Quality Assurance Project Plan

Rouge River Watershed
Benthic Macroinvertebrate Monitoring Program

Updated November 2020

Prepared by

Sally Petrella, Monitoring Manager
Friends of the Rouge
650 Church Street, Suite 209
Plymouth, MI 48170
www.therouge.org

Table of Contents

A3. Distribution List

Paul Steen
Aquatic Ecologist
Huron River Watershed Council & Michigan Clean Water Corps
1100 N. Main St., Ann Arbor, MI 48104
734-769-5123 x601

Kevin Goodwin
Aquatic Biologist
Water Resources Division, Michigan Department of Environment, Great Lakes and Energy (EGLE)
Constitution Hall
525 West Allegan
Lansing, MI 48933
(517) 284-5552
goodwink@michigan.gov

John Baumann
Fisheries Biologist
Michigan Department of Natural Resources
248-221-8110
baumanj@michigan.gov

Susan Thompson
Environmental Specialist
Wayne County Department of Public Services
3600 Commerce Court
Wayne, MI 48184
734-326-5515
sthompso@waynecounty.com

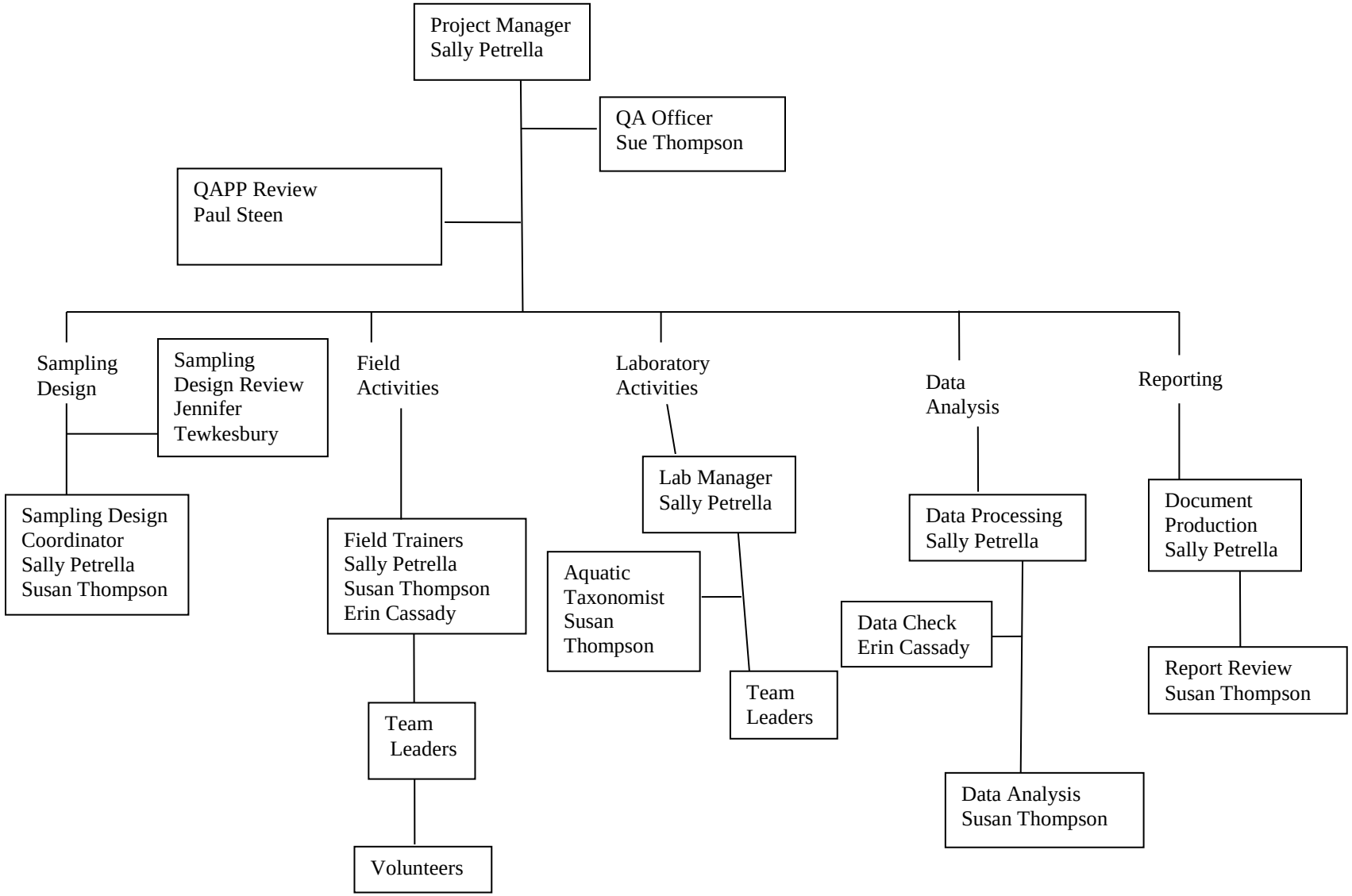
Sally Petrella
Monitoring Manager
Friends of the Rouge
650 Church Street, Suite 209
Plymouth, MI 48170
734-927-4904
spetrella@therouge.org

Erin Cassady
Education Manager
Friends of the Rouge
650 Church Street, Suite 209
Plymouth, MI 48170
734-927-4907
ecassady@therouge.org

Jennifer Tewkesbury
Senior Environmental Quality Analyst - Clinton, Rouge and Saginaw River/Bay
EGLE
SE Michigan District Office
27700 Donald Court
Warren, MI 48092
517-897-3257
tewkesburyj@michigan.gov

Team Leaders

A4. Project Organization



A5. Project Member Roles & Responsibilities

Project Manager
Oversees entire project as well as production of QAPP.

QA Officer
Assists in development of QAPP, reviews and suggests changes

QAPP Reviewer
Reviews QAPP and provides comments. Reviews and approves edited QAPP.

Sampling Design Coordinator
Develops selection of sites based on sampling goals and submits to Sampling Design Reviewer.

Sampling Design Reviewer
Reviews list and map of planned sites and provides feedback to coordinator.

