

Quality Assurance Project Plan  
For  
River Raisin Watershed Council  
Macroinvertebrate Monitoring

Date: 3-21-06  
Version # 2

Grantee: River Raisin Watershed Council  
Grant Tracking Number: 2005 – 0117  
Funding Source: Federal Clean Water Act Section 319

QAPP Prepared by: Jill Kelley  
Organization: River Raisin Watershed Council

MDEQ Reviewer: _____	
Approved	Returned for modifications
_____	_____
Signature of MDEQ Reviewer	Date

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**1. Project Management**  
**1.a. Key Personnel**

Name	Responsibility	Address	Phone/ e-mail	Relevant Credentials
Gayle Mitchell, RRWC Executive Director	Oversee funding allocation and ensure project milestones are met	1042 Sutton Rd. Suite #3 Adrian, MI 49221	517.265.5599 <a href="mailto:gayle.mitchell@comcast.net">gayle.mitchell@comcast.net</a>	
Jill Kelley, RRWC Adopt-A-Stream Program Director	Program Director provides planning, training, data analyses and ensures data quality is met.	Same	517.423.8395 <a href="mailto:jill.kelley@comcast.net">jill.kelley@comcast.net</a>	Current University of Michigan Graduate Student with ongoing research of River Raisin macroinvertebrates
Gretchen Alexander, Aquatic Ecologist	Assists with program training, planning and data analyses	Same	517.265.5599 <a href="mailto:gretchen.alexander@comcast.net">gretchen.alexander@comcast.net</a>	M.S. University of Michigan, Aquatic Ecology
David Allan, University of Michigan Professor	Habitat assessment oversight and evaluation		734.	
Yansey	Habitat assessment	Same		
??	Habitat assessment	Same		

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**1.b. Background**

The River Raisin Watershed Council is located in SE Michigan; the river encompasses parts of Lenawee, Jackson, Hillsdale, Washtenaw and Monroe Counties in Michigan and Fulton County in Ohio. The river is used extensively for public drinking supplies, recreation, warm water fisheries, intense cropland drainage, irrigation and waste water discharge. Non-point source pollution is a serious threat to the river with containments such as herbicides, pesticides, sewer overflows, nutrients, nitrates and sediments posing the greatest risks. A majority of the watershed has been classified as “High Concern” for bacteria and various portions are listed in

the state 303(d) listing for poor fish community, pathogens, PCB's, pesticides, mercury, nitrates and poor macroinvertebrate communities. There are three TMDLs in the River Raisin basin that have been finalized. (Lenawee County Drain #70, River Raisin and the Saline River) The River Raisin Watershed basin is also a high priority watershed as we have a designated Area of Concern in Monroe County as a result of PCB contamination. Sedimentation and erosion are a very high priority concern for the River Raisin basin as well as apathy toward the river itself. The River Raisin is a much maligned natural resource and is sorely in need of some positive PR. The River Raisin Basin is a beautiful and special area, but with years of abuse, misuse and neglect and the increasing threats of development both large and small, actions need to be taken to engage the basin residents, schools, organizations, business, agriculture and industry to work together to improve water quality and practice best management practices.

Many of the water quality problems in the River Raisin watershed are likely the result of the runoff of sediments and/or nutrients, altered hydrology, too (more "flashy" streams). Pesticides also may impact water quality. Because non-point pollution sources are diffuse and inputs can be pulsed based on precipitation, biological and habitat assessments are more effective than chemical monitoring in detecting watershed wide problems. The primary objectives of this volunteer monitoring project are to:

- Develop a long term record of benthic macroinvertebrate communities and habitat quality.
- Determine whether water quality is changing over time (trends).
- Assess the health of the River Raisin Watershed.
- Educate and increase awareness and facilitate a community effort to improve and preserve the conditions necessary for a healthy river system within the watershed.
- Recommend Best Management Practices (BMP's) or other actions at specific locations.

