A1. Title and Approval Sheet

Quality Assurance Project Plan for
Michigan Trout Unlimited Stream Monitoring Program: Rogue River

Date: 8/10/2010
Version # 1
Organization: Michigan Trout Unlimited

QAPP Prepared by: Kristin Thomas
Title: Aquatic Ecologist, Project Expert

Signature: _____

Other responsible individual:
Title: Schrems West Michigan Chapter Trout Unlimited Project Manager

Signature: _____

(Other signatures may be added as necessary)

MiCorps Staff Use

Tracking Number:

MiCorps Reviewer: _____

☐ Approved ☐ Returned for modifications

_____

Signature of reviewer Date

A2. Table of Contents

A3. Distribution List

Kristin Thomas
Aquatic Ecologist
Michigan Trout Unlimited

Dr. Bryan Burroughs
Executive Director
Michigan Trout Unlimited

Jim Flamming
Conservation Chair
Schrems West Michigan Chapter Trout Unlimited

Dr. Paul Steen
MiCorps
Huron River Watershed Council

A4. Project Organization

Key Personnel	Role	Affiliation	Contact: email	Phone
MITU Aquatic Ecologist	Project Expert	MITU	kthomas@michigantu.org	616-460-0477
	QA Expert			
	Training/Field Leader			
MITU Executive Director	Executive Director	MITU	bryanburroughs@michigantu.org	517-599-5238
	Scientific Advisor			
SWMTU Project Manager	Chapter Project Manager	Schrems West MI Chapter		
Volunteers	Volunteer Roles (collectors, pickers, etc.)	Schrems West MI Chapter		

Management Responsibilities

1. Kristin Thomas, M.S: Aquatic Ecologist. The Aquatic Ecologist trains volunteers to monitor stream biota, habitat, and physical parameters in coldwater stream throughout Michigan. She is responsible for quality assurance, analysis and interpretation of these data for volunteers and stakeholders. Kristin earned a M.S. in Biology: Aquatic Science from Grand Valley State University.
2. Bryan Burroughs, Ph.D: Executive Director. The Executive Director provides grant administration and program implementation. In addition, he is a technical and scientific advisor for the MITU volunteer stream monitoring program. Dr. Burroughs earned a Ph.D. in Fisheries Management from Michigan State University focusing on fluvial geomorphology and dam removal strategies. Kristin Thomas reports to Dr. Burroughs.
3. Jim Flamming, Schrems West Michigan Trout Unlimited Project Manager. The SWMTU Project Manager is an avid fly fisherman with a background in science and natural resources. Jim is responsible for coordinating sampling events for the Schrems West Michigan Chapter

Roles filled by key personnel

1. Management Responsibilities
    - **MITU Executive Director** will primarily be responsible for grant administration. He will also support the project expert and make sure all of her needs are met.
    - **MITU Aquatic Ecologist** is the project expert. She will assist the volunteer project manager to ensure that all of his needs are met. In addition, she will manage data and samples.
    - **SWMTU Project Manager** is the volunteer project manager. He will primarily be responsible for organizing and managing the volunteers at sampling and identification events and storing and distributing equipment.
2. Field Responsibilities

- **SWMTU Project Manager** will be the leader in the field for the Schrems Chapter. Organizing, managing, and training the volunteers are Jim's primary responsibilities. He will also be in charge of gathering the samples taken at each site.
- **MITU Aquatic Ecologist/Project Expert** will assist the SWMTU Project Manager in the field to help facilitate the field portion of sampling events. She will also be in the field participating in sampling. The Project Expert will be the QA manager.
- **Volunteers** will participate in collection, sorting, and preserving of sampling during each event.

3. Laboratory Responsibilities
    - **SWMTU Project Manager** will lead laboratory sessions for the Schrems Chapter. He will be in charge of identification events and packing samples for storage. The equipment will be kept with the Schrems Chapter of Trout Unlimited.
    - **MITU Aquatic Ecologist** will participate in identification events. The aquatic ecologists will help to identify unknown bugs at identification events. The samples will be stored with MI Trout Unlimited. The aquatic ecologist will be responsible for safely transporting the samples and verifying identifications.
    - **MITU Executive Director** will help identify any bugs the volunteers and the aquatic ecologist are unable to identify.
    - **Volunteers** will assist in identification using training provided by the SWMTU Project Manager and the MITU Aquatic Ecologist as well as identification materials recommended and/or provided by MiCorps.
4. Corrective Action
    - **SWMTU Project Manager** is in charge of identifying areas in which improvements can be made in sampling and/or identification technique. If actions are discovered that are compromising the integrity of the project, the SWMTU Project Manager is responsible for bringing them to the MITU Aquatic Ecologist's attention and working with her to correct them.
    - **MITU Executive Director and Aquatic Ecologist** are responsible for ensuring that project deliverables and work plans match up with those outlined in the contract. If inconsistencies are discovered they will work with chapter project managers to correct the matter. They will also work with MiCorps staff to make sure contract details are directly followed.

