid-in-glass Thermometer	± 0.5° F	-40-160° F
Air Temperature	Liquid-in-glass Thermometer	± 0.5° F	-40-160° F
pH Level	Digital Pocket Meter	±0.1 units at 20° C	0.0 to 14.0 units
Dissolved Oxygen	Drop Count Titration/Modified Winkler	± 1 drop	1-20 mg/L
Turbidity	Secchi Disk	90%	0-10 ft
	Ohio Sediment Stick (estimates TSS)	90%	0-60 cm
Stream Flow	Estimated Flow	90%	NA
Phosphorous Level	Orthophosphate (low, mid, high range)	± 10%	0.02 to 2.50 mg/L PO_4^{3-}
	Meta (Poly) Phosphate	± 10%	0.02 to 2.50 mg/L PO_4^{3-}
	Organic Phosphate	± 10%	0.06 to 3.50 mg/L PO_4^{3-}
	Total Phosphate	± 10%	0.06 to 3.50 mg/L PO_4^{3-}
Nitrogen Level	Nitrate: High Range	± 10%	0.3 to 30.0 mg/L NO_3^-–N
	Nitrate: Mid-Range	± 10%	0.1 to 10.0 mg/L NO_3^-–N
	Nitrate: Low Range	± 10%	0.01 to 0.50 mg/L NO_3^-–N
	Ammonia-Nitrogen	± 10%	0.02 to 2.50 mg/L NH_3–N
Chlorine Level	DPD	± 10%	0.7 to 3.50 mg/L
QHEI	Qualitative Habitat Evaluation Index	NA	NA

Laboratory Information

Water samples will be tested using the water sampling kits purchased from the Hach Company. Hach Company has received USEPA certification for a select number of methods that are qualified to be used in quality data collecting. A copy of the letter of approval from the USEPA for Hach methodology may be viewed on the next page.

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.

Should any samples need laboratory testing, consultation will first be taken with a certified lab, which has the capabilities to test water samples. Further testing of a sample that is not possible to conduct at the lab will be sent to an appropriate certified laboratory that has the capacity to perform the needed tests.

On the next page is the letter of approval for Hach water sample testing methods from the USEPA, 1999:

Laboratory Information Continued

Letter from Hach Company

HACH COMPANY
PO Box 389 • Loveland, Colorado 80539-0389
970-669-3050 • Fax: 970-669-2932
http://www.hach.com

Hach Methods approved/accepted by the USEPA

Effective: December 1, 1999

Dear Customer,

Hach is providing the attached copy of United States Environmental Protection Agency letter, dated June 17, 1996, as a service to you to help you document your compliance with USEPA regulatory reporting requirements.

These Hach methods for drinking water and wastewater analysis have been reviewed by the USEPA and are either approved or accepted by the Agency for regulatory monitoring.

Additionally, for Hach methods that received USEPA Acceptance or Approval *after* June 17, 1996, Federal Register citations and individual USEPA letters are provided as follows:

USEPA-APPROVED HACH METHODS[1]:

On December 1, 1999, two Hach methods received USEPA Approval for Drinking Water compliance monitoring. Documentation for these methods can be found in the Federal Register (Dec. 1, 1999, FR Vol. 64, No. 230, 67449-67467) and will be published in 40 CFR 141. The two USEPA-Approved methods are:

- Hach Method 10029, m-ColiBlue24® Method for the Determination of Total Coliforms and *E.coli* for use in Total Coliform Rule compliance monitoring[2].
- Hach Method 1001, Determination of Lead, for use in Lead and Copper Rule compliance monitoring.

USEPA-ACCEPTED HACH METHODS[1]:

- The attached letter dated March 1, 1999, accepts Hach Method 8190 for Determination of Total Phosphorous for use in NPDES compliance monitoring.
- The attached letter dated March 1, 1999 also accepts Hach Method 8048 for Determination of Orthophosphate for use in NPDES and NPDWR compliance monitoring.
- The letter dated April 20, 1998, accepts Hach Method 8195 for Determination of Turbidity, which cites Hach StablCal® Standards as primary calibration standards, for use in NPDES and NPDWR compliance monitoring.

Scientific Collector's Permit

The objectives of the data collection are to calculate the water quality of the watershed using baseline data from various sampling sites throughout the watershed. As further watershed best management practices are implemented, water quality trends will be assessed.

On the opposite page is the application for a Scientific Collection Permit. This application will be submitted for the 2010 year. This permit will be renewed annually.

Benthic macroinvertebrates to be collected include:

- Dobsonfly Larva
- Caddisfly Larva
- Snails
- Riffle Beetle
- Water Penny
- Mayfly Nymph
- Dragonfly Nymph
- Clam
- Cranefly Larva
- Scud
- Aquatic Sowbug
- Crayfish
- Damselfly Nymph
- Beetle Larva
- Aquatic Worm
- Midge Larva
- Leech
- Black Fly Larva

Data collectors will not, at any time, collect or disturb any shellfish located within the watershed.

