Quality Assurance Project Plan (QAPP) for Rouge River Area of Concern Public Advisory Council (PAC) Support Benthic Macroinvertebrate and Fish Monitoring

Project Name: ARC Rouge River Area of Concern PAC Support;
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Prepared For

Michigan Department of Environment, Great Lakes, and Energy (EGLE)

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A1.

Project Title: ARC Rouge River Area of Concern PAC Support
Benthic Macroinvertebrate and Fish Monitoring

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Project Initiation: January 1, 2023

Project Termination: December 31, 2025

Sampling Operations: Friends of the Rouge (FOTR)

Manager: Sally Petrella

A2. Table of Contents

A3. Distribution List

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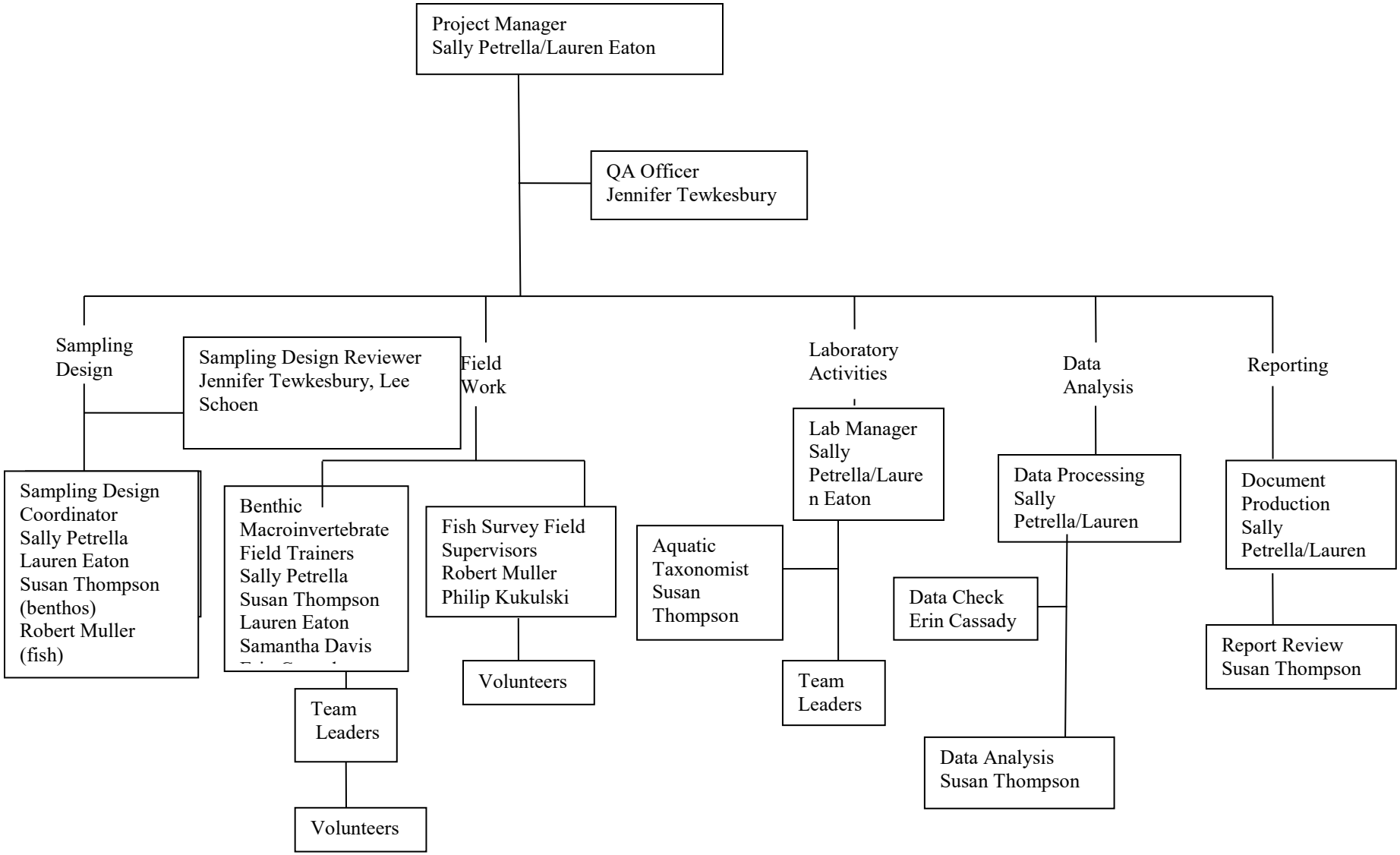
A4. Project Organization



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.

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

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

Benthic Macroinvertebrate 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.

Benthic Macroinvertebrate 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 during Fall Bug Hunts. Take responsibility for cleaning and returning equipment. Submit voucher specimens and completed field forms. Attend identification days following Fall Bug Hunt.

