Quality Assurance Project Plan
For the
Huron River Watershed Council
River & Stream Monitoring Study of the
Ecological Condition of the Creek

Version 2.0, July 2008

SECTION A: QAPP Organization and Project Description

This QAPP covers monitoring benthic macroinvertebrate communities, extreme summer temperatures, conductivity and the in-stream & riparian habitat, which combine to measure the ecological condition of the creek. HRWC has been monitoring all of these parameters (following similar methods with minor changes over time) since 1992.

A1. Title and Approval Sheet

(Attached as a separate document)

A2. Table of Contents

QUALITY ASSURANCE PROJECT PLAN **1**

SECTION A: QAPP ORGANIZATION AND PROJECT DESCRIPTION **1**
A1. Title and Approval Sheet *1*
A2. Table of Contents *1*
A3. Distribution List *2*
A4. Project Organization *2*
A5. Problem Definition/Background *3*
A6. Project Description - Overview *3*
A7. Data Quality Objectives *4*
Habitat Assessment: 4
Accuracy & Precision: 4
Bias 5
Completeness 5
Representativeness 5
Comparability 5
A8. Special Training/Certifications *6*
Training for Macroinvertebrate Monitoring 6
Training for Habitat Study: 7
Personnel and documentation: 7
SECTION B: MEASUREMENT/DATA ACQUISITION 7
B1. Study Design and Methods *7*
Study design 7
Monitoring Task Schedule 8
Locating and Identifying Monitoring Sites 8
Monitoring Benthic Macroinvertebrates 9
Measuring Habitat Quality 10
Measuring Conductivity 10
Measuring Temperature Extremes 11
Records and Custody 11
B2. Instrument/Equipment Testing, Inspection, and Maintenance. *12*

B3. Inspection/Acceptance for Supplies and Consumables *12*
B4. Non-direct Measurements *12*
B5. Data Management *12*
SECTION C: DATA VALIDATION AND REPORTING 13
C1. Assessments and Response Actions *13*
C2. Data review, validation, and verification *13*
C3. Reconciliation of data with DQO's *13*
C4. Data reporting *13*
APPENDICES 13

A3. Distribution List

NAME:	ORGANIZATION: for each individual who will receive the QAPP.
Dr. Steen	MiCorps & Huron River Watershed Council
Dr. Martin	MiCorps & Huron River Watershed Council
Laura Rubin	Huron River Watershed Council
Ric Lawson	MiCorps & Huron River Watershed Council

A4. Project Organization

Key Personnel	Role	Affiliation	Contact: email	Phone
Paul Steen	Project Manager	HRWC: Watershed Ecologist	psteen@hrwc.org	(734) 769-5123 X14
	Program Expert			
	QA Manager			
Joan Martin	Project Staff	HRWC: Director of Adopt Program	jmartin@hrwc.org	(734) 769-5123 X11
Laura Rubin	Executive Director	HRWC	lrubin@hrwc.org	(734) 769-5123 x12
Mike Wiley	Scientific Advisor	University of Michigan: Professor	mjwiley@umich.edu	(734) 764-6286

Dr. Steen reports to MiCorps, Dr. Martin and Dr. Steen work together.

Management Responsibilities

1. Paul Steen, Ph.D: Watershed Ecologist, Project Manager. As co-director of the HRWC Adopt-A-Stream program, Dr. Steen trains volunteers to monitor stream biota, habitat, and physical and chemical parameters throughout the watershed, and is responsible for quality assurance, analysis and interpretation of these data for volunteers, stakeholders, and staff. Dr. Steen earned a M.S. and Ph.D. in Aquatic Ecology from the University of Michigan, focusing on watershed and fish ecology. Dr. Steen is the individual responsible for maintaining the official, approved QA Program plan, and will be responsible for initiating, developing, and implementing.
2. Joan Martin, Ph. D: Adopt-A-Stream Program Director and Volunteer Manager. Dr. Martin created and has directed the Adopt-A-Stream Program since 1992. Previous to that, she was a research scientist studying insect physiology at the University of Michigan. Dr. Martin focuses on developing stewardship and involving watershed residents in learning about the river system through monitoring and other experiences. She adapts scientifically sound research practices to procedures that are accessible to the general public.
3. Laura Rubin, M.S., M.B.A: Executive Director. Laura provides business administration and program implementation. She has overseen numerous grant projects involving public and private funding from the MDEQ, U.S. EPA, and private foundations. Dr. Steen and Dr. Martin report to Ms. Rubin.

4. M. J. Wiley, Ph. D: Professor of Natural Resources at University of Michigan, Project Advisor. Dr. Wiley has been the principal investigator on several large research grants dealing with river ecosystem management. Issues addressed include instream flow regulation, land use practices, and controls on large-scale patterns of biological productivity. He has been advising the Adopt-A-Stream Program of volunteer monitoring since its conception in 1992.

A5. Problem Definition/Background

The Huron River Watershed is home to over 500,000 people and several threatened and endangered species of plants and animals. It covers a 900-square mile area that includes parts of seven counties in southeastern Michigan, primarily Livingston, Oakland, Washtenaw, and Wayne Counties. The River provides a bounty of drinking water and is one of the best warm water fisheries in the State. Furthermore, it contains the only state-designated Scenic River Zone in southeast Michigan.

Increasingly, however, the ecological health of the River is threatened, and many parts of the River and its tributaries fail to meet water quality standards or are unsafe for swimming and fishing. Wetlands, forests and other open spaces are vanishing as growth continues at a rapid pace. The Huron River faces threats not only from the way land is developed but from the ways people pollute through their everyday activities. Each community in the watershed must become committed to protect their local fresh water in order to prevent the river and its tributary streams from becoming degraded.

Project Goals and Objectives

The primary goals of the Adopt-A-Stream Program of volunteer monitoring are to provide reliable data about the conditions of the entire river system, educate the watershed residents about what the river needs from them and engage residents and communities in actions to protect the river system. The primary actions we envision taking based on monitoring results are to report the trends and conditions of the stream sections studied. As clarified in other sections of this document, we do not present any results on the ecological conditions until we have three years of benthic community data plus a habitat assessment and one season of temperature measurements. In the event that an extreme change in benthic macroinvertebrates and habitat is observed (such as oil in the sediment and an impoverished community), we will notify the appropriate authorities about the unverified results immediately and stay in contact with them as they investigate the situation. Our goal is to assist in removing causes of stream deterioration.

A6. Project Description - Overview

The purpose of monitoring the ecological conditions of the Huron River system is to assess trends of changes that occur in various parameters throughout the system in order to recommend improvements to agencies, communities and residents and, in cases of sudden or excessive change, to alert responsible agencies as rapidly as possible.

Project success will be measured by the data collection about the conditions of the entire river system and protective measures taken by communities and individuals.

We will identify the ecological conditions at 73 or more sites in the river and its tributary streams. (A map of all of the current sites in the watershed is appended.) Our measure of ecological condition is based on an assessment model (created by Dr. Mike Wiley at the University of Michigan) which compares each creek site to our expectations for a healthy site that has its characteristics (such as drainage area and stream temperature). The ecological condition score for each site is determined by a combination of biological and physical data that our volunteers collect for that site. The biological data include the diversity of insect families[i], EPT families[ii], sensitive families[iii] and winter stoneflies[iv]. The physical data encompass water conductivity[v] and habitat assessment information including stream bank characteristics, channel width and depth, and stream bed materials (such as sand or gravel).

Volunteer stewards work in small teams led by trained leaders to monitor the macroinvertebrate populations and the physical characteristics of all sites under study in the Huron River system at least once/year in order to assess the conditions of the sites, and to learn about the River system. On a single day in April and September of each year, the stewards collect a sample of the benthic macroinvertebrate population at each of 30 - 50 stream sites. In January, volunteers search for winter stoneflies at a similar number of sites. During the spring, fall, and winter monitoring, stewards collect a sample of stream water at each site to measure conductivity. Invertebrate samples are stored in alcohol, and aquatic biologists identify the macroinvertebrates in the samples. Volunteers also measure the weekly maximum and minimum in-stream temperatures in July and August during one year and the habitat conditions of each site every four or five years. Experienced volunteers are trained in collecting and data-recording techniques one or two weeks prior to the spring and fall monitoring events.

Volunteers are recruited during the 6 weeks preceding each monitoring event, using press releases to local newspapers and radio as well as email lists. We also find new volunteers when we talk to community groups about HRWC and its Adopt-A-Stream Program. We value the work of our volunteers and express that by thanking them personally, providing them with the results of their work and appreciating them publicly in our publications. Our volunteer data base is maintained by staff prior to and just after each monitoring activity.

Monitoring reports that describe the current stream conditions and any statistically significant trends are available on www.hrwc.org/adopt and will be updated within three months of each monitoring event.

A7. Data Quality Objectives

Habitat Assessment:

There is not a lot of Quality Control for quantitative measures in the habitat assessment since much of the information generated is narrative and subjective. Volunteers receive a three-hour training, with classroom and field components. All data are reviewed by program staff, who follow up immediately with volunteers if anything unusual is recorded on the data sheets. All data are entered and interpreted by program staff with the aide of the notes, photographs, and sketches that the volunteers include.

We don’t base any evaluation about habitat on a single data point. Our metrics are composites of many different measurements and observations made by volunteers and different teams complete subsequent studies of each site.

Macroinvertebrate Monitoring:

Accuracy & Precision:

The following techniques will be reviewed during training and in periodic retraining of team leaders: [1] collecting style (must be thorough and vigorous), [2] habitat diversity (must include all habitats present and be thorough in each one), which will be recorded on the field data sheet, and [3] the transfer of collected macroinvertebrates from the net to the sample jars (thoroughness is critical).

Since there is inherent variability in accessing the less common taxa in any stream site and program resources do not allow program managers to perform independent (duplicate) collections of the sampling sites, our goal for quality assurance is conservative. A given site’s diversity measure across macroinvertebrate taxa is noted as “preliminary” until three spring sampling events and three fall sampling events have been completed. At least two of these six measures will be collected by different volunteer teams. The resulting measures of Total Taxa for each site will be compared to the composite (median) results and each should have a relative percent difference of less than 40%.

All stream data records will include the personnel of the monitoring team and the number of each type of habitat sampled. Dr. Steen will verify and correct all macroinvertebrate identifications made by the volunteer experts.

