

A1. Title and Approval Sheet

**Quality Assurance Project Plan for
Friends of the Shiawassee River Stream Monitoring Program**

Date: November 22, 2016

Version # 1

Organization: Friends of the Shiawassee River

QAPP Prepared by: Sarah Baker

Title: Program Coordinator

Signature: _____

Other responsible individual: Tom Cook

Title: President Board

Signature: _____

(Other signatures may be added as necessary)

MiCorps Staff Use	
Tracking Number:	
MiCorps Reviewer: _____	
<input type="checkbox"/> Approved	<input type="checkbox"/> Returned for modifications

Signature of reviewer	Date

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Team Leaders

Friends of the Shiawassee River Volunteers

A4. Project Organization

Grant activities will be conducted by Friends of the Shiawassee River (FOSR). Sarah Baker, the current Program Coordinator, will coordinate the program, including maintaining the QAPP, and all Stream Team activities. All work and final decisions made by the Program Coordinator will be overseen by the Board Members of FOSR, as well as any future Executive Director. They will recruit, train, and oversee field volunteers and make arrangements for program events, including equipment purchases. The Program Coordinator will also be responsible for implementing corrective actions.

Identifications will be aided by aquatic ecologist John Matousek. He currently conducts biological monitoring and assessment of Michigan's waters for the MDEQ, making him uniquely qualified for this volunteer position. Identifications will be done at a separate time from the day of the collections and will be held at Baker College of Owosso, Michigan. Additional program oversight, such as pinpointing future site locations, will be provided by Matt Herbert, Aquatic Ecologist with TNC. He aided in the the development of the FOSR MiCorps program in 2007/2008, when the former FOSR Director was partially funded by TNC. A Stream Team Board subcommittee has been created to ensure Board engagement and awareness of program processes. A Board Member of FOSR, will be nominated as the Chair of the Stream Team subcommittee to advise FOSR staff. Following sample verification, the Program Coordinator will manage data and analysis. All reporting will come from FOSR.

A5. Problem Definition & Background

Located in a highly-agricultural region, the Shiawassee River has historically been stressed by excessive levels of sedimentation as a result of incompatible land practices. The Villages of Chesaning, St. Charles, Byron and the City of Owosso will partner with the FOSR, a volunteer-based organization, to monitor benthic macroinvertebrate communities within the Shiawassee River watershed. This project will be an expansion of the FOSR monitoring program, Stream Team, to include additional communities in the watershed and promote partnerships among local governments, community organizations, and citizens for the betterment of water quality. Monitoring will be conducted twice annually (spring and fall).

During the 2014 Great Lakes Restoration Initiative project when FOSR worked with elected officials in the Shiawassee River watershed, stakeholders were surveyed regarding their interests in water quality. This survey determined that water quality protection is a concern of local governments, but is often not highly prioritized due to their limited resources as small, rural municipalities. By engaging a variety of community stakeholders in the monitoring process, we hope to achieve greater community buy-in for water quality improvement and therefore a higher prioritization of water quality improvement actions by local governments. More specifically, the goals of the proposed partnership and the Stream Team Program are:

- to collect baseline data and initiate a long-term data set on the health of the Shiawassee River;
- to determine variability in health of the River within different environs and watershed communities;
- to engage community organizations, local government officials, and other volunteers in data collection to foster appreciation of the Shiawassee River and its habitats; and,
- to work closely with local governments in order to encourage greater awareness of water quality issues and spur the adoption of water quality protection policies by local governments.

