A1. Title and Approval Sheet

Quality Assurance Project Plan for
Cedar River Watershed Volunteer Stream Monitoring Program

Date: January 25, 2021
Version # 2
Organization: Little Forks Conservancy

QAPP Prepared by: Elan Lipschitz
Title: Director of Land Conservancy

Signature: _____

Other responsible individual: Name
Title: Title

Signature: _____

(Other signatures may be added as necessary)

MiCorps Staff Use

Tracking Number:

MiCorps Reviewer: _____

☐ Approved ☐ Returned for modifications

A2. Table of Contents

Appendices

A3. Distribution List

Elan Lipschitz
Director of Land Conservancy
Little Forks Conservancy
105 Post Street
Midland, Michigan 48640

Gladwin Conservation District
1501 North State Street
Gladwin, Michigan 48624

Clare Conservation District
225 South Main Street

Cedar River Watershed Volunteer Stream Monitoring Program
Little Forks Conservancy

Harrison, Michigan 48625

Leon P. Martuch Chapter of Trout Unlimited
143 E. Main Street
Midland, Michigan 48640

Central Michigan Health Department
Main Office
2012 East Preston Street
Mount Pleasant, Michigan 48858

Paul Steen
MiCorps Program Manager
Huron River Watershed Council
1100 North Main Street
Ann Arbor, Michigan 48104

A4. Program Organization

Elan Lipschitz, Director of Land Conservancy, Little Forks Conservancy
Project Manager; provides oversight of the project including maintaining the quality assurance project plan (QAPP)

Huron Pines AmeriCorps Member, Land Steward, Little Forks Conservancy
Provides support with events, training, data collection and entry

Sara Huetteman, Preserve and Volunteer Manager, Little Forks Conservancy
Provides support in coordinating the event and volunteer recruitment

Andrea Foster, Director of Programing and Partnerships, Little Forks Conservancy
Provides support in coordinating the event

Alyssa Walters, Outreach Coordinator, Little Forks Conservancy
Promotion and outreach for the event

Volunteer Team Leader
Attends training provided by Little Forks Conservancy and collection events, understands purpose and scope of study, and leads volunteers in correct sampling procedures including collecting 100 specimens per site within the given time frame, filling out data sheets on site and encouraging the collection of all possible species types and quantities from a given habitat type.

Volunteer Collector
Attends training provided by Little Forks Conservancy (or has previous sampling experience), wades in stream for duration of sampling timeframe, collects specimens from various habitat types and informs team leader of habitats sampled and returns to bank every few minutes to provide samples for pickers.

Volunteer Assistant
Provides support in emptying collection net into sorting trays, going back and forth between stream bank and picking station, and helps to keep collector moving into different habitats and along entire sampling length within given timeframe.

Volunteer Picker(s)
Ideally, at least two volunteers perform this role.
Removes specimens from trays into ethanol-filled collection containers, thoroughly sorting through debris to find all possible specimens, and remaining unbiased in collection of all specimens.

A5. Problem Definition/Background

The Cedar River Watershed is located in north-central Michigan, crossing parts of Clare and Gladwin Counties. The system is a tributary to the Tittabawassee River and eventually flows into Saginaw Bay (Lake Huron). Due to the high quality of the resources found within the watershed, it supports a very diverse recreational base. Studies have been conducted on the CRW which have identified issues with sedimentation through stream bank erosion, improper road/stream crossings, and improper land use. In the 1990s an inventory of the watershed showed there were 140 erosion sites along the Cedar River, 59 road stream crossings and that approximately 17% of the cropland within the watershed is highly erodible. A watershed management plan was created in 2001 and updated in 2010 with the assistance of local stakeholders. In addition to impacts by sedimentation, the Cedar River downstream of the City of Gladwin has been listed on the 303d list for nonattainment for e coli. In addition, in 2013, the Leon P. Martuch Chapter of Trout Unlimited sampled sited identified in the CRW Management Plan which for e. coli and found several sites with elevated levels.