Sample results that exceed these standards will be noted as “outliers” and examined to determine if the results are likely due to sampling error or a true environmental variation. If sampling error is determined, the data point shall be removed from the data record. Volunteer teams that generate more than one outlier will be observed by Dr. Steen at the next sampling event and be considered for retraining.

Bias

Sites will be sampled by different team leaders a minimum of once every three years in each season (two events among six sampling events, if conducted twice per year) to examine the effects of bias in individual collection styles. An RPD between the new measure and the mean of past measures should be less than 40%. Sites not meeting this DQO will be evaluated as above.

Completeness

Following a QA review of all collected and analyzed data, data completeness will be assessed by dividing the number of measurements judged valid by the number of total measurements performed. The data quality objective for completeness for each parameter for each sampling event is 90%. If the program does not meet this standard, Dr. Steen will consult with staff to determine the main causes of data invalidation and develop a course of action to improve the completeness of future sampling events.

Representativeness

Study sites are selected to represent the full variety of stream habitat types available locally, emphasizing the inclusion of riffle habitat. All available habitats within the study site will be sampled and documented to ensure a thorough sampling of all of the organisms inhabiting the site. Resulting data from the monitoring program will be used to represent the ecological conditions of the contributing subwatershed.

Comparability

To ensure data comparability, all volunteers follow the same sampling methods and use the same units of reporting. To the extent possible, the monitoring of benthic communities at all study sites is completed on a single day.

For each sampling event that is not completed on the designated day, benthic monitoring by volunteers will be completed within the same two week period. If the issue concerning inaccessibility is continued beyond the extended dates, then no monitoring data will be collected during that time and there could be a gap in the data.

Our protocol was designed by professional aquatic ecologists and is similar to the collecting protocol established by the State biologists (MDEQ). The primary differences between our protocol and that of the State are: [1] we do not select a subset of creatures randomly from the collected sample; [2] we collect fewer than 300 creatures (closer to 100); and [3] we do not identify our collection at the study site. While our population sample is sometimes affected by the bias of the people who are collecting creatures out of the sample pans, we do multiple collections (over three years) to assess a site, allowing a variety of people to add to the information. We conduct a very reliable identification of the collected sample in a laboratory setting with aquatic entomologists doing the identifications, and should any questions arise, we can reexamine the stored collections.

Our performance was compared with that of an aquatic entomologist, by that entomologist (Catherine Riseng, Fluvial Ecosystems paper, Univ. of MI, 1995). Five of our sites in two streams (one urban and one rural) were thoroughly sampled by her for one hour each, one month after our collection, to compare our results with hers. She concluded that the collections were mostly similar, especially for the parameters that we use in site analysis. She did, however, find a different number of families at each site. She compared her collections to an average of our three years of data. She found two and four more families than we did (each in two locations), while in one location we found five more families than did she. A Paired T-test showed that this difference was not statistically significant.

We shall continue to learn from the professionals whenever we can arrange the opportunity.

A8. Special Training/Certifications

The volunteer group leaders are trained for each activity and lead the teams of volunteers when monitoring the macroinvertebrate populations or measuring the habitat quality of a site.

Training for Macroinvertebrate Monitoring

Selected volunteers will act as leaders of the benthic macroinvertebrate monitoring teams or the instream habitat assessment. Team leaders will learn their responsibilities in a half-day training session. Training will include monitoring methodology, proper field data entry, monitoring procedures, stream safety and an introduction to benthic macroinvertebrates.

Each benthic team has a trained Collector and a data recorder. Most of the data recorders are trained to be a team Leader. All monitoring team volunteers receive a description of the team roles, which engenders understanding and respect for the knowledge of trained team members.

The Collector is the only person that enters the water (unless there is an Assistant to carry trays or a Collector-in-Training). They are responsible for collecting a water sample for conductivity measurement, collecting macroinvertebrates from all of the habitats, and bringing the trays containing macroinvertebrate to the rest of the team to sort through.

Collector training occurs primarily in the creek to allow volunteers to learn and practice the methods of collecting samples from all habitat types. They are then paired with an experienced collector for their first team collecting experience. Training sessions are offered about two weeks prior to the spring and fall collections. In addition, collectors and leaders review the methods in the morning just prior to collecting, and the Field Data Sheet includes sampling categories and questions that guide the collector when they are in the stream.

The Streamside Leader instructs the team and is responsible for filling out the data sheets, labeling the jars, helping people learn about the study and how to pick the macroinvertebrates and reminding the Collector to cover all available habitats. They are asked to be sure to do the following tasks. This role requires one hour of training.
1. Tell people about the study before there is too much to do.
2. Ensure that the Pickers are doing a thorough job. Show them how a little water can encourage the bugs to move. Encourage them to look long enough to find the slow movers and tiny creatures. Have people search the trays that another team member has finished searching.
3. Fill in every blank on the data sheet, including the boxes that show the number of samples in each habitat type.

New volunteers typically start out as Pickers. This job does not require getting into the stream and is a good way to get introduced to monitoring and the interesting creatures that live in the stream. No training is required to be a Picker. Pickers are responsible for sorting through the samples collected by the Collector, picking out the macroinvertebrates from the rocks and leaves and putting them in a collection jar. The challenge is to learn to see small creatures hidden in the debris or a clump of pebbles and clinging to rocks and leaves.

Certificates are presented to trained volunteers upon completion of their training. They are dated and the Collector certificates are valid for only three years following training or re-training. Retraining is done in a format that includes sharing lessons learned and some competition among the Collectors who are retraining.

Mike Alexander, aquatic biologist with the DEQ, attended our macroinvertebrate collector training in March, 1998. He appraised the training as follows, “Your training is very thorough. It is good the way you have those with more experience paired up with the less experienced. I have no improvements to suggest. You have a good system, with many checks and balances. It seems very solid.”

Training for Habitat Study:
Team leaders assessing habitat quality attend a 3-hour training session. At the Habitat Training volunteers learn how to “read a river” by examining characteristics of the stream such as the stream banks, measuring the stream widths and depths, and recording the type of material (such as sand and gravel) located along 10 transects on the stream bottom. Volunteers also learn how to make a simple map of the locations of various features, such as pools and riffles that are important homes for aquatic animals. The training begins with some illustrated classroom instruction and then the group carpools to a nearby creek to practice the measurements and discuss some of the more subjective measures of habitat quality. (See Instructions for the Habitat assessment and Habitat assessment data sheet, appended.)

Personnel and documentation:
Dr. Steen and Dr. Martin are responsible for leading the training sessions. They will watch for problems in the data in order to learn which volunteers could potentially benefit from additional training. Training is documented within a volunteer database, which lists what training sessions a volunteer has participated in.

SECTION B: Measurement/Data Acquisition

B1. Study Design and Methods

Study design

Conditions in the Huron River system will be characterized by the following measurements, realizing that our conclusions pertain most reliably to those portions of the system closest to the sites under study. The stream’s benthic macroinvertebrate community will be monitored in April and in September or October, following HRWC’s Adopt-A-Stream monitoring protocol, at new and existing Adopt-A-Stream monitoring sites. The stonefly community will be monitored in late January at as many sites as volunteers can get to on a single day. In-stream and riparian habitat will be assessed during low-flow summer conditions (July – November) following HRWC’s Adopt-A-Stream monitoring protocol at all sites, approximately once every five years.

Max/min thermometers will be used to assess weekly water temperature extremes in July and August at each site at least once. Conductivity will be measured in a water sample taken at each site at the time of (but prior to) sampling the macroinvertebrate or stonefly community.

Provisions for dealing with unexpected changes such as weather or site access:
If a site is temporarily inaccessible, such as due to prolonged high water or ice, the monitoring time for macroinvertebrates may be extended for two weeks and habitat conditions can be assessed until the middle of November. If the issue concerning inaccessibility continues beyond the extended dates, then no monitoring data will be collected during that time and there may be a gap in the data.

Monitoring Task Schedule

January: Find new volunteers and invite experienced volunteers to participate in the Stonefly Search. Check that the equipment is in good repair and sufficient numbers. Organize refreshments and a volunteer staff to assist with the event. Create small teams that include experienced and new volunteers. Remind everyone when and where to begin. Conduct the Stonefly Search.

February: Enter data about the volunteers and the stoneflies and send a brief report to the press to report that the study happened and that many local people participated. Place results on HRWC web page.

March: Begin recruitment of volunteers for the April monitoring event, including monthly publications that need 3 weeks lead time for announcements.

April: Find new volunteers and invite experienced volunteers to participate in the April River RoundUp. Check that the equipment is in good repair and sufficient numbers. Organize refreshments and a volunteer staff to assist with the event. Create small teams that include experienced and new volunteers. Remind everyone when and where to begin. Conduct the RoundUp. Organize and conduct the Bug ID Day.

May: Verify the identifications of benthic macroinvertebrates. Enter data about the volunteers and the macroinvertebrates and send a brief report to the press to report that the study happened and that many local people participated. Place results on the HRWC web page.

June: Find new volunteers and invite experienced volunteers to participate in the training for habitat study. Check that the maps and equipment are in good repair and sufficient numbers.

July: Conduct the training for habitat study, arrange people into teams and assist them to schedule their dates to complete the habitat study. Enter data about new volunteers and about new activities by experienced volunteers.

August: Begin recruitment of volunteers for the September monitoring event, including monthly publications that need 3 weeks lead time for announcements.

September: Find new volunteers and invite experienced volunteers to participate in the September River RoundUp. Check that the equipment is in good repair and sufficient numbers. Organize refreshments and a volunteer staff to assist with the event. Create small teams that include experienced and new volunteers. Remind everyone when and where to begin. Conduct the RoundUp.

October: Organize and conduct the Bug ID Day. Verify the identifications of benthic macroinvertebrates. Enter data about the volunteers and the macroinvertebrates and send a brief report to the press to report that the study happened and that many local people participated. Place results on the HRWC web page.

November: Review and interpret data, make reports and improve the maps that teams will use to locate the study sites.

December: Begin recruitment of volunteers for the Stonefly Search, including monthly publications that need 3 weeks lead time for announcements.

Locating and Identifying Monitoring Sites

Monitoring sites are placed on all major tributaries in the entire Watershed and most large tributaries have several sites. Locations are near the mouth and above major tributaries, in most cases, in an attempt to monitor the contribution from each portion of the system. Some sites have been selected in response to community interest.