A5. Problem Definition/Background

The Rogue River watershed is a sub-watershed of the Grand River located about 25 miles northwest of Grand Rapids. The Rogue River watershed is home to approximately 15,000 people and drains about 261 square miles. The Rogue River watershed has both warm and cold water fisheries. Monitoring efforts will be concentrated in cold-water portions of the Rogue River because Trout Unlimited is a cold-water conservation organization.

The Rogue River Watershed Management Plan, completed by the Annis Water Resources Institute in 2001, indentifies threats to the coldwater fishery from thermal pollution and

sedimentation. Development, stormwater run-off, water withdrawal, and agriculture all pose threats to the coldwater fishery in the Rogue River watershed. In 2010 Trout Unlimited chose the Rogue River as a site for a Home Rivers Initiative. The Home Rivers Initiative is a watershed level approach to stream restoration. A project manager will be working to identify and correct sources of degradation within the watershed. It is important we continue to document the health of the Rogue River to determine the impact restoration efforts are having and to identify new sources of degradation.

Project Goals and Objectives

The mission of Michigan Trout Unlimited is to conserve, protect, and restore Michigan's coldwater fisheries and their watersheds. The goals of the volunteer stream monitoring program are to collect reliable data about the conditions of many of the coldwater stream in Michigan, to use this information to determine conservation and restoration needs within each watershed, to carry out the steps necessary to address these needs, and educate TU members and the public about the health and needs of their streams. The primary actions we envision taking based on monitoring results are to report trends and conditions of streams studied to the DNRE, TU chapters, and communities. We will not formally present any results until we have three years worth of macroinvertebrate data plus one habitat evaluation. When we have established the condition of the stream sections studied we will evaluate conservation and restoration techniques that may help improve stream quality and minimize future degradation, with the ultimate goal being to maintain or improve stream quality.

A6. Program Description

The purpose of monitoring coldwater streams in Michigan is to assess the condition of streams and trends in stream health. This information will be used to prioritize conservation and restoration needs for each stream, recommendations for protection and improvement will be provided to agencies, partners, and the community.

Volunteers will work in small teams led by trained leaders to monitor macroinvertebrate populations and stream habitat. The initial sampling will consist of 1 site on Stegman Creek and 1 site on Cedar Creek. Both sites will be sampled on the same day. It is intended that the sampling from year to year will take place during a consistent weekend, with the realization that the actual dates will depend on weather and stream conditions. Ideally the sampling will take place from year to year during the same two week period surrounding the target dates. As experience is gained and the number of well-trained volunteers increases, we plan to identify additional sites to add to the sampling program to better represent the entire watershed. Macroinvertebrate samples are stored in alcohol and identified in a laboratory. An aquatic biologist verifies all identifications. The habitat conditions at each site will be measured every three to four years.

Volunteers are recruited in the weeks leading up to each event, using email, online notifications, and press releases. We also find new volunteers when we give presentations at Trout Unlimited chapter meetings. Our volunteer database is maintained by staff before and after each monitoring event.

A7. Data Quality Objectives for Measurement Data

Habitat Assessment:
There is not a lot of Quality Control for quantitative measures in the habitat assessment because much of the information generated is subjective. Volunteers receive training on how to analyze habitat. Data are reviewed and any unusual information is discussed with the volunteer. All data are reviewed, entered, and interpreted by staff.

We don't base any evaluation or action about habitat on a single data point. We look at many different measurements and observations made by volunteers and staff to complete subsequent studies of each site.

Macroinvertebrate Monitoring:

The data quality objectives listed below are for aquatic macroinvertebrate collection and identification that will take place during this project. The data collected will lead to an understanding of the biodiversity and quality of the sampled stream reach. Quality will be inferred based on the diversity and quantity of species collected based on formulas presented in the MiCorps protocol.

Accuracy and Precision
The following techniques will be reviewed during training and in 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), 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 project managers to perform independent (duplicate) collections of sampling sites, our goal for quality assurance is conservative. A given site's Stream Quality Index (SQI) score or total diversity (D) measure across macroinvertebrate taxa will be 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 D and SQI for each site will be compared to the composite (median) results and each should be within two standard deviations of the median.

All stream data records will include the personnel of the monitoring team and each type of habitat sampled. The Project Expert or Executive Director will verify and correct all macroinvertebrate identifications made by the volunteer experts.