### **1.c. Project Description**

The Adopt-A-Stream program utilizes teams of volunteers to monitor macroinvertebrates in the River Raisin in both the spring and fall. Teams are lead by two trained volunteers, a captain and collector while other volunteers assist by sorting through stream samples for macroinvertebrates. Specimen are preserved at the site to be identified during a lab identification event in most cases within 2 weeks of the collection. Basic stream physical data will be collected by volunteers. Data will be verified by the program director and then analyzed for trends and changes in the macroinvertebrate communities on a site and sub-watershed basis. Reports will be made available to the public through the River Raisin website [www.riverraisin.org](http://www.riverraisin.org).

- Volunteer training will be completed once a year for all stream captains, collectors and interested volunteers.
- Stream search will be conducted in both spring and fall to identify the annual community. This will capture macroinvertebrates that may be in diapause during one sampling period.

- 24 sites will be monitored: 16 historic AAS sites and 8 sites will be added in fall 2006 to complete the minimum of 2 sites per sub watershed (Table 1.)
- Commonly used DEQ metrics will be determined for all monitoring sites including taxa richness, EPT and MiCorps Stream Quality Score (Appendix 1)
- Volunteers will document other stream characteristics. Observations concerning land use and potential sources/causes of stress also will be recorded.
- University of Michigan research assistants will evaluate stream habitat while a cadre of trained volunteers is developed.
- Taxonomy experts will identify the macroinvertebrates during ID Day.
- Volunteer data will be entered into the MiCorps database.
- Data summary and reports are the responsibility of the RRWC (refer to Data Management and Reports). These reports will be used to guide site selection, identify trends, and provide local assessments for River Raisin Watershed Management Plan, RRWC educational program and local municipalities.

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If there is evidence of degraded water quality at a site, the MDEQ will be informed of the findings to evaluate whether more detailed monitoring is required. Data also will be used by MDEQ to help identify priority sites. Local government entities will be provided data when action is required for which county or municipal governments have authority. Interested area citizens will receive data summaries that describe the overall water quality in the watershed, potential threats to water quality, and actions that may be taken to address/reduce these threats. The information will be used to educate local communities, organizations, and schools.

#### 1.d. Data Quality Objectives

##### Accuracy and Precision

It is more difficult to generate quantitative goals for accuracy and precision for benthic macroinvertebrates. We will use two methods to ensure quality macroinvertebrate data is generated. The MiCorps benthic macroinvertebrate water quality score used to rank volunteer monitoring sites has a measurement range of 0 to 82.1. In any given stream reach, there are likely to be some taxa that are very rare. Therefore, unlike chemical measurements, it is impossible to quantify the accuracy of a benthic macroinvertebrate score. It is, however, possible to outline precision goals. The first precision goal is that multiple measurements of a stream reach should yield benthic macroinvertebrate scores in which the difference between the maximum and minimum score is not more than 9.1 points. This value is based on the potential for a site to contain one rare Group One taxa (which would impact the score by 5 points), one rare Group 2 taxa (which would impact the score by 3 points), and one rare Group 3 taxa (which would affect the score by 1.1 point). Replicate quality control sampling of 15% of the monitoring sites will be completed by the program director or aquatic ecologist within 2 weeks of the volunteer monitoring.

While Procedure #51 is a replicable set of metrics, there is still inherent subjective evaluation. Habitat characterization ranges from 200 to 0 with representative categories differing by approx. Procedure #51 is based on 10 metrics scored from 0 to 20. Assuming that field data collection will result in metrics being placed in either the lower or higher category of the replicate sample.

Metric scores may be off by 2 perhaps 3 points, but replicate metrics scores differing by more than 4 points should be rare. 20 points at the high end 154 is 13% and 20 points at the low end of 54 points is 37%. For simplicity a target of +/- 20% difference between the field and replicate sample scores will be the precision allowance.