Monitoring sites are identified by the name of the county, the creek and the road crossing or other distinctive landmark. Road maps and field-drawn maps showing the location of each site are provided to the collecting team. Conversations about any difficulties in finding the sites or about apparent changes in the map of the site help to alert staff to realize if a team has gone to the wrong location in the stream. Extreme conditions of weather or stream volume are noted on the field data sheet. Permission to access property is obtained at least one week prior to the designated study date.

Monitoring Benthic Macroinvertebrates

Our monitoring is intended to characterize the condition of our 900-square-mile Huron River system and to involve our residents in the study. We have designed our macroinvertebrate monitoring program so that both collection and identification are one-day group events in which anyone can participate, even young children (as long as each one is with an adult). Both events are described below and on p.11 in the Summer 2005 edition of the Volunteer Monitor at http://www.epa.gov/owow/monitoring/volunteer/newsletter/volmon17no2.pdf. (The Stonefly Search follows the same procedures except that only stoneflies are collected and no ID Day is needed.)

Benthic community and habitat assessment methods are based on the state's Procedure #51. However, rather than collect a random sample of macroinvertebrates, we attempt to collect all the different kinds of macroinvertebrates to measure diversity. Since we do not attempt to have a quantitative sample, randomness and a uniform sampling effort are not required. This allows less experienced collecting teams to take additional time in order to be thorough. The length of time spent at each site is noted on the data sheet and is usually between 45 minutes to 1 ¼ hours. Two collectors sample larger sites (over 50 feet wide), thus doubling the total sampling time, on the main stem of the Huron River.

On a single Saturday in the fall, the winter and again in the spring, volunteer teams visit many of our 73 study sites to collect macroinvertebrates. Each team visits two sites. This five-hour event, called River RoundUp, typically attracts about 110 - 180 people.

At their sites, the teams collect macroinvertebrates from stream samples provided by a trained Collector using a D-frame collecting net (500 micron mesh). The Collector samples multiple locations in all available habitats in a 300-foot stretch of stream. Everyone helps pick the macroinvertebrates out of the debris with featherweight forceps. About 100 organisms—including at least one representative of all the different kinds present in the sample—are preserved in a jar of 70% ethyl alcohol. Transfer from the net into white pans is facilitated by use of large squirt bottles to rinse out the debris and the macroinvertebrates. Plastic spoons, in which the center has been replaced with fine mesh screening are excellent for catching fast swimming macroinvertebrates.

Data sheets include reminders for the team to follow crucial procedures, such as collecting multiple samples from all habitats, showing new volunteers how to find the bugs, rechecking that all of the bugs were found in each tray, what was seen but not collected and asking for notes on what was different. Staff phone numbers are included on the data sheets to allow for questions during the field study.

Prior to leaving each site, the net is thoroughly rinsed and examined to ensure that no creatures are carried in it to the next site. Sites that have zebra mussels are either the last sites visited or are collected with a separate net.

The collections are identified in one afternoon, one or two weeks after the RoundUp. With the help of magnifying glasses, dissecting microscopes and pictures of some of the macroinvertebrates they are likely to see, volunteers sort their collection into "look-alike" groups based on whatever looks different to them. They place the groups into trays with multiple compartments individually marked with a letter code. Those who are new to this activity work at a table with experienced volunteers. Program staff members help the sorters notice subtle differences and ignore differences that are only in size. The benthic community sample is then identified to family level by trained aquatic entomologists working together with volunteers. HRWC provides two research-quality microscopes for the experts' use. Following the expert's work, the volunteers count the number of bugs in each family, record the data, and place all the bugs into a labeled jar of fresh alcohol for storage. Thus, the people who do all the work except for the actual ID need no training in macroinvertebrate identification.

Using this method, we are able to identify macroinvertebrates from over 50 samples of approximately 100 bugs each in a single afternoon. To speed things up, bugs that are especially challenging can be placed in a "mystery jar" attached to the sample jar. Later, HRWC staff member Dr. Steen identifies these "mystery bugs." He also spends 8-12 hours rechecking all the samples, focusing especially on verifying the identification of any rare or hard-to-identify organisms noted on the data sheets.

Sorting and identifying macroinvertebrates collected in this project will take place at the NEW Center at 1100 N. Main Street, Ann Arbor, Michigan. All samples will be stored in HRWC's storage shed, located in Ann Arbor. Laboratory staff includes several volunteer, qualified aquatic entomologists working under the direction of Dr. Steen.

Measuring Habitat Quality

Habitat assessments are completed on a single day. A descriptive procedure guides the team to make observations and map a 300-foot stretch of the creek and take detailed measurements over half of that area (150 feet). Photos are used to document areas of erosion and anything that the team is unsure how to characterize. When it is difficult to pick a single number, for example 60% of the banks were bare, the team is encouraged to write down a description and a range of numbers (such as 50-75% of the banks were bare). The habitat assessment includes a mixture of objective and subjective measurements, with some repetition, to assure accuracy of important information. When discrepancies occur, the team is contacted as soon as possible and issues are resolved through discussion or a staff member may visit the site to verify the information.

We have added many objective measurements to the habitat assessments, to augment the Procedure #51-based descriptive data. For instance, the team examines ten transects along which ten or more measurements per transect are made. The measurements include stream depth and the size of the substrate material at that point. At the same time, the width of the stream and the channel, the depth of the channel, and the angle of the banks are also recorded. We are particularly interested in the composition of the substrate and believe that, with well over 100 measurements, we get reliable data on the substrate composition.

Equipment for measuring the habitat quality includes a Keson® fiberglass or nylon tape measure and a wooden measuring stick, both marked in feet and tenths of feet.

Measuring Conductivity

Samples of stream water are collected in plastic jars with plastic caps right after the jar has been rinsed three times with water from the stream. Conductivity is measured in all the collection jars at one time at the end of the sampling day, with a Myron L Tech Pro meter that has been calibrated with a potassium chloride standard for 1413 uS per cm. After discarding the samples, the jars are rinsed three times with tap water and allowed to air dry before storage. Outliers detected by plotting long-term conductivity datasets may be rejected for purposes of long-term analysis.

Measuring Temperature Extremes

Volunteer stewards secure a max/min thermometer underwater at a location of moderate depth and out of direct sunlight. They record, on the same day each week, the maximum and minimum temperatures reached during each week of July and August. After each reading is taken the thermometer is reset. Volunteers use mercury (Taylor #5458) max/min thermometers that have been calibrated with ice water and at room temperature to agree with several other similar thermometers. While the data reflect extremes, data points that are significantly higher or lower than the extremes recorded in prior or later weeks are investigated by comparison with air temperature data available from various public websites. Data points that seem unreasonable with reference to weather conditions are rejected.

Records and Custody

The “streamside leader” is a trained volunteer, familiar with the procedures and datasheets, who works with the Collector to lead each monitoring team. During the benthic collections, streamside leaders record the following information at each site: [1] number and locations sampled in each habitat type, [2] answers to questions about specific techniques and about deviations from protocol. All macroinvertebrate collections are stored in 70% ethyl alcohol (replaced every few years) and kept indefinitely as vouchers. The datasheets include the name of the biologist who identified the collection. Teams assessing the habitat quality are guided by a list of procedures and an informative datasheet (appended). In addition to keeping all of the original paper datasheets, the information is stored, managed and analyzed in Microsoft Access on the HRWC server, which is backed up weekly on tapes stored in a separate building.

At the collecting site, all invertebrate sample jars receive a label written in pencil which is included in the jar. The label includes date, location, name of collector, and number of jars containing the collection from this site, which is placed inside the jar. The data sheet also states the number of jars containing the collection from this site. The team leader is responsible for labeling and securely closing the jars, and the team manager is responsible for returning all jars and all equipment. Upon return to the Program building, the collections are checked for labels, the data sheets are checked for completeness and for correct information on the number of jars containing the collection from the site, and the jars are secured together with a rubber band and site label and placed together in one box. They are stored in the central office until they are examined and counted on the day of identification (one or two weeks later).

The data sheets are used on the identification day, after which they remain on file indefinitely. At the time of identifying the sample, the sample identifier checks the data sheet and jars to ensure that all the jars, and only the jars, from that collection are present prior to emptying them into a white pan for sorting. If any specimens are separated from the pan during identification, a site label accompanies them. For identification, volunteers sort all individuals from a single jar into look-alike groups, and then are joined by an identification expert who confirms the sorting and provides identification of the taxa present. These identifications are then verified by the Program Expert. When identification of a sample is complete, the entire collection is placed in a single jar of fresh alcohol with a poly-seal cap and a printed label inside the jar and stored at the Program storage shed indefinitely. The alcohol is carefully changed in the jars every few years.

Multiple collections are taken from each habitat type present at the site, including riffle, rocks or other large objects, leaf packs, submerged vegetation or roots, and depositional areas, while wading and using a D-frame kick-net. The trained Streamside Leader will record the number of locations sampled within the monitored reach in each habitat type and note the locations sampled on a site map. The trained Collector will transfer the material from the net into white pans. The other volunteers (Pickers) will pick out samples of all different types of macroinvertebrates from the pans and place them into jars of 70% ethyl alcohol for later identification. During the collection, the Collector will provide information to the team Streamside Leader in response to questions on the data sheet that review all habitats to be sampled, the state of the creek, and any changes in methodology or unusual observations. The streamside leader will instruct and assist other team members in detecting and collecting macroinvertebrates in the sorting pans, including looking under bark and inside of constructions made of sticks or other substrates. Potential sources of variability such as weather, stream flow differences, season, and site characteristic differences will be noted for each event and discussed in the study results. There are places on the data sheet to record unusual procedures or accidents, such as losing part of the collection by spilling. The data sheet will include an explanation if a site needs to have an extended collection time or there are other variations in procedure. (See appended data sheet.)

B2. Instrument/Equipment Testing, Inspection, and Maintenance.

In the days prior to a monitoring event, Dr. Steen will check all equipment carefully. Holes in the D-frame kicknets will be identified and patched or the nets will be replaced in the case of large holes. Waders will be visually inspected for leaks and filled with a rubber sealant. We put together a bucket of equipment for each team, including pans, forceps, droppers, and jars with alcohol, and make sure all included equipment is in good condition. Conductivity meters and thermometers are also checked before use, as described in the above section. All equipment is stored in HRWC's storage shed or office located in Ann Arbor.