Form 167
(R1205)

DIVISION OF WILDLIFE
Ohio Department of Natural Resources

WILD ANIMAL PERMIT APPLICATION

☒ Scientific Collection ($25) ☐ Education ($25) ☐ Banding (No Fee)

(check one) ☒ New Permit. ☐ Renewal Permit

Full Name of Applicant	Date of Birth	Tax ID # or Social Security No.
Laura B. Walker	7-16-80	[redacted]

Street Address	County
4382 Guadalupe Rd.	Mercer

City	State	Zip Code	Telephone No. (home)	(work)
Celina	OH	45822	419-268-0114	419-586-3289

Name and Address of Corporation, College, University, Organization or Agency which you are representing:
Grand Lake St. Marys/Wabash Watershed Alliance

220 West Livingston Street, Suite 1, Celina, OH 45822

Check or money order No. _____ for $25.00 payable to the **Ohio Division of Wildlife** is attached.

Outline the project for which wild animals will be collected. If scientific collection, indicate purpose, objectives, specific species, and number requested. If education, provide a description of proposed program (s) and intended audience.
Use additional sheets if necessary.

This permit will be used for the collection of aquatic insects in conjunction with a Qualified Data Collector Program. This program is under the direction of Mercer, Darke and Auglaize Soil and Water Conservation Districts. Collection will take place in the Grand Lake St. Marys and Wabash River Watersheds.

COLLECTION LOCATIONS (county/stream)	SPECIES AND AMOUNTS TO BE COLLECTED	*COLLECTION METHOD	LOCATION WHERE SPECIMENS WILL BE DEPOSITED
Mercer - Beaver Creek	See	Seine Net	Same
Auglaize - Barnes Creek	Attached	"	"
Darke - Wabash River	Sheet	"	"

Unattended collection equipment must be marked with the name and address of user and permit number.

• A U.S. Fish and Wildlife Service permit may be required if your project includes the collection, posession, or banding of migratory birds, or a federally protected species. Please list any current USFWS Permits and number(s).

_____ / _____ / _____

The applicant agrees to keep daily records, submit an annual report (education/banding) or the wildlife diversity data base form (scientific collection), and abide by provisions of the law:

_____ January 1, 2009
(Applicant's Signature) *(Date)*

This permit will expire on the next March 15th after issuance.

Send this application to:

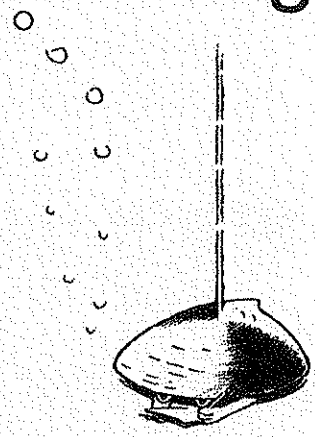
ODNR Division of Wildlife, Law Enforcement, 2045 Morse Rd. Bldg. G, Columbus Ohio 43229-6693

Completion of the form is required - Section 2921.13 O.R.C., Penalty: Imprisonment up to 6 months or $1000 fine or both.
Section 1533.99 O.R.C., Penalty: Imprisonment up to 30 days or $250 fine or both.

DNR 8907

CLAM Handbook

Citizen Lake Awareness & Monitoring



CLAM Handbook For Lake Monitors

Updated

July 2002

CLAM Handbook

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CLAM Handbook

What is CLAM?

The Citizen Lake Awareness and Monitoring (CLAM) program enables the Ohio public to take an active role in learning about aquatic ecology, lake and stream water quality, and pollution prevention. CLAM participants become trained citizens that gather vital water quality data to document the changing conditions of Ohio waterbodies. CLAM then provides this information to concerned individuals, water management groups, and to local, state, and federal agencies to evaluate and improve Ohio lakes and their watersheds. The CLAM program is also an excellent networking opportunity for citizens and environmental organizations.

CLAM's mission is: ***To care for Ohio lakes and their watersheds.***

CLAM's goals are:

To promote citizen awareness of the impacts of nonpoint source (NPS) pollution on lakes and watersheds.

To encourage local watershed-based initiatives to control NPS source pollution.

To generate the formation and growth of lake management organizations to ameliorate the impacts of NPS pollution.

To provide educational opportunities for citizens to learn about the biological, geological and sociological relationships between lakes and the surrounding watershed.

To maintain a database of the water quality information to be used by concerned individuals, environmental organizations, local, state and federal agencies, and the CLAM monitors to evaluate and improve Ohio lakes and their watersheds .

CLAM is sponsored by the **Ohio Lake Management Society (OLMS)**, with funding from the **U.S. Environmental Protection Agency (EPA)** through a federal 319 grant. Additional support is provided by **Kent State University (KSU), Ohio Environmental Protection Agency (OEPA), Ohio Department of Natural Resources (ODNR), Richland County Soil and Water Conservation District (SWCD), Ohio State University (OSU) Extension**, and the **Muskingum Watershed Conservancy District (MWCD).**

For more information, see our web site at:
www.olms.org

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CLAM Contacts

The following people comprise the staff of the CLAM program. If you have any requests or questions regarding CLAM or the monitoring methods, please write or call the Regional Coordinator or Lake Representative in your area or the Program Manager. See map on page 4 for a listing of Ohio CLAM regions.