Table 1. Accuracy and precision goals for measurements taken by:

**Citizen Volunteers**

Measurement	Accuracy	Precision
MiCorps Stream Quality Score	NA	+ or - 9 points
Macroinvert family level identification	NA	+ or - 2 families
Water Temperature	+ or - 0.5 degrees C	+ or - 20%
Stream Width	+ or - 2 feet	+ or - 10%
Stream Depth	+ or - 3 inches	+ or - 25%
Stream Velocity	+ or - 2 cfs	+ or - 25%

**Research Assistants**

Habitat assessment Procedure #51 score	NA	+ or - 20%
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NA = Not Applicable

It should be noted that these goals are initial estimates. Some likely will need to be revised as the program develops and monitoring and QA data become available. In some cases, precision goals may need to be relaxed, while others it may be feasible to make the goals more restrictive. This QAPP may be updated periodically to reflect any necessary modifications.

The assessment procedures will ensure that the data are representative of each location. At each site, volunteers will evaluate a 300 ft. stream reach. Because streams in this watershed have variable physical characteristics, benthic macroinvertebrates will be collected from all available habitat types and composited for scoring. This procedure will allow site scores to reflect the entire community at each location.

Comparability

The MDEQ has developed standardized habitat and benthic macroinvertebrate collection and analysis procedures for use by volunteers across Michigan. Volunteers who collect data for use by RRWC must undergo training that meets MDEQ standards. Further, data are recorded on standard MiCorps monitoring data forms and maintained in MiCorps database. These procedures, training requirements, and data management activities ensure that data collected by

volunteers within the River Raisin watershed are comparable to other watersheds, and that data collected by organizations throughout the state are comparable.

Habitat assessment will be completed using the MiDEQ recommended and standard stream assessment protocol of GLEAS Procedure #51.

### Completeness

These data will not be used for legal or compliance purposes, and there are no statistical reasons why a certain percentage of the anticipated data must be collected. However, it is recognized that failure to monitor even a few sites every year may be indicative of waning volunteer interest in the program. When data are not collected as scheduled from a site, RRWC and volunteer leaders will attempt to ascertain the reasons for this failure and correct them if possible.

Unfavorable weather on several consecutive weekends in the spring, for example, may lead to failure to report, about which nothing can be done. However, if a stream captain consistently shows a lack of interest or commitment, then we will work with that individual to identify reasons for the apathy and try to remedy any problems. In extreme cases, it may be necessary to find another volunteer to take over a site.

### **1.e. Training Requirements and Certification**

Macroinvertebrate sampling training will be provided by Jill Kelley, whom has completed University of Michigan aquatic ecology and aquatic entomology courses with ongoing research sampling River Raisin macroinvertebrates, and Gretchen Alexander, whom also has completed U of M aquatic ecology and aquatic entomology courses. Eventually, it is anticipated that experienced volunteers will be able to assist in the training process.

Stream captains and stream collectors are required to attend a two part training session, but all volunteers are encouraged to attend as well. The first half is conducted in a classroom and the following topics will be covered:

Goals of the volunteer monitoring program;

Safety protocols;

Proper use of equipment;

Explanation of field data sheet;

Slide show demonstrating various stream habitat characteristics, and

Identification of a reference collection of benthic invertebrates using a dichotomous key.

During the second half of the training, participants will visit a stream site to sample invertebrates and identify key habitats. This gives an opportunity to “get their feet wet” and to ask questions that may not have occurred in the classroom setting. Volunteers also can practice benthic macroinvertebrate identification in the field.

Habitat assessment using Procedure #51 training will be provided by David Allan. Graduate students will be versed on the application of the Procedure #51 manual (MiDEQ, 2002). Ten percent of each graduate student's evaluations will be replicated for quality assurance using the designated precision requirement.