B3. Inspection/Acceptance for Supplies and Consumables

The only consumable used by the HRWC monitoring program is ethanol, the preservative used in the bug jars. Prior to a monitoring event, Dr. Martin will check the ethanol supply and get more from a local University if necessary.

B4. Non-direct Measurements

Not applicable.

B5. Data Management

All data are recorded on original field and laboratory paper data sheets. These data sheets are stored on site at HRWC offices indefinitely.

All data are entered into electronic form, in either Excel spreadsheets or Access databases. The electronic data are stored primarily on the HRWC server on site, on the hard drive of Dr. Steen's desktop computer on site, and both on site and off site electronic storage drives.

All benthic macroinvertebrate samples are preserved in 70% ethanol (replaced periodically) in glass jars with evaporation-resistant "polyseal" caps and stored in an off-site storage building.

Field data sheets are checked by Program staff for completeness upon return to the Watershed Council office; any omissions or confusions are clarified as soon as possible. Dr. Steen will enter data into an Access database which is then used for both analysis as well as for production of stream reports. The final tables of data are checked for accuracy against the raw data sheets after the time of entry. The results of monitoring are analyzed and then reported in a series of .pdf's that are posted on the web site (www.hrwc.org).

Monitoring data will be submitted to MDEQ in an electronic format such that the data are suitable for entry into U.S. EPA's STORET database using the data submission template on the NPS Unit website, and will be entered into the MiCorp data exchange.

Section C: Data Validation and Reporting

C1. Assessments and Response Actions

Program effectiveness is gauged through post-events surveys given to each participant. These surveys bring in new and fresh ideas as well as help Dr. Steen and Dr. Martin pinpoint any problems in the methods or with particular volunteers. Volunteers may be encouraged to repeat a training event if their work is judged to be of poor quality. We also seek out the opinions of expert volunteers who participate in the events; we have several professional biologists who consistently take part in the monitoring.

C2. Data review, validation, and verification

For benthic macroinvertebrate collections, volunteer Team Leaders and Collectors are trained in completing field data sheets thoroughly and accurately. All volunteers performing habitat assessments and temperature monitoring are also trained in this way. Benthic macroinvertebrate and habitat data sheets are double-checked in the field by someone other than the data recorder so that no question is left unanswered. All data sheets are reviewed by HRWC staff (Dr. Steen or Dr. Martin) for thoroughness and clarity immediately upon their submission.

The long-term nature of the Adopt-A-Stream monitoring program and the database it has generated allows for comparison of new data to previous data collected at the same site. If new data deviate from previous records beyond the previously stated DQOs, these outliers can be identified, and the site can be resampled or the data rejected outright. Dr. Steen has primary responsibility for identifying questionable data and taking corrective action.

C3. Reconciliation of data with DQO's

If a sample deviates from the previously stated DQO's, the parameter will be resampled at the site in question if it is feasible to do so within a two week period. Because environmental change can cause substantial variation in a parameter from one sampling event to the next, resampling soon after the deviant data were recorded can confirm if those conditions truly exist, or if it resulted from sampling error. If resampling suggests sampling error in the original data, those data are rejected and replaced by the resampled data. If resampling confirms the reliability of the original data, then those data are preserved. If resampling is not possible within the two week period following the original sampling event, then the original data are retained but flagged for comparison with future sampling events, and may be rejected if inconsistent with future data.

C4. Data reporting

Benthic macroinvertebrate and habitat assessment data summaries, with a number of calculated metrics including an ecological condition score, are reported with brief interpretations for the entire Huron River watershed in HRWC's "Monitoring Gazette", available publicly in print and online at www.hrwc.org.

Monitoring data will be submitted to MDEQ in an electronic format such that the data are suitable for entry into U.S. EPA's STORET database using the data submission template on the NPS Unit website. Dr. Steen has primary responsibility for data analysis, interpretation, and reporting for the Adopt-A-Stream program.

Appendices

- Appendix I: Map of study site locations
- Appendix II: Instructions for the Habitat assessment
- Appendix III: Habitat assessment data sheet
- Appendix IV: Checklist for sampling the Aquatic population (used by the Team Leader)
- Appendix V: Field data sheet for Aquatic population ("Stream Search")

- Appendix VI: “Count List” data sheet
- Appendix VII: Temperature Measurement Instructions

[i] Family – In biological classification, a family is the rank between order and genus. For example, "Weasels and otters belong to the weasel family" is a short way of saying, "Weasels (genus Mustela) and otters (genus Lutra) both belong to the weasel family (Mustelidae)." This is the taxonomic level to which aquatic macroinvertebrates are identified for the Adopt-A-Stream program. For examples, midges (family Chironomidae) and black flies (family Simuliidae) both belong to the fly order (order Diptera).

Insect Families – The total number of insect families found at a stream site gives us a good overall picture of stream health. There are about 87 insect families in the Huron River system.

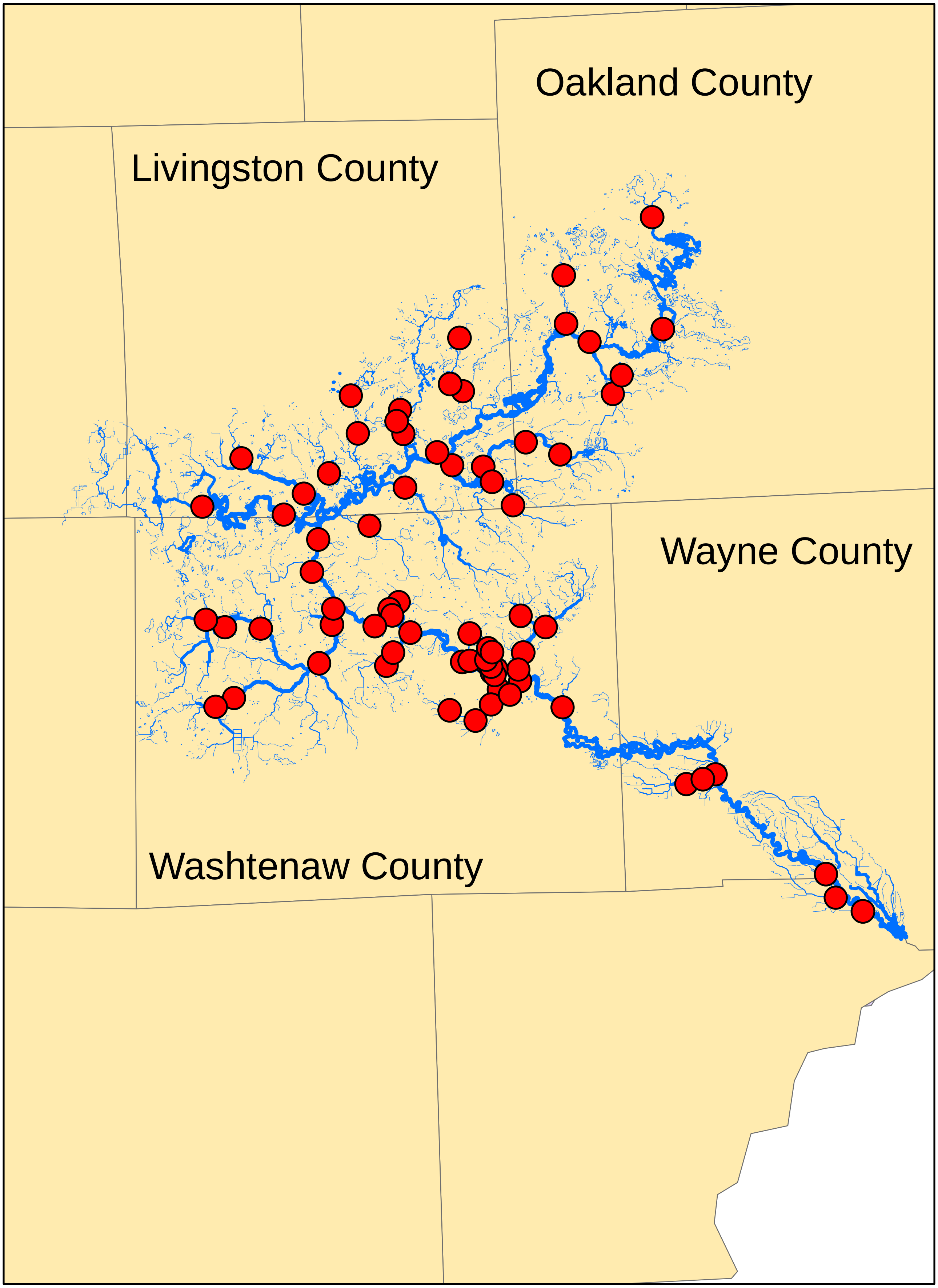
[ii] EPT Families – Insects in the orders Ephemeroptera (the mayflies), Plecoptera (the stoneflies), and Trichoptera (the caddisflies) generally evolved in streams with high levels of oxygen and faster flowing waters. As a result, many of these insects are particularly sensitive to factors that reduce oxygen, reduce flow, increase temperature, or otherwise stress the insect. High numbers of these families at a stream site are indicative of good stream quality.

[iii] Sensitive Insect Families – Some aquatic insect families have been identified as particularly vulnerable to organic pollution (such as fertilizers, human or animal waste), based on the work of W. L. Hilsenhoff. Twenty sensitive insect families live in the Huron River system.

[iv] Winter Stoneflies – The winter stoneflies, which require high levels of oxygen, are active in January when the solubility of oxygen is high. At that time of year, an absence of stoneflies suggests that toxic pollutants may be present in the river. The winter stoneflies allow us to see the effects of the chemicals entering the river, which is much harder to gauge in the summer, when warm water and low water levels may also impact the invertebrate community. The ability to use stoneflies as an indicator of pollutants makes the winter Stonefly Search a good tool for investigating the conditions of our creeks.

[v] Conductivity – an indication of the amount of dissolved ions (for example salt, metals) present in the water. It is determined using a meter that measures how easily an electrical current can flow through the water sample. If the average conductivity measured at a site is 800 micro Siemens per centimeter (μS) or less, it is considered natural for stream water in this region. Conductivity over 800 μS is considered excessive and may indicate the presence of toxic substances; however, many toxins, although harmful, are not measured by conductivity. One source of elevated conductivity is development. At some of our sites with high levels of development and impervious surfaces (roads, driveways, roofs), rainwater washes chemicals, such as road salt, fertilizers and pet wastes, from the developed landscape into the creek.