Fish Survey Field Supervisors
Train and direct volunteers and FOTR staff in conduction of fish surveys

Volunteers
Benthic Macroinvertebrates: Assist Team Leaders during sampling days, picking through trays for benthic macroinvertebrates and other duties as assigned by leader.
Fish Surveys: Under the direct of the Fish Survey Field Supervisors, carry equipment, chase fish into nets, collect fish from nets and other duties.

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
Benthic macroinvertebrates: 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 Database. 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 one of 43 original Areas of Concern (AOC) in the Great Lakes Basin with nine Beneficial Use Impairments (BUIs). 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 state of Michigan to the U.S. Environmental Protection Agency (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.

The Rouge River Advisory Council (RRAC) began focusing restoration efforts on habitat-related BUIS and submitted Delisting Targets for Fish and Wildlife Habitat and Population BUIS to the state in 2008. In 2014, RRAC completed a Fish and Wildlife Population and Degradation of Benthos BUI Pre-Assessment to better determine the extent of the impairments and degradation. Eighteen river segments were identified as the most impaired. A workgroup then reviewed potential projects submitted from PAC members to address the identified impaired areas and examined additional fish and wildlife data including frog and toad, benthic and fish data collected by FOTR trained citizen scientists starting in 1998. A list of 26 projects necessary for the Loss of Fish/Wildlife Habitat and Populations BUI Removal was developed with the understanding that the implementation of the 25 projects along with the concrete channel modifications/ enhancement and continued progress on the remaining BUIs would lead to the completion of all management actions and eventual delisting of the Rouge River AOC.

As these 26 habitat projects are developed and completed, monitoring data is needed to track and assess restoration progress yet long-term monitoring has not been included in most AOC-related funding sources. At the same time, funding for monitoring done by state agencies has greatly diminished. FOTR, a local non-profit that works to restore, protect, and enhance the Rouge River watershed through stewardship, education, and collaboration, has been training citizen scientists to collect data on benthic macroinvertebrate populations and on fish since 2012. Conducted under an approved QAPP, the data quality is high and the number of sites covered is far more extensive than state biologists are able to cover.

FOTR will continue to collect data on fish and benthic macroinvertebrates to be used to track the success of Rouge AOC Habitat Projects. Fish data will be collected in the summer of 2023, 2024 and 2025. Benthic macroinvertebrate data will be collected in the spring and fall of 2023, 2024 and 2025. The use of trained citizens as monitors will increase public awareness of Rouge issues and support for corrective actions by promoting citizen involvement and awareness.

The data collected will be submitted to the RRAC and EGLE to be used as a of measure progress towards delisting of the Rouge River AOC. The data will also be provided to all participating Rouge communities, volunteers and anyone else on request.

A7. Project Description

Benthic Macroinvertebrate Monitoring
Friends of the Rouge's Benthic Macroinvertebrate Monitoring Program trains adult volunteers to become team leaders and lead groups of untrained volunteers in benthic macroinvertebrate sampling every spring (April) and fall (October). 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 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. 24-25) for each site sampled. They also use a Site Sketch (Appendix p. 28) to orient them to the site and to record any changes in the habitat at the site (fallen trees, etc.).

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 (Appendix p. 21-23 for map and list of proposed sites).

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. 26-27) 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.

Fish Surveys
Fish seining surveys will be conducted in the summer of 2023 and 2024 and 2025. At each site, 300 feet of stream will be surveyed using seine nets. Seining strategy will target all available habitats (riffle, cobble, undercut banks, pools, woody debris, etc.). Seining techniques will include setting the brail at the stream edge and moving the other brail upstream and to shore and lifting; dipping, reaching and lifting in deep pools; setting the net on the bottom and having volunteers rush the net kicking for minnows or shuffling for darters. Dip nets will be used for undercut banks and around woody debris in shallow

water. Twenty seine hauls or more will be made at each site. All fish will be removed from nets and placed in buckets of water that are carried.

When sampling is complete, or partway through if fish are numerous, all fish will be identified to species and measured to the nearest 1/2 cm using a marked PVC pipe cut in half. Site Field ID, water temperature, number of seine hauls, time spent seining and size of each fish by species will be recorded in a field notebook (sample p. 33). All fish will be returned to the stream except in cases where they cannot be identified in the field or if they are non-native fish. Fish of uncertain species will be taken live and photographed in an indoor setting. Photos will be sent to fish biologists for examination. If necessary, specimens will be preserved in ethanol and sent to fish biologists for final species identification.