The Cedar River Watershed contains a cold-water fishery, a portion of which is a blue ribbon trout stream. As one of three designated blue ribbon trout streams in the Saginaw Bay region, it is a sought-after destination for anglers. The North, West and Main branches of the Cedar River, which constitute the Upper Watershed, have native, reproducing brook trout populations. However, the North branch is stocked by the DNR, which highlights how valuable, but fragile, trout streams are. The portion of the Cedar River upstream of Wiggins Lake is a priority area for protection, as it has been identified by the DEQ Integrated Report as a High Quality Watershed. Monitoring can help identify areas that might require restoration efforts to decrease degradation among the critical headwaters for the brook trout. Little Forks Conservancy (LFC), in cooperation with all organizations involved in the Cedar River Watershed Steering Committee (CRWSC), want to work to protect this important sub-watershed of the Tittabawassee River. Monitoring streams in close proximity to potential sources of non-point source pollution (i.e. concentrated animal feeding operations, agricultural runoff, etc.) could help identify areas to focus restoration and education efforts.

A6. Program Description

The Little Forks Conservancy's seeks to establish a volunteer stream monitoring program to monitor macroinvertebrates and habitat conditions in the Cedar River watershed. The upper portion of the Cedar River watershed is a designated trout stream and a key asset to the local community. This project builds upon a 319 approved watershed management plan for the watershed that has identified the importance of stream monitoring.

The primary goals for this project include:

1. Create a sustainable strategic monitoring plan that spans the entire Upper Cedar River Watershed with sampling on the north, west and main branches of the river.
2. Strengthen collaborations between various conservation organizations in the area working to improve the health of the Cedar River Watershed
3. Build local support for protecting this important community resource through engaging new volunteers for water quality monitoring.
4. Obtain data to support the objectives of the Cedar River Watershed Plan, a MDEQ-approved 319 plan.
5. Build project support through collaborations with local educational institutions including Gladwin High School and Delta College.

The project will follow MiCorps protocol with sampling conducted in the in the fall and spring of each year.

A7. Data Quality Objectives

This study has been designed to characterize the habitat and macroinvertebrate community of selected sites in the Cedar River watershed. The Conservancy's objectives are to collect data that is accurate, representative, complete, comparable and relevant, recognizing that the precision of the data will be confined to the elements of natural and temporal variability along with bias associated with sampling and identification inconsistencies. In order to collect data that provides the best general characterization of the habitat and macroinvertebrate community for future comparison as stream restoration and best management practices (BMPs) are established in the Cedar River watershed, we will attempt to minimize bias, increase precision, and control the quality of the data, to the degree that is attainable and addressed herein.

Precision and Accuracy

Accuracy is the degree of agreement between the sampling result and the true value of the parameter or condition being measured. Accuracy is most affected by the equipment and the procedure used to measure the parameter. Precision refers to how well you are able to reproduce the result on the same sample, regardless of accuracy.

The purpose of this project is to gauge stream health by measuring the total diversity of macroinvertebrate taxa. 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 multiple independent (duplicate) collections of the sampling sites, our goal for precision and accuracy 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.

Precision and accuracy will be maintained through following standardized MiCorps procedures. The Program Manager must be trained in MiCorps procedures at the annual MiCorps training led by MiCorps staff. MiCorps staff also conducts a method validation review (the "side-by-side" visit) with the Program Manager to ensure their expertise, preferably prior to the first volunteer leader training session. This review consists of supervising the Program Manager's macroinvertebrate sampling and sorting

methodology to ensure that they are consistent with MiCorps protocol. All cases of collecting deficiencies are promptly followed (during that visit) by additional training in the deficient tasks and a subsequent method validation review may be scheduled for the following collecting season. Upon request, MiCorps staff may also verify the accuracy of the program's macroinvertebrate identification. If a problem arises with a subset of macroinvertebrates, a thorough check may be requested. (The side-by-side visit was held on September 15, 2015 with MiCorps Program Manager Paul Steen).