CLAM **Program Manager:** **Matthew Smith**
Ohio Lake Management Society
P.O. Box 463
Kent, OH 4424
330-672-5475
smith@olms.org

CLAM **Regional Coordinators:**

Gary Comer, Jr., Miami Region
Ohio State University Extension
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Dana Oleskiewicz, Central and Eastern Lake Erie Regions
Ohio State University Extension
1680 Madison Ave.
OARDC Administrative Building
Wooster, Ohio 44691
330-263-3831 (w)
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mailto:oleskie@olms.org

Not Filled, Maumee Region

Contact Program Manager

John Reinhard, Scioto Region
CLAM Monitor
Choctaw Lake Association
1394 East Choctaw Drive
London, OH 43140
740-852-1959 (h)

Mark Swiger, Muskingum and East Regions
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1319 Third St. NW, P.O. Box 349
New Philadelphia, OH 44633-0349
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CLAM Lake Representatives:

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419-589-5951

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Sidney, OH 45365
937-492-4788 x112

Ken Faulhaber, Holiday Lakes
29 Sandy Trail
Willard, OH 44890
419-933-8303

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US Coast Guard Axiliary
11306 Oneida Path
Lakeview, OH 43331-9235
937-843-5146

CLAM Advisory Board Members:

Dr. Robert Carlson, Co-Chair
Kent State University

Gary Comer, Jr.
Ohio State University Extension

Erik Akin
Northeast Ohio Four County Regional Planning & Development Organization

John Hildreth, Co-Chair
Richland Co. Soil & Water Conservation District

Robert Mason
Hamilton County Park District

Carl Moore
OLMS Director / CLAM monitor

Dana Oleskiewicz
Ohio State University Extension/ OLMS Treasurer

John Reinhard
CLAM monitor

Mark Swiger
OLMS Secretary / Muskingum Watershed Conservancy District

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CLAM Regions

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Safety First

Your personal safety is our (and should be your) primary concern. Be sure to follow all boat safety rules when taking CLAM *readings. Some definite rules to follow include:*

Do not go onto the lake if your safety would be at risk.

Do not go onto the lake if it is raining or if the weather even suggests that it might rain. **Lightening**, of course, is the primary reason for not going out, but also the possibility of **high winds**, **waves** and **limited visibility** are safety considerations. Remember that you should be taking Secchi readings on clear or partly cloudy days only; clouds may produce erroneous readings. Get off the lake immediately if there is thunder or lightning.

Do not take readings if heavy boat traffic or lake users (water skiers or jet skis) could put your safety at risk.

The Coast Guard requests that you wear your life jacket at all times. Even if you can swim, remember that you are required to wear a life jacket. You will be leaning over the edge and there is always the possibility that you will fall overboard.

Always anchor your boat. You need to do so to get good readings. And, if you happen to fall out, your boat won't leave you out there alone.

Be careful about the stability of your boat. If possible, don't use a canoe or flat-bottomed boat because they are unstable and prone to tipping. If you use one of these boat types, keep your center of gravity well within the boat; don't lean too far out to see the Secchi disk.

Take along a friend. Use the buddy system so that if something happens to you, there will be someone else who can help.

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Data Collection Method

Introduction

One of the goals of the CLAM program is to train the monitors to do basic lake quality monitoring. Two of the most common measurements taken are the Secchi disk depth and water temperature.

With this information, we can start to compile a computerized record of the lake, allowing us to document the condition of the lake over time. This helps us to determine what management plans, if any, should be implemented and if they are working. Even if your lake does not have a pollution problem, it is a good idea to have background information on record to alert you to any changes in the lake condition.

Sampling Sites

Site Selection

When you are selecting the location of a sampling site or sites, it is recommended that you have a map available that shows the different depths of the lake. The first sample site should be at the deepest part of the lake and can be easily located by referring to your map. If you cannot obtain a map of the lake, the deepest part of a reservoir will usually be near the dam or if it is a pond, near the spillway.

The second and third sites are optional and are not necessary for smaller lakes and ponds. If you would like to collect data at additional sample sites for the larger lakes and reservoirs, you are encouraged to do so. These additional sites could be located near the headwaters, the center of the lake, in large coves, or other branches of the lake. If two people monitor the same lake, each monitor can sample a different site or be an alternate in the event that someone is unable to sample at their site at any given time.

Finding and Marking Your Site

The first time you are out on the lake, use a map to help you locate the sampling site. Once you have located the site, look for several landmarks you can use to help you find the site the next time. It is important that you use the same site on each monitoring trip. Try to locate at least three different landmarks and write them down on the back of the data sheet. Better yet, draw a map that contains the landmarks. This will help you remember the landmarks and, if you are going to miss a sampling date, a CLAM-trained alternate can use them to find the site(s).