Following sampling, the site Field ID, water temperature, number of seine hauls, time spent seining, and sizes for each fish species will be entered into an Excel spreadsheet (sample p. 34) from the field notebook by the Fish Field Survey Supervisor. This will be emailed along with photocopies of raw data to the Data Processor who will enter date into an existing Access database and check Excel data against raw data. A map will be made showing all site locations. Data will be analyzed and a report including all the data will be submitted.

A8. Data Quality Objectives

<u>Precision</u>
Precision measures the reproducibility of measurements under a given set of conditions. Since there is inherent variability in assessing diverse sites and program resources do not allow managers to perform independent (duplicate) collections of sampling sites, our goal for quality assurance is conservative.

Benthic Macroinvertebrates
We use consistent sampling methods (Appendix p. 31-32). 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.

All specimens collected will be identified by volunteers or FOTR staff with confirmation by Project Manager and aquatic biologists to Family and recorded on the Family Datasheet (Appendix p. 24-25). SQI, WQR, # Families (D), # Aquatic Insect Families, and EPT will be calculated. The 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] x 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. Chloride is tested with test strips using a cup of water from the river that is first rinsed three times, and recorded in Quantab units and ppm using supplied conversion chart.

Fish Surveys

At every site, seining surveys are conducted under the supervision of the same two experienced people. Robert Muller oversees the measuring and identification of all fish. He has been surveying, collecting and raising native fish from the region for over 30 years and for the Rouge for the past seven years. Bob published a book entitled “The Fish Community of the Rouge River Watershed” in 2018 that includes his own close up digital photographs of every species found in the Rouge by FOTR surveys since 2012. Philip Kukulski oversees the netting techniques. He has been surveying fish with seine and dip nets in the region for over 20 years and the Rouge for seven years and has collected and raised many native species.

At each site, at least 300 feet of stream are sampled with at least 20 seine hauls for at least one hour. Every available habitat is sampled (riffle, cobble, undercut banks, pools, woody debris). Water temperature is measured with two thermometers placed in the river and checked after three minutes or later. Thermometers must agree within a degree or measurement is retaken.

All fish are transferred to five gallon buckets and held until survey work is complete. To ensure accurate identification, Robert Muller personally identifies or oversees the identification of all species. In any case where identification is uncertain, individual voucher specimens are placed in a container with water and taken home by Mr. Muller. He places them in a v-shaped bottom aquarium and photographs them digitally. These photographs are sent to fish biologists for verification. The fish is held alive until verification and if identification is still uncertain, it is preserved in ethanol and transported to fish biologists.

<u>Bias</u>

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

Benthic Macroinvertebrates
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.

Fish Surveys
We use the same seining method at every site to keep it comparable: at least 300 feet of stream; 20 seine hauls; and one hour of sampling. Over sampling or under sampling at a site can bias the data. Identifications will all be done by Robert Muller with any questionable fish collected and identified in the lab or preserved and sent to fish biologists for identification.

Completeness

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

Fish Surveys
Every effort will be made to collect all species that inhabit the site. This includes using specific techniques for each available habitat, sampling at least 300 feet of stream and using at least 20 seine hauls and sampling for at least one hour. The average number of species for each site, branch or tributary calculated from past data collected by this team will be compared and additional sampling done if far fewer species of fish are found.

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 as well as some of the larger fish that escape the nets.

A9. Training Requirements/Certification

Benthic Macroinvertebrates
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 virtual training session and a field training session conducted under the guidance of 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. 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.

Fish Surveys
Fish surveys are carried out under the direction of Robert Muller and Philip Kukulski who have many years of experience in seining surveys and fish identification. Additional fish technicians Bill Eisenman and Jerrad Jankowski also have man years of experience with Rouge fish surveys. New volunteers will be given minor roles such as carrying buckets and chasing fish into nets. Additional responsibilities such as working the seine nets, removing fish from nets and measuring fish will be added at the discretion of Muller and Kukulski.

A10. Documentation and Records

FOTR staff, each of whom will participate in the collection and/or analysis of environmental data the collection of environmental data (see Section A3), will receive electronic versions of the approved QAPP.

Any fish and macroinvertebate jars will be 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.

Hard copies of all macroinvertebrate and fish data sheets, field notebooks, and voucher samples are stored at the FOTR office and available if requested.

SECTION B. SAMPLING DESIGN

B1. Sampling Design and Methods

Benthic Macroinvertebrates
Sampling Events
Sites are sampled during one-day group sampling events held in the spring (April) and fall (October). Team Leaders do the collecting (Streamside Procedures, Appendix p. 29-30) and fill out the Stream Macroinvertebrate Datasheet (Appendix p. 24-25), and collect and

preserve all specimens found except for live crayfish, clams and snails which they count, record and release. 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 spring and fall sampling events, Identification Nights are held for Team Leaders to identify specimens to Family with confirmation from the Program Manager and aquatic biologists. Remaining specimens and Stonefly Search specimens are identified to Family by Program Manager, aquatic biologists and FOTR staff. A Family Level Datasheet is completed for each site (Appendix p. 26-27) for spring and fall.