Precision and accuracy will be maintained by conducting consistent volunteer team leader training. Volunteer team leaders will be trained up joining the program, and retrained every three years (at a minimum). Techniques under Volunteer Stream Monitoring Quality Assurance Program Plan Guidance Version 4 review shall include:

- collecting style (must be thorough and vigorous);
- habitat diversity (must include all available habitats and be thorough in each one);
- picking style (must be able to pick thoroughly through all materials collected and pick all sizes and types of macroinvertebrates);
- variety and quantity of organisms (must ensure that diversity and abundance at site is represented in sample);
- transfer of collected macroinvertebrates from the net to the sample jars (specimens must be properly handled and jars correctly labeled).

Precision and accuracy will be maintained through careful macroinvertebrate identification. Volunteers may identify macroinvertebrates in the field, but these identifications and counts are not official. All macroinvertebrate samples are stored in alcohol to be identified at a later identification session. Volunteers can be designated as identification experts as determined by the judgment of the Program Manager. All field identifications and counts will be checked by an expert with access to a scope, keys, and field guides. The Program Manager, or designated professional, will check at least 10% of the specimens processed by experts to verify results (with a concentration on hard to identify taxa). If more than 10% of specimens checked were misidentified, then the Program Manager , or designated professional, will review all the specimens processed by that expert and reassess if that person should be considered an expert for future sampling events.

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 example 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 this DQO will be evaluated as above by the Program Manager.

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 measurement preformed. The data quality objective for completeness for each parameter for each sampling event is 90%. If the program does not meet this standard, the Program Manager 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 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. Since not enough resources area available to allow the program to cover the entire watershed, some subwatersheds will not be initially represented. Additional subwatershed sites will be added as resources and volunteers allow.

Comparability
To ensure data comparability, all volunteers in the watershed will follow the same sampling and site selection methods and use the same units for reporting. Program 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 on a single day.

A8. Special Training/Certifications

The Project Manager (E. Lipschitz, LFC), Director of Programming and Partnerships (A. Foster, LFC) and Preserve and Volunteer Manager (S. Huetteman, LFC) have received MiCorps training. In addition, E Lipschitz has a BA in Environmental Studies, and a MS in Environmental Science. Volunteer for team leaders have macroinvertebrate experience through college or assisting with other volunteer monitoring projects.

During sampling events, each sampling group will have an experience streamside leader. This leader will be responsible for making sure data sheets are filled out property, samples labeled, and assure that all representative habitats are sampled. New volunteers will start out as a streamside assistant and pickers (taking measurements, transporting samples to expedite the in stream volunteers, and sorting samples).

B1. Study Design and Methods

Monitoring will be conducted within the Upper Watershed of the Cedar River Watershed, which is a sub-watershed of the Tittabawassee River Watershed that drains into the Saginaw Bay. These areas are critical cold-water fisheries within the Saginaw Bay region. These headwaters are located in Clare, Gladwin, and Roscommon counties. Six sites have been identified for monitoring based on accessibility of stream, depth of water during sampling periods and wealth of habitat for organisms. The site locations are also determined based on their distance of at least 150 feet upstream from any human made obstruction. Sites will be sampled twice a year, once in May and once again in late September or early October. A minimum of three teams of three to four volunteers will be able to sample two sites each at a collection event.

Sampling sites include: (see corresponding Sampling Map in Appendix 1)
1. A1-Trout Unlimited Property in Hamilton Township (44.036052, -84.641691). This area is comprised of a mix of small recreational properties along the West Branch of the Cedar River. This property has good access and is publicly accessible.