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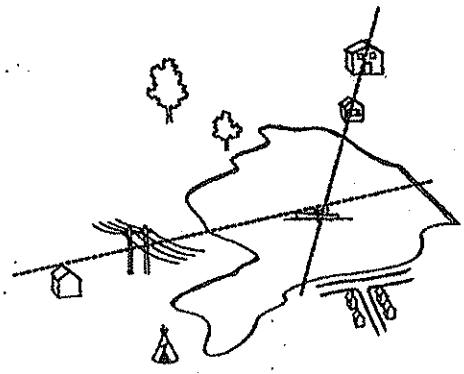
This method of using landmarks to locate a position is called **triangulation**. It is important that the Secchi depth readings be taken in the same general area. Using triangulation will aid you in locating the same sampling site each time you collect data.



The lake monitor in this illustration is triangulating his position by lining up the tops of two houses in one direction with the line-up of the house and power poles in the other. When all four objects are in line, the monitor is over the sampling site.

If you are collecting data on ponds or smaller lakes, you may want to use a marker buoy to mark you sampling site so you can always return to the same spot. If you do not have a buoy, you can easily make one using an old plastic milk carton filled with Styrofoam beads anchored to some kind of weight. Buoys are not recommended for public lakes or reservoirs, since the buoy may interfere with boating or other recreational activities.

The Equipment

Secchi Disk

Water transparency is one of the easiest measurements to make and can provide valuable data about the lake. The Secchi disk is a simple scientific instrument used to measure water transparency. The Secchi disk is eight inches in diameter and has alternating black and white quadrants. The disk is attached to a non-stretchable rope so that it can be suspended in the water column. It is named after *Pietro Angelo Secchi*, a Jesuit astronomer who used the disk to measure the transparency of the Mediterranean in 1865. The operation of the Secchi disk is simple: you just lower the disk until the disk disappears. The depth of disappearance, measured with a ruler in inches, is called the Secchi depth and is an indicator of the transparency of the water. It can provide a rough estimate of light penetration in the water column. Such as, the greater the Secchi depth reading, the water is documented as more clear.

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This is important for a number of reasons. For example, as a general rule, aquatic plants can penetrate to a depth of 2 times the Secchi depth. If the Secchi depth was 5 feet, then sufficient light for algal or rooted plant growth can penetrate to a depth of 10 feet (5 feet x 2 = 10).

The Secchi disk depth can be affected by dissolved color in the water, algae. or suspended sediment. *Dissolved water color* comes from the decay of plant material in the watershed and the lake itself. Small lakes surrounded by a forested watershed or small bogs may have water deeply stained and have a diminished transparency. Second, the microscopic plants called *algae* are an important part of the food web in a lake. At high densities, algae will reduce the Secchi depth.

Finally, *suspended sediment* is the largest water pollutant by volume in the United States. Sediment can be brought into the lake from a variety of sources and, depending on the type of lake, can easily be resuspended in the water column. In a shallow lake, winds can mix the water causing the sediment to be resuspended off the lake bottom. Rough fish such as carp and bullheads will often stir up sediment while searching for food. When sediment is suspended in the water, it gives the water a muddy or cloudy appearance and reduces the water transparency

Water Color Chart

When CLAM receives your Secchi depth data, we know what the water transparency is, but we don't know whether the transparency was affected by dissolved color, algae, or suspended sediment. The color of the water has been found to help us decide what type of substance may be affecting transparency.

If the lake has a small Secchi depth and a green color, we know that algae were reducing the water transparency. If the lake is a muddy brown color, then sediment was reducing the water clarity. Finally, if the lake has a relatively large transparency but has a brown water color, then the lake may be influenced by dissolved color in the water.

Thermometer

The thermometer supplied will be used to take the air temperature and the water temperature. Water is collected one foot below the surface in a container and the temperature stabilized before taking the temperature reading.

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On Shore Preparations

When to Monitor

The Secchi depth data should be collected during the **first and third weeks of each month, May through October,** between the hours of **10:00 a.m. and 4:00 p.m.** Try to allow a two-week period (or at least ten days) between sampling dates to get an overall view of conditions during the month. Attempt to monitor on bright, calm days, however, this may not always be possible.

Equipment Check

Before leaving home, check to make sure you have all the equipment and the Data Reporting Forms with you. Go through the checklist in your manual and make sure you have all the equipment in your vehicle so that nothing is left behind.

Data Sheet Entries

Some of the data can be recorded before you leave the dock or while you are waiting in line at the boat ramp. Please try to fill in as much as possible before leaving the shore, except for the specific site data (Secchi depth, water temperature, water depth, etc.).

Monitor Name: Put the name of the CLAM-trained monitor who will take the Secchi readings. Do not put the names of any non-CLAM guests on the form. You will speed the data entry process if you enter your name as they are listed on the mailings coming from CLAM to you.

Lake Name: Please enter the full name of the lake, pond or reservoir.

County: In what county is your lake or site? Some lakes straddle several counties, so put the name of the county where your site(s) is located.

Date: Write the complete date (i.e. May 4, 1998). Do not use only numbers (5/4/98) because of potential confusion as to whether the month or day comes first.

Time of Observations: Please put the time you arrive at your site. Do not forget to mark AM or PM, even though it may seem obvious to you.

Cloud Cover: Record an X in the description of clouds present when you reach your first sampling site. The amount of cloud cover can affect your readings, so try to visit your site on clear or partly cloudy days. Under **no circumstances** should you try to get a reading when it is raining. Remember, your safety is more important than a Secchi reading. If you are on the lake and it starts to thunder, get off the lake immediately!