Field Trainers
Teach Team Leaders how to collect benthic macroinvertebrates and how to identify them to order and in some cases, family as listed on datasheets. Provides Team Leaders with background on Rouge River Watershed and procedures for sampling days.

Team Leaders
Attend a one-day training in collection and identification of benthic macroinvertebrates. Following training, sample under the direction of a trained and experienced Team Leader. Following that, lead groups of volunteers in sampling two sites on sampling days. Take responsibility for cleaning and returning equipment. Submit voucher specimens and completed field forms. Attend identification days following Bug Hunts.

Volunteers
Assist Team Leaders during sampling days, picking through trays for benthic macroinvertebrates and other duties as assigned by leader.

Lab Manager
Keeps all equipment in clean working order and orders new equipment when needed. Maintains all voucher specimens clearly labelled with date and location of sampling.

Aquatic Taxonomist
Identifies all voucher specimens to family and in some cases, to genus or species, and records on datasheets.

Data Processing
Checks all datasheets for errors and inputs data into Access. Maps sites.

Data Check
Checks field sheets against database to minimize errors.

Data Analysis
Conducts trend analysis on data collected for each event.

Document Production
Writes summary report following each sampling event.

Report Review
Reviews and edits report and provides comments back to Document Producer.

A6. Problem Definition/Background

The Rouge River is listed by the International Joint Commission as one of 43 Areas of Concern in the Great Lakes Basin. In response, a Remedial Action Plan has been developed to guide restoration of impaired uses of the Rouge throughout the watershed. Use impairments that relate to benthic populations include loss of fish/wildlife habitat; degradation of benthic, fish, and wildlife populations; and eutrophication/undesirable algae growth. For most of these uses, the Rouge is considered severely impaired. The Rouge River is also listed on the Section 303(d) list submitted by the MDEQ to the USEPA as required by the Clean Water Act, this list includes water bodies statewide that are not attaining one or more designated uses and require the establishment of Total Maximum Daily Loads to meet and maintain Water Quality Standards. Portions of the Rouge have been placed on this list for violations of water quality standards for dissolved oxygen, aquatic biota, pathogens, and mercury and polychlorinated biphenyls both in fish tissue and ambient water. The degree of impairment can only be crudely estimated for most locations as there is inadequate survey/monitoring information available. Although professional monitors provide detailed data for a few sites, the number of sites is very small and does not adequately characterize the watershed.

Volunteer monitoring has the potential to gather relevant, reliable data for a far greater number of sites than is possible with professional monitoring. In addition to other benefits, a volunteer program costs far less to run and can garner a great deal of support from local communities. These factors create the potential for a long-term, sustainable monitoring program.

The Rouge River Watershed Benthic Macroinvertebrate Monitoring Program will increase the number of stream sites throughout the Rouge River watershed for which reliable data on benthic populations and riparian corridor conditions is available. The program will also increase public awareness of Rouge issues and support for corrective actions by promoting citizen involvement in monitoring and by publicizing projects and their results to all appropriate parties.

The data collected will be submitted to the Michigan Clean Water Corps, Rouge Communities, ARC and RRAC. The data will also be provided to all participating volunteers and anyone else on request.

A7. Project Description

Friends of the Rouge's Benthic Macroinvertebrate Monitoring Program trains adult volunteers to become team leaders and lead groups in benthic macroinvertebrate sampling every spring (April), fall (October), and winter (January) on Sampling Days. In the spring and fall, all benthic macroinvertebrates are collected. In the winter, only stoneflies are collected because, unlike other benthic macroinvertebrates, they hatch from streams in winter.

Two levels of volunteers are involved: Team Leaders and volunteers. The Project Manager will train Team Leaders in sampling techniques and identification with the assistance of the Field Trainer. Team Leaders will be responsible for collecting samples at each site, overseeing sorting by volunteers, filling out data sheets, and preserving representative specimens. The volunteers will search trays for organisms and sort them.

Sampling will be conducted as a team activity. Each team will consist of 1-2 Team Leaders and 1-6 volunteers. Each team will visit and sample two sites on Sampling Days. Teams will complete a Stream Macroinvertebrate Datasheet (Appendix p. 22-23) for each site sampled. They also use a Site Sketch (Appendix p. 26) to orient them to the site and to record any changes in the habitat at the site (fallen trees, etc.). They also will complete a physical survey form for each site (Appendix p. 27-28).

Sampling sites are located on wadable streams within the Rouge River Watershed. Sampling sites will be determined by the Project Manager in consultation with the Sampling Design Reviewer.

Following each Sampling Day, FOTR staff and aquatic biologists will sort and identify specimens. Aquatic insects will be identified to Family on a Family Form (Appendix p. 24-25) and any unusual or new Families will be verified by an aquatic biologist. Team Leader Lab Identification Days will be held following monitoring to give team leaders the opportunity to verify their field identifications.

Results for each site will be compiled and a report of the findings will be produced and distributed following each sampling event.

A8. Data Quality Objectives

<u>Precision</u>
We use consistent sampling methods (Appendix p. 30-31). The following techniques will be reviewed during training and in retraining of Team Leaders every three years: (1) collecting style (must be thorough and vigorous), (2) habitat diversity (must include all habitats present and be thorough in each one), (3) the transfer of collected macroinvertebrates from the net to the tray to the ice cube tray to the sample jars (thoroughness is critical).

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.

Data submitted by Team Leaders on Stream Macroinvertebrate Datasheets will be considered preliminary until reviewed by Project Manager. The Project Manager and aquatic biologists will identify all specimens collected (except for crayfish and large clams and snails which are not collected) to Family and record on the Family Form (Appendix p. 24-25). Data from the Family Form will then be compared MiCorps forms submitted by Team Leaders. Any errors will be corrected based on actual specimens collected and SQI and D recalculated.

The resulting measures of D and SQI for each site will be compared to the composite (median) results and each should have a relative percent difference (RPD) of less than 40%. Sample results for sites with three or more years of data will be compared to the median SQI and D. This statistic will be measured using the following formula:

$$RPD = [(Xc – Xv)/ Xc] \times 100,$$

where Xc is the composite measurement and Xv is an individual measurement for each parameter.

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

Water temperature will be measured to the nearest degree Celsius using thermometers that are checked for accuracy prior to each sampling event. Average water depth is estimated to the foot or half foot with the assistance of the net pole which has been marked every half foot.