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. The sites for this project are determined by communities who sponsor sites and RRAC projects (Appendix p. 21-23). 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 300 feet of stream is sampled and multiple samples taken from all available habitats. 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. 24). The Team Leader will instruct and assist other volunteers in detecting and collecting macroinvertebrates in the sorting trays, including looking under bark and stones. Pickers will keep a rough count of the number of individual macroinvertebrates found. They will pick at least 100 individuals; 60 of 100 is unattainable. Picking will be stopped after one hour or after 150 organisms are found if this happens in less than an hour. All specimens will be transferred into jars of 95% ethyl alcohol with the exception of crayfish, clams, and snails which will be counted, recorded and released to the river. Two jars will be provided for each sampling site. 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.

Fish Surveys

Sampling Events

Fish surveys will be scheduled based on availability of Field Supervisors and volunteers. Two sites are done each day with supervisors, technicians and volunteers meeting at first site. If rain occurs prior to sampling days, supervisors consult with Project Manager on postponement to avoid high water levels. Each site is sampled for approximately one hour/300 feet of stream. Following sampling, all fish are identified, measured and returned to the stream. The team then follows each other to a second site where they procedure is repeated. On rare occasions, three sites are done in one day.

Sampling Sites

Sampling sites are determined based on accessibility and past sampling for benthic macroinvertebrates and fish. The sites for this project will be determined by Project Manager in consultation with Fish Survey Field Supervisors and reviewed by Field Survey Reviewer. At each site, 300 feet of stream and every available habitat is sampled.

Sampling Procedures

At each site, 300 feet of stream will be surveyed. Surveys will be done using 12-foot long by four-foot tall seine nets. Seining strategy will target all available habitats (riffle, cobble, undercut banks, pools, woody debris, etc.). Seining techniques will include setting the brail at the stream edge and moving the other brail upstream and to shore and lifting; dipping, reaching and lifting in deep pools; setting the net on the bottom and having volunteers rush the net kicking for minnows or shuffling for darters. Dip nets will be used for undercut banks and around woody debris in shallow water. Twenty seine hauls or more will be made at each site. Fish will be removed from nets and placed in buckets of water that are carried.

When sampling is complete or part way through if fish are numerous, all fish will be identified to species and measured to the nearest 1/2 cm using a marked PVC pipe cut in half. Site Field ID, water temperature, number of seine hauls, time spent seining, habitats sampled and length of each fish by species will be recorded in a field notebook. All fish will be returned to the stream except in cases where they cannot be identified in the field or if they are non-native fish. Fish of uncertain species will be taken live and photographed in an indoor setting. Photos will be sent to fish biologists for examination. If necessary, specimens will be preserved in ethanol and sent to fish biologist for final species identification.

Following sampling, the site Field ID, water temperature, number of seine hauls, time spent seining and sizes for each fish species will be entered into an Excel spreadsheet from the field notebook. Raw data and excel spreadsheets are emailed to FOTR.

FOTR enters data from spreadsheets into an existing Access database and checks against raw data for errors. A map will be made showing all site locations. Data will be analyzed and a report including all the data will be submitted.

B2. Sample Handling and Custody

Benthic Macroinvertebrates
Macroinvertebrates collected in the field are placed into jars of 95% ethyl alcohol 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 or Assistant. Upon return to the program building, the collections are checked for labels and placed together with corresponding data sheets. Within the next four weeks, an Identification Night will be held for Team Leaders to identify specimens in the lab under the direction of the Program Manager and aquatic biologists. At the Identification Night and following, all specimen jars will be checked, all individuals identified to Family and recorded on the Family Level Datasheet (Appendix p. 26-27). 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 unknown specimens will be examined by aquatic biologists.

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.

Fish Surveys
In most cases, fish specimens are not collected. On rare occasions when the species is not apparent, individual fish are taken home live in a bucket by Robert Muller. They are then photographed in an aquarium and photos sent to fish biologists for identification. If necessary, specimens are preserved in 95% ethanol and sent to fish biologists for final identification.

B3. Quality Control

Equipment Quality Control:
- Check to make sure equipment is in working order and not damaged
- Clean equipment thoroughly 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 for benthic macroinvertebrate sampling 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.

For benthic macroinvertebrate monitoring, 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. Equipment Testing, Inspection, and Maintenance

Benthic Macroinvertebrates
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 95% ethanol
Alcohol wipes/band-aids
Latex/nitrile gloves
Five-gallon bucket (clean and dry)
Long rubber gloves and cotton liners
Car signs
Laminated identification keys
Data forms
Site maps
Chloride strips
Sample cup for chloride strips
Conversion chart for chloride strips

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.