2. A2-West Branch of the Cedar River at Bard Road (44.015120, -84.352421). This area of the river is a designated Blue Ribbon Trout Stream. It is upstream of a small residential area. The LFC holds

conservation easements on almost ¾ mile of this stretch of the river. It is anticipated sampling would occur adjacent to the protected properties and downstream by the residential development.
3. A3-Gladwin Field Trial Area (44.138243, -84.530078). The sampling location for this will be on Stoneybrook Creek which is located in MDNR state forest land. This area is located in the headwaters of the Cedar River watershed. There is significant beaver activity in this area which affects water levels.
4. A4-MDNR Cedars for the Cedar Project site (44.109100, -84.558488). This area is located on the North Branch of the Cedar River and is in between two habitat restoration projects.
5. A5-West Branch of the Cedar River at the end of a small residential subdivision (44.014280, -84.345800).
6. B1-George and Sue Lane Preserve (44.073078, -84.573570). This site is on the North Branch of the Cedar River which has had in-stream habitat improvement projects. The land is owned by LFC and LPMTU has a riparian easement to manage the river.

Additional sites may be identified for further sampling as time, volunteer commitment and environmental concerns permit including additional monitoring in the warm water portion of the watershed in the future.

Habitat Assessment Procedure

Volunteer teams of at least three to four arrive at a designated sampling site, verify the location with GPS or map, and record the site ID, stream name, location, date, start time, and monitoring team names on the datasheets. It is not necessary for the habitat assessment and macroinvertebrate collection to happen on the same day, but for good data collection, assessments will try to be performed during the sampling event. Before teams begin to assess stream habitat, it is important to reference general safety guidelines learned at the monitoring training (implement the buddy system, always use caution, note any floods or stream warnings, always carry a first aid kit, leave wildlife alone, etc.)

Teams begin by recording location information such as county, township, latitude, longitude, and GPS coordinates. The Team Leader creates a site sketch including direction of flow, location of road or closest road-stream crossing, and any important landmarks such as an eroding bank, large tree, or deep pool. Photos may be taken both upstream and downstream to best represent site conditions as teams work. Stream event conditions (high/low flow, days since last rain, temperature, color, type) are noted on the data sheet. Teams record stream depth and width measurements of the site and categorize stream flow as dry, stagnant, low, medium, or high. Teams conduct a visual assessment of the stream's substrate and quantify the percent boulder, gravel, sand, detritus, and bedrock (substrate total to equal 100%). Teams also note the location's morphology to indicate the presence of riffles, pools, the type of channel, and the highest water mark. A cross-section sketch is drawn to show the dimensions of the stream channel. Additional data that is collected on the stream habitat assessment sheet includes physical appearance (presence of algae, oil sheens, foam, trash), in-stream cover (undercut banks, overhanging vegetation, pools, boulders, woody debris), stream corridor (riparian width, severity of bank erosion, streamside land cover), adjacent land uses observed and potential sources of stream degradation.

Sampling Event Procedure

The collection of macroinvertebrate specimens will occur for 30 minutes, and total no more than 60 minutes as additional time might be needed for sampling error, from within an identified 300' section of stream (a sampling site). Multiple collections will be 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. Each habitat type will be thoroughly searched for three minutes, as time allows, beginning at the

most-downstream location moving upstream for the entirety of the 300' section ensuring that the net is gathering material flowing downstream. The trained team leader will record the number of locations sampled within the monitored section and note the locations on a site map. The collector transfers the material from the net into a sorting tray. Picker(s) will remove the macroinvertebrates from the trays and into jars of 70% ethyl alcohol for identification at a later date.

In order to identify all organisms to the required taxonomic level, it is imperative that all observed specimens, within the collection timeframe, be transferred to sampling containers regardless of abundance. Volunteers are encouraged to collect a minimum of 100 specimens. 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. Unusual events or accidents, such as losing part of the collection by spilling, are recorded on the data sheet. Any variations in procedure should also be explained on the data sheet. All sample containers are labeled using a piece of paper indicating date, location, name of collector, and number of sample containers per site in pencil and is placed in the container. The data sheet also states the number of containers used in collection from a particular site. Between sites and after final collection, team leaders should ensure all collection equipment and waders are free of plant and animal matter to prevent cross-site contamination.