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Rainfall: Put an X where appropriate if rain occurred on the monitoring date (today) or one to three days prior. You may want to start recording rainfall the three days before the monitoring day so you do not have to look it up later. We use this data to see if rainfall and subsequent runoff may affect Secchi readings. Also indicate whether the rain or describe another factor that has made the site unusually turbid.

Wind Direction: Mark the direction the wind is blowing.

Management Practices: Please note if anything has been done to manage the algae, weeds, sediments, etc. since your last visit. When was it done? Practices might include the application of copper sulfate, weed harvesting, grass carp, or dredging.

Water Quality: While *still on shore*, go to the bottom half of the form and mark the description that best describes your *opinion* today on how suitable the lake water is for each recreation and aesthetic enjoyment.

Excellent, No Problems - beautiful, could not be any nicer
Minor Problems - very minor problems, excellent for this purpose
Slight Use Impairment - use for this purpose is slightly impaired
Substantial Impairment - desire to use the lake for this purpose is reduced
Use Totally Impaired - enjoyment of the lake for this purpose is nearly impossible

The term "overall water quality" should include your general impression of the quality of the lake today (or in the past two weeks). Do not include factors such as weather.

Next mark what you believe to be the biggest problems of your lake (site) today (or in the past two weeks). Please check all that apply. Use the classification above to estimate the degree of impairment caused by any of these factors. If other factors seem to be impairing the use of the lake, please note them as well.

Number of People/Boats: We are trying to estimate the number of people using our lakes. Please mark the number of people or boats involved in the various categories.

None - no one present on the lake
Light - a few people on the lake
Moderate - a typical weekend crowd
Heavy - a very large crowd of people

Other Information: Write any other information that you think might be useful in our understanding of your lake (i.e. fish kills, development in the watershed, etc.).

Communications to CLAM: Need more Data Reporting Forms? Your thermometer broke? Have any suggestions or questions? Please write in your comments here or call a CLAM staff member (listed on page 2) for a more prompt response. Do not hesitate to be critical. CLAM can only improve with your help.

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On the Lake

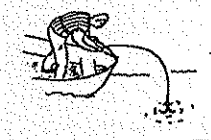
Sampling Sites

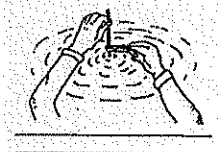
Using the techniques described above (triangulation or buoy marking), go to your designated site.

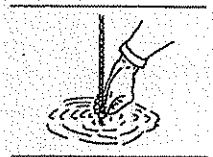
Anchoring at the Site

Anchor the boat to prevent drifting. Be careful not to disturb the sediments on the bottom when anchoring since this could cloud the water and interfere with the Secchi disk reading, especially in shallow lakes.

Taking the Secchi Disk Depth







1. Once you are properly anchored at the sampling site, go to the *shady side* of the boat and if you are wearing sunglasses, remove them.

2. Lower the Secchi disk straight down into the water until the disk just disappears from sight. Mark the rope at the water level with a clothespin.

3. Lower the disk about two feet until you can no longer see the disk. Slowly raise the disk up until it reappears. Mark the rope at the water level with your fingers or with the other clothespin.

4. To find the Secchi depth, grasp both clothespins in one hand and find the center of the loop of rope. Move one clothespin to that point and remove the other. This point is one-half the distance between the point of disappearance of the disk and the point where it reappeared. Measure the distance from this point to the Secchi disk.

5. Record the Secchi depth on your data card to the nearest inch.

Diagrams courtesy of the Wisconsin Department of Natural Resources self-help Lake Monitoring Handbook, 1986.

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Estimating Water Color

1. Lower the Secchi disk to one-half the Secchi disk depth.

2. Describe the color by comparing the water color against the white quadrants of the Secchi disk with the color strip. Record the number of your best color estimate.

Taking the Water Temperature

1. Lower the container one foot below the water level and fill it with water.

2. Bring the container out of the water and insert the thermometer into the container. Wait about one minute and read the temperature without removing it from the water.

3. Record the temperature on the data sheet.

Measuring Water Depth

After taking your Secchi depth and color measurement, use the Secchi disk to find the water depth. This depth should be about the same each time you sample. If the depth is different (over two feet), check your landmarks to make sure you have triangulated to the proper location. Remember that heavy rains or drawdown can change the lake level and affect the water depth at the sampling site.

Lower the Secchi disk to the bottom and read the water depth from the marks on the line. Record this distance to the nearest half foot. *Please do not measure water depth before you take your Secchi reading; the disk will disturb the bottom mud and ruin your reading.*

Completing the Data Reporting Form

1. Record the type of the waves at the site your best choice of 1 – 4 **(NOT INCHES or feet)**.

2. Some reservoirs have a lake level or staff gauge located at the dam. If there is a gauge at your lake, record the lake level to the nearest hundredth of a foot (two decimal places). Even a small change in water level can mean a large change in the water volume of the lake.