The Shiawassee River is a top conservation priority and has been identified as one of the best remaining examples of a warm-water river system within its ecoregion, a geographically-cohesive natural area that covers the southern half of the Lower Peninsula and reaches beyond Michigan's southern-most border. Of great ecological significance are the wetland systems located within the headwaters region of the Shiawassee River (e.g., prairie fens and wet meadows), which support a diverse assemblage of rare plants and animals. The Shiawassee is the principle river flowing into the Shiawassee National Wildlife Refuge, a wetland sanctuary for an array of migratory bird species and other wildlife. The Shiawassee River flows through largely rural regions of the state before merging with the Flint, Cass, and Tittabawassee River to form the Saginaw River, which drains into the Saginaw Bay of Lake Huron. The Shiawassee River Watershed contributes to sedimentation and nutrient loading issues in the bay. In order to create lasting water quality improvements for the bay, local governments within the watershed must engage in water quality protection.

This project will address sediment, the largest water quality issue of the Shiawassee River, which has the potential to damage habitat for macroinvertebrates and spawning habitat for many species of fish, including those valued for recreation. As human impacts on the Shiawassee River continues to grow, it is our ultimate goal to create a long-term data set to supplement that collected

by the MDEQ and to continually monitor changes in the ecosystem. FOSR will both collect reliable data while actively engaging and educating the public in conservation issues and, consequently, build local support for natural resources. Through increased public awareness, we anticipate more support from communities and funders within the watershed resulting in long-term sustainability.

A6. Project Description

FOSR, a volunteer-based organization, will monitor benthic macroinvertebrate communities within the Shiawassee River Watershed. Sampling will occur at eight sites in the Owosso/Corunna area, as well as sites in Chesaning, St. Charles, Byron, Holly and Fenton. Some of the participating communities were chosen based on the response of community leaders during 2014 Great Lakes Restoration Initiative (GLRI) project work to build watershed partnerships for improving water quality.

Existing sampling sites in Owosso/Corunna include: Corunna Dam, DeVries Nature Conservancy (DNC), Owosso Dam, Shiatown Dam, and a site on the South State Drain on Chipman Road north of the city of Owosso. The State Drain (agricultural site) and DNC are located significantly downstream of the Owosso wastewater treatment facility. The Corunna Dam and Owosso Dam sites are located within two of the largest urban areas in the county. Both of these sites are sampled above and below low-head dams. Removal of the Corunna low-head dam is anticipated in the near future. Volunteers are continuing to sample above and below a former dam at the Shiatown Dam site throughout the phases of removal. The remaining landscape is dominated by agriculture and dotted by a few small villages. The DNC, Owosso, Shiatown, and State Drain sites have been sampled annually since 2008, and all of the data collected has been entered in the MiCorps database.

The sampling site in the St. Charles area, referred to as the H Julien Road location, within the Shiawassee State Game Area. This site is east of St. Charles on Bad River, a tributary of the Shiawassee River with surrounding land getting heavy agricultural use. This site is directly adjacent to a parking lot, causing the village concern about the potential impacts of runoff. The Chesaning site is located on the main stem of the Shiawassee River as it flows through downtown Chesaning at Show Boat Park. The community is invested in protecting this site as a natural resource. The Byron site is located within Byron Sesquicentennial Park in a forested area where a storm water drain enters the river. The Holly Site is located within Waterworks Park. This collection site is near the headwaters of the Shiawassee River. This particular site is also the gateway launch site to the Shiawassee River Heritage Water Trail. The Fenton site is located near the Fenton Community Center and represents a probable sampling site in the warmer waters of the North Branch. We will begin collecting from this site in fall of 2016.

The current sites are heavily weighted toward the Shiawassee mainstem. As our program expands, we would like to add sites within tributaries near where they flow into the mainstem. Because they are smaller, tributaries respond to perturbations much more robustly and quickly than mainstem sites. In addition, tributary sites offer a much more specific perspective as to what is going on spatially within the watershed. Also, having additional sites that match up with DEQ

“trend” sites would allow us to fill the gaps between the every five years the DEQ is monitoring those areas.

To ensure that data is consistently reported to MiCorps beyond the grant position of the Program Coordinator in 2017, a Stream Team Board subcommittee has been created to ensure Board engagement and awareness of program processes.