The team leader is responsible for labeling and securely closing the containers and for returning all containers and all equipment to Little Forks Conservancy. Upon return, the Program Manager or Land Steward checks for sample container labels, data sheets for completeness and correct information regarding the sample containers and that the containers are bound together with a site label and placed in one box. Samples are stored at the Conservancy until they are examined and counted in an identification event (within two weeks of sampling), at which time samples are retained for a period of at least five years. Sample jars are inspected periodically for structural integrity. The data sheets are used for identification tracking, after which they remain on file for a period of at least five years.

Contingency

For any sampling event that is not completed on a single day, monitoring by volunteers will be completed within two weeks from initial sampling event. 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 is continued beyond the extended dates, then no monitoring data will be collected during that season 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 Program Manager as soon as possible, no later than the end of the first week in the sampling window, in order to arrange for another team to complete the monitoring. If no team is available, the Program Manager and Land Steward will, if feasible, sample the site. Otherwise, the site will go unmonitored for that season.

Inconsistent macroinvertebrate scores or habitat assessments between monitoring sites or collection events may need further assessment. It is the responsibility of the Program Manager to take note of sources of variability in such inconsistencies and address whether variability is due to human error or a recent environmental impact. Re-sampling is conducted if warranted and feasible, given that the deviation is noted soon after occurrence and volunteers are available.

Identification Event Procedure

Identification will be done one site at a time to remove error caused by mixing of samples by location. A sample container from a specific site will be poured into a sorting tray where the specimens will be sorted into like groups. The specimens will then be identified using a microscope, magnification glass and identification guides, as needed, to the taxonomic order. The Program Manager or a qualified

expert is available to verify identifications. Once sample identification is verified, the numbers of individual species for a specific site is recorded on a MiCorps identification sheet (Appendix 2). The specimens are then returned to their sample container with label and covered in new 70% ethyl alcohol for storage before moving on to the next sample site container. Every five years the alcohol is changed in the containers carefully to retain small sample integrity.

**There is no assumption that a single collection represents all the diversity in the community, but rather results are considered reliable only after repeated collections spanning at least three years. Results are compared with other locations in the same river system that has been sampled in the same way. All collectors attend an in-stream training session, and most sites are sampled by different collectors at different times to diminish the effects of bias in individual collecting styles.

B2. Instrument/Equipment Testing, Inspection, and Maintenance

All equipment will be maintained and deemed acceptable for use in sampling by the Program Manager. Equipment testing of nets will be to make sure that the nets are firmly attached to poles and free of holes, collection jars should have poly seal tops, forceps must have tips that meet, and waders must be clean, dry and do not leak. In the case that the Project Manager should find the equipment insufficient for sampling, it is his/her responsibility to repair or replace the equipment prior to use in the field. All equipment will be stored in a designated area at The Little Forks Conservancy office.

A detailed list of the macroinvertebrate sampling kit for each team includes:

- ✓ Clipboard case
- ✓ Field data collection packets
- ✓ Laminated sampling tip sheets
- ✓ Laminated emergency contact list including site GPS coordinates
- ✓ 2 pencils
- ✓ 2 pens
- ✓ D-net
- ✓ 5-Gallon bucket
- ✓ Rinse jar
- ✓ A habitat assessment worksheet
- ✓ 2 light colored sorting trays
- ✓ Tweezers (enough for the group)
- ✓ 2 eye droppers
- ✓ 2 sampling containers filled ¾ with 70% ethanol with site label including location, date and group leader names
- ✓ 2 magnifying glasses
- ✓ Water (as needed)
- ✓ First aid kit
- ✓ Decontamination bucket

B3. Inspection/Acceptance for Supplies and Consumables

Supplies such as ethanol, glass jars with poly seal lids, etc. will be inspected after each sampling date. Low supplies will be replenished immediately after sampling date to insure they will be ready for the next event. The Program Manager will maintain detailed records of all equipment including purchase date and approve supplies for use in the field or laboratory setting.

B4. Non-direct Measurements

Not applicable

B5. Data Management

After each sampling event, raw data will be entered and managed in Microsoft Excel workbooks. All data is backed up to the MITCON Data Center. Computer passwords will be used to provide data security. All data will be double-checked for accuracy and correctness.