Fish Surveys
Fish Survey Supervisors provide all fish sampling equipment except waders for volunteers that are provided by themselves or by FOTR. All survey equipment is cleaned, disinfected and dried following every sampling day by Fish Survey Supervisors during sampling season and checked prior to each sampling day.

Chest waders and waist belts for all participants
12-foot seine net
1 dip net
2 5-gallon buckets with screw type lids
2 5-gallon buckets with bait lid and flap
1 small aquarium net
1 fish bong
2 PVC pipe measurers
1 plastic wash bin
1 aquarium net
2 plastic collection jars
1 field table
1 field notebook and 2 pencils
Camera
2 Celsius thermometers

Invasive species known to be in the Rouge River system include round goby, zebra mussels, Asian clams, European frog-bit, red swamp crayfish and Eurasian milfoil. 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 subwatersheds, all equipment will be thoroughly disinfected with a diluted bleach solution (1/2 cup bleach per 5 gallons 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 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 personal 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

Benthic Macroinvertebrates
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.

Fish Surveys
Field data notebooks are completed in the field and input into Excel spreadsheets by Robert Muller. Spreadsheets and electronic copies of field notebook sheets are emailed to FOTR and maintained at FOTR. FOTR checks spreadsheets for errors against field notebooks.

All data is input into Access database by FOTR. A separate individual checks database against field forms to minimize errors.

C. ASESSMENT 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. Reporting

A report will be produced following each benthic macroinvertebrate sampling season and fish sampling season as well as a final report. 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 forwarded to RRAC, EGLE and all participants. Project status reports will be provided quarterly to EGLE. Electronic copies of these reports will be maintained on the FOTR server.

Each Team Leader completes the two-page Benthic Macroinvertebrate Form in the field (Appendix p. 24-25). All benthic macroinvertebrates collected at the site are preserved in

the jar of alcohol provided except for crayfish, clams, mussels and snails which are counted and noted on datasheet. The jar has a label on the outside and on the inside with the station location and date. An additional Family Datasheet (Appendix p. 26-27) is completed during Identification Night. Following Lab Identification Day, data are input into an Excel spreadsheet by Project Manager or Assistant and an Access database and checked by other staff. Data is submitted to the MiCorps website. Voucher collections are maintained by Friends of the Rouge (FOTR), 650 Church St., Plymouth, MI 48170.

D. Data Validation and Usability

D1. 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.

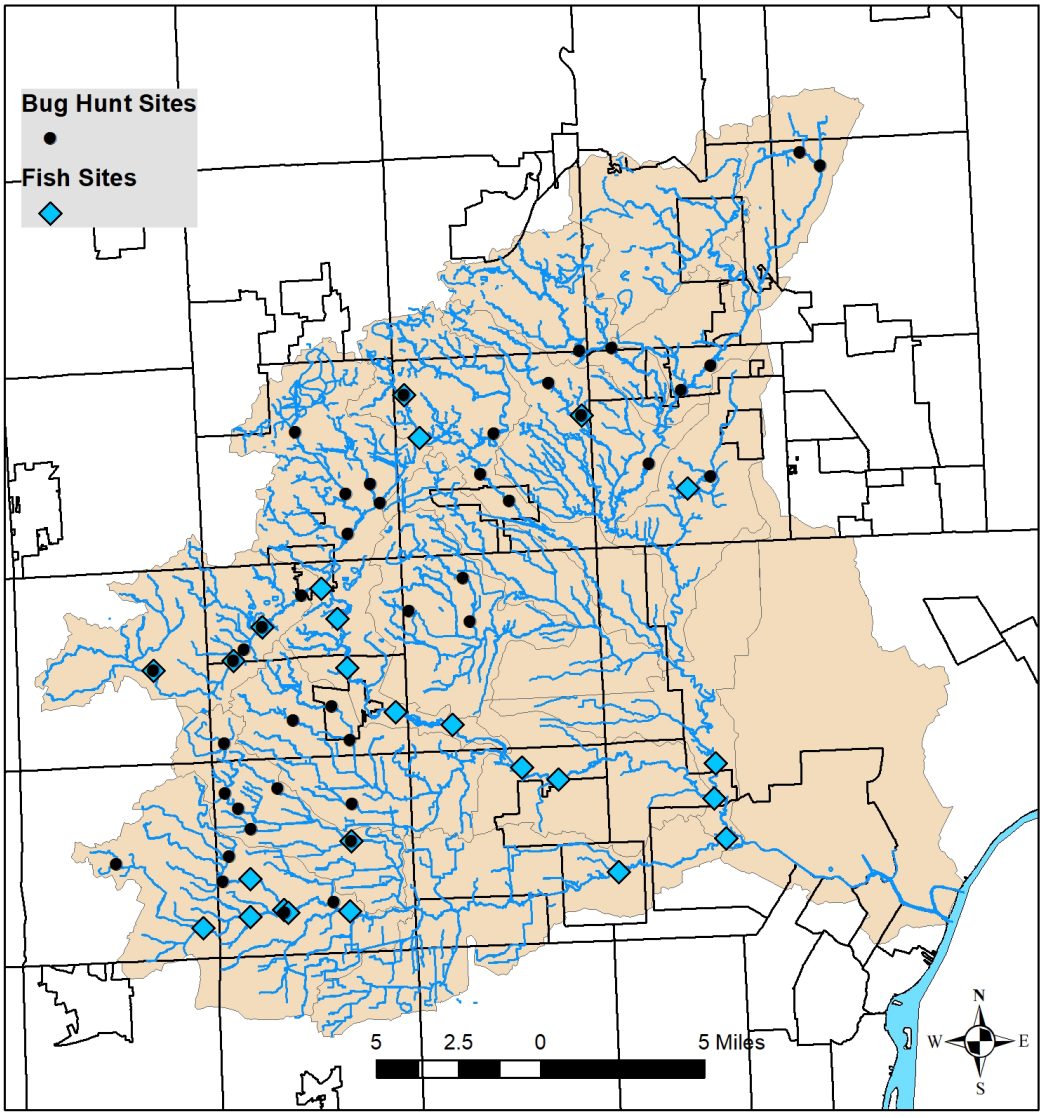
D2. Reconciliation with Data Quality Objectives