Monitoring will be conducted twice annually, (spring and fall) at 12 sites within and along the Shiawassee watershed. All sites will be sketched, photographed and monitored as an event within a two-week period each season and, with the assistance of aquatic ecologists, all samples will be identified to order level. It is the intent that additional parameters, such as chemical analysis, habitat assessment, and sampling sites will be added as interest and volunteer numbers grow with the program in future years.

This program will rely upon recruitment and training of volunteers through local newsletters, social media outlets, press releases, websites and relationships with community groups. FOSR will be responsible for recruitment and training of volunteers for spring and fall sampling.

Prior to collection events, ‘team leader’ and ‘collector’ volunteers will be required to attend training from FOSR, Huron River Watershed Council, or any other MiCorps-affiliated training course. FOSR will review the training with the team leaders and collectors to ensure that any differences in procedure between FOSR and other MiCorps organizations are recognized and that the volunteers will correctly follow FOSR procedures. Team leaders will get additional instruction from staff on overall procedure, safety precautions, data collection, and sample identification in order to assist other volunteers in collecting quality data. The team leader will also receive additional instruction in the field on proper sampling techniques. To track volunteer activities, FOSR maintains a web-based relationship management system with dynamic data collection, communications, and tracking capabilities.

Sampling will be conducted as a team activity with one team per sample site. All sites will be located in wadable, accessible portions of the Shiawassee River watershed. Each team will consist of 1-2 team leaders and 2-7 additional collectors/pickers. All sampling will be conducted in one day, if possible. But in the event that numerous leaders are not obtainable, all sampling will be completed within a two-week period. Specimens will be preserved for a separate identification event, to occur no more than 4 weeks after sampling. Collected specimens will be identified to order with the assistance of aquatic biologists.

A7. Data Quality Objectives

Precision/Accuracy

Since there is inherent variability in accessing the less common taxa in any stream site and program resources do not allow program managers to perform independent (duplicate) collection of the 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.

Precision and accuracy will be maintained through following standardized MiCorps procedures. The Program Coordinator will be trained in MiCorps procedures at the annual MiCorps training led by MiCorps staff. MiCorps staff also conduct a method validation review to ensure Program Coordinator's expertise. This review consists of supervising the Program Coordinator's macroinvertebrate sampling and sorting methodology to ensure that they are consistent with MiCorps protocol. All cases of collecting deficiencies are promptly followed by additional training in the deficient tasks. 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. Precision and accuracy will be maintained by conducting consistent volunteer team leader training. The following techniques will be reviewed during training and in regular re-training of team leaders every three years: 1) thorough and vigorous collecting style; 2) habitat diversity, inclusive of all habitats present at sampling site; and 3) the transfer of collected macroinvertebrates, with particular attention to thoroughness, from the net to sampling jars. These techniques will also be reiterated and stressed by project staff and team leaders prior to sampling on collection day.

Bias

Volunteers will sign in and record activities at each sampling site for each sampling event. Sites will be sampled by different team leaders at least once every three years in each season (spring and fall) 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 these requirements will be evaluated by the Program Coordinator.

Completeness

Following a Quality Assurance review of all collected and analyzed data, data completeness will be assessed by dividing the number of measurements judged valid by the number of total measurements performed. The data quality objective for completeness for each parameter for each sampling event is 90%. If the program does not meet this standard, the Program Coordinator will consult with MiCorps staff to determine the primary causes of data invalidation and develop an action plan 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 sub watershed. Since not enough resources are available to allow the program to cover the entire watershed, some sub watersheds will not initially be represented. Additional sub watersheds will be added in the future as resources and volunteers allow.

Sampling after extreme weather conditions may result in samples not being representative of the normal stream conditions. The Program Coordinator will compare suspect samples to the long term record as follows:

Measures of D and SQI for every sample will be compared to the median results from the past three years and each should be within two standard deviations of the median. If the sample falls outside this range, it will be excluded from the long-term data record.