Appendix I - HRWC Study Sites



Appendix II

Huron River Watershed Council

• PROCEDURE for the HABITAT INVENTORY •

What you are going to do:

Map and make observations on a 300-foot stretch of the stream, and measure transects on the downstream half of that (150 feet). Record information on both the Habitat Data Form as well as your hand-drawn map.

To begin the inventory, label all pages of the Data Form and map (6 pages), then begin your measurements along transects every 15 feet to a maximum of 150 feet, starting downstream and working up. As you work, periodically read through the observations and fill in information as you can. Observations are needed on the entire stretch, **so continue the observations to at least 300 feet**.

We encourage you to take pictures, especially of the banks or anything that you are unsure about. The pictures are a very useful record of the stream's health. When taking pictures, remember to note the location and reason for taking the photo. Also, you can place the measuring stick somewhere in the photo to give an idea of scale. If you have a digital camera, that is an ideal way to share pictures of what you observed.

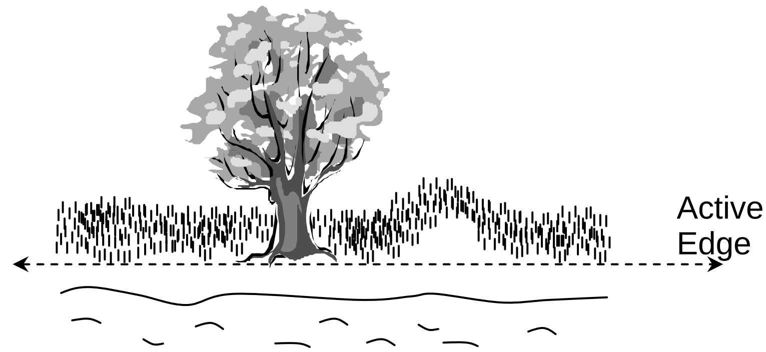
- Be sure to **fill in the stream name, location, and date** on **every page** of the **Form** and on the **Map.** Then, on the first page of the Form, enter your names and describe the **location** of the reach under study, including landmarks and compass directions (such as N or W). Also, note if the site is upstream or downstream of the road crossing and answer the questions about rain. Finally, note the **time** you **begin** the habitat inventory.

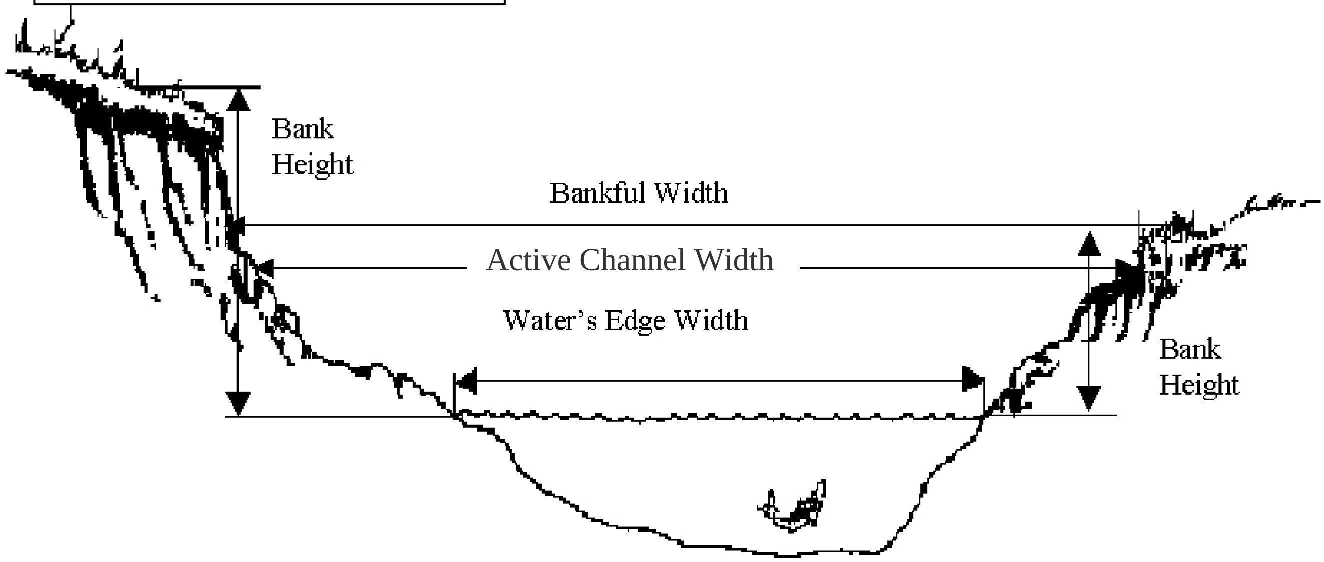
Transects are used to measure stream width and depth features at 10 places perpendicular to the flow of the stream. (You may answer the other habitat questions as you measure the transects.)

How to Measure Transects:
Pull the tape tight across the stream, perpendicular to the line of flow to make the first transect at the beginning of your site. Identify the location as **"1"** on the Map. Using the diagram on the next page, measure as best you can the **bankfull width** (bankfull is the top of the bank, above which stream would overflow its banks; if the banks are unequal in height, use the top of the lower bank to determine bankfull elevation), **active channel width** (the bottom edge of vegetation), and **bank height** (the distance from the top of the **LOWEST bank** to the surface of the water) and record these values under Transect 1 on the Form. Also, note the **angles** that each of the **banks** make relative to the surface of the water (see examples on the Form.) Sketch these on the Form below the transect column.

Measuring Active Channel Width

To determine where the Active Channel Edge is, look across the bank and identify the line that runs along the bank at the bottom edge of the vegetation. The Active Edge is where the energy of the water is preventing the growth of vegetation. Measure across the water from one Active Edge to the other, keeping the tape parallel to the water's surface.





With the measuring tape still across the stream, use it to identify the **substrate material** and **water depth** at the cross-section in the following way: Use the depth rod to point down to the material on the stream bed at <u>more than 10 but less than 20</u> regular intervals across the stream. (For streams less than 10 feet wide, measure every 0.5 feet, for streams greater than 10 feet wide, measure every foot, etc.) On the Form, record the <u>single piece of substrate</u> and the depth at each point. (Be sure to note only the one piece of substrate that the rod rests on per measurement. If the rod hits more than 1 piece, arbitrarily pick one substrate type.)

NOTE: As you proceed with the Habitat Inventory, please be sure to repeat the transect measurements **every 15 feet** along the stream, for a total of 10 complete transects.

As you measure every 15 feet along the stream, **draw a map** on the graph paper using approximately 5 feet to the square. Please show the **shape of the stream**, the location of each transect, and any **landmarks**, being accurate without struggling for precision. Note on the Map which **direction** is **north** and which **direction** the **stream is flowing**. Please remember to **label the map** with the stream name, location, and date.

Observations: These habitat questions refer to the entire 300 foot stretch.

1. As you walk, look for **pools** (areas of slower flow and greater depth than the surrounding areas), **eddies** (areas where the water seems to be moving against the main current or in a circular motion, usually on the sides), and **riffles** (wanna-be rapids, where the surface ripples), and note them on the Map. For each **pool** and **riffle** *of a reasonable size*, record the **depth** and the **length** in the table on the Form. Also, as you note these stream features, look for a **run** (an area of even flow) where you can later measure the water velocity. Note whether the stream is straight and count the number of bends (draw these on the map).

2. Estimate the **percent** of the stream bottom that could be classified as **stable habitat** or **hiding places** for creatures living in the stream. Hiding places can be comprised of rocks, logs, undercut banks, grocery carts, trash, etc.

3a. Note where new or recent deposition has occurred on the site sketch. Sediment deposition may cause the formation of islands, point bars (areas of increased deposition usually at the beginning of a meander that increases in size as the channel is diverted toward the outer bank) or shoals, or result in the filling of runs and pools. Usually deposition is evident in areas that are obstructed by natural or human-made debris and areas where the stream flow decreases, such as bends. High levels of sediment deposition are symptoms of an unstable and continually changing environment that becomes unsuitable of many organisms.

3b. Consider the amount of sediment or fine particles that cover the stream bottom in the area that the transects were measured and beyond. **After completing the transects**, note if the amount of fine material at the rest of the site is more than the amount in the area of the transects.

4. Answer the questions about locations in the stream that have a **soft bottom**. Soft bottoms are usually the result of muck deposits or loose deposits of sand. Use caution around soft bottoms because walking across them can be difficult and you might get stuck in the muck.

5. **Only in the upstream or central portions of riffles or in areas of cobble substrate**, estimate the extent to which the bottom substrate (gravel, rocks, logs, etc.) is **covered by or sunken into the silt**. We are using this question to assess whether living spaces are available to aquatic creatures or if they have been filled in by deposited muck or sand. On the datasheet, please note the percent of substrate **IN THE RIFFLE OR COBBLE AREA** that has been filled in by depositional materials.

6. Note on the Map locations where the **banks are unstable or eroded** and **measure the areas of erosion.** We are looking for locations where the bank surfaces are not covered by vegetation, gravel, or larger material and show signs that the exposed sediment is moving, possibly sloughing off the banks into the creek. Using your observations, estimate the stability of the banks over the entire 300 feet on a scale of 1 through 10, with 10 indicating no bank erosion and 1 indicating massive erosion. Use the descriptions on the Form as a guide and enter the value there. Please photograph areas of erosion.