Sample results that exceed these standards will be noted at "outliers" and examined to determine if the results are likely due to sampling error or 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 the Project Expert at the next sampling event and be considered for retraining.

The Project Expert will make the final identifications for each sample. MiCorps staff will conduct a method validation review with the designated Project Expert to ensure his or her expertise, preferably prior to the first training session held by the Project Expert. This will be conducted with each new Project Expert added to the MiCorps monitoring program. This review will consist of a joint sampling event, with MiCorps staff jointly collecting, sorting, and identifying the macroinvertebrates with the Project Expert. Any monitoring issues will be addressed on site. If no major concerns remain, the Project Expert will be considered "certified" by MiCorps.

Bias
Sites will be sampled by different team leaders at least 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. The new measure should be within two standard deviations of the median of past measures. Sites not meeting the DQO will be evaluated by the Project Expert.

Completeness
Following a quality assurance review of 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, the Project Expert will consult with MiCorps 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 a full variety of coldwater 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 tributaries. Since not enough resources are available to allow the program to cover the entire watershed, some cold tributaries will not initially be represented. Additional stream sites will be added as resources and volunteers allow.

Comparability
To ensure comparability, all volunteers in the watershed will follow the same sampling and site selection methods and use the same units of reporting. Project directors and trainers will learn the standard MiCorps monitoring methods at annual trainings by MiCorps staff and will train their volunteers to follow those methods to ensure comparability of results among all MiCorps programs. To the extent possible, the monitoring of all study sites will be completed in a single weekend.

For each sampling event that is not completed in a single weekend, monitoring by volunteers will be completed within the same two week period. If a site is temporarily inaccessible, such as due to prolonged high water, the monitoring time may be extended for two additional weeks. If the issue concerning inaccessibility continues beyond the extended dates, then no monitoring data

will be collected during that time and there will be a gap in the data. If a team is unable to monitor their site during the specified time, the Team Leader will contact the Project Manager as soon as possible and no later than the end of the first week in the sampling window in order for the Manager to arrange for another team to complete the monitoring. If no team is available, the Project Manager will, if feasible, sample the site. Otherwise, the site will go unmonitored for that season.

A8. Special Training/Certifications

The Project Expert, MITU Executive Director, and a SWMTU Chapter Leader have had hands-on MiCorps training to witness and learn first-hand how a volunteer-based stream monitoring program is expected to work. In addition, the Project Expert has observed and helped sample with a MiCorps project on the upper Manistee River.

Training will be provided to each volunteer participating in the project. When new volunteers join a sampling event they will be paired up with more experienced volunteers so they can learn by "shadowing" volunteers with more experience. This technique will allow new volunteers to ask questions as they learn in a hands-on environment.

During a collection event each sampling group will have an experienced streamside leader. This leader will be responsible for filling out the data sheets, labeling jars, helping people pick the macroinvertebrates, and reminding the collectors to cover all available habitats.

New volunteers typically start out as pickers. No training is required to be a picker. Pickers are responsible for sorting through the samples collected by the collectors, picking out the macroinvertebrates, and putting them in a collection jar.

Team leaders sampling habitat attend a training session. At this training session volunteers learn how to assess stream banks, measure the stream widths and depths, and record the substrate located along transects. Volunteers also learn how to make a simple map of the stream.

Documentation
Training is documented with a volunteer database, which lists what training sessions a volunteer has participated in. The Project Expert is responsible for maintaining the database. MITU staff will also keep record of field data sheets and a database with all of the monitoring data.

SECTION B: Measurements/Data Acquisition

B1. Study Design and Methods

Study Design
The streams benthic macroinvertebrate community will be monitored in April and October, following MiCorps stream monitoring protocol. In stream and riparian habitat will be assessed during low-flow summer conditions (July – November) following MiCorps stream monitoring protocols.

Monitoring Task Schedule

March: Begin recruitment for volunteers for the April monitoring event.

April: Prepare for the April sampling event. Check that equipment is in good repair. Create small teams with experienced and inexperienced volunteers. Tell each group where they will be sampling. Conduct macroinvertebrate collection and identification.

May: Verify identifications of benthic macroinvertebrates. Enter data about the volunteers and macroinvertebrates. Send a brief press release to the local paper and a brief report to the chapter. Place the results on Michigan Trout Unlimited webpage.

June: Recruit and train volunteers for the habitat survey. Make sure equipment is in good repair.

July: Conduct habitat survey training. Arrange volunteers into teams and help them schedule dates to complete the survey. Enter data about new volunteers.

August: Begin recruiting volunteers for the October monitoring event.