Comparability

To ensure data comparability, all volunteers in the watershed will follow the same sampling and site selection methods and use the same units of reporting. Program Coordinators and trainers will learn the standard MiCorps monitoring methods at annual trainings conducted by MiCorps staff and will train their volunteers to follow those methods to ensure comparability of results among all MiCorps programs. If a Program Coordinator leaves the position and a new Program Coordinator is hired, the new hire will attend the next available training given by MiCorps. To the extent possible, the monitoring of all study sites will be completed on a single day. For each sampling event not completed on a single day, monitoring by volunteers will be conducted within a two- week period.

A8. Special Training & Certification

FOSR staff will be trained following MiCorps procedures. FOSR staff will provide training to team leaders and collector volunteers. Team leaders must participate in one sampling day event (prior experience in benthic training will be sought out), attend a training session conducted by the Program Coordinator or Executive Director of FOSR, sample jointly with another team leader when possible, attend bug identification sessions following sampling days, sign in at all events, and participate in regular re-training events.

SECTION B: PROGRAM DESIGN AND PROCEDURES

B1. Study Design and Methods

Sampling Events

All sites will be sampled during a one-day group sampling event held in the spring (May) and fall (October) each year for all benthic macroinvertebrates. In the event that we do not have the necessary number of team leaders, sampling will be completed within a two-week period. Each site will also be assessed for habitat at least once every five years, and more frequently if FOSR staff suspects a site is changing rapidly. Prior to collection events, “team leader/collector” volunteers will be required to attend training from FOSR or another MiCorps affiliated training program. The team leaders will get additional instruction from staff on overall procedure, safety precautions, data collection, and sample identification in order to assist other volunteers in collecting quality data. The collector will also receive additional instruction in the field on proper sampling techniques. All other volunteers who attend our collection events will be the “pickers” and pick macroinvertebrates from material in the trays and sort into jars. Data forms and samples collected during the event are then submitted to the Program Coordinator on the day of the event or within a week of the event. A timeline of all tasks to be performed is included in **Appendix A**.

The program manager will schedule an identification workshop. During this workshop, volunteers receive a training session on macroinvertebrate identification and then sort the macroinvertebrates collected into groups. The aquatic ecologist will further identify the specimens to order level.

Sampling Sites

Sites will be selected based on the following criteria: safety, accessibility, quality of habitat, prior sampling history (at some sites with the DEQ), ability to inform future conservation efforts, as well as areas that are currently, or soon to be, altered by dam removal.

The following sites will be monitored by Friends of the Shiawassee River:

1. Waterworks Park (42.78621, -83.62649)
2. Downtown Fenton (42.79492, -83.7055)
3. Byron Sesquicentennial Park (42.82454, -83.94602)
4. Shiatown Dam, both above (42.92828, -84.0695) and below the dam (42.93033, -84.07393)
5. Corunna Dam, both above (42.98778, -84.11722) and below the dam (42.98511, -84.117639)
6. Owosso Dam, both above (42.99656, -84.17351) and below the dam (43.00041, -84.17605)
7. DeVries Nature Conservancy (43.03654, -84.18742)
8. South State Drain (43.05402, -84.18644)

9. Showboat Park (43.174869, -84.111761)
10. Hulien Road Site (43.30299, -84.11117)

A map of our current sampling sites in Shiawassee Watershed is attached in **Appendix B**.

Prior to each collection event, the team leader will meet with the Program Coordinator to go over the procedures of the upcoming collection and to receive all equipment and materials that will be needed. Volunteers will be given directions to the site location when they sign up for the event on the FOSR website. Volunteers will meet at the site on the day of the collection, unless otherwise directed to meet at a more centralized location. Before beginning a collection, there will be a quick overview of the study for new volunteers, as well as an explanation of the exact location on where to collect the specimens. To help with consistency, returning volunteers will be asked to sample the same locations at least 3 years in a row. However, sites will be sampled by different team leaders at least once every three years, but preferably annually, in each season to account for bias in individual collection styles.