### **1.f. Documentation and Records – Field Sheets / Database**

#### **Macroinvertebrate data:**

- Volunteers will complete the MiCorps Stream Macroinvertebrate Datasheet and RRWC amendment (see appendix).
- Page 2 of 3, Identification and Assessment, may be completed in the field if taxonomy expertise is available. This requires order level precision and a several unique families. Field identification will be verified during ID Day.
- Page 3 of 3 River Raisin Amendment includes flow data.
- Hard copies of the data sheets will be sent to MDEQ and macroinvertebrate data will be included in MiCorps database. The field data sheets will be stored both digitally in Excel and in hard copies at the RRWC office for 10 years. MDEQ will also maintain hard copy records at the Lansing Office. All records in the database will be maintained, ensuring that historical data are not lost. QA documentation generated from this project will be maintained by RRWC and MDEQ.

#### **Habitat assessment:**

- Procedure #51 will be completed for 24 AAS sites by University of Michigan graduate students.
- Habitat data will be kept in both hard copy and Excel

## **2. Measurement/Data Acquisition**

### **2.a. Sampling Process**

The River Raisin Watershed AAS sites are sampled twice a year for macroinvertebrates in late April or early May and in September. A sampling visit includes basic stream flow and habitat data and the collection and identification (either in the field or laboratory) of benthic macroinvertebrates. During extremely wet periods (common in April), sampling may have to be delayed. However, this situation is to be avoided, if possible, because of invertebrate life history characteristics and the potential for shifts in community composition.

Volunteers are encouraged to work in groups of two or more, and safety procedures are discussed during the training sessions. If a volunteer cannot make a scheduled sampling visit for any reason, they must notify the AAS Program Director who will attempt to find a replacement. If a replacement cannot be found, then the site visit may have to be rescheduled or canceled. Final decisions will be made by the AAS Program Director.

If site access requires crossing private property, the RRWC will seek permission from the owner. If access is not granted, then a nearby alternate site will be selected.

### **2.b. Sampling Method Requirements**

- Volunteers will visually inspect the stream reach to identify any potential pollution sources and tile inflows.
- A thermometer is needed to record the air and water temperature, and a tape measure to determine stream width and depth.
- Volunteers will be trained to use an orange or apple to measure stream current velocity.

For benthic macroinvertebrate collections:

- Volunteers will use D-frame nets with a mesh size of 400 microns.
- Volunteers will sort through collectors' samples until no new families are found.
- Several specimen of each taxa will be preserved in jars with 70% ethanol. There is no specific holding time for preserved specimens, but laboratory identifications should be completed within one month of a site visit in most cases this will be two weeks.
- Prior to leaving a site, volunteers are instructed to wash the nets and remove remaining invertebrates.

Laboratory identification:

- Laboratory identification will be completed to the family level (for insecta class only) within one month of collection
- Each site sample will have a site label following general research protocol including identifying the stream name and location, collection date and time, and the name(s) of the volunteers(s) that collected the data.

Habitat assessment:

University of Michigan graduate students will complete Procedure #51 for all 24 AAS sites during the months of May and June, 2006.

### **2.c. Sample Handling and Custody Requirement**

The only samples that are brought into the laboratory are benthic macroinvertebrates. A label is enclosed in all historic samples with site name, sample location, date and time, and collectors. RRWC maintains macroinvertebrate samples and a reference collection of taxa based on specimens found in the watershed.

### **2.d. Analytical Methods Requirements**

EPT, taxa richness and stream quality rating metrics will be determined for each site. Chronological analyses of these metrics will identify changes in the macroinvertebrate community over time and identify trends.

Habitat assessment will result in each site receiving a rating of excellent, good, marginal and poor. David Allan will provide statistical analyses on a sub-basin level to support the decision processes of the Watershed Management Plan. The identified habitat and macroinvertebrate data will be used to support the overall biosurvey assessment of the River Raisin Watershed.