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.

Appendices

2023-25 Fish and Benthic Macroinvertebrate Sites



Potential Benthic Macroinvertebrate Monitoring Sites 2023-25				
BRANCH	Stream Name	FIELDID	Latitude	Longitude
Lower	Fellows Creek	Fel1	42.35729	-83.5399
Lower	Fellows Creek	Fel2	42.31932	-83.5246
Lower	Fellows Creek	Fel4	42.31346	-83.4647
Lower	Fellows Creek	Fel5	42.335263	-83.5398
Lower	Fellows Creek	Fel6	42.328188	-83.5322
Lower	Fellows Creek	LR-9	42.33709	-83.5085
Lower	Fowler Creek	Fowl1	42.30423	-83.6052
Lower	Fowler Creek	Fowl2	42.28226	-83.5052
Lower	Lower Rouge	Low2	42.30724	-83.5379
Lower	Lower Rouge	Low4	42.286604	-83.4757
Lower	Lower Rouge	LR-8	42.295976	-83.5418
Main	Evans Creek	Evan2	42.472955	-83.2479
Main	Franklin Creek	Frank1	42.53024	-83.3059
Main	Franklin Creek	Frank2	42.529325	-83.3254
Main	Main Rouge	Main1	42.60991	-83.1798
Main	Main Rouge	Main5	42.52219	-83.2469
Main	Main Rouge	Main6	42.47882	-83.2845
Main	Nottingham Creek	Nott	42.51149	-83.2646
Main	Pebble Creek	Peb2	42.51521	-83.344
Main	Pebble Creek	Peb3	42.500849	-83.3245
Main	Sprague Creek	Sprag	42.615971	-83.1921
Middle	Bishop Creek	Bish2	42.47131	-83.4515
Middle	Ingersoll Creek	Ing1	42.46293	-83.4455
Middle	Johnson Creek	John1	42.3897	-83.5819
Middle	Johnson Creek	John2	42.39382	-83.5342
Middle	Johnson Creek	John3	42.40844	-83.5169
Middle	Johnson Creek	John5	42.4224	-83.4929
Middle	Johnson Creek	John7	42.398572	-83.528
Middle	Tonquish Creek	Nton	42.37312	-83.4757
Middle	Tonquish Creek	Ton1	42.36701	-83.499
Middle	Tonquish Creek	Ton2	42.35809	-83.4651
Middle	Walled Lk Drainage	Wall1	42.44957	-83.4653
Middle	Walled Lk Drainage	Wall2	42.46732	-83.4662
Middle	Walled Lk Drainage	Wall3	42.49486	-83.4958
Middle	Willow Creek	Will1	42.33002	-83.4642
Upper	Bell Branch	Bell1	42.42924	-83.3967
Upper	Bell Branch	Bell2	42.415119	-83.429
Upper	Bell Branch	Bell3	42.41015	-83.3929
Upper	Minnow Pond	Min2	42.493065	-83.3773
Upper	Seeley Creek	See3	42.51073	-83.4304
Upper	Upper Rouge	Up1	42.47526	-83.3855
Upper	Upper Rouge	Up2	42.463216	-83.3682