September: Prepare for October monitoring event. Recruit new volunteers and invite experienced volunteers to participate. Check that equipment is in good repair. Create teams with experienced and inexperienced volunteers. Tell each group when and where to begin.

October: Organize and conduct macroinvertebrate collection and macroinvertebrate ID day. Verify identifications of benthic macroinvertebrates. Enter volunteer and macroinvertebrate data and send reports to the press and the chapter. Place the results on the Michigan Trout Unlimited webpage.

November: Review and interpret data and make reports. Enter results into MiCorps data exchange.

Site Descriptions (see attached map)

Locating and Identifying Monitoring Sites

Monitoring site are located within the Rogue River watershed. All sites are located on coldwater tributaries to the Rogue River. Presently we do not have enough volunteers to sample all coldwater in the Rogue River watershed, therefore, a subset of key tributaries has been chosen.

Monitoring sites are identified by the name of the county, the creek, and the road crossing or other distinctive landmark. Maps are provided to the collecting team. Permission to access private 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 a subset of coldwater streams in the Rogue River Watershed while involving Michigan Trout Unlimited members and members of the community. We have designed our macroinvertebrate monitoring program so that the collection and identification events are one-day group events in which anyone can participate.

The macroinvertebrate community will be monitored and identified to order level twice per year, once in the spring and once in the fall. Samples will be saved to allow for the possibility of future identification to the family level. Equipment to be used for this process includes: 12" D-frame kicknets, forceps, white plastic sorting trays, sealable sample jars, ethanol, and a magnifier. Literature references used for identification are materials recommended and/or provided by MiCorps, such as the *Guide to Aquatic Invertebrates of the Upper Midwest.*

All sites are sampled on a single Saturday in the spring and fall. It is intended that the sampling from year to year will take place during a consistent weekend, with the realization that the actual dates will depend on weather and stream conditions. If a site is inaccessible on the sampling date that site will be sampled within two weeks of the original sampling date. If the site remains inaccessible for two weeks, or volunteers are not available to conduct the sampling at a different time, the site will not be sampled and there will be a gap in the data. Each team will sample one site. Each team then will bring their collection back to a central location.

Multiple collections will be taken from each habitat type present at the site, including riffle, rocks and other large objects, leaf packs, submerged vegetation or roots, and depositional areas, while wading using a D-frame kicknet. The trained Streamside Leader will record the number of locations sampled within the monitored reach in each habitat type. The trained Collector will transfer the material from the net into white pans. The remaining volunteers (Pickers) will pick out samples of all different types of macroinvertebrates from the pans and place them into jars of 70% ethanol 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 constructions made of sticks and 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 study results. There are places on the data sheet to record unusual procedures or accidents, such as losing part of the collection by spilling. Any variations in procedure should be explained on the data sheet.

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.

At the collecting site, all invertebrate sample jars receive a label written in pencil, stating 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 meeting location, 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. Identification is conducted on the same day after lunch is served. Some volunteers participate in both events while others only come for collection or identification. The data sheets are completed during the identification period of the 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 identify all individuals from a single jar. These identifications are then verified by the Project 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 with Michigan Trout Unlimited indefinitely. The alcohol is carefully changed (to avoid losing small specimens) in the jars every few years.

Habitat

Habitat assessments will be conducted during a single week. A descriptive procedure is provided to volunteers to guide them through the process. Photos are used to document areas of erosion, degradation, or concern. Habitat will be monitored at least every five years, during low flow in the summer or fall. Monitoring procedures and methods will follow MiCorps guidelines. Data sheet is attached.

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

Quality Control Checklists

Equipment Quality Control

- Check to make sure equipment is in working order and not damaged
- Clean equipment before and after taking it into the field
- Label equipment with their dates of purchase and dates of last usage
- Check the expiration date of chemical reagents prior to each use
- Check the batteries on all equipment that requires them
- Make sure all equipment is calibrated appropriately before conducting each test

Field Procedures Quality Control

- Conduct repeat and/or side-by-side tests performed by separate field crews
- At least once every three years in each season: change the composition of the field crews to maintain objectivity and minimize individual bias
- Review field records before submitting for analysis to minimize errors

Because our evaluation is based on the diversity in the community, we attempt to include a complete sample of different groups present, rather than a random sub-sample. We do not assume that a single collection represents all the diversity in the community, but rather we consider our results reliable only after repeated collections spanning at least three years. Our results are compared with other locations in the same river system that have been sampled by

different collectors at different times to diminish the effects of bias in individual collecting styles. Samples where the diversity measures diverge substantially from past samples at the same site are re-sampled by a new team within two weeks. If a change is confirmed, the site becomes a high priority for the next scheduled collection. Field checks include checking all data sheets to make sure each habitat type available was sampled, and the team leader examines several picking trays to ensure that all present families have been collected. All lab sorting is rechecked by an expert before completing identification.