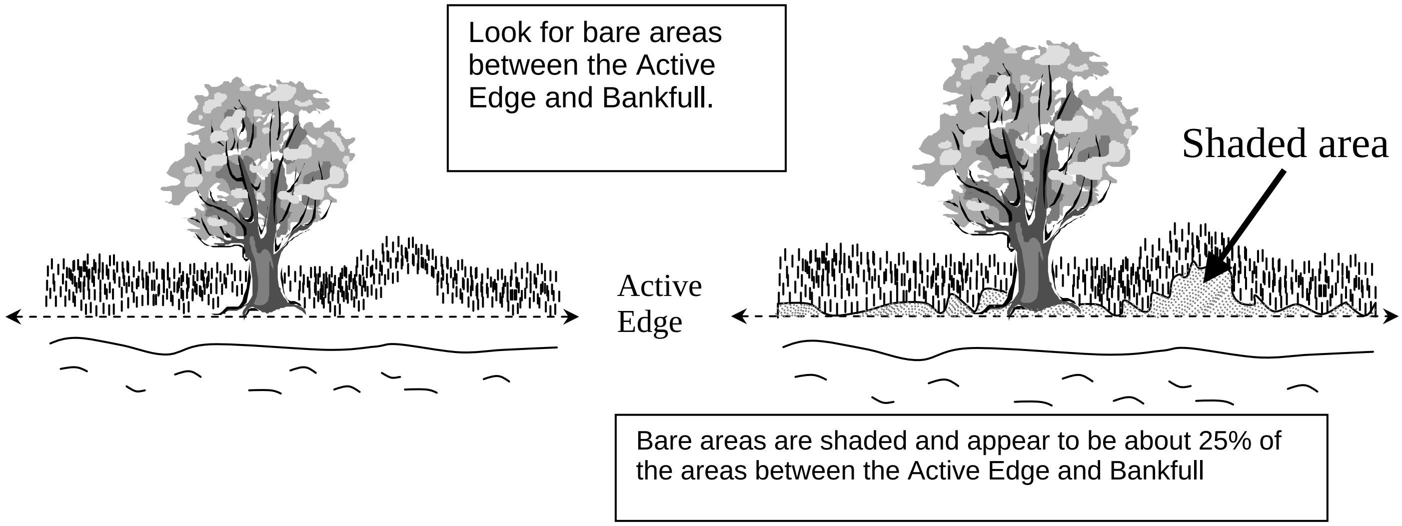
7. Estimate the amount of exposed substrate in the stream channel. The amount of suitable substrates for aquatic organisms becomes limited when stream flow is not maintained at adequate levels.

8. Note the amounts of algae and other **plants in the stream** on the Form. (Many kinds of plants may be abundant in a stream, but only one kind of plant may be dominant.) Also, note whether algae called Cladophora are present. Cladophora may be green to brown and from 1 centimeter to a meter in length. Cladophora typically grows on rocks or other substrate, and a distinguishing characteristic is that it feels like wet, unconditioned hair to the touch. Many other types of algae will feel slimy. Finally, and only if you wish, use the Aquatic Plant Key to identify plants standing in the stream and note their names on the data sheet.

9. Note the amounts of **vegetation on the banks.** Are they trees, shrubs, and/or grasses (plus weeds), or, are the banks covered with rocks or something else? Note the relative abundance of each plant type on the Form.

10. Estimate the width of the vegetation area along each bank of the stream (**vegetation corridor**). Plants next to the stream are very beneficial. The roots hold the banks in place and keep soil from being washed away during storms. Shade moderates summer temperatures. Plant parts that fall into the stream provide cover as well as food for microbes and other creek inhabitants. Stems and branches reduce the force of floodwater and provide stable, secluded substrate for creatures to rest in or live on.

11. Estimate the percent of the banks above the Active Edge, but below Bankfull, that are bare soil (the percent **not covered** with vegetation, rocks, rip-rap, etc.). Note any large bare areas on the Map and take a photo.



12. Stand in the middle of the stream and estimate the percent of the stream that could be shaded by vegetation on the banks. Leafy shrubs and trees provide food (fallen leaves) as well as shade that helps to keep the water cool.

13. On the map, note any places where the water seems cool or any places where springs occur.

14. If a large amount of trash is present, please note that.

15. Note whether the water looks or smells strange.

16. Record the **land use** of the property around the site on the Form (and on the Map if you have enough room). Is the land woodland, wetland, open field, farmland, residential, commercial (specify), other (specify)?

17. Show the locations of **pipes** plus their diameter on the Map. Also, please note whether the opening extends out over the water or whether it empties onto the bank (this could potentially cause erosion.) Also, note areas of erosion around or behind the pipe; this occurs often with broken pipes.

Before You Leave

- Photograph one or more views that typify the state of the stream and make notes **before leaving** about what the photos show. Notes should include a reference to north, the direction of flow, and the approximate width of the stream. When photographing the site, stand in the middle of the stream and try to capture a significant length of the area studied. You may wish to take a photo of the beginning of the site and then move to capture the end of it, or you may wish to stand in the middle of the site and photograph upstream and downstream of your position.

- Be sure that someone **checks each page** of the Habitat Data Form and the Maps to be sure that they have been labeled and that **all** questions have been answered. The checker should initial each page after checking it.

- Finally, note the time you end the Habitat Inventory and double check that you have all the equipment.

Appendix III

Stream Name______________________ **Location** ___________________________ **Road** **Date**______

HABITAT DATA FORM

Site #:

Start Time:

Please follow the directions on the "Procedure for Habitat Inventory" to complete this form. If you need to reach us, our number at the office is (734) 769-5123, Joan's home (734) 994-4203, Paul's cell (734) 709-6589.

Huron River Watershed Council

Will you face **UPSTREAM** or **DOWNSTREAM** when making observations of "left" and "right" banks (Circle one)?

Your Names:____

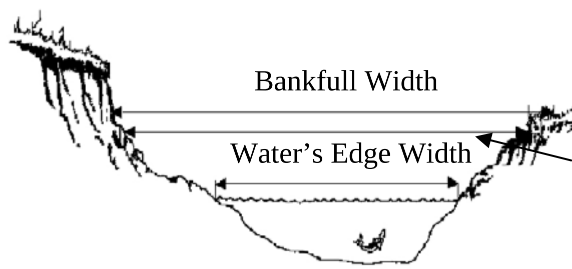
Precise Location: ____
(Please describe permanent landmarks like power lines, radio towers, signs or buildings near the stream, wetlands, etc.)

Did you work **upstream** or **downstream** of the road (circle one)?

Did it rain in the past 3 days? ______ If so, when and how much (approximately)?______________________________

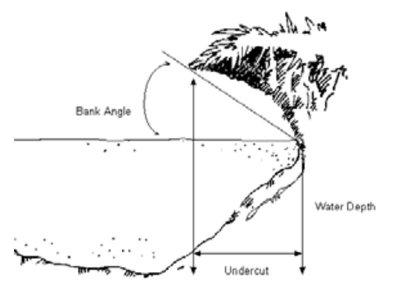
- ❑ **TRANSECTS**

Measure the Bankfull width, Active Channel width, Water's edge width and the **lower** bank height for a stream transect. Use the rod to measure depth (D) and substrate (S) at more than 10 but less than 20 regular intervals along the entire transect. (For streams less than 10 feet wide, measure every .5 feet, for streams greater than 10 feet wide, measure every foot, etc.) Identify the single piece of substrate that the rod lands on (can be arbitrary). Enter the depth and substrate for each interval in the table on the following pages. Substrate codes are listed above each table.



- ❑ **BANK HEIGHT AND STABILITY**

Vertical banks higher than 3 feet are usually unstable, while banks less than 1 foot, especially with overhang, provide good habitat for fish. Bank angles <90° often improve the habitat. Please sketch the bank angles for the LEFT and RIGHT banks of each transect (as shown below) and record the bank height. Also, please note if the bank is undercut, and if so, list its width.



1. FLOW PATTERNS
Please note the number of POOLS (deep and slow), and RIFFLES (shallow and faster), record their LENGTH and DEPTH below, and locate them on the map:

Pools				**Riffles**			
Total Number = _____				*Total Number =* _____			
Length	Depth	Length	Depth	Length	Depth	Length	Depth

Is the stream perfectly straight? _________ How many **BENDS** are in the 300' stretch of creek?____

Sheet Checked By:

Stream Name_____________________ **Location** __________________________ **Road** **Date**______

B: Boulder -- more than 10”
C: Cobble -- 2.5 - 10”
R: Rock -- 1 - 2.5”
G: Gravel -- up to about an inch

S: Sand -- fine particles, all about the same tiny size, gritty
F: Clay or Muck -- finer than sand and not gritty
Rt: Root
I: Island

T= Reading on tape
D = Depth
S = Substrate

Transects												
	EXAMPLE			**1**			**2**			**3**		
Bank Height (lower of the 2)	0.7 feet											
Active Channel Width	16.5											
Water’s Edge Width	13.3											
	T	**D**	**S**	**T**	**D**	**S**	**T**	**D**	**S**	**T**	**D**	**S**
Beginning Water's Edge:	1.5	X	X		X	X		X	X		X	X
1	2.5	0.4	G									
2	3.5	0.4	G									
3	4.5	0.4	G									
4	5.5	0.2	C									
5	6.5	0	I									
6	7.5	0.6	C									
7	8.5	0.7	G									
8	9.5	0.7	G									
9	10.5	0.6	R									
10	11.5	0.7	R									
11	12.5	0.4	G									
12	13.5	0.3	G									
13	14.5	0.2	Rt									
14												
15												
16												
17												
18												
19												
Ending Water's Edge	14.8	X	X		X	X		X	X		X	X

Transects	**1**			**2**			**3**			**4**		
	L	**R**	x	**L**	**R**	x	**L**	**R**	x	**L**	**R**	x
Does the bank have an undercut?			x			x			x			x
If so, how wide is it?			x			x			x			x
Bank Angles: Sketch			x			x			x			x

(Additional transect forms continue on page 6. Stream characteristics for the entire site that you should be observing are listed below. Remember to look at these as you continue with the transects.)

Sheet Checked By:

Stream Name______________________ **Location** ___________________________ **Road** **Date**______

2. STABLE HABITAT (HIDING PLACES)

What percent of the bottom substrate has hiding places for small fish and bugs? _____________
Circle the objects that make up the hiding places:

rocks grocery carts submerged logs undercut banks other (please describe)

3. SEDIMENT

Did you see:
Islands with little vegetation? **YES NO**
Point bars? **YES NO**
Deposition along the inside of bends? **YES NO**
Deposition along obstructions? **YES NO**

Please check whether the substrate on the bottom of the stream **beyond** the area of transects contains:
much more ☐ , much less ☐ , or a similar amount ☐ of fine sediment than you saw in the transects.

4. SOFT BOTTOM

Was a soft bottom common in shallow areas? **YES NO**
Was a soft bottom only found in pools? **YES NO**
Was the muck deep (did you sink in above the tops of your feet)? **YES NO**

5. EMBEDDEDNESS

Estimate the extent to gravel, cobble and boulder particles are surrounded by fine sediment. Look in the upstream or central portions of **riffles or** in areas of **cobble** substrate.
<25% (clean) _____
25-50% (somewhat silted) _____
50-75% (silty but a little loose) _____
>75% (firmly lodged) _____

6. BANK STABILITY

Map: Look for bare soil, scoured banks, and sloughing banks. Please map these by measuring their lengths and widths from a stable area upstream to a stable area downstream and note them on the map. Also, map trees with many exposed roots, trees that are severely leaning, or trees that have recently fallen into the stream.
Summarize the extent of erosion along each bank separately on a scale of 1 through 10, by circling a value below.