Bias

Bias is the unequal probability of sampling members of a population.

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 eliminate the effects of bias in individual collection styles.

Completeness

Every effort will be made to collect all species that inhabit the site. This includes using specific techniques for each available habitat multiple times. Sampling will continue until no new species are being found, at least 30 minutes and cover at least 100 feet of stream.

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 the organisms inhabiting the site. Resulting data from the monitoring program will be used to represent the ecological conditions of that section of stream.

Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set may be compared to another. The use of standard techniques at each site should make the data comparable for sites with similar habitats. Past data for each site will be compared to ensure that the methods and reporting limits are comparable.

Sensitivity

Monitoring is not expected to identify every member of a benthic or fish community at a site but provide a snapshot of the types and relative abundance of most. It is expected that some smaller and less common benthic macroinvertebrate families will be missed.

A9. Training Requirements/Certification

Team Leaders must:

1. Participate in one sampling day event as a volunteer or have some prior experience in benthic sampling before they can attend training
2. Attend a training session conducted by the Project Manager
3. Sample with another experienced Team Leader
4. Attend Lab Identification Days following Sampling Days
5. Attend periodic retraining

Trainings are provided by the Project Manager who will attend MiCorps training. Sign-in sheets are filled out by volunteers at every training and volunteer attendance is recorded afterwards in the office by FOTR staff on a spreadsheet.

SECTION B. PROJECT DESIGN AND PROCEDURES

B1. Study Design and Methods

Sampling Events

Sites are sampled during one-day group sampling events held in the spring (April) and fall (October) for all benthic macroinvertebrates and in January for winter stoneflies. Team Leaders do the collecting, identifying to Order, filling out the MiCorps data forms (Appendix p. 22-23), and collecting specimens for all taxa found except for live crayfish, clams and snails. It is assumed that volunteers are correctly identifying these larger organisms and mussels cannot be collected without a permit. Other volunteers pick macroinvertebrates from material in trays. Data forms and samples are submitted to the Program Manager within the week after the event.

If a team is unable to monitor their site on that day, the Project Manager and available volunteers will, if feasible, sample the site 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 is continued beyond the extended dates, then no monitoring data will be collected during that time and there will be a gap in the data.

Following sampling events, the Program Manager and aquatic biologists examine specimens, compare specimens collected to identifications on field form, and identify specimens to Family in the lab.

Sampling Sites

Sites have been established based on history of sampling for benthic macroinvertebrates at the site, available instream benthic macroinvertebrate habitats, accessibility for volunteers, and community interest in site. Sites are distributed on all four major branches (Lower, Main, Middle and Upper) and major tributaries (Appendix p. 20-21). In addition to the sites sampled by FOTR, Wayne County follows the same protocol but samples the downstream sites that are deep and not suitable for volunteers and submits the data to FOTR.

At each site, approximately 100 feet of stream is sampled. Additional stream is sampled if additional habitat types are not present within the 100 feet. Some sites do not have all available habitats even within 300 feet of stream. The habitat types sampled are noted on the datasheet.

Sampling Procedures

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, while wading and using a D-frame net. The Team Leader will check off the habitats sampled (Appendix p. 22) will pick out samples of all different types of macroinvertebrates from the trays and sort them by like organism into white ice cube trays. The Team Leader will instruct and assist other volunteers in detecting and

collecting macroinvertebrates in the sorting trays, including looking under bark and stones. 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. Once all material in sorting trays has been picked, the Team Leader will identify specimens to Order, count individuals, and fill out MiCorps form using C (common) for more than ten individuals and R (rare) for ten or less, and transfer 5-6 individuals of each taxa into jars of 95% ethyl alcohol for later identification to Family. One jar is utilized for each sampling site.

B2. Sample Handling and Custody

Voucher specimens of macroinvertebrates collected in the field are placed into jars of 95% ethyl alcohol. Jars are pre-labeled for the site with a paper label that is written in pencil and placed in jar prior to the sampling event. The label contains the date, Field ID and the site name. The Team Leader is responsible for labeling and securely closing the jars and returning the jars and all equipment.

At the program building, custody of samples and data sheets is transferred from the Team Leader to the Program Manager. Upon return to the program building, the collections are checked for labels and placed together with corresponding data sheets. Within the next two weeks, the Program Manager and aquatic biologists check each specimen jar, identify all individuals to Family and check against the field completed data sheet. Stereo dissecting microscopes are used to identify specimens to the Family level. Texts consulted include: A Guide to Common Freshwater Invertebrates of North America by Voshell, Aquatic Entomology by McCafferty, An Introduction to Aquatic Insects of North America by Merritt & Cummins, and Guide to Aquatic Invertebrates of the Upper Midwest by Bouchard. Any inconsistencies in Team Leader identification are reconciled with the specimens, and a Family Form is completed. Following that, a Lab Identification Day is held and Team Leaders check samples and resolve any inconsistencies between field identification and specimens collected.

Samples are maintained by FOTR, one jar for each site and sampling event, and stored at the program building indefinitely. The alcohol is carefully changed in the jars every few years.

B3. Quality Control

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 ethyl alcohol with purchase date and track all use in logbook

Field Procedures Quality Control:

- 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

Data Analysis Quality Control:

- Check all calculations twice
- Hard copies of all computer entered data should be reviewed for errors by comparing to field data sheets
- Qualified professionals review data analysis methods and results once year

Since our evaluation is based on the diversity in the 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 volunteers attend an in-stream training session, and most sites are sampled by different volunteers at different times to diminish the effects of bias in individual collecting styles. Samples where the diversity measures diverge by greater than 40% from past samples at the same site are re-sampled by a new team within two weeks when possible. 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 sorting trays to ensure that all present Families have been collected and sorted.

B4. Instrument/Equipment Testing, Inspection, and Maintenance

FOTR purchases and maintains the following items for use by each team. This list is provided to Team Leaders as part of Training as well as included with the equipment.