Data will be entered from data sheets into the online MiCorps database by a single trained volunteer, AmeriCorps member, or Conservancy personnel for storage within the MiCorps data exchange system. Data sheets will be filed at Conservancy's office for a period of at least five years. Data will be entered by the data manager into a database (e.g. Excel) for long-term storage. All new data will be exported to a MiCorps compatible format and sent to MiCorps for inclusion in their data exchange system.

Macroinvertebrate: Data will be summarized for reporting into four metrics: All taxa, insects, EPT (Ephemeroptera + Plecoptera + Trichoptera), and sensitive taxa. Units of measure are families counted in each metric. The MiCorps Stream Quality Index (SQI) will also be computed.

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.

B6. Decontamination

Decontamination is of utmost importance in stopping the spread of invasive species and the transport of aquatic diseases. Team Leaders will ensure the following decontamination steps are completed:

a. Conduct a visual inspection of gear before and after field work.
b. If going to another monitoring site, thoroughly inspect and remove all plants, dirt and mud, and any other visible debris like seeds, shoots, animals, insects, and eggs from clothing and equipment. If going to another site on the same sampling day, disinfect with dilute bleach and allow to sit for 10 minutes before rinsing with tap water and towel dry all equipment before leaving the site.
c. Remove plant and debris from equipment and let dry for at least 5 days.
d. If necessary, Team Leaders should use high pressure hot washes to clean monitoring equipment if areas are known to be infected by invasive species.
e. Be on the lookout for New Zealand mud snails.

Additional details can be found in the MiCorps Volunteer Monitoring Invasive Species Prevention Kit Use Guide which is located with monitoring supplies.

C1. Assessments and Response Actions

Volunteer Team Leaders trained by the Program Manager or Land Steward ensures that quality assurance protocols are followed and report any issues possibly affecting data quality. When significant issues are reported, the Program Manager may accompany groups in the field to perform side-by-side sampling and verify the quality of work by the volunteer team. In the event that a group is determined to have done a poor job sampling, a performance audit to evaluate how people are doing their jobs of

collecting and analyzing the data is accomplished through side-by-side sampling and identification. During side-by-side sampling a team of volunteers and an outside expert sample the same stream. Agreement in sample composition between the two should be 60% or greater. A system audit is conducted following each spring and fall monitoring event to evaluate the process of the project. The system audit consists of the Program Manager, any other program leader, and one or two Volunteer Stream Monitoring Quality Assurance Program Plan Guidance Version 4 active volunteers, and is a start to end review of the monitoring process and how things could be improved for the next event. If deviation from the QAPP is noted at any point in the sampling or data management process, the affected samples will be flagged and brought to the attention of the Program Manager and the team that collected the sample. Re-sampling is conducted as long as the deviation is noted soon after occurrence and volunteers are available (two week window). Otherwise, a gap must be left in the monitoring record and the cause noted. All corrective actions are documented and communicated to MiCorps staff. Details of the process for assessing data quality are outlined in section A7. Response to quality control problems is also included in section A7.

C2. Data Review, Verification, and Validation

A standardized data-collection form is used to facilitate spot-checking to ensure that forms are completely and correctly filled out. The Program Manager or a single trained volunteer reviews the data forms before they are stored in a computer or file cabinet. After data has been compiled and entered into a computer file, it is verified with raw data from field survey forms.