### **2.e. Quality Control Requirements**

With regard to benthic macroinvertebrates, the goal is for the volunteer score and quality control scores to differ by <10 points, as described in the "Data Quality Objectives" section above. If variability is greater than 10 points, then the AAS Program Director will determine whether differences are caused by different sampling efficiency among volunteers and/or by problems with invertebrate identifications. Once the cause of the variability is determined, it will be addressed at the next training session. Volunteers may be asked to practice invertebrate

identification in the laboratory, or to work with an experienced individual to improve sampling efficiency. Volunteers are asked to maintain voucher specimens from sampling events, and the identifications of each individual will be checked once per year (at least for the first 2 years of the program). If a sample has multiple misidentifications, then results will be flagged or discarded and the volunteer will be provided with additional training.

For habitat assessment, if replicate quality control samples are outside the assigned QA goal, David Allan will evaluate whether it is a one time incident or systemic issue. In the later case, sites will be rescored correctly.

#### **2.f. Equipment Testing, Inspection, and Maintenance Requirements**

Nets will be inspected for tears/holes in the mesh by volunteers and repaired prior to each sampling event. Volunteers are required to thoroughly rinse and clean nets prior to returning from the field. Nets will be stored at the RRWC office. Voucher specimen jars also will be inspected by volunteers for cracks prior to sample collection. Thermometers will be checked for accuracy once a year. This will be done by placing thermometers into a jar of water at room temperature and taking readings from each. If one is found to differ from the others by more than 1 degree C, it will be properly discarded and replaced.

#### **2.g. Instrument Calibration and Frequency**

No equipment requires calibration.

#### **2.h. Data Management**

- The field data sheet is reviewed by the volunteer stream captain prior to leaving a site to ensure that the forms are fully completed and that nothing is left blank (exception must be needed).
- The AAS Program Director also will examine the data sheets for completeness when submitted. Upon submission volunteers will be questioned about any omissions or possible errors.
- The Program Director will inspect voucher collections to ensure that they are properly labeled, and any necessary corrections/additions will be made.
- Family level identification will be completed during ID Day by taxonomy experts.
- 10% of each “experts” samples will be re identified and the results compared with ID Day.
- Data will be entered into the MiCorps volunteer monitoring database spreadsheet/database designed by MDEQ for the statewide volunteer monitoring program. The quality of data entry will be evaluated by comparing 20% of the data sheets to the appropriate database records. If multiple errors are found, then all data sheets will be compared with their database records, and steps will be taken to address the source of the data entry errors.

#### **Habitat Assessment**

- Procedure #51 data will be collected by graduate students

- Data will be stored both in hard copy and in Excel

### **3. Assessments and Oversight**

#### **3.a. Assessments**

Volunteer participation is documented in an Excel database. If team results do not meet QA objectives, adjustments in the team members will be made to pair those requiring additional training with proven experienced members. Taxonomy experts will receive a report of their QA. Any discrepancies will be discussed with the expert.

#### **3.b. Reports**

The AAS Program Director will produce an annual report summarizing the River Raisin Watershed monitoring results from the previous sampling year. It will include:

- List of monitored sites
- Trends for each sub-basin will be analyzed including graphs depicting several years of macroinvertebrate data.
- Habitat analyses from University of Michigan
- QA results including any problems that were discovered
- Notable achievements
- How the data were used by federal, state, and local agencies
- Names of volunteers

This report will be presented to the River Raisin Watershed Council at the fall meeting and will be made public to anyone who requests it.

A quarterly AAS report will be prepared and submitted to MDEQ as required by 319 River Raisin Watershed Management Plan Grant. Both reports will be available through the web [www.riverraisin.org](http://www.riverraisin.org).

### **4. Data Validation, and Usability**

#### **4.a. Data Review**

All data collected during this project is reviewed by the AAS Program Director to determine whether the QA objectives are met. The AAS Program Director decides whether data are accepted, rejected, or qualified based on the QA objectives.

Habitat assessment data will be reviewed by David Allan for completeness and accuracy.