D-frame nets (firmly attached to poles and free of holes)
Chest waders (clean and dry and do not leak)
Forceps (with tips that meet)
Magnifiers (not scratched)
Ice cube trays (clean and dry)
White sorting trays (clean and dry)
Plastic spoons (clean and dry)
Plastic droppers (clean and dry)
Celsius thermometer
Ground cloth (clean and dry)
Collection jars with poly seal tops labeled, with ethanol
Alcohol wipes/band-aids
Latex gloves
Five-gallon bucket (clean and dry)
Nitrile gloves
Long rubber gloves and cotton liners
Car signs
Laminated identification keys

Data forms
Site maps

All equipment is stored at FOTR and inspected by Project Manager or Project Assistant once it is returned to the storage site after each monitoring event. It is also inspected again before it is sent out for sampling. Nets and waders are inspected for holes and replaced if necessary, all other items are cleaned and stored.

Invasive species known to be in the Rouge River system include round goby, zebra mussels, Asian clams, red swamp crayfish, European frog-bit, Starry stonewort and Eurasian watermilfoil. To minimize the risk of spreading known and potential new aquatic invasive species the following measures will be taken:

- On sampling and training days, each team will be assigned two sites within the same subwatershed. The first site will be the one upstream of the second one to decrease the likelihood of carrying species farther up into the watershed. In the event that a team must sample within different watersheds, all equipment will be thoroughly disinfected with a diluted bleach solution (1/2 cup bleach per 5 gallons of water) applied by spraying or sponging so the surface is thoroughly exposed to bleach solution for ten minutes. Disinfection will be done away from the stream to avoid any disinfectant entering the surface waters. At each site, the sampling is done from the downstream end, moving upstream.

- Before a team leaves a site, waders and footwear will be inspected and any plants or excessive mud will be removed. Nets, waders and trays will be rinsed in the stream.

- All equipment is thoroughly cleaned and dried following every sampling and training event. Nets and chest waders are inspected for holes and repaired or replaced if necessary. All equipment is inspected again before it is used.

- If invasive aquatic plants or animals are collected from a site, the Team Leader will take steps to minimize the spread of these species. Invasive species education is part of Team Leader Training. Invasive plant material and invasive clams or mussels will not be returned to the waterbody but be bagged and disposed of at a landfill.

- All field personnel will be on the lookout for invasive species that are not yet known to be established in the Rouge River watershed or in a particular branch or tributary of the watershed. All invasive sightings will be reported to MISIN.

B5. Data Management

Field data sheets are completed in the field and checked by FOTR once submitted. Any inconsistencies or incomplete forms are investigated by FOTR. Organism identifications are rechecked by volunteers on Lab Identification Day, verified by Project Manager or

Assistant, and re-checked by aquatic biologists. Hard copies of all data sheets and voucher samples are stored at the FOTR office and available if requested.

Data is input into Access database by FOTR. A separate individual checks database against paper field forms to minimize errors. All paper and electronic records are maintained at FOTR and available for examination upon request.

SECTION C. ASSESSMENT AND OVERSIGHT

C1. System Audits and Response Actions

The Project Manager will perform audits so that deficiencies can be found and corrected. Audits are to be conducted with a site visit to a randomly selected site during each of the sampling events. The site visit will ensure that Datasheets are completed and managed properly and that field procedures are being properly followed.

Should corrective action need to be taken due to problems that are encountered; appropriate steps will be taken to correct this. For example, if datasheets are not completed or procedures not followed, Team Leaders will be notified and provided with additional training if needed.

C2. Data Review, Verification, and Validation

The Project Manager and the QA Officer review all sampling data and determine if the data meet QAPP objectives. Decisions to reject or qualify data are made by the Project Manager and the QA Officer.

The Project Manager will recheck any findings out of the ordinary by re-sampling the site as soon as possible. All samples are re-identified by Project Manager and re-checked by aquatic biologist.

Data is input into Access database by Project Manager. The Field Trainer proofreads database against datasheets and errors in data are corrected. Any outliers that vary by more than 40% are investigated. If the variation is determined to be sampler error, the data point is flagged in the database, reports and not used in the trend analysis.

C3. Reconciliation with Data Quality Objectives

Data forms will be checked for completeness and computations checked following sampling events and on Lab Identification Day when samples are checked against forms. If data quality indicators do not meet project objectives, they will be discarded or limitations will be detailed in all reports.

If failure to meet project specifications is found to be unrelated to sampling error, specifications may be revised for the next sampling session. Revisions will be submitted to the QAPP Officer for approval.

C4. Reporting

A report will be produced following each benthic macroinvertebrate sampling season. Reports will consist of data results, interpretation of data (if possible), information on project status, and volunteer highlights. Reports will be posted on the Friends of the Rouge website www.therouge.org and a link sent to MiCorps, ARC, Rouge Communities,

and all participants. Electronic copies of these reports will be maintained indefinitely on the FOTR server.