3. Record any miscellaneous information you may consider important.

4. Clean off the Secchi disk and the other equipment. Store them in a safe place.

5. Check over the data form before you leave the site to make sure everything has been completed. Copy the information onto the Summary Form for your records. Send the forms in at the end of July and October.

Sample Location Information Statement

Location Availability

The Project Manager will make available to the director the following information for each site location:

- Water body name
- Watershed name
- Sampling location by latitude and longitude
- Sample location river mile where possible or practical
- General location information
- Closest crossroads
- U.S. Geological Survey 7.5 minute quadrangle map name

The purpose for collecting samples in this project is to determine water quality trends over time. Multiple sample locations are used in order to better establish relative environmental impacts throughout the watershed, characterizing the relative effects from varying land areas and land uses on the quality of the watershed, both upstream and downstream. Through the utilization of watershed improvement projects we hope to be able to measure water quality improvements.

Signature: _____ Date: _____

Digital Photo Statement

Digital Photo Catalog

All digital photos taken during QDC site monitoring will be submitted with their data. These can be accessed through SWIMS and the OEPA. Digital photos will also be available at the Mercer County Soil and Water Conservation District. These pictures will include the specific sampling site and an upstream and downstream shot including the riparian zone and surrounding general land use.

Signature: _____ Date: _____

Voucher Statement

Specimen Provision

If requested by the Director , the Project Manager will provide ten voucher specimens of each identified taxonomic family of macroinvertebrates collected from different sampling locations. These specimens will be kept for at least ten years at the Mercer County Soil and Water Conservation District or the current watershed coordinator's office.

Signature: _____ Date: _____

Trespassing Certification

QDC's Certification

Each QDC must certify that he or she has not been convicted of or pleaded guilty to a violation of section 2911.21 of the Revised Code (criminal trespass) or a substantially similar municipal ordinance within the previous five years.

I have not been convicted of or plead guilty to a violation of section 2911.21 of the Revised Code (criminal trespass) or substantially similar municipal ordinance within the previous five years.

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Signature: ______________________________ Date: ____________