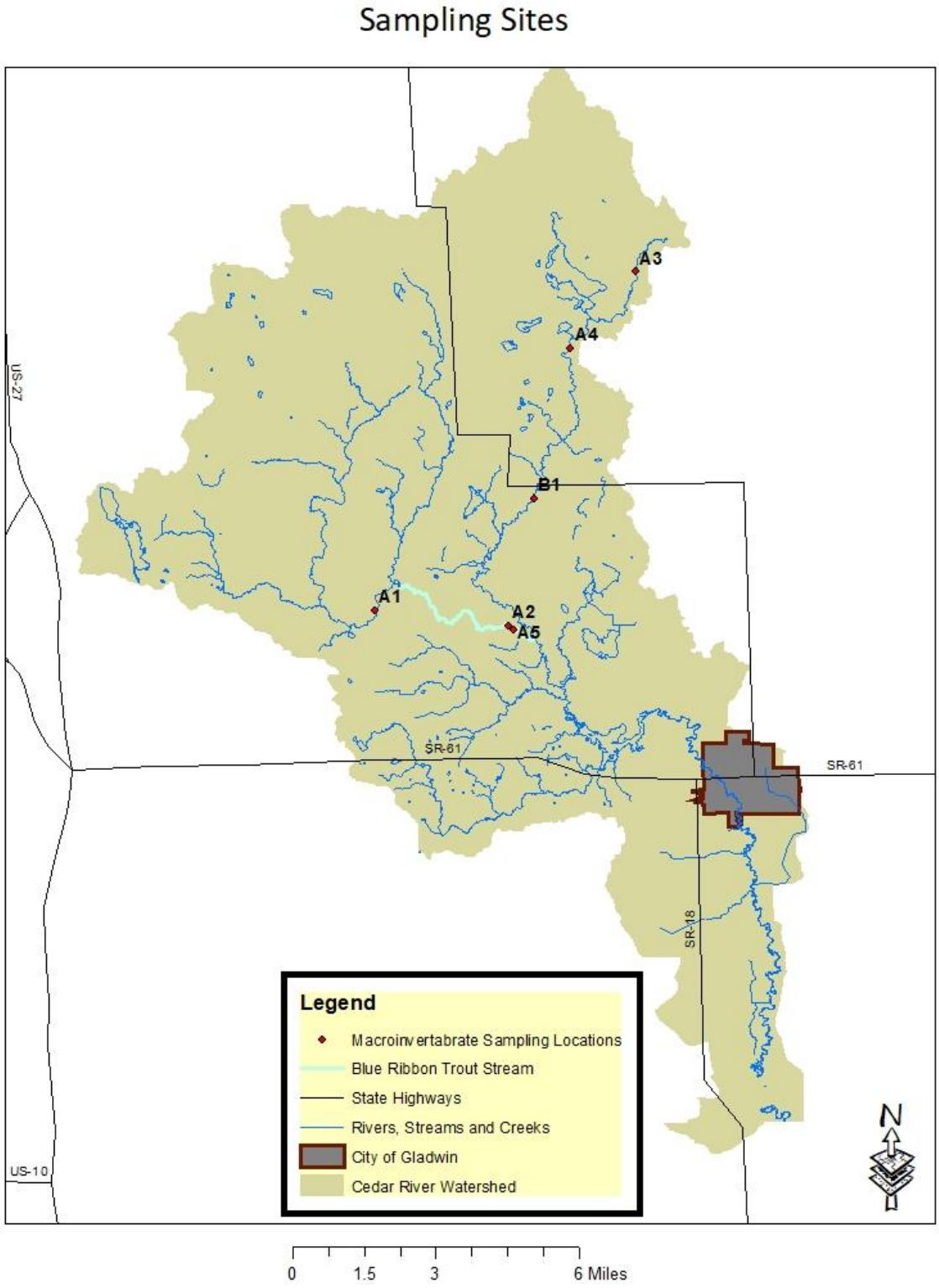
C3. Reconciliation with Data Quality Objectives

Data quality objectives are reviewed annually to ensure that objectives are being met. Deviations from the data quality objectives are reported to the Program Manager and MiCorps staff for assessment and corrective action. Also, data quality issues are recorded as a separate item in the database and are provided to the Program Manager and data users. Response to and reconciliation of problems that occur in data quality are outlined in Section A7.

C4. Reporting

Throughout the duration of this program, quality control reports are included with quarterly project reports that are submitted to MiCorps. Quality control reports provide information regarding problems or issues arising in quality control of the project. These could include, but are not limited to: deviation from quality control methods outlined in this document relating to field data collection procedures, indoor identification, data input, diversity calculations and statistical analyses. Program staff generates annual reports sharing results of the program with volunteers, special interest groups, local municipalities, and relevant state agencies. Data and reports are made available via the organization's web page.