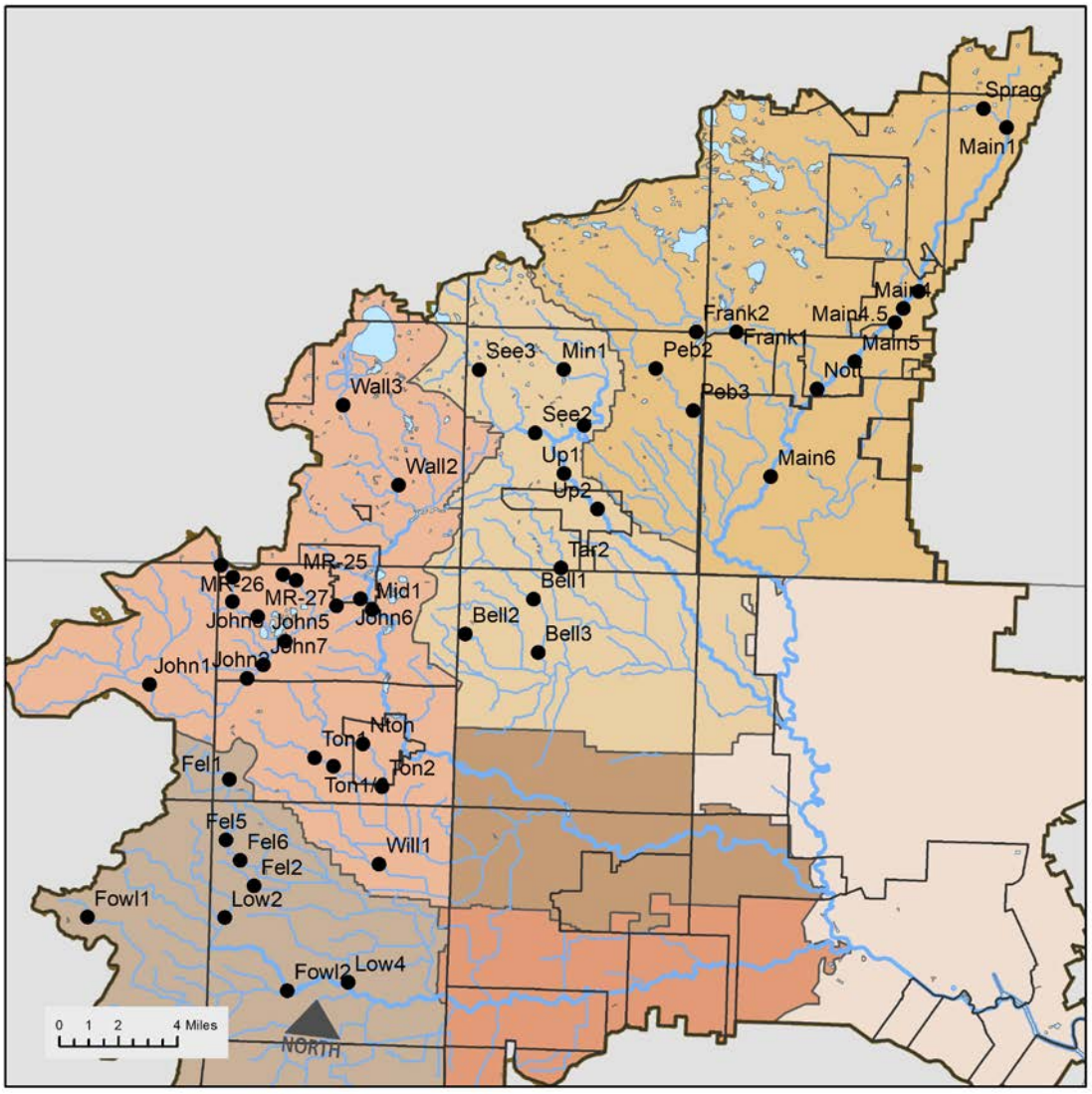
Each Team Leader completes the two page Benthic Macroinvertebrate Form in the field (Appendix p. 22-23). Several specimens of each type of organism found must be collected at the site and preserved in the jar of alcohol provided. This jar has a label on the outside and on the inside with the station location and date. An additional Family Form is completed during Lab Identification Day. Following Lab Identification Day, data are input into an Excel spreadsheet by Project Manager. Data is submitted to the MiCorps website. Voucher collections are maintained by Friends of the Rouge (FOTR), 650 Church St., Plymouth, MI 48170.

COVID-19 Note:

In the event that restrictions are still in place with regard to the COVID-19 pandemic, alterations will be made to some of the specific protocol to prevent the spread.

Appendix

Sampling Sites



FOTR Sampling Site Locations – Lower and Main Branches						
FIELDID	**BRANCH**	**Stream Name**	**Site Description**	**County**	**Latitude**	**Longitude**
Fel1	Lower	Fellows Creek	Top of Hill Ct	Wayne	42.35729	-83.53988
Fel2	Lower	Fellows Creek	Vintage Valley	Wayne	42.31932	-83.5246
Fel5	Lower	Fellows Creek	Warren Ridge	Wayne	42.335263	-83.539831
Fel6	Lower	Fellows Creek	Hanford	Wayne	42.328188	-83.532192
Fowl1	Lower	Fowler Creek	Prospect	Washtenaw	42.30423	-83.60516
Fowl2	Lower	Fowler Creek	Fowler Beck	Wayne	42.28226	-83.50515
Low2	Lower	Lower Rouge	Cherry Hill	Wayne	42.30724	-83.53793
Low3	Lower	Lower Rouge	Gotfredson	Washtenaw	42.3227	-83.565967
Low4	Lower	Lower Rouge	Sheldon Rd	Wayne	42.2866039	-83.475661
Nfowl	Lower	Fowler Creek	Fowler Ridge	Washtenaw	42.289405	-83.547127
Evan2	Main	Evans Creek	LTU	Oakland	42.474374	-83.246909
Frank1	Main	Franklin Creek	Franklin Cider Mill	Oakland	42.53024	-83.30585
Frank2	Main	Franklin Creek	Ink Pump Sta	Oakland	42.529325	-83.325381
Main1	Main	Main Rouge	FF Pk	Oakland	42.60991	-83.17984
Main11	Main	Quarton Branch	Quarton at Lakeside	Oakland	42.554445	-83.226312
Main3	Main	Main Rouge	Booth Pk	Oakland	42.54891	-83.21774
Main4	Main	Main Rouge	Linden Pk	Oakland	42.54242	-83.22478
Main4.5	Main	Main Rouge	Fairway Pk	Oakland	42.53718	-83.22861
Main5	Main	Main Rouge	Douglas Evans	Oakland	42.52219	-83.24692
Main6	Main	Main Rouge	Sfld Civic Ctr	Oakland	42.47886	-83.2845
Main8	Main	Main Rouge	Fordson Island	Wayne	42.29352	-83.14873
Mur2	Main	Murphy Creek	Roeper School	Oakland	42.59375	-83.25174
Nott	Main	Nottingham Creek	Country Day	Oakland	42.51149	-83.26463
Peb1	Main	Pebble Creek	Danvers Ct	Oakland	42.50133	-83.32912
Peb2	Main	Pebble Creek	Pebble 13 Mile	Oakland	42.51521	-83.34402
Peb3	Main	Pebble Creek	Pebble d/s Dam	Oakland	42.500849	-83.324474
Sprag	Main	Sprague Creek	Main Lloyd Stage	Oakland	42.61623	-83.19174