Potential Fish Monitoring Sites 2023-25				
BRANCH	Stream Name	FIELDID	Latitude	Longitude
Lower	Fellows Creek	Fel4	42.31346	-83.46471
Lower	Fowler Creek	Fowl4	42.275562	-83.553772
Lower	Fowler Creek	Fowl5	42.280294	-83.525426
Lower	Lower Rouge	Low11	42.297215	-83.525437
Lower	Lower Rouge	Low9	42.283461	-83.505311
Lower	Lower Rouge	LR-10	42.298506	-83.305839
Lower	Lower Rouge	LR-11A	42.312568	-83.241523
Lower	Lower Rouge	LR-12	42.282317	-83.466103
Lower	Lower Rouge	LR-2	42.281962	-83.503009
Main	Evans Creek	Evan5	42.467809	-83.261619
Main	Main Rouge	Main20	42.33006	-83.2415
Main	Main Rouge	MN-7A	42.346016	-83.247099
Main	Pebble Creek	Peb3	42.500849	-83.324474
Middle	Johnson Creek	John1	42.3897	-83.58194
Middle	Johnson Creek	John2	42.39382	-83.5342
Middle	Johnson Creek	John3	42.40844	-83.51693
Middle	Johnson Creek	John6	42.42546	-83.48138
Middle	Middle Rouge	MR-11	42.34516	-83.3629
Middle	Middle Rouge	MR-12	42.33975	-83.34093
Middle	Middle Rouge	MR-15	42.3306	-83.2483
Middle	Middle Rouge	MR-17	42.370466	-83.437574
Middle	Middle Rouge	MR-18	42.390248	-83.466365
Middle	Middle Rouge	MR-20	42.411952	-83.471703
Middle	Middle Rouge	MR-4	42.36445	-83.40406
Upper	Seeley Creek	See3	42.51073	-83.4304
Upper	Seeley Creek	SeeBosch	42.491667	-83.421528

MiCorps Site ID#:_____

Michigan Clean Water Corps

Stream Macroinvertebrate Datasheet

FIELDID: _____Stream Name:_____

Site Name/Location:_____Date:_____

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

Collection End Time:_____ (AM/PM) Picking End Time:_____ (AM/PM)

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

Latitude:_____ Longitude:_____

Monitoring Team:

Collector:_____ Bank Leader:_____

Pickers:_____ _____

_____ _____

_____ _____

_____ _____

Stream Conditions: Water Temperature_____°C Average Water Depth:_____ feet

Saltwatch: Quantab units:_____ ppm: (read from card)_____

Notable weather conditions in the last week:_____

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

Are there any current site conditions that may impede normal macroinvertebrate sampling? (weather, flooding, poor visibility, etc.?) ( ) Yes ( ) No

If yes, please describe as well as any site concerns:_____

_____

Datasheet checked for completeness by:_____ Datasheet version 10/08/05

Data entered into MiCorps database by:_____ Date:_____

MiCorps Site ID#:_____

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

____ Riffles	____ Backwater areas	____ Submerged Wood
____ Rocks (Cobbles)	____ Leaf Packs	____ Other. Describe:_____
____ Aquatic Plants	____ Pools	
____ Runs	____ Undercut banks/Overhanging Vegetation	

Macroinvertebrates Observed but not collected: These animals should be counted then **returned to the stream.** Please count and list the number found.

____ **Crayfish**

Bivalves (Clams/Mussels)	**Snails/Limpets**
____Fingernail clams	____Gilled (right-handed snails)
____Freshwater mussels (large)	____Pouch snails (left-handed)
____ zebra mussels	____Pouch snails (coiled in one plane)
____ Asian clams	____Limpets

Did you see any fish? ( ) Yes ( ) No If so, describe:_____

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

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

MiCorps Site ID#_____Sample Date_____

Identifier_____Identification Date_____

Identifications Checked by:_____

FAMILY LEVEL IDENTIFICATION AND ASSESSMENT

Count	Name	Sensitivity Rating	Count x Sensitivity

ANNELIDA-Segmented Worms

	Hirudinea	10	
	Oligochaeta	10	

COLEOPTERA- Beetles

	Curculionidae	5	
	Dryopidae	5	
	Dytiscidae	5	
	Elmidae	4	
	Gyrinidae	5	
	Haliplidae	5	
	Hydrophilidae	5	
	Lampyridae		
	Noteridae		
	Psephenidae	4	
	Ptilodactylidae	3	
	Scirtidae	5	
	Staphylinidae	8	

DIPTERA- True Flies

	Athericidae	2	
	Blephariceridae	0	
	Ceratopogonidae	6	
	Chaoboridae	8	
	Chironomidae	6	
	Culicidae	8	
	Dixidae	1	
	Dolichopodidae	4	
	Empididae	6	
	Ephydridae	6	
	Muscidae	6	
	Psychodidae	8	
	Ptychopteridae	10	
	Sciomyzidae	6	
	Simuliidae	6	
	Stratiomyidae	8	
	Syrphidae	10	
	Tabanidae	6	
	Tipulidae	4	