Appendix 1: Maps



Appendix 2: Data Sheets

MiCorps Site ID#:_____

Michigan Clean Water Corps

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#:_____

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 10/08/05
Data entered into MiCorps database by:_____ Date:_____

STREAM HABITAT ASSESSMENT

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					

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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:_____

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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:_____

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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

6

MiCorps Site ID#:_____

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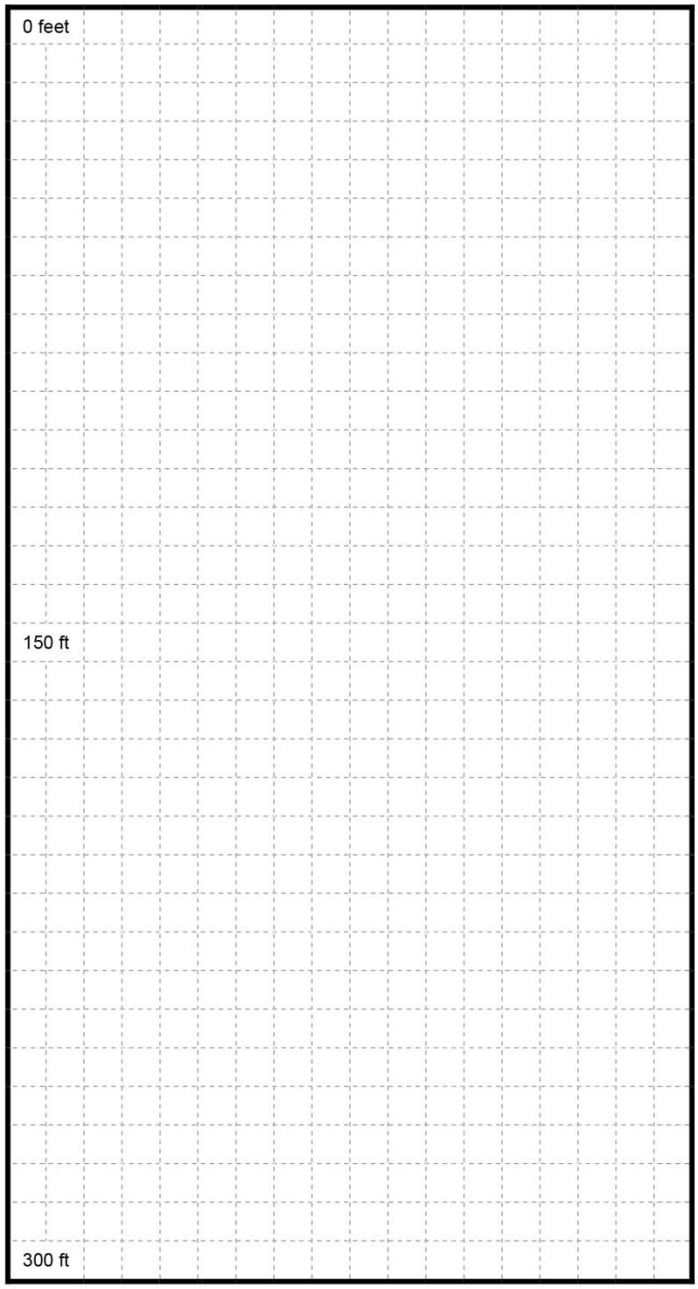
Site Sketch

Stream Name:_____ Location:_____

Date:_____ Drawn by:_____

Draw a bird's-eye view of the study site. Include enough detail that you can easily find the site again! Include the following items in the sketch:

- Direction of water flow
- Which way is north
- Large wood in the water
- Vegetation
- Bank features
- Areas of erosion
- Riffles
- Pools
- Location of road
- Trees
- Fences
- Parking lots
- Buildings
- Any other notable features



Datasheet version 6/22/05