Excellent	Good	Marginal	Poor
Banks Stable. No evidence of erosion or bank failure. Little potential for problems during floods. < 5% of bank affected.	Moderately stable. Small areas of erosion. Slight potential for problems in extreme floods. 5-30% of bank in reach has areas of erosion.	Moderately unstable. Erosional areas occur frequently and are somewhat large. High erosion potential during floods. 30-60% of banks in reach are eroded.	Unstable. Many eroded areas. > 60% banks eroded. Raw areas frequent along straight sections and bends. Bank sloughing obvious.
LEFT BANK 10 - 9 RIGHT BANK 10 - 9	LEFT BANK 8 - 7 - 6 RIGHT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3 RIGHT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0 RIGHT BANK 2 - 1 - 0

Any
comments?____

7. LOW FLOW

Estimate the amount of substrate (stream bottom, especially along the sides of the channel) that is exposed in the channel during low flow (circle one):

0-10% 10-25% 25-75% 75-100%

Sheet Checked By:

Stream Name______________________ Location ___________________________ Road **Date______**

8. PLANTS IN THE STREAM

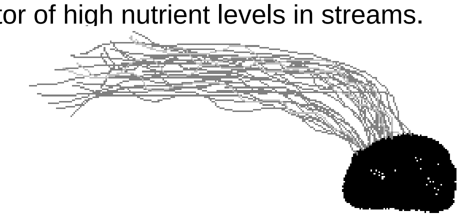
Estimate their relative abundance on the following scale of 0 to 4:
Algae on Surfaces of Rocks or Plants ______
Filamentous Algae (Streamers) ______
Macrophytes (Standing Plants) ______
Other ______

0 = Absent
1 = Rare
2 = Common
3 = Abundant
4 = Dominant

If streaming, green/greenish-brown algae are present and it feels like wet hair (not slimy) this may be Cladophora. Please note if it's present ☐ or not ☐ . Cladophora may be an indicator of high nutrient levels in streams.

NOTES:

- *If macrophytes are present and if you want to, try to identify them with the macrophyte sheet included with this form.*
- *If you are unsure of the plants you see in the stream, bring back a piece in a small bag.*
- *More than 1 type of plant may be abundant, but only 1 plant type can be dominant.*
- *Not every stream will have a dominant plant type.*



Cladophora

9. PLANTS ON THE BANKS

Estimate their relative abundance on the following scale of 0 to 4:
Shrubs ________
Trees ________ Trees leaning over the creek? _______
Grasses ________ Any mature trees present on the bank? _______
Other? ________

0 = Absent
1 = Rare
2 = Common
3 = Abundant
4 = Dominant

10. CORRIDOR WIDTH

Excellent	Good	Marginal	Poor
Width of riparian zone >150 feet, dominated by vegetation, including trees, understory shrubs, or non-woody macrophytes or wetlands; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally. Human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone.	Width of riparian zone 75-150 feet; human activities have impacted zone only minimally.	Width of riparian zone 10-75 feet; human activities have impacted zone a great deal.	Width of riparian zone ,10 feet; little or no riparian vegetation due to human activities.
LEFT BANK 10 - 9 RIGHT BANK 10 - 9	LEFT BANK 8 - 7 - 6 RIGHT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3 RIGHT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0 RIGHT BANK 2 - 1 - 0

11. BARE BANKS

What percent of the banks are bare (showing either soil or sand)? Bank areas covered by rocks, rip-rap, or anything else should not be considered "bare". Please estimate only the percent of banks showing sand or soil. Use the procedure to identify the bare areas between the Active Edge and Bankfull (see page 1 and the Procedure). If percent is difficult to estimate, use words. ☐

If any, estimate the percent of bank covered in cement or rock. ☐

Sheet Checked By:

Stream Name______________________ **Location** ___________________________ **Road** **Date**______

12. SHADE
Stand in the middle of the stream and look overhead.
How much of the stream could be shaded by the vegetation? [ ]

13. COOL AREAS
Did you find any spots where the water has a localized cool area? [ ] Please note them on the **map**.
This may be difficult to notice with waders on.

Did you notice any springs or seeps along the stream bank? [ ]

Did an orange-yogurt-like substance accompany these features? [ ]

14. TRASH
Does trash need to be removed from the stream? [ ] If so, please describe the kinds and amounts.

15. APPEARANCE OR ODOR
Does the water have an unusual appearance or odor? [ ] If so, please describe.

16. LAND USES
Please describe the land uses around the site on the lines below:
Categories: woodland wetland open field farmland residential commercial or other (please describe)

North	**South**	**East**	**West**
________________	________________	________________	________________

17. PIPES
Were pipes present? **YES NO** Does the opening extend over the water? **YES NO**
Do the areas around or behind the pipes show signs of erosion? **YES NO**
Comments:

Please use the space below to record any additional observations about this stream site or your experience today:

Sheet Checked By:

CONGRATULATIONS!
You've completed a challenging job!
Please check that you have answered all questions on all pages and initial each box.

Stop Time:______________

Sheet Checked By:

Stream Name______________________ **Location** ___________________________ **Road** **Date**______

B: Boulder -- more than 10”
C: Cobble -- 2.5 - 10”
R: Rock -- 1 - 2.5”
G: Gravel -- up to about an inch

S: Sand -- fine particles, all about the same tiny size, gritty
F: Clay or Muck -- finer than sand and not gritty
Rt: Root
I: Island

T= Reading on tape
D = Depth
S = Substrate

❑ **MORE TRANSECTS!** ☺

	Transects								
	4			**5**			**6**		
Bank Height (lower of the 2)									
Active Channel Width									
Water’s Edge Width									
	TM	**D**	**S**	**TM**	**D**	**S**	**TM**	**D**	**S**
Beginning Water's Edge:		X	X		X	X		X	X
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
Ending Water's Edge		X	X		X	X		X	X
Transects	**4**			**5**			**6**		
	L	**R**	x	**L**	**R**	x	**L**	**R**	x
Does the bank have an undercut?			x			x			x
If so, how wide is it?			x			x			x
Bank Angles: Sketch			x			x			x

Sheet Checked By:

Stream Name______________________ **Location** ___________________________ **Road** **Date**______

B: Boulder -- more than 10”
C: Cobble -- 2.5 - 10”
R: Rock -- 1 - 2.5”
G: Gravel -- up to about an inch

S: Sand -- fine particles, all about the same tiny size, gritty
F: Clay or Muck -- finer than sand and not gritty
Rt: Root
I: Island

T= Reading on tape
D = Depth
S = Substrate

	Transects											
	7			**8**			**9**			**10**		
Bank Height (lower of the 2)												
Active Channel Width												
Water’s Edge Width												
	TM	**D**	**S**	**TM**	**D**	**S**	**TM**	**D**	**S**	**TM**	**D**	**S**
Beginning Water's Edge:		X	X		X	X		X	X		X	X
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
Ending Water's Edge		X	X		X	X		X	X		X	X
Transects	**7**			**8**			**9**			**10**		
	L	**R**	x	**L**	**R**	x	**L**	**R**	x	**L**	**R**	x
Does the bank have an undercut?			x			x			x			x
If so, how wide is it?			x			x			x			x
Bank Angles: Sketch			x			x			x			x

Sheet Checked By:

Appendix IV

Checklist for the Leader

- Explain what people need to do to prepare for departure.
- Show them what is in the bucket and the clipboard.
- Get more forceps & jars if the team is large (one/picker).
- ★ Check that the map and the data sheet are in the right envelope for that site. [Report any problems!]
- Agree on the first site and ask someone to fill in the Checkout form.
- Oversee selection and success of the Team Manager.
- Ask people what they want to know about what they will do today. (Note on your evaluation form any questions that staff should cover in the Orientation or in the Leadership Training.)
- Take a sign and also extra buckets if you want them – in the stairwell.
- On the trip: ★ Be sure the map is used to find the correct part of the creek.
- Use the site map landmarks to verify that you are at the right site.
- At the Site: First open the Special Envelope with everyone (including the Collector).
- ★ Show people how to pick the trays.
- Ask someone to search the trays again for more creatures *after* they have been picked.
- ★ Record the data:
  - Answer EVERY question.
  - Remember to note locations (esp. water sample) on the sketch map.
- ★ Prompt the Collector to go to all habitats. (You may have to shout).
- ★ Label the jars IN PENCIL, inside the jar. State number of jars on label & data sheet.
- ★ Remind folks to pick the net before leaving.
- Remind the manager to be sure we have everything.
- Ask people to fill out evaluation forms before leaving the RoundUp

[★ indicates tasks that make the data reliable.]

Appendix V.

Stream Search Data Sheet

Number of Jars Used → ◯

STREAM:________________ SITE: __________________ DATE: _____________

Collector:__________________ Leader: _________________ Arrival Time:__________

Team Members: ____

Is the collector working: ☐ Upstream of bridge ☐ Downstream of bridge ☐ Other: _____________

GPS Coordinates (Lat/Long; optional):____

Commonly asked questions:

HOW MANY creatures do we take? We are looking for variety. It is not necessary to collect 50 of the same thing, but we want all of the different groups at the site. If you find something different, be sure to add it.

Why are there several jars? Simply for convenience, everything from the site goes into any of them. Do NOT set an open jar down on ANY surface-it will turn over. Put the lid on!

Collecting Guide:

Please note on the sketched map the locations in the stream where the water sample and organisms are collected.

Work upstream to minimize disturbing the sample. Collect anywhere that is different.
Be aggressive! Work the bottom well and poke and jab in undercuts.

Getting Started:

Collect the water sample first, before you stir up the stream. Rinse the jar with river water 3 times before collecting the sample.

Habitats:

Please note the **number** of locations sampled in each of the following habitats and if any habitat was not found. (We hope you can get at least 2-3 samples.)