#### **4.b. Validation and Verification Methods**

- Field data collection accuracy - Sheets are reviewed by the AAS Program Director for completeness, unusual measurements, and accuracy of calculations.
- Sampling accuracy - 15% of the sites will be sampled within two weeks of the volunteer monitoring to serve as a quality control check. QA objectives will be applied. MDEQ macroinvert results will also be used as a QA reference.

- Identification accuracy - 10% of each family level taxonomy expert will be checked by Jill Kelley or Gretchen Alexander.
- Habitat assessment – 10% of each habitat sampler will be field checked by David Allan for accuracy

If unacceptable discrepancies are discovered adjustments will be made in the team sampling the site and corrective training provided.

Table 2. River Raisin Adopt-A-Stream Sites 3-21-06

	Site	Sub-basin	Water course	Location	Cross Street
1	BC1	Black Creek	TBD	TBD	TBD
2	BC2	Black Creek	TBD	TBD	TBD
3	E1	Evans Creek	Evans Creek	Tecumseh	Maumee St.
4	E2	Evans Creek	TBD	TBD	TBD
5	G1	Goose Creek	Goose Creek	Brooklyn	M-50
6	G2	Goose Creek	TBD	TBD	TBD
7	IC1	Iron Creek	TBD	TBD	TBD
8	IC2	Iron Creek	TBD	TBD	TBD
9	LRR1	Little River Raisin	Little River Raisin	Petersburg	Brewer Rd.
10	LRR2	Little River Raisin	TBD	TBD	TBD
11	RR1	River Raisin	River Raisin	Monroe	Telegraph Rd.
12	RR2	River Raisin	River Raisin	Monroe	Ida-Maybee Rd.
13	RR3	River Raisin	River Raisin	Dundee	M-50
14	RR5	River Raisin	River Raisin	Manchester	Sharon Valley Rd.
15	RR6	River Raisin	River Raisin	Tecumseh	Blood Rd.
16	RR7	River Raisin	River Raisin	Clinton	M-52
17	S2	Saline River	Saline River	Milan	Wilson Park
18	S3	Saline River	Saline River	Saline	Millpond Park
19	S4	Saline River	Wood Outlet	Pittsfield twp	Maple Rd
20	S5	Saline River	Pittsfield No. 5	Pittsfield twp	Moon Rd
21	SBM1	Macon Creek	South Branch Macon Creek	Dundee	Petersburg Rd
22	SBM2	Macon Creek	TBD	TBD	TBD
23	SBR1	South Branch River Raisin	South Branch River Raisin	Adrian	Heritage Park
24	SBR2	South Branch River Raisin	South Branch River Raisin	Cadmus	Brenner Rd.

Appendix 1. Stream Macroinvertebrate Datasheet

MiCorps Site ID#: \_\_\_\_\_



**Stream Macroinvertebrate Datasheet**

**Stream Name:** \_\_\_\_\_

Location: \_\_\_\_\_ (Circle one: *Upstream* or *Downstream* of road?)

Date: \_\_\_\_\_ Collection Start Time: \_\_\_\_\_ (AM/PM)

Major Watershed: \_\_\_\_\_ HUC Code (if known): \_\_\_\_\_

Latitude: \_\_\_\_\_ Longitude: \_\_\_\_\_

**Monitoring Team:**

Name of Person Completing Datasheet: \_\_\_\_\_

Collector: \_\_\_\_\_

Other Team Members: \_\_\_\_\_

**Stream Conditions:** Average Water Depth: \_\_\_\_\_ feet

Is the substrate covered with excessive silt?  No  Yes (describe: \_\_\_\_\_)

Substrate Embeddedness in Riffles:  0-25%  25-50%  > 50%  Unsure

Did you observe any fish or wildlife? ( ) Yes ( ) No If so, please describe: \_\_\_\_\_