B2. Instrument/Equipment Testing, Inspection, and Maintenance

In the days prior to a monitoring event, the Chapter Project Manager will check all equipment carefully. Supplies for each team will be put together including a bucket, net, pans, forceps, and jars with alcohol. All equipment will be stored with SWMTU.

- **D-frame kick nets:** will be inspected before and after each sampling session to look for any defects or tears in the nets.
- **Collection jars** (with poly seal caps): each jar and lid will be inspected for cracks or defects before each use. After jars are in use they will be inspected for leaky tops, improper seals, cracks, and chips.
- **Forceps**: will be cleaned and inspected to make sure the tips meet before each sampling event.
- **Magnifiers/Dissection Scopes**: will be cleaned and inspected to make sure they are functioning properly before and after each identification event.

B3. Inspection/Acceptance for Supplies and Consumables

- **D-frame Kick Nets** – Purchased August 2010, replace when damaged beyond repair
- **Collection Jars** – Purchase August 2010, replace when all are in use or broken
- **Forceps** – Purchased August 2010, replace when tips do not meet when squeezed
- **Magnifier/Dissection Scope** – Purchased in fall 2010, replace when no longer functional
- **Ethanol** – Purchase August 2010, replace when all is consumed or past expiration date
- **Sorting Trays** – Purchased August 2010, replace when they no longer function as needed

Prior to a monitoring event a SWMTU representative will make sure there are ample data sheets, labels, and that all equipment is in order.

B4. Non-direct Measurements

This section is not applicable to our project.

B5. Data Management

All data are recorded on original field and laboratory paper data sheets. These data sheets are stored with MITU. Raw data will be entered and managed in a Microsoft Access database. All data is backed up before and after each sampling event's data has been entered.

Data will be entered by the data manager into the program's MS Access database for long-term storage. Once a year, all new data will be exported to a MiCorps compatible format and sent to MiCorps for inclusion in their data exchange system. Data sheets will be filed with MITU indefinitely.

Field data sheets are checked by the Project Expert upon return to MITU. Any omissions or confusions are clarified as soon as possible. The Project Expert will enter data into a database which is then used for both analysis and reporting. The final data tables are checked against the data sheets. The results of monitoring will then be posted on the MITU and SWMTU websites.

Macroinvertebrates: Data are summarized for reporting into four metrics: all taxa, insects, EPT (Ephemeroptera + Plecoptera + Trichoptera), and sensitive taxa. A Stream Quality Index (SQI) is also computed. The method for calculating that metric can be found on the macroinvertebrate sampling data sheets.

Habitat: specific measures are used from habitat surveys to investigate problem areas at each site. The percentage of stream bed composed of fines (sand and smaller particles) is calculated and changes are tracked over time as an indicator of sediment deposition.

Section C: Data Validation and Reporting

C1. Assessment and Response Actions

Program effectiveness is gauged through post-event surveys given to each participant. These surveys bring in good ideas and help identify any problems in methods, training, or with particular volunteers. Volunteers may be encouraged to repeat a training event if their work is of poor quality.

- Side-by-side sampling will take place during which the Project Expert and an outside expert will sample the stream together. The outside expert will watch the volunteers for procedural problems and will suggest remedies as necessary.
- Data sheets will incorporate essential QAPP procedures, such as the number of net samples taken from each type of habitat.
- Volunteer team leaders trained by MiCorps will make sure that quality assurance protocols are followed and report any issues possibly affecting data quality to the project manager.

If deviation from the QAPP is noted at any point in the sampling or data management process, the affected samples may be deleted from the data set. Re-sampling will be conducted if warranted and feasible, given that the deviation is noted soon after occurrence and volunteers are available. Otherwise, a gap may be left in the monitoring record. All corrective actions, such as above, will be document and communicated to MiCorps.

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 are also trained in this way. Benthic macroinvertebrate and habitat data sheets are double checked in the field. All data sheets are reviewed by the MITU staff for thoroughness and clarity. Data entered into the database will be checked against the respective hard copy of the data sheet.

If new data deviate from previous records beyond previously stated DQOs, these outliers will be identified, and the site can be re-sampled by the Project Manager or Project Expert, or the data will be thrown out. The Project Expert has primary responsibility for identifying questionable data and taking corrective action.