If a team is unable to monitor its site on collection day, or the weather does not cooperate on our scheduled collection day, the team/teams will be given a two-week period in which to sample their sites and return the data and equipment to the Program Coordinator. If an issue concerning inaccessibility continues beyond the two-week period, then no monitoring data will be collected during that season and there will be a gap in the data.

Sampling Procedures

Procedures for our sampling events will be based on the MiCorps “Techniques for Stream Macroinvertebrate Collecting” document. The team leader will ensure the collector takes multiple samples from each habitat type present at each site, including riffle, quiet place/pool, undercut bank/overhanging vegetation or roots, submerged or emergent vegetation, rocks/logs, and leaf packs while wading and using a D-frame kick net. The collector will start downstream and work upstream to avoid disturbing the areas yet to be sampled. Once specimens are collected, the collector will transfer the material from the net into white pans. During this time, the team leader will be communicating with the collector to make sure samples are taken from each habitat. The leader will also be recording information such as stream name, location, date, monitoring team, stream conditions and site sketch on the “Stream Macroinvertebrate Datasheet”. Once the specimens have been transferred into the white pans, the pickers will pick out the macroinvertebrates from the rocks and leaves and put them into collection jars filled with 70% ethyl alcohol for later identification. Specimens of each invertebrate type will continue to be saved until at least 15 individuals of each type are preserved. Prior to sampling, the team leader will explain to all pickers the importance of preserving multiple specimens of each type (i.e., will be used to define whether a taxa is rare or common, helps ensure that different families that may look alike to pickers all get preserved) and will explain that these collections will have no impact on local populations. The collection period will last 40 minutes, or as long as it takes to thoroughly sample every different kind of habitat, up to an hour. Picking will continue until all collected material has been sufficiently sorted. Collectors can help pick through material upon completion of collection activities. At the end of each sampling, the nets and pans will be rinsed before leaving the site to avoid transporting animals or plants between sampling sites. The team leader will also

double check that the data sheet is completely filled out and that all habitats have been sampled. 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. Any variations in procedure will be explained on the data sheet. **(Appendix C)**

Identification Procedures

At the collecting site, all invertebrate sample jars receive a label that includes the collection date, location, site ID number, and the name of the leader. 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 returning all jars and all equipment to the Program Coordinator. Upon return, the Program Coordinator checks the collection jars for labels, makes sure the data sheets are complete with the correct information on the number of jars containing the collection from the site, and that the jars are secured together with a rubber band and site label and placed together in one box. The jars will be stored at FOSR office until they are examined and counted on the day of identification (two or three weeks later). The data sheets are used on the identification day, after which they remain on file indefinitely. At the time of identifying the samples, the Program Coordinator checks the data sheet and jars to ensure that all the jars, and only the jars, from that collection site 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 will accompany them. For identification, volunteers sort all specimens from a single site into look-alike groups. An aquatic ecologist will then identify them further to the order level. Literature references used for identification will include: Guide to Aquatic Invertebrates of the Upper Midwest: Identification Manual for Students, Citizen Monitors, and Aquatic Resource Professional, by Bouchard; A Guide to Common Freshwater Invertebrates of North America by Voshell; and Aquatic Insects of North America by Merritt and Cummins. When an 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 on the jar and stored at the FOSR office indefinitely. The alcohol will be carefully changed (to avoid losing small specimens) in the jars every few years.

Sampling Equipment

The following is a list of equipment, FOSR has purchased to assist us with our collection events:

20 D-frame nets	2 cases of glass jars
20 sorting trays	5 tarps
40 forceps	20 waders
10 (4L) bottles of preservative	10 squirt bottles

All equipment will be stored at DeVries Nature Conservancy or the FOSR office. After each collection day, the Project Coordinator will inspect the equipment and make any necessary repairs.