FOTR Sampling Site Locations – Middle and Upper Branches						
FIELDID	**BRANCH**	**Stream Name**	**Site Description**	**County**	**Latitude**	**Longitude**
Bish2	Middle	Bishop Creek	Bishop Scarborough	Oakland	42.47131	-83.45151
Ing1	Middle	Ingersoll Creek	Brookfarm Park	Oakland	42.46293	-83.44552
John1	Middle	Johnson Creek	5M Salem	Washtenaw	42.3897	-83.58194
John2	Middle	Johnson Creek	5M NV	Wayne	42.39424	-83.534404
John3	Middle	Johnson Creek	6M NV	Wayne	42.40844	-83.51693
John5	Middle	Johnson Creek	Fish Hatchery Pk	Wayne	42.4224	-83.49289
John6	Middle	Johnson Creek	Hines	Wayne	42.42546	-83.48138
John7	Middle	Johnson Creek	Arcadia	Wayne	42.399455	-83.526902
John8	Middle	Johnson Creek	Maybury Angell	Wayne	42.42148	-83.54396
Mid1	Middle	Middle Rouge	Northville Rec E	Oakland	42.42177	-83.47546
MR-28	Middle	Tonquish Creek	N Branch Tonquish Creek	Wayne	42.380628	-83.497516
Nton	Middle	Tonquish Creek	S Evergreen St	Wayne	42.37312	-83.47572
Ton1	Middle	Tonquish Creek	Plym Twp Pk	Wayne	42.36701	-83.49895
Ton1/2	Middle	Tonquish Creek	Canton Ctr Rd	Wayne	42.36437	-83.48939
Ton2	Middle	Tonquish Creek	Ann Arbor Rd	Wayne	42.35809	-83.46507
Wall0	Middle	Walled Lk Drainage	Parm Cider Mill	Wayne	42.43673	-83.47369
Wall1	Middle	Walled Lk Drainage	Rotary Pk	Oakland	42.44957	-83.46525
Wall2	Middle	Walled Lk Drainage	WL 10 M	Oakland	42.46732	-83.46623
Wall3	Middle	Walled Lk Drainage	WL 12 M	Oakland	42.49486	-83.49575
Wall4	Middle	Walled Lk Drainage	WL Ford Field	Wayne	42.43354	-83.48056
Will1	Middle	Willow Creek	Willow Barchester Pk	Wayne	42.33002	-83.46422
Bell1	Upper	Bell Branch	Bicentennial Park	Wayne	42.42924	-83.39666
Bell2	Upper	Bell Branch	Schoolcraft College	Wayne	42.4151185	-83.429007
Bell3	Upper	Bell Branch	Livonia 6 Mile	Wayne	42.41015	-83.39285
Min1	Upper	Minnow Pond	Minnow 13 M	Oakland	42.51274	-83.38905
Min2	Upper	Minnow Pond	OCC	Oakland	42.493065	-83.37734
Min3	Upper	Minnow Pond	Farm. STEAM Academy	Oakland	42.500565	-83.37127
See2	Upper	Seeley Creek	Sleepy Hollow	Oakland	42.48927	-83.40099
See3	Upper	Seeley Creek	Kennedy Ct	Oakland	42.51073	-83.4304
Tar2	Upper	Tarabusi Creek	Tara 8 M	Wayne	42.441084	-83.38423
Up1	Upper	Upper Rouge	Heritage Park	Oakland	42.47526	-83.38567
Up2	Upper	Upper Rouge	Shiawasee Park	Oakland	42.46323	-83.36811

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: Water Temperature_____°C 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)

Invasive species found
_____ zebra mussels other_____
_____ Asian clams
_____ red swamp crayfish
_____ round goby

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:_____

Creek:_____ Sampling date:_____ ID Date:_____

Sampling Site:_____ Identifier:_____

Please write the number of different TYPES (not individuals) for each Order. Put a check by the family name if it has been confirmed.

INSECTA

_____ **PLECOPTERA – STONEFLIES**
- ♥ Capniidae — slender winter stonefly *(adults walk on snow)*
- ♥ Nemouridae — Nemourid broadback
- ♥ Perlidae — Perlid stonefly *(common stonefly in early summer)*
- ♥ Perlodidae — Perlodid stonefly
- ♥ Taeniopterygidae — broad-back stonefly *(Taeniopteryx is relatively tolerant)*

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

_____ **HEMIPTERA – TRUE BUGS**
- Belostomatidae — giant water bug
- Corixidae — water boatman
- Gerridae — water strider
- Mesoveliidae — water treaders
- Naucoridae — creeping water bug
- Nepidae — water scorpions
- Notonectidae — back-swimmers
- Pleidae — pigmy back-swimmers
- Veliidae — short-legged striders

_____ **MEGALOPTERA — DOBSONFLIES**
- ♥ Corydalidae — dobson fly or hellgrammite
- Sialidae — alderfly

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

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

ODONATA – DAMSEL AND DRAGONFLIES

_____ **ANISOPTERA – DRAGONFLIES**
- Aeshnidae — darner
- Cordulegastridae — biddy
- Corduliidae
- ♥ Gomphidae — clubtail
- Libellulidae — common skimmer

_____ **ZYGOPTERA — DAMSELFLIES**
- Calopterygidae — broad-winged damselfly
- Coenagrionidae — narrow-winged damselfly
- Lestidae — spread-winged damselfly

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

Rouge River Benthic Macroinvertebrate Count List, p. 2

NON-INSECT TAXA

MISCELLANEOUS MACROINVERTEBRATES

Most of the macroinvertebrates we collect are insects, but some are other Arthropods, and some are worms, leeches, flatworms, snails, or clams.

MOLLUSCA – SNAILS, CLAMS, ETC.