C3. Reconciliation of data with Data Quality Objectives

In order to best determine if the data meets the DQOs set forth in section A7, we will assess our data within one week after sampling. If a sample deviates from the previously stated DQO's, the parameter will be re-sampled 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, re-sampling soon after the deviant data were recorded can confirm if those conditions truly exist, or if it resulted from sampling error. If re-sampling suggests sampling error in the original data, those data will be rejected and replaced by the re-sampled data. If re-sampling is not possible within the two week period, 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

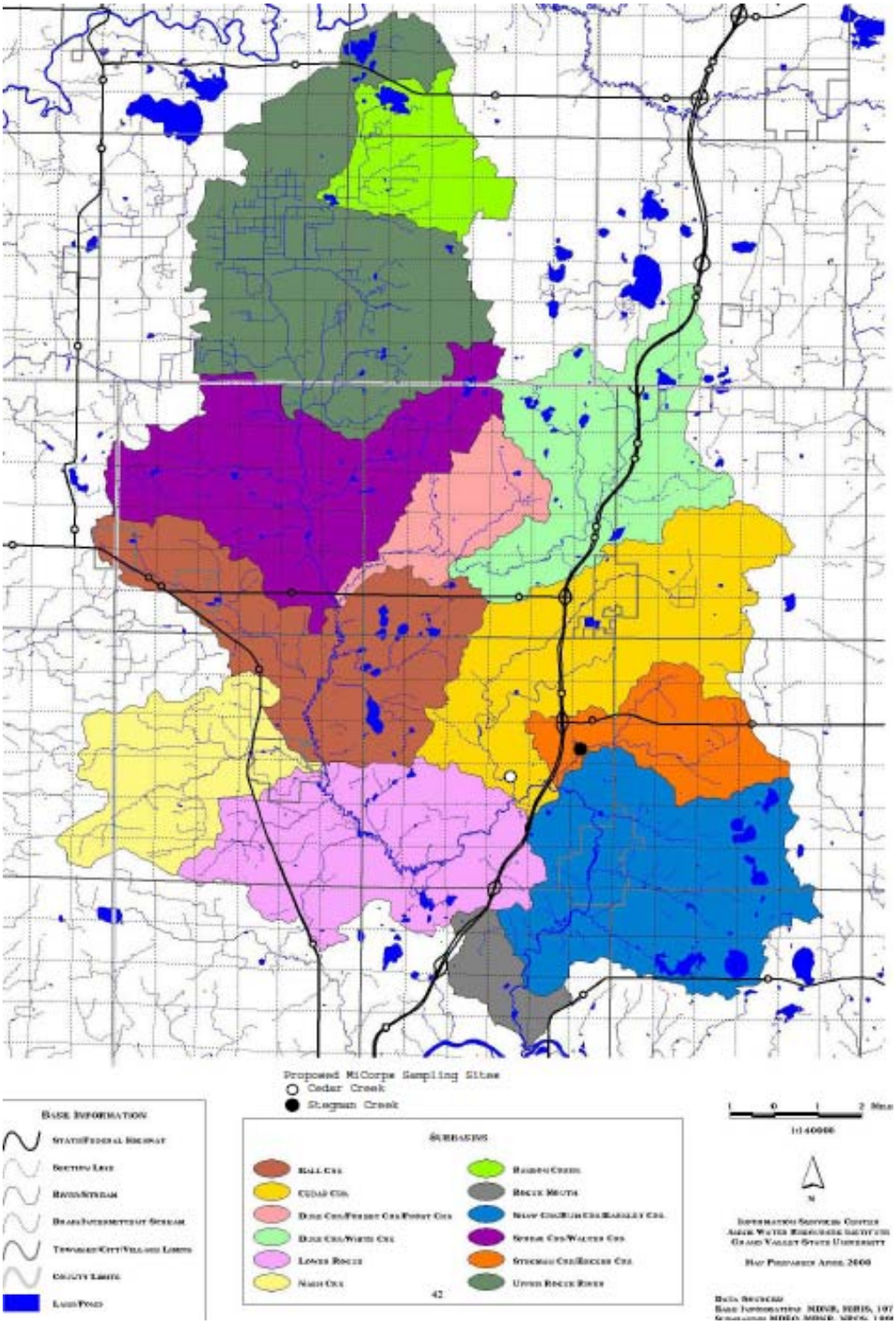
Reporting will be a key component to the success of this project. Many reports between volunteers and the project managers will be informal, and will be completed over email, telephone, or in person. These informal reports will help ensure the continued success of the sampling/identification events. The Project Expert will also report to the MiCorps program administrator in a more formal way on a regular basis.

Benthic macroinvertebrate and habitat assessment data summaries, with a number of calculated metrics including a Stream Quality Index, are reported with brief interpretations for the sampling sites on the MITU website and in the SWMTU newsletter.