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 dates of purchase and dates of last usage
- Check the expiration date of chemical reagents prior to each use
- Check the batteries of all equipment that requires them

Field Procedures Quality Control

- Collect replicate samples
- 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

Since our evaluation is based on the diversity in the river community, we attempt to include a complete sample of the 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 in the same way. All collectors attend an in-stream training session, and all sites are sampled by different collectors every three years to diminish the effects of bias in individual collecting styles. Samples where the diversity measures diverge substantially from past samples at the same site will be re-sampled by a new team within two weeks or will be discarded. 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. All lab sorting is rechecked by an expert before completing identification.

B2. Instrument/Equipment Testing, Inspection, and Maintenance

Equipment	Inspection	Maintenance
D-frame collection nets	Firmly attached to poles and free of holes	Adhere the nets to the poles, if beyond repair then replace.
Sorting Tray	Clean and dry	Clean all trays before next collection. Replace as needed
Forceps	With tips that meet	Replace any forceps if the tips don't meet
Waders	Clean, do not leak	Fix any holes that have formed. Replace if beyond repair
Squirt Bottles	Clean and dry	Clean all bottles before next collection. Replace as needed

Inspections and maintenance will be conducted by the Project Coordinator once the equipment is returned to the storage site after each monitoring event. Equipment will also be inspected again before it is sent out for sampling. A tracking sheet will be created, and kept with the supplies, that records the purchase and replacement dates. Equipment will be stored at DeVries Nature Conservancy.

B3. Inspection/Acceptance for Supplies and Consumables

Equipment	Inspection	Maintenance
Preservative 70% Ethyl Alcohol	Check expiration date. Assure there is enough for next collection	Purchase more as needed.
Collection Jars	Poly seal top is intact. Assure there is enough for next collection	Purchase more as needed

B5. Data Management

Field data sheets are completed in the field and checked by the Project Coordinator once submitted. All original data sheets will be scanned in and will be backed-up on FOSR's Google Drive. After every collection, all new data will be entered into MiCorps data exchange system. Data sheets will be filed at FOSR office for a period of at least five years.

Metrics that will be calculated include the following:

- Stream Quality Index
- Stream Quality Score
- Total Number of Orders
- Sensitive Taxa

Each of these metrics will be tracked over time at each site (significant trends will be identified through regression) and sites will be compared based upon mean scores over time and differences in trends among sites.

C1. System Audits and Response Actions

To ensure quality data collection, steps will be taken to evaluate whether data collection procedures are being implemented correctly. This will be accomplished by training team leaders to evaluate team performance and by periodic steps from program staff to evaluate team leaders and team performance. This will ensure that data collection and management processes are being followed accurately. Any potential deviations from process will be corrected, noted, and will be evaluated using the results of the data (both short-term and long-term). Actions will be taken to eliminate data, if warranted. Steps that will be taken to periodically evaluate the performance of the program include the following:

- Volunteer team leaders will be trained for MiCorps protocols and will be instructed to evaluate sampling procedures to assure that methods and quality assurance protocols are followed. They will be asked to report any issues possibly affecting data quality. Program staff will periodically visit sites to evaluate sampling procedures and the performance of team leaders.
- If deviation from the QAPP is noted at any point in the sampling or data management process, the affecting samples may be deleted from the data set. Re-sampling will be conducted if warranted and feasible, if 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 the above, will be documented and communicated to MiCorps.