_____ **GASTROPODA – SNAILS AND LIMPETS** *(Have a single shell.)*
- Ancylidae – limpet; have a flat cone
- Right-handed snail
- Physidae — pouch snail; left-handed spiral
- Planorbidae – coiled in one plane; has no operculum

_____ **PELECYPODA – BIVALVES; CLAMS AND MUSSELS**
(Have a pair of symmetrical shells joined by a ligament.)
- Dreissenidae — zebra mussels
- Sphaeriidae – fingernail clams; usually tiny with a thin shell (either Pisidium or Sphaerium)
- Unionidae – large unless very young (either Anodonta or Elliptio)

_____ **CRUSTACEA**
- Decapoda — crayfish
- Isopoda – sowbug
- Amphipoda — scud

_____ **PLATYHELMINTHES**
- Turbellaria – flatworm
- Oligochaeta — worm

_____ **ANNELIDA**
- Hirudinea – leech

_____ **ARACHNIDA – SPIDERS, MITES**
- Hydracarina — water mites;parasites

_____ **PORIFERA – FRESHWATER SPONGES**

_____ **BRYOZOA – MOSS ANIMALS**

TALLY

_____**1. Number of taxa** (add up all the numbers you wrote on the line next to the order name)

_____**2. Number of non-insect taxa** (add up all the numbers from p.2 - misc. macroinvertebrates)

_____**3. Number of insect taxa** (subtract #2 above from #1)

_____**4. Number of EPT families** (add up number of families of mayflies, stoneflies, and caddisflies)

_____**5. Number of sensitive families** (add up all the number of families you found with a heart by it)

6/6/01
FOT
PI-S

FOTR Benthic Macroinvertebrate Monitoring Program
Site Sketch

Field ID: Location:

Date:_____

Team Leaders:_____

1. Mark all the locations where samples were taken.
2. Draw any changes and note any discharges or concerns
3. Mark all locations with an "x" where samples were taken

Friends of the ROUGE

Physical Survey Data Sheet

Name of group _____ Length of section to be surveyed _____ *(at least 100ft or 30m)*
Location /Site ID _____ Date ___/___/___
City/Township _____ Time ___:___ am or pm

Weather

Describe today's weather _____ Air temperature ___ °C or °F Water temperature ___ °C or °F
_____ Has there been a significant rain event in the last 7 days? Y or N

Land Use Observations

Check all that are present and circle the most predominant.

Agricultural	Parkland	Forested	Other (describe)
Residential	Nature preserve	Golf course	_____
Urban	Open field	School/university	_____
Commercial/industrial			

Land use score _____

4 (excellent) Mostly forest or grassland, very little development
3 (good) Some forest or grassland, parks and fields, some development
2 (fair) Native vegetation clearly disturbed, suburban areas (residential)
1 (poor) Urban, industrial, no or very few natural areas

Riparian Vegetation

Riparian vegetation is vegetation along the river corridor. Look downstream: right hand=right bank, left hand=left bank.
Riparian vegetation is made of _____
[choices include brush, mowed grass, grasses, shrubs, trees, barren, other (please note)]

Average width of riparian vegetation [not including mowed grass] _____ m or ft

Riparian vegetation score
_____ *for right bank*
_____ *for left bank*

4 (excellent) Vegetation present, extends at least 30m/100ft
3 (good) Vegetative buffer present, but less than 20m/65ft; some disturbance
2 (fair) Small buffer less than 5m/16ft, vegetation disturbed for local land use
1 (poor) Cleared land, urban development, no buffer or consists of mowed grass

Bank Erosion & Stability Evaluation

Estimate the percentage of bare soil on the stream banks _____ %

The bank slope is (circle one) Steep Moderate Slight
Bank stability is (circle one) Stable Slightly eroded Moderately eroded Unstable

Bank erosion score
_____ *for right bank*
_____ *for left bank*

4 (excellent) Stable, no sign of bank erosion, no bare soil
3 (good) Very occasional and very local erosion, small patches of bare soil
2 (fair) Some erosion evident, obvious areas of bare soil
1 (poor) Extensive erosion, unstable banks, almost no deep-rooted vegetation present

Habitat & Substrate Assessment

Check all that are present.

Wood in stream	Undercut banks	Aquatic plants
Logjams (# of ? large or small?)	River bends	Algae (what color?)
Overhanging vegetation	Leaf packs	_____

Proportion of reach represented by stream morphology types (if present) riffle___% pool___% run___%

Friends of the ROUGE

Physical Survey Data Sheet

Habitat & Substrate Assessment (cont'd)

Habitat score _____

4 (excellent) Bends present, lots of riffles, many logs or undercut banks
3 (good) Bends present, some riffles, some logs or large rocks
2 (fair) Occasional bend, riffles or pools present but spaced far apart, few logs and rocks
1 (poor) Very channelized/straight, riffles and pools absent, no large logs or rocks

Check if present, circle the predominant two.

____Boulder *(>10" diameter)* ____Cobble *(2.5-10" diameter)* ____Gravel *(0.1-2.5" diameter)* ____Sand ____Silt ____Clay

Percent embeddedness in riffles (circle one or leave blank if no riffles) 0-25% 26-50% 51-75% 76-100%

Substrate score _____

4 (excellent) Large cobbles, boulders present in stream, large rocks are not smothered by sand and silt; kicking the bottom of the stream does not result in clouding
3 (good) Some large cobbles, gravel, less than 50% embedded in silt or clay
2 (fair) Gravel & sandy bottom, or larger rocks well embedded and hard to move in mucky bottom
1 (poor) Sandy or silty bottom, no large rocks present, kicking up the bottom results in cloudiness lasting one or two minutes

Water Odor & Appearance

Place a sample of river water in a large clear or white container.

Describe the odors that you smell in the water _____
[choices include chlorine, earthy, musty/moldy, sewage, fishy, grassy, sulfur (rotten eggs), flowery, chemical, other (describe)]

What appearance does the water have? Check all that apply.

_____ No unusual appearance	_____ Blue	_____ Milky white
_____ Orange-red (rust)	_____ Multi-colored oily sheen	_____ Foamy/soapy
_____ Green	_____ Muddy/cloudy	_____ Other (describe)

How turbid is the water?

____Clear *(can see clearly to the bottom)* ____Slightly turbid *(can partially see to bottom)* ____Turbid *(cannot see to bottom)*

Stream Characteristics

Has the stream been altered? _____
_____
[Is there a detention basin, bridge/dock, evidence of channelization, a dam, erosion wall (seawall or other control)? Has a wetland been drained, are there pipes/outfalls draining into the river that you can see?)]

If you can see pipes, how many are there? _____
Are the pipes flowing? Y or N

Can you tell what the discharge is? (circle)
Stormwater Sewage Industrial

If you notice suspicious activity or evidence of illegal dumping, call the State of Michigan at 800-292-4706.
If you witness illegal dumping in action, call 911.