**Macroinvertebrate Collection:** Check the habitats that were sampled. Include as many as possible.

<input type="checkbox"/> Riffles	<input type="checkbox"/> Stream Margins	<input type="checkbox"/> Submerged Wood
<input type="checkbox"/> Cobbles	<input type="checkbox"/> Leaf Packs	<input type="checkbox"/> Other (describe: _____)
<input type="checkbox"/> Aquatic Plants	<input type="checkbox"/> Pools	
<input type="checkbox"/> Runs	<input type="checkbox"/> Undercut banks/Overhanging Vegetation	

Did you see, but not collect, any **live crayfish**? (\_\_\_ Yes \_\_\_ No), or **large clams**? (\_\_\_ Yes \_\_\_ No)  
*\*remember to include them in the assessment on the other side!\**

**Collection Finish Time:** \_\_\_\_\_ (AM/PM)

Datasheet checked for completeness by: \_\_\_\_\_ Datasheet version 10/08/05  
 Data entered into MiCorps database by: \_\_\_\_\_ Date: \_\_\_\_\_

Appendix 2. Macroinvertebrate Identification and Assessment Datasheet

MiCorps Site ID#: \_\_\_\_\_



**IDENTIFICATION AND ASSESSMENT**

Use letter codes [R (rare) = 1-10, C (common) = 11 or more] to record the approximate numbers of organisms in each taxa found in the stream reach.

*\*\* Do NOT count empty shells, pupae, or terrestrial macroinvertebrates\*\**

**Group 1: Sensitive**

- \_\_\_ Caddisfly larvae (Trichoptera)  
*EXCEPT Net-spinning caddis*
- \_\_\_ Hellgrammites (Megaloptera)
- \_\_\_ Mayfly nymphs (Ephemeroptera)
- \_\_\_ Gilled (right-handed) snails (Gastropoda)
- \_\_\_ Stonefly nymphs (Plecoptera)
- \_\_\_ Water penny (Coleoptera)
- \_\_\_ Water snipe fly (Diptera)

**Group 2: Somewhat-Sensitive**

- \_\_\_ Alderfly larvae (Megaloptera)
- \_\_\_ Beetle adults (Coleoptera)
- \_\_\_ Beetle larvae (Coleoptera)
- \_\_\_ Black fly larvae (Diptera)
- \_\_\_ Clams (Pelecypoda)
- \_\_\_ Crane fly larvae (Diptera)
- \_\_\_ Crayfish (Decapoda)
- \_\_\_ Damselfly nymphs (Odonata)
- \_\_\_ Dragonfly nymphs (Odonata)
- \_\_\_ Net-spinning caddisfly larvae (Hydropsychidae; Trichoptera)
- \_\_\_ Scuds (Amphipoda)
- \_\_\_ Sowbugs (Isopoda)

**Group 3: Tolerant**

- \_\_\_ Aquatic worms (Oligochaeta)
- \_\_\_ Leeches (Hirudinea)
- \_\_\_ Midge larvae (Diptera)
- \_\_\_ Pouch snails (Gastropoda)
- \_\_\_ True bugs (Hemiptera)
- \_\_\_ Other true flies (Diptera)

Identifications made by: \_\_\_\_\_

Rate your confidence in these identifications: Quite confident 5 4 3 Not very confident 2 1

STREAM QUALITY SCORE	
Group 1:	
___ # of R's * 5.0 =	___
___ # of C's * 5.3 =	___
Group 1 Total = ___	
Group 2:	
___ # of R's * 3.0 =	___
___ # of C's * 3.2 =	___
Group 2 Total = ___	
Group 3:	
___ # of R's * 1.1 =	___
___ # of C's * 1.0 =	___
Group 3 Total = ___	
Total Stream Quality Score = ___	
<i>(Sum of totals for groups 1-3; round to nearest whole number)</i>	
Check one:	
___ Excellent	(>48)
___ Good	(34-48)
___ Fair	(19-33)
___ Poor	(<19)

Datasheet checked for completeness by: \_\_\_\_\_ Datasheet version 10/08/05  
Data entered into MiCorps database by: \_\_\_\_\_ Date: \_\_\_\_\_