C2. Data Review, Verification, and Validation

Data will be reviewed at multiple stages for completeness and accuracy. Macroinvertebrate identification will be performed as part of an identification day where volunteers will help to sort specimens and record data, but all identifications will be confirmed by qualified ecologists/entomologists. All results will be examined for potential outliers that might indicate poor collection techniques. Any outliers will be investigated and eliminated if necessary. Specific steps for Data Review, Verification, and Validation include the following:

Data Review

- Data forms will be standardized and will be designed to prompt collectors to complete all tasks.
- Team leaders will be asked to review all data sheets for completeness prior to leaving the site.
- Sheets will be reviewed by the Program Coordinator for completeness, unusual measurements, and accuracy of calculations.
- Data sheets and data on computer will be scanned to proofread for data entry errors

Verification and Validation

- Macroinvertebrates will be identified by program experts with dichotomous keys, including Guide to Aquatic Invertebrates of the Upper Midwest: Identification Manual for Students, Citizen Monitors, and Aquatic Resource Professional, by Bouchard; A Guide to Common Freshwater Invertebrates of North America by Voshell; and Aquatic Insects of North America by Merritt and Cummins.
- If total diversity undergoes a steep decline at a site, the site will be visited by staff to assess potential changes at the site and potentially to sample for missing taxa or to conduct a new survey. Sites with less than 70% of the diversity previously found at the site may indicate less-than-thorough sampling. In this event, the site may be re-sampled for verification or results may be discarded.
- Data will be compared with data collected previously at the site. Results may be discarded if there is evidence pointing to poor volunteer sampling, or unusual/ extreme weather conditions as described in the Data Quality Objectives (A7).
- Some sites will overlap between MiCorps and DEQ P51 monitoring. We will compare MiCorps results with DEQ results to evaluate data collected at those locations.
- Teams will shift to different sites over time, which will allow us to statistically compare efficiency among sampling teams (or team leaders) after several years of monitoring and will serve to validate the data collected in the program. A certain amount of annual variability will be expected at each site, but if a team is consistently collecting a lower diversity of organisms over time (even if the results are within 1 standard deviation from the median), we may be able to detect this. Should some teams be less efficient than others, the issue will be documented and communicated to the volunteer and MiCorps. These data may still be utilized and may be

statistically corrected for differences in sampling efficiency among teams, but this process will be noted and data points may need to be removed from the monitoring record. Similarly, sampling efficiency may improve over time as team leaders gain experience, which we will also be able to evaluate statistically.

- If time allows, replicate quality control sampling may be conducted by program staff at a subset of sites within 2 weeks of the volunteer monitoring.

C3. Reconciliation with Data Quality Objectives

Data will be reviewed periodically to determine if the project's data quality objectives are being met. The Program Coordinator will determine and ensure that the data have high quality (accuracy, precision, representativeness, comparability, and completeness), if program protocols should be changed or updated; and if corrective actions are necessary. The Program Coordinator will also consult with other staff and partners to review sampling locations and determine if any should be changed and/or what new stream sites might be added, as well as whether more data should be collected, different water quality indicators should be assessed, and/or different indices should be utilized. Project goals, aims, direction, and purpose will be reviewed on an annual basis.

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:

- List of sites monitored
- Comparison among sites and trends in data at each site
- Quality Assurance results, with a summary of any problems discovered
- Any notable achievements
- Names of volunteers

FOSR 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 upon request.