Physical Condition Rating

Overall Score _____

4 (excellent) Healthy stable banks, riparian zones well vegetated, diverse habitats, rocky bottom, no odors or off-colors
3 (good) Somewhat stable banks, riparian zones partially vegetated, some diversity in habitats, gravel bottom, slight odor or off-colors present
2 (fair) Unstable banks, riparian zone minimally vegetated or highly disturbed, little habitat diversity, bottom has silt build-up, detectable odor, and water is off color
1 (poor) Seriously channelized or eroded banks, little to no natural or riparian area, silty or sandy bottom, no habitat rocks or woody material

What do you think is the greatest **current** and **potential** threat to the river's health at this site?

Friends of the ROUGE

Winter Stonefly Search

Benthic Macroinvertebrate Sampling Program

Data Form

Site Field Id:_____ Site name:_____ Date:_____

Start Time:_____ End Time:_____

Air temperature:_____°C Water temperature:_____°C Weather:_____

Collector:_____Identifier:_____

Person who filled in data sheet:_____

Check the types of habitats and substrates from which invertebrates were collected:

___Riffles	___Runs	___Pools
___Cobbles	___Margins	___Undercut banks/ Over-hanging vegetation
___Aquatic plants	___Leaf packs	___Submerged wood
___Other (Please describe)_____		

******Stonefly Distinguishing Characteristics: Abdomen ends in two tails, No gills visible on abdomen, 2 tarsal claws***

Record the approximate numbers of stoneflies found in the stream (write 0 if none)

_____Stoneflies (put 5-6 specimens in collection jar)

List any other benthic macroinvertebrates or fish found (Please do not collect unless there is a chance it is a stonefly)

Describe any problems noticed at site (unusual discharges to river, etc.)

_____

For Lab Use Only: _____# capnids _____# perlodids _____# other _____

Lab identifier:_____

12/22/2016

FOTR Streamside Procedures

When you get to the site/orienting team

1. Make sure you're at the right site! Check your maps and Site Sketch to verify.
2. Scout out a nice place for your team to sit on the bank and sort through samples.
3. Set out all the equipment and explain its use. Orient your team to what they are looking for. Explain that:
    - We are looking for as many different kinds of organisms as we can and use the ice cube trays to sort them.
    - Be patient when sorting; it may take a little time to see the tiny creatures that are there, movement is key (unless it's very cold).
5. Appoint one or two energetic volunteers to ferry trays from the stream to the team, especially if vegetation and steep banks force team to set up a distance from the creek.
6. Have someone take the water temperature.
7. Record Collection Start Time on Datasheet.

Collecting Hints

1. Always start Downstream and work Upstream to avoid disturbing where you're about to collect.
2. The most important thing is to get some of each type of creature.
3. You should spend approximately 30 minutes collecting at a small stream. Collect as long as you need to thoroughly sample every different kind of habitat.
4. Sample a number of times in each habitat. Use three samples as a guideline but collect enough that you feel you got all of the different animals living in each habitat.
5. Remember - BE AGGRESIVE- the animals are holding on tight to rocks, branches, and leaves to avoid being carried downstream and you want to shake them loose!

Net Tips:
1. Point opening of net upstream.
2. Lift up carefully in sweeping motion to avoid losing organisms.

Riffle:

Note: When selecting a riffle, keep in mind that flow has a big impact on the types of animals that can live there. Two riffle samples, one in the fastest part (white water present, larger rocks) and one in the slowest part (no white water, smaller gravel sized rocks) will likely yield different animals.
1. Put net on bottom of stream, stand upstream, hold net handle upright.
2. Use kicking/shuffling motion with feet to dislodge rocks. You are trying to shake organisms off rocks as well as kick up organisms that are hiding under the rocks. Dig down with your toes an inch or two. Do a lil' dance. Some people use their hands to rub organisms off rocks, but beware of sharp objects on the stream bottom.

Quiet Place/pool:

1. Scoop some sediment up in your net. Some animals burrow into the muck.
Tip: When your net is full of muck, it is very heavy. To clean the excess muck out of your net: keep the top of the net out of the water to avoid losing animals, then sway the net

back and forth, massaging the bottom of the net with your hand. When choosing a soft bottom area try to find one that contains silt since it is a far more productive habitat than just sand.

Undercut Bank/Overhanging Vegetation or Roots:

1. Jab the net into the undercut bank while pulling the net up. Move in a quick bottom to surface motion to scrape the macroinvertebrates from roots. Do this several times.
2. If you notice roots or overhanging vegetation, put the net under the bank at the base of the plants. Shake the vegetation using your net, trying to shake off the animals clinging to these plants. Feel free to use your hands if you are sure the plants are not poisonous.

Submerged or emergent vegetation:

1. Keeping the net opening pointed upstream, move the net through vegetation trying to shake the vegetation and catch any animals.
2. Use your hands to agitate the vegetation and dislodge the animals into the net.

Cobble/Rocks/Logs:

1. Small logs and rocks can be pulled out of the water and given to the team to search for animals. Hint for Logs: Be sure to check under bark.
Hint for Rocks: Caddisfly homes often look like small piles of sticks or clumps of small gravel attached to rocks.

Leaf Packs:

1. Look for a decomposing leaf pack. A "good" leaf pack has dark brown-black skeletonized leaves. Slimy leaves are an indication that they are decaying. Scoop a few into your net and let the team pull then apart and look for animals.
2. Tip: Sometimes a little water in the pan with the leaves will help dislodge the animals.

Identifying Bugs and Recording Data

1. Once all of the trays have been "picked" (try passing picked trays around to increase thoroughness) go through and identify everything. Use keys provided and if in doubt, make your best guess.
2. Fill out the Stream Macroinvertebrate Datasheet as a team. As you record the number of each type (remember 0-10=R, 11+=C), place 5-6 individuals of each type of organism in the specimen jar with the exception of crayfish, snails & large clams. Make sure to collect a variety of sizes and shapes of each and if there is a lot of variation, make sure to get a sample of each. If you are unsure of your identifications, make sure to collect the ones you are unsure of.
3. Fill out the Quick Habitat Assessment Form as a group.
4. Mark the Site Sketch for where you sampled and note any changes to the site.
5. Gather all equipment, rinse all trays and nets and return extra organisms to the stream.
6. Do a final check to make sure you have all of your equipment. If this is your first site, make sure your team has maps and know how to get to the second site.