Monitoring data will be submitted to MDNRE in an electronic format such that they are suitable for entry into EPA's STORET database using data submission templates. The Project Expert is primarily responsible for data analysis, interpretation, and reporting.

Attachments

Attachment 1 – Site Map



Attachment 2 – Macroinvertebrate Datasheets

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.

____ Riffles
____ Cobbles
____ Aquatic Plants
____ Runs
____ Stream Margins
____ Leaf Packs
____ Pools
____ Undercut banks/Overhanging Vegetation
____ Submerged Wood
____ Other (describe:_____ _____)

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:_____

MiCorps Site ID#:_____

Michigan Clean Water Corps

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)

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 = _____
(Sum of totals for groups 1-3; round to nearest whole number)

Check one:
_____ Excellent (>48)
_____ Good (34-48)
_____ Fair (19-33)
_____ Poor (<19)

Identifications made by:_____

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

Datasheet checked for completeness by:_____ Datasheet version 10/06/05
Data entered into MICorps database by:_____ Date:_____

Attachment 3 – Habitat Datasheets

STREAM HABITAT ASSESSMENT

Michigan Clean Water Corps

I. Stream, Team, Location Information

Site ID:_____ Date:_____ Time:_____

Location:_____

Name(s):_____

II. Stream and Riparian Habitat

A. General Information *Circle one or more answers as appropriate*						Notes and Observations: Give further explanation when needed.
1	Average Stream Width (ft)	< 10	10-25	25-50	>50	
2	Average Stream Depth (ft)	<1	1-3	>3	>5	
3	Has this stream been channelized? (Stream shape constrained through human activity- look for signs of dredging, armored banks, straightened channels)	Yes, currently	Yes, sometime in the past	No	Don't know	
4	Estimate of current stream flow	Dry or intermittent	Stagnant	Low	Medium	High
5	Highest water mark (in feet above the current level)	<1	1-3	3-5	5-10	>10
6	Which of these habitat types are present?	Riffles	Deep Pools	Large woody debris	Large rocks	Undercut bank
		Overhanging vegetation	Rooted Aquatic Plants	Other:	Other:	Other:
7	Estimate of turbidity	Clear	Slightly Turbid (can partially see to bottom)		Turbid (cannot see to bottom)	
8	Is there a sheen or oil slick visible on the surface of the water?	No	Yes			
9	If yes to #8, does the sheen break up when poked with a stick?	Yes (sheen is most likely natural)		No (sheen could be artifical)		
10	Is there foam present on the surface of the water?	No	Yes			
11	Is yes to #10, does the foam feel gritty or soapy?	Gritty (foam is most likely natural)		Soapy (foam could be artifical)		
The following are optional measurements not currently funded by MiCorps						
8	Water Temperature					
9	Dissolved Oxygen					
10	pH					
11	Water Velocity					

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

B. Streambed Substrate

Estimate percent of stream bed composed of the following substrate.

If group will take transects and pebble counts (in Section IV), check this box and record the measured percentages. ☐

Substrate type	*Size*	*Percentage*
Boulder	>10" diameter	
Cobble	2.5 - 10" diameter	
Gravel	0.1 - 2.5" diameter	
Sand	coarse grain	
Fines: Silt/Detritus/Muck	fine grain/organic matter	
Hardpan/Bedrock	solid clay/rock surface	
Artificial	man-made	
Other (specify)		

C. Bank stability and erosion.

Summarize the extent of erosion along each bank separately on a scale of 1 through 10, by circling a value below. Left/right banks are identified by looking downstream.

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	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

You may wish to take photos of unstable or eroded banks for your records. Record date and location.

Comments:

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

II. Stream and Riparian Habitat (continued)

D. Plant Community

Estimate the percentage of the stream covered by overhanging vegetation _____%

Using the given scale, estimate the relative abundance of the following:

Plants in the stream:		*Plants on the bank/riparian zone:*	
Algae on Surfaces of Rocks or Plants	Filamentous Algae (Streamers)	Shrubs	Trees
Macrophytes (Standing, Floating Plants)	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**	Grasses	**0= Absent 1= Rare 2= Common 3= Abundant 4= Dominant**
Identified species (optional)		Identified species (optional)	

E. Riparian Zone

The riparian zone is the vegetated area that surrounds the stream. Right/Left banks are identified by looking downstream.

1. Left Bank

Circle those land-use types that you can see from this stream reach.

Wetlands Forest Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

2. Right Bank

Circle those land-use types that you can see from this stream reach.

Wetlands Forest Residential Lawn Park Shrub, Old Field Agriculture

Construction Commercial Industrial Highways Golf Course Other_____

3. Summarize the size and quality of the riparian zone along each bank separately on a scale of 1 through 10, by circling a value below.