Appendix A

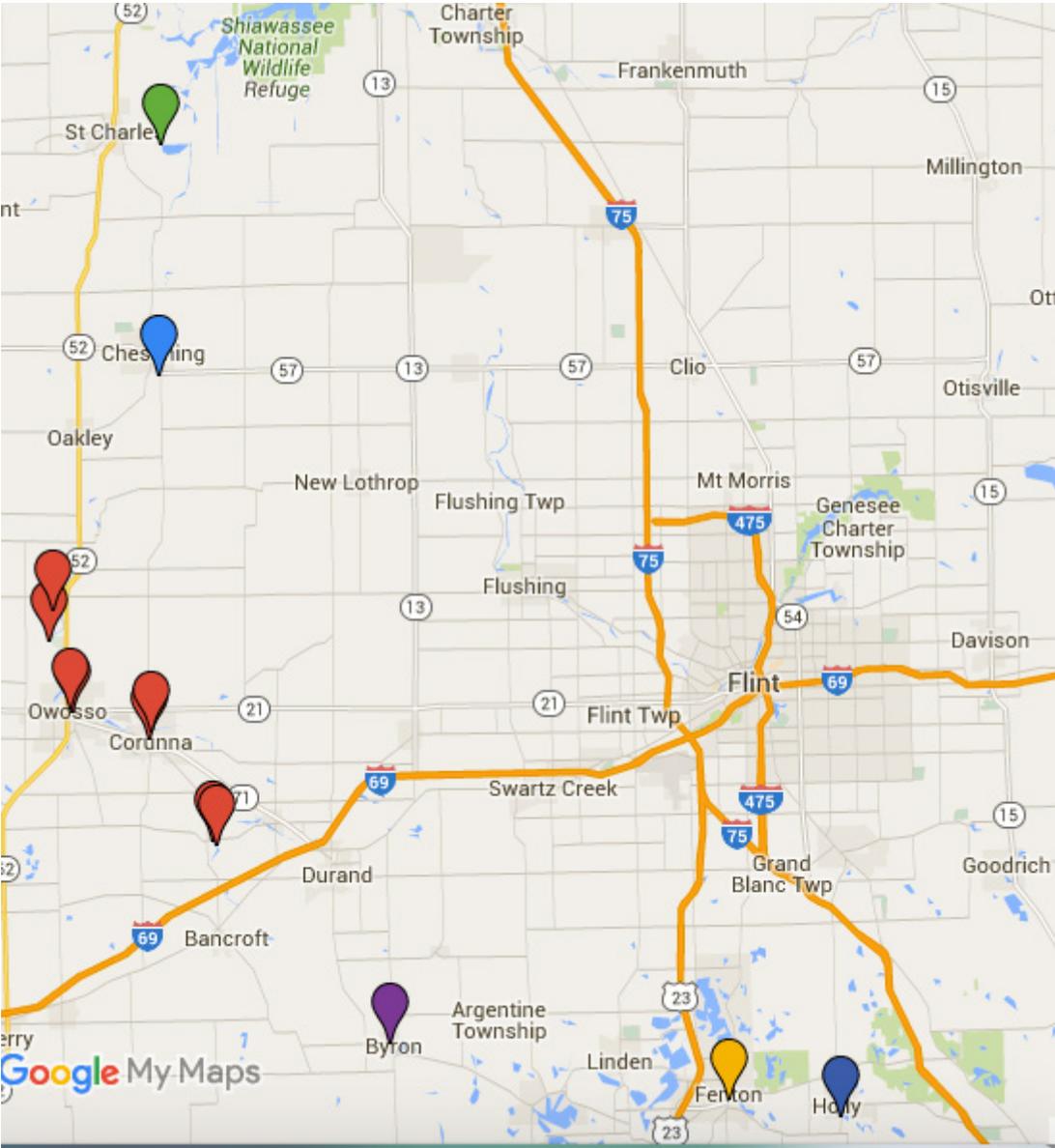
Project Year 1: 2015/2016

Task	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
Project Preparation												
Sampling Events												
Data Management												
Outreach & Education												
Project Management												

Project Year 2: 2016/2017

Task	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
Project Preparation												
Sampling Events												
Data Management												
Outreach & Education												
Project Management												

Appendix B



To view this map in more detail please go to:
https://www.google.com/maps/d/edit?mid=1rqEvhMFbD3yLQ_IyM5JvnPDAN3Y

Appendix C

MiCorps Site ID#: _____



Stream Macroinvertebrate Datasheet

Stream Name: _____

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

Date: _____ Collection Start Time: _____ (AM/PM)

Major Watershed: _____ HUC Code (if known): _____

Latitude: _____ Longitude: _____

Monitoring Team:

Name of Person Completing Datasheet: _____

Collector: _____

Other Team Members: _____

Stream Conditions: Average Water Depth: _____ feet

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

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

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

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

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

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

Collection Finish Time: _____ (AM/PM)

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

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: _____