Field Sheets

MIAMI COUNTY PARK DISTRICT

NUMBER OF SPECIES

_____ X 3 = _____

NUMBER OF SPECIES

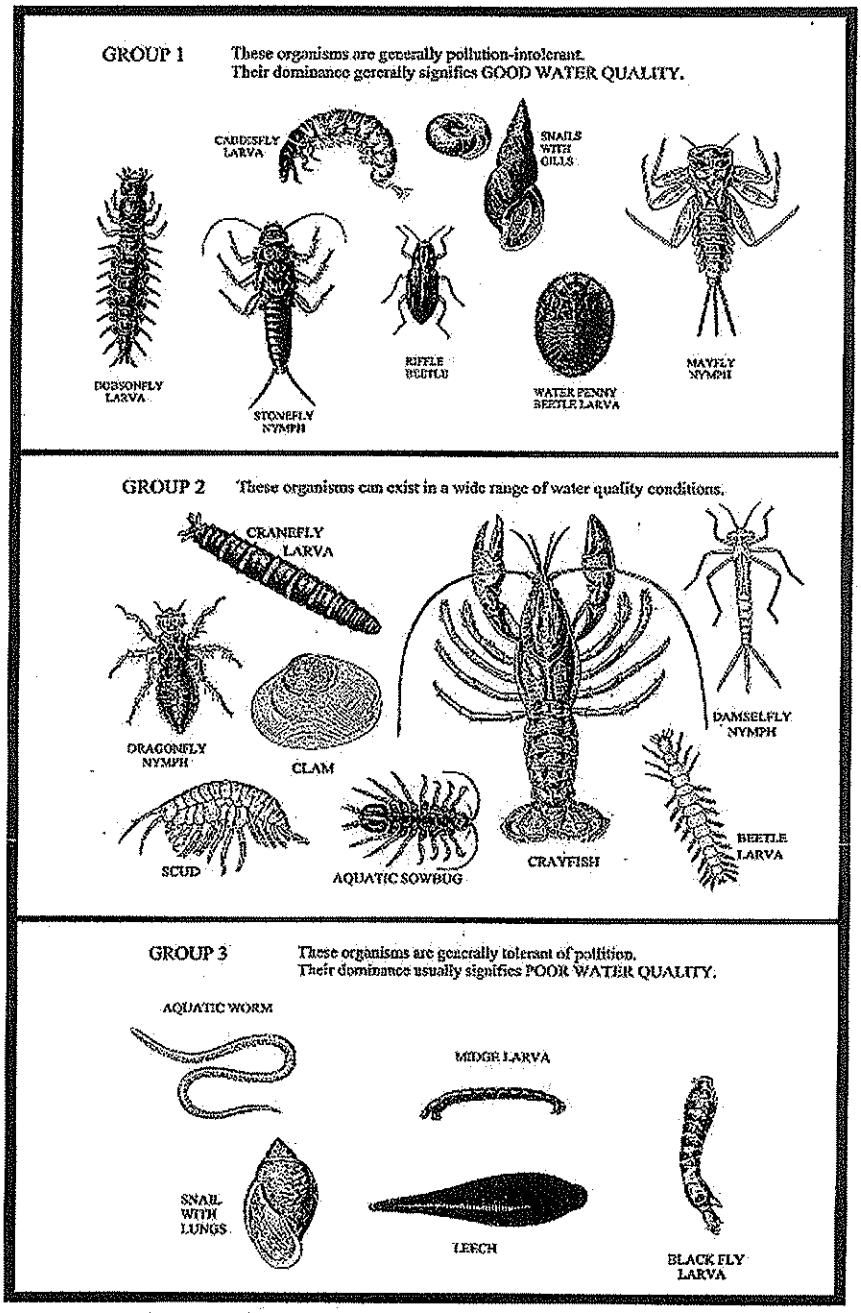
_____ X 2 = _____

NUMBER OF SPECIES

_____ X 1 = _____

MACROINVERTEBRATE TAXA GROUPS

Macroinvertebrate grouping for calculating the Pollution Tolerance Index.



STREAM QUALITY ASSMENT

TOTAL POINTS _____

MULATIVE INDEX - VALUE

EXCELLENT (> 22) ☐ GOOD (17 - 22) ☐

FAIR (11 - 16) ☐ POOR (< 11) ☐

Site: _____

QDC: _____ Safety Officer: _____

Date:_____ Time: _____ Observers: _____

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

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

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]

Check ONE (Or 2 & average)

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]	
☐ LACUSTURINE [0]		☐ NORMAL [0]	Maximum 20
☐ 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.

____ UNDERCUT BANKS [1]	____ POOLS > 70cm [2]	____ OXBOWS, BACKWATERS [1]
____ OVERHANGING VEGETATION [1]	____ ROOTWADS [1]	____ AQUATIC MACROPHYTES [1]
____ SHALLOWS (IN SLOW WATER) [1]	____ BOULDERS [1]	____ LOGS OR WOODY DEBRIS [1]
____ ROOTMATS [1]		

AMOUNT Check ONE (Or 2 & average)

☐ EXTENSIVE >75% [11] ☐ MODERATE 25-75% [7] ☐ SPARSE 5-<25% [3] ☐ 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)	(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!)

☐ > 1m [6] ☐ 0.7-<1m [4] ☐ 0.4-<0.7m [2] ☐ 0.2-<0.4m [1] ☐ < 0.2m [0]

CHANNEL WIDTH Check ONE (Or 2 & average)

☐ POOL WIDTH > RIFFLE WIDTH [2] ☐ POOL WIDTH = RIFFLE WIDTH [1] ☐ POOL WIDTH < RIFFLE WIDTH [0]

CURRENT VELOCITY Check ALL that apply

☐ TORRENTIAL [-1] ☐ SLOW [1] ☐ VERY FAST [1] ☐ INTERSTITIAL [-1] ☐ FAST [1] ☐ INTERMITTENT [-2] ☐ MODERATE [1] ☐ EDDIES [1]

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 ____

A] SAMPLED REACH

Check ALL that apply

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

B] AESTHETICS

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

C] RECREATION

AREA DEPTH

POOL: ☐ >100ft² ☐ >3ft

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:

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

Stream Drawing:

TO IMPROVE THE QUALITY OF LIFE

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

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)