 # samples

☐ Riffle [Stretch of fast moving, somewhat turbulent, water]

How much sunlight is it exposed to? ☐ a lot ☐ little (shaded)

How turbulent was it? ☐ gentle ☐ moderate ☐ very turbulent

What is on the bottom in the riffle? ☐ sand ☐ rocks ☐ gravel ☐ other: _________

☐ Quiet place with a soft, mucky bottom (not just sand)

☐ Undercut Bank [where the water is cutting into the side of the bank]

☐ Submerged or Emergent Vegetation [growing from underwater]

☐ Overhanging Vegetation [hanging into the water from the bank or a tree, etc.]

☐ Rocks [Please ask people to remove tiny objects stuck to the rocks; they may be limpets or caddisflies. Sprinkling water on the rock may help to see the animals.]

☐ Log pieces [Please ask people to pry into the crevices and look under the bark.]

☐ Leaf packs [Old decaying clumps of leaves that are matted together.]

☐ Other habitat: (please describe)_____________________

continued on back

Stream Search Data Sheet

Water Sample: was the jar rinsed 3 times with river water before the samples was collected? ______

Did the Collector look for clams in the mud? ______Were any found? ______

Did anyone look for leeches? ______Were any found? ______

Did anyone look for crayfish?______Were any found? ______
(We don't keep them, but want to know if live ones were present.)

What kinds of creatures did you find in the stream but did not collect?

Was any of the collection lost, for instance by a jar turning over? ______

Did you write the total number of jars for this site on the other side, and on the jar labels? ______

Are the labels filled out in pencil, and placed *inside* each jar? ______

Did someone make sure that the net has no creatures clinging to it before you leave the site?______

Please describe any ways this site, or the team's work on it, is different from the other sites, or from the demonstration. [This is very important!]

Departure Time: ________

Remember to take everything with you when you leave the site. See the Manager's sheet for the **equipment** list.

Please give us suggestions for ways we could improve the River RoundUp experience either here or on the evaluation sheet.

Appendix VI.

COUNT LIST
MACROINVERTEBRATES in the Huron River System

Stream Site: ____

Date: ____________ ☞Please circle the number and draw a line to the name. **ID Verified By:** ________________________

INSECTA Additional insects are listed on the back of this page.

♥ Indicates sensitive groups.

PLECOPTERA – STONEFLIES

♥ Capniidae -- slender winter stonefly; adults walk on snow
♥ Nemouridae -- Nemourid broadback
♥ Perlidae -- common stonefly in early summer
♥ Perlodidae -- Perlodid stonefly
♥ Taeniopterygidae -- broad-back stonefly; Taeniopteryx is relatively tolerant

EPHEMEROPTERA – MAYFLIES

Baetidae -- small minnow mayfly
Caenidae -- small, square gills (often in silt)
Heptageniidae -- flathead mayfly *(If time, are there Stenacron? Stenonema? Heptagenia?)*
♥ Isonychiidae -- brush-legged mayfly (formerly grouped with Oligoneuridae)
Tricorythidae -- little stout crawlers; quite tolerant
♥ Ephemerellidae -- spiny crawler
♥ Polymitarcyidae -- pale burrowers
♥ Leptophlebiidae -- pronggill
♥ Metretopodidae -- cleft minnow mayfly
♥ Oligoneuridae -- brush-legged mayfly
Baetiscidae -- armored mayfly
Ephemeridae -- common burrower
Potamanthidae -- hacklegill
Siphloneuridae -- primitive minnow mayfly

ODONATA – DAMSEL AND DRAGONFLIES

ANISOPTERA – DRAGONFLIES

Aeshnidae -- darner
Cordulegastridae -- biddy
♥ Gomphidae -- clubtail
Libellulidae -- common skimmer
Corduliidae

ZYGOPTERA -- DAMSELFLIES

Calopterygidae -- broad-winged damselfly
Coenagrionidae -- narrow-winged damselfly
Lestidae -- spread-winged damselfly

HEMIPTERA – TRUE BUGS

Belostomatidae -- giant water bug
Corixidae -- water boatman
Gerridae -- water strider
Pleidae -- pigmy back-swimmers
Naucoridae -- creeping water bug
Nepidae -- water scorpions
Notonectidae -- back-swimmers
Mesoveliidae -- water treaders
Veliidae -- short-legged striders

TRICHOPTERA – CADDISFLIES (Build Cases and/or Spin Nets)

♥ Brachycentridae -- humpless case makers
♥ Glossosomatidae -- saddle-case makers; in cool streams with current
Helicopsychidae -- snail-case caddisfly; tolerate warmer water]
Hydropsychidae -- common net-spinner; often abundant *(Were Cheumatosyche present, if looked for?)*
Hydroptilidae -- micro (or purse-case) caddisfly; don't require flow
Leptoceridae -- long-horned case makers
Limnephilidae -- northern caddisfly; many are scrapers
♥ Lepidostomatidae -- Lepidostomatid case makers
Philopotamidae -- finger-net caddisfly; in riffles only
♥ Psychomyiidae -- net-tube caddisfly
♥ Rhyacophilidae -- free-living caddisfly
♥ Odontoceridae -- strong-case makers
Molannidae -- hoodcase maker
Phryganeidae -- giant case-maker; common in slow flows
Polycentropodidae -- spotted head
Uenoidae
Goeridae

More on the next side!

COUNT LIST
MACROINVERTEBRATES in the Huron River System

Stream Site: ____

Date: ____________ ☞Please circle the number and draw a line to the name. **ID Verified By:** ______________________

INSECTA (continued)

♥ *indicates sensitive groups*

MEGALOPTERA -- DOBSONFLIES

- ♥ Corydalidae -- dobson fly or hellgrammite
- Sialidae -- alderfly

COLEOPTERA -- BEETLES

- Chrysomelidae -- aquatic leaf beetle
- Dryopidae -- long-toed water beetle
- Dytiscidae -- predacious diving beetle
- Elmidae -- riffle beetle (larvae + adults)
- Gyrinidae -- whirligig beetle
- Haliplidae -- crawling beetle
- Hydrophilidae -- water scavenger beetle
- Lampyridae
- Noteridae -- burrowing water beetle
- Psephenidae -- water penny
- Scirtidae -- marsh beetle
- Staphylinidae -- rove beetle

DIPTERA -- TRUE FLIES

- ♥ Athericidae -- watersnipe fly
- Ceratopogonidae -- no-see-um
- Chironomidae -- midge
- Culicidae -- mosquito
- Dixidae -- dixid midges
- Dolichopodidae -- aquatic long-legged fly
- Empididae -- aquatic dance fly
- Ptychopteridae -- phantom crane fly
- Sciomyzidae -- marsh fly
- Simuliidae -- black fly
- Stratiomyidae -- soldier fly
- Tabanidae -- deer fly, horse fly
- Tipulidae -- crane fly
- Ephydridae -- shore, brine fly

LEPIDOPTERA

- Pyralidae -- aquatic Pyralid moths

COLLEMBOLA -- springtail

MISCELLANEOUS MACROINVERTEBRATES

Most of the macroinvertebrates we collect are insects, but some are other Arthropods, and some are worms, leeches, flatworms, snails, or clams. (The Arthropods include the Insecta and also the Crustacea.)

PLATYHELMINTHES

- Turbellaria – flatworm

ANNELIDA

- Hirudinea – leech
- Oligochaeta -- worm

ARACHNIDA – SPIDERS, MITES

- Hydracarina -- water mites; parasites

MOLLUSCA – SNAILS, CLAMS, ETC.

GASTROPODA – SNAILS AND LIMPETS (Have a single shell.)

- Ancylidae – limpet; have a flat cone
- Right-handed snail
- Physidae -- pouch snail; left-handed spiral
- Planorbidae – coiled in one plane; has no operculum

PELECYPODA – BIVALVES; CLAMS AND MUSSELS (Have a pair of symmetrical shells joined by a ligament.)

- Dreissenidae -- zebra mussels
- Sphaeriidae – fingernail clams; usually tiny with a thin shell (either Pisidium or Sphaerium)
- Unionidae – large unless very young (either Anodonta or Elliptio)

CRUSTACEA

- Decapoda -- crayfish
- Isopoda – sowbug
- Amphipoda -- scud

PORIFERA – FRESHWATER SPONGES

BYOZOA – MOSS ANIMALS

More on the next side!

Appendix VII.

Huron River Watershed Council
Adopt-A-Stream Program

MEASURING MAXIMUM AND MINIMUM TEMPERATURES

The thermometer must be placed securely [1] to withstand the very strong currents during a storm; [2] to remain unseen by anyone other than the stewards; and [3] in the stream flow. The desired location is described under PLACEMENT (below).

EQUIPMENT NEEDED:

- Max/min thermometer in metal casing
- Data sheet and 2 pencils (Please do not write with ink since the paper may get wet.)
- Map to show the location of the thermometer

PLACEMENT IN THE STREAM:

WHEN: You can place it in the water anytime before or on the first weekend in July. Be sure both temperatures have adjusted to the temperature **in the water** before you reset it [see below].

WHERE: The thermometer must be:

1. In water deep enough to cover the thermometer under low flow conditions
2. Parallel to stream flow, preferably with the tip pointing upstream.
3. Placed in the current, as much out of sight as possible. Hide it with branches or other stream debris where appropriate.

☞ Show the precise location of the thermometer on the the sketch-map of the stream site.

REMEMBER! You need to go to the stream at the end of June or the beginning of July to reset the thermometer. This is one week before your first reading, which will be no later than July 9th. RESET: Be sure the thermometer is reading the water temperature and then bring the metal bars down to the mercury. Please note the date, time and this initial temperature on the data sheet. (Keep the data sheet until the study is complete.)

WEEKLY MEASUREMENTS:

1. Please try to read the thermometer on the same day each week.
2. Try to keep the thermometer always under water.
3. **Important!** Read the BOTTOM edge of the rod (where it touches the mercury)**!**
4. Record on the data sheet the temperature that corresponds to the the Maximum, and the Minimum, and the Current temperature (all in Farenheit). Also record the date and any observations.
5. Check that the temperatures you recorded are correct, then…Reset the bars and replace the thermometer in its secure hiding place

IMPORTANT! From now until the end of August, the tip of the thermometer must remain submerged. To read the thermometer in comfort, take a bucket in which to keep the thermometer submerged while you sit down. (If you do accidentally lift it out of the water, hold it underwater until it reads the water temperature and reset it [see below.])

☞ To RE-SET the thermometer:
Use the magnet to move both of the rods down to the mercury.

Questions? Call Joan at (734) 769-5123, X.11 (7 AM – 3 PM) or (734) 994-4203 before 9 PM.