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.	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	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

MiCorps Site ID#:_____ Date:_____

III. Sources of Degradation

1. In what ways is this stream degraded, if any?

2. Does a team need to come out and collect trash?

3. Based on what you can see from this location, what are the potential causes and level of severity of this degradation? Only judge what you can see from the site.

(Severity: S – slight; M – moderate; H – high) (Indicate all that apply)							
Crop Related Sources	S	M	H	Land Disposal	S	M	H
Grazing Related Sources	S	M	H	On-site Wastewater Systems	S	M	H
Intensive Animal Feeding Operations	S	M	H	Silviculture (Forestry)	S	M	H
Highway/Road/Bridge Maintenance and Runoff	S	M	H	Resource Extraction (Mining)	S	M	H
Channelization	S	M	H	Recreational/Tourism Activities (general)	S	M	H
Dredging	S	M	H	• Golf Courses	S	M	H
Removal of Riparian Vegetation	S	M	H	• Marinas/Recreational Boating (water releases)	S	M	H
Bank and Shoreline Erosion/ Modification/Destruction	S	M	H	• Marinas/Recreational Boating (bank or shoreline erosion)	S	M	H
Flow Regulation/ Modification (Hydrology)	S	M	H	Debris in Water	S	M	H
Invasive Species	S	M	H	Industrial Point Source	S	M	H
Construction: Highway, Road, Bridge, Culvert	S	M	H	Municipal Point Source	S	M	H
Construction: Land Development	S	M	H	Natural Sources	S	M	H
Urban Runoff	S	M	H	Source(s) Unknown	S	M	H

Additional comments:

MiCorps Site ID#:_____ Date:_____

IV. Optional quantitative measurements

A. Transects and Pebble Counts

To take quantitative stream habitat measurements, conduct 5-10 transects of your stream reach. Required equipment: tape measure long enough to stretch across the stream, and graduated rod or stick to measure water depth. Data sheet is on the next page.

Directions:
1) Determine stream width.
2) 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 ½ foot, for streams about 10 feet wide, measure every foot, etc.)
3) At every depth measurement, identify the single piece of substrate that the rod lands on (can be arbitrary).
4). For every measurement, enter the reading on the tape measure, the depth, and the substrate on the data sheet on the next page.

Data use: The depth and tape measure reading can be used to produce stream cross-section profiles. The pebble count can be used to give a more accurate percentage breakdown of the stream substrate than simply making an eyeball estimate (see Section II-B).

B. Bank Height

Vertical banks higher than 3 feet are usually unstable, while banks less than 1 foot, especially with overhang, provide good habitat for fish. While doing the transects, measure the bank heights and record the angle of the bank (right, acute, or obtuse) as indicated on the data sheet. Left/right banks are identified by looking downstream.

Data use: Calculate the percentage of banks with right, obtuse, and acute angles. Right angles indicate higher erosive potential, while acute angles improve the habitat structure of a stream.

V. Final Check

This data sheet was checked for completeness by: _____

Name of person who entered data into data exchange: _____

Date of data entry:_____

VI. Credits

This habitat assessment was created for the MICorps Volunteer Stream Monitoring Program from a combination of habitat assessments from the Huron River Watershed Council, the Friends of the Rouge River, and the Michigan Department of Environmental Quality. Version 1.0, June 2009.

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

STREAM TRANSECT DATASHEET

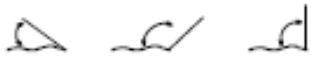
B: Boulder -- more than 10"
C: Cobble -- 2.5 - 10"
G: Gravel – 0.1 – 2.5"
S: Sand – fine particles, gritty

F: Fines: Silt/Detritus/Muck
H: Hardpan/Bedrock
A: Artificial
O: Other (specify)

T= Reading on tape
D = Depth
S = Substrate

	EXAMPLE			Transect #			Transect #			Transect#		
Stream Width	13.3 feet											
	T	D	S	T	D	S	T	D	S	T	D	S
Beginning Water's Edge	1.5											
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	S									
6	7.5	0.6	S									
7	8.5	0.7	G									
8	9.5	0.7	G									
9	10.5	0.6	C									
10	11.5	0.7	B									
11	12.5	0.4	G									
12	13.5	0.3	F									
13	14.5	0.2	F									
14												
15												
16												
17												
18												
19												
Ending Water's Edge	14.8											
Bank Side	L	R		L	R		L	R		L	R	
Bank Height	1.7 feet	0.5 feet										
Does the bank have an undercut?	N	Y										
If so, how wide is it?		1 ft										
Bank Angles: Sketch												

Sketch examples:



Undercut (Acute) Obtuse Right