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:_____

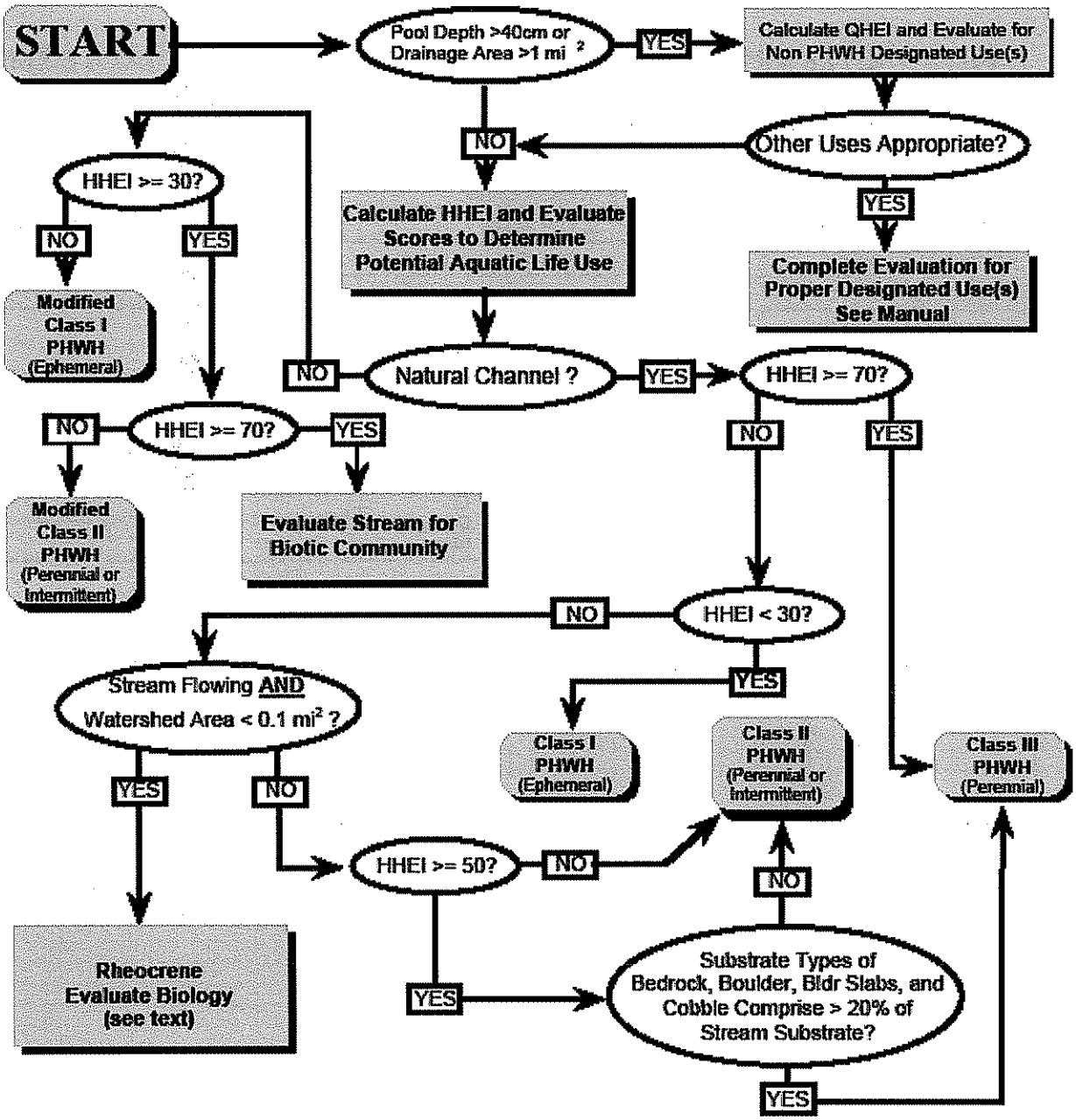
_____

_____

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 ➡



Site GPS Points:

Site: _____

_____ degrees _____ minutes _____seconds

Map Site:

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**	**Has there been a heavy rain in the last 7 days?** ☐ Yes ☐ No
	☐	storm (heavy rain)	☐	
	☐	rain (steady rain)	☐	**Air Temperature**_____° C
	☐	showers (intermittent)	☐	
	____%☐	%cloud cover	☐____%	**Other**_____
	☐	clear/sunny	☐	
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^2

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)				

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	Sialidae	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	Simulidae	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)

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 5 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, 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 _____

Site Locations

SITE NUMBER	SITE NAME	LAT DE-GREE	LAT MIN	LAT SEC	LONG DEGREE	LONG MIN	LONG SEC	ROAD TO NORTH	ROAD TO EAST	ROAD TO SOUTH	ROAD TO WEST	ACCESS POINT	MONITOR AS OF X/X/20XX
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
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25													

Parameters

Parameter	Technique	Level	Credible Data	Hach Company	Hoosier Riverwatch	Rapid Bioassessment Protocols	Standard Methods		Other
			(Complete references provided at end of table)						
						Method	Chapter	Chapter	Method	-
Macroinvertebrate Pollution Tolerance Index	Kick Seine Net	1,2				5	7			
	Dip Net	1,2				5	7			
	Combination Sampling	1				5				
Water Temperature	Liquid-in-glass Thermometer	1,2						2550 B		
Air Temperature	Liquid-in-glass Thermometer	1,2						2550 B		
pH Level	Digital Pocket Meter	1,2		8156						
Dissolved Oxygen	Drop Count Titration/Modified Winkler	1,2		8332						
Turbidity	Secchi Disk	1,2								See endnote [1]
	Ohio Sediment Stick (estimates TSS)	1,2								See endnote [2]
Stream Flow	Estimated Flow	1								See endnote [2]
Phosphorous Level	Orthophosphate (low, mid, high range)	1,2		8048						
	Meta (Poly) Phosphate	1,2		8048						
	Organic Phosphate	1,2		8190						
	Total Phosphate	1,2		8190						
Nitrogen Level	Nitrate: High Range	1,2		8039						
	Nitrate: Mid-Range	1,2		8171						
	Nitrate: Low Range	1,2		8192						
	Ammonia-Nitrogen	1,2		10023						
Chlorine Level	DPD	1,2		8210						
QHEI	Qualitative Habitat Evaluation Index	2,3								See endnote [3]
HHEI	Headwater Habitat Evaluation Index	2,3								See endnote [4]

Parameter	Technique	Level	Credible Data	Hach Company	Hoosier Riverwatch	Rapid Bioassessment Protocols	Standard Methods	Other
			(Complete references provided at end of table)					
			Method	Chapter	Chapter	Method	-	
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	Hoosier Riverwatch. Spring 2008. *Volunteer Stream Monitoring Training Manual, Eighth Edition*. Indianapolis, Indiana.							
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	2. Lake Soil and Water Conservation District. 2007. *Fieldsheet for the Ohio Sediment Stick*. Painesville, Ohio.							
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