Appendix 3. Stream Datasheet RRWC Amendment

RR Site ID#: \_\_\_\_\_



Stream Datasheet (RRWC amendment pg 3 of 3, 3-9-06)

Velocity Trial #1: _____	Average Width at water level: _____
Trial #2: _____	Water temperature: _____
Trial #3: _____	Air temperature: _____
Sum: _____	
Divide by 3: _____	
Average velocity: _____	

Please note any unique features of your site so we can add this to the site file e.g. any trash found, tiles flowing into the stream, active erosion, visit from interested landowners, signs of fishing activity, other wildlife including fish, birds, or mammals:

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Appendix 4. GLEAS – Procedure #51 Habitat Assessment, May 2002

<b>METRIC (Riffle/Run)</b>	<b>SCORING RANGE/RATING</b>			
	Excellent	Good	Marginal	Poor
<b>Substrate and Instream Cover</b>				
1. Epifaunal Substrate/Available Cover	16 - 20	11 - 15	6 - 10	0 - 5
2. Embeddedness	16 - 20	11 - 15	6 - 10	0 - 5
3. Velocity/Depth Regime	16 - 20	11 - 15	6 - 10	0 - 5
<b>Channel Morphology</b>				
4. Sediment Deposition	16 - 20	11 - 15	6 - 10	0 - 5
5a. Flow Status – Maintained Flow Volume	9 - 10	6 - 8	3 - 5	0 - 2
5b. Flow Status – Flashiness	9 - 10	6 - 8	3 - 5	0 - 2
6. Channel Alteration	16 - 20	11 - 15	6 - 10	0 - 5
7. Frequency of Riffles (or Bends)	16 - 20	11 - 20	6 - 10	0 - 5
<b>Riparian and Bank Structure</b>				
8. Bank Stability	16 - 20	11 - 15	6 - 10	0 - 5
9. Vegetative Protection	16 - 20	11 - 15	6 - 10	0 - 5
10. Riparian Vegetation Zone Width	16 - 20	11 - 15	6 - 10	0 - 5

<b>METRIC (Glide/Pool)</b>	<b>SCORING RANGE/RATING</b>			
	Excellent	Good	Marginal	Poor
<b>Substrate and Instream Cover</b>				
1. Epifaunal Substrate/Available Cover	16 - 20	11 - 15	6 - 10	0 - 5
2. Pool Substrate Characterization	16 - 20	11 - 15	6 - 10	0 - 5
3. Pool Variability	16 - 20	11 - 15	6 - 10	0 - 5
<b>Channel Morphology</b>				
4. Sediment Deposition	16 - 20	11 - 15	6 - 10	0 - 5
5a. Flow Status – Maintained Flow Volume	9 - 10	6 - 8	3 - 5	0 - 2
5b. Flow Status – Flashiness	9 - 10	6 - 8	3 - 5	0 - 2
6. Channel Alteration	16 - 20	11 - 15	6 - 10	0 - 5
7. Channel Sinuosity	16 - 20	11 - 20	6 - 10	0 - 5
<b>Riparian and Bank Structure</b>				
8. Bank Stability	16 - 20	11 - 15	6 - 10	0 - 5
9. Vegetative Protection	16 - 20	11 - 15	6 - 10	0 - 5
10. Riparian Vegetation Zone Width	16 - 20	11 - 15	6 - 10	0 - 5

<b>Habitat Characterization</b>	<b>Total Point Score (metrics 1-10)</b>
1. Excellent	>154
2. Good	105 – 154
3. Marginal	56 – 104
4. Poor	<56

## Bibliography

Michigan Department of Environmental Quality, 5/28/02, GREAT LAKES AND ENVIRONMENTAL ASSESSMENT SECTION PROCEDURE #51, QUALITATIVE BIOLOGICAL AND HABITAT SURVEY PROTOCOLS FOR WADABLE STREAMS AND RIVERS