Count	Name	Sensitivity Rating	Count x Sensitivity

CRUSTACEA- Crustaceans

	Amphipoda	4	
	Decapoda	6	
	Isopoda	8	

EPHEMEROPTERA- Mayflies

	Ameletidae	0	
	Ametropodidae		
	Anthropleidae		
	Baetidae	4	
	Baetiscidae	3	
	Caenidae	7	
	Ephemerellidae	1	
	Ephemeridae	4	
	Heptageniidae	4	
	Isonychiidae	2	
	Leptohyphidae	3	
	Leptoplebiidae	2	
	Metretopodidae	2	
	Neoephemeridae		
	Polymitarcyidae	2	
	Potamanthidae	4	
	Pseudironidae		
	Siphlonuridae	7	

GASTROPODA- Snails, Limpets

	Ancylidae	6	
	Bithyniidae		
	Hydrobiidae		
	Lymnaeidae		
	Physidae	8	
	Planorbidae	7	
	Pleuroceridae		
	Pomatiopsidae		
	Valvatidae		
	Viviparidae		

Count	Name	Sensitivity Rating (0-10)	Count x Sensitivity

HEMIPTERA- True Bugs

	Belostomatidae	10	
	Corixidae	10	
	Gelastocoridae		
	Gerridae	5	
	Hydrometridae		
	Mesoveliidae		
	Naucoridae	5	
	Nepidae	8	
	Notonectidae		
	Pleidae		
	Saldidae	10	
	Veliidae	6	

LEPIDOPTERA- Moths and Butterflies

	Cosmopterigidiae		
	Nepticulidae	5	
	Noctuidae		
	Pyralidae	5	
	Tortricidae		

MEGALOPTERA

	Corydalidae	0	
	Sialidae	4	

ODONATA- Damselflies, Dragonflies

	Aeshnidae	3	
	Calopterygidae	5	
	Coenagrionidae	9	
	Cordulidae	2	
	Cordulegastridae	3	
	Gomphidae	1	
	Lestidae	9	
	Libellulidae	9	
	Macromiidae	3	

PELECYPODA-bivalves

	Corbiculidae	6	
	Dreissenidae	8	
	Sphaeriidae (aka Pisidiidae)	8	
	Unionidae	6	

Note: MiCorps was not able to locate a tolerance value of every taxa listed here; in those cases, it was left blank. If you can aid our research with tolerance values, please email psteen@hrwc.org .

0-0=3.5 excellent, pollution unlikely
3.51-4.50 very good, slight pollution possible
4.51-5.50 good, some pollution possible
5.51-6.50 fair, fairly substantial pollution likely
6.51-7.50 fairly poor, substantial likely
7.51-8.50 poor, very substantial pollution likely
8.51-10.0 very poor, severe pollution likely

Count	Name	Sensitivity Rating (0-10)	Count x Sensitivity

PLECOPTERA- Stoneflies

	Capniidae	1	
	Chloroperlidae	1	
	Leuctridae	0	
	Nemouridae	2	
	Perlidae	1	
	Perlodidae	2	
	Pteronarcyidae	0	
	Taeniopterygidae	2	

TRICHOPTERA- Caddisflies

	Apataniidae	3	
	Brachycentridae	1	
	Dipseudopsidae	5	
	Glossosomatidae	1	
	Goeridae	3	
	Helicopsychidae	3	
	Hydropsychidae	4	
	Hydroptilidae	4	
	Lepidostomatidae	3	
	Leptoceridae	4	
	Limnephilidae	4	
	Molannidae	6	
	Odontoceridae	0	
	Philopotamidae	3	
	Phryganeidae	4	
	Polycentropodidae	6	
	Psychomyiidae	2	
	Rhyacophilidae	0	
	Sericostomatidae	3	
	Uenoidae	3	

OTHER GROUPS

	HYDRACARINA Water mites	6	
	COLLEMBOLA springtails	5	
	PLATYHELMINTHES-Turbellaria/Flatworms	4	

WATER QUALITY RATING

	←Add up the Count columns on both sides (Total Abundance) Add up the "Count x Sensitivity" column for both sides ❼	

First: If your total abundance is Less than 30 ☐ Automatically give it a WQR of 10 (Very Poor rating).

Less than 60 ☐ Automatically give it a WQR of 7 (Poor rating)

Water Quality Rating =

Sum of (Count x Sensitivity)
Divided By
Total Abundance

= _____

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

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 and do the salt test.
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 45 minutes collecting at a small stream and up to an hours collecting at a large stream (or two collectors spend 30 minutes in a river). Collect as long as you need to thoroughly sample every different kind of habitat. The goal is to find as many types of macroinvertebrates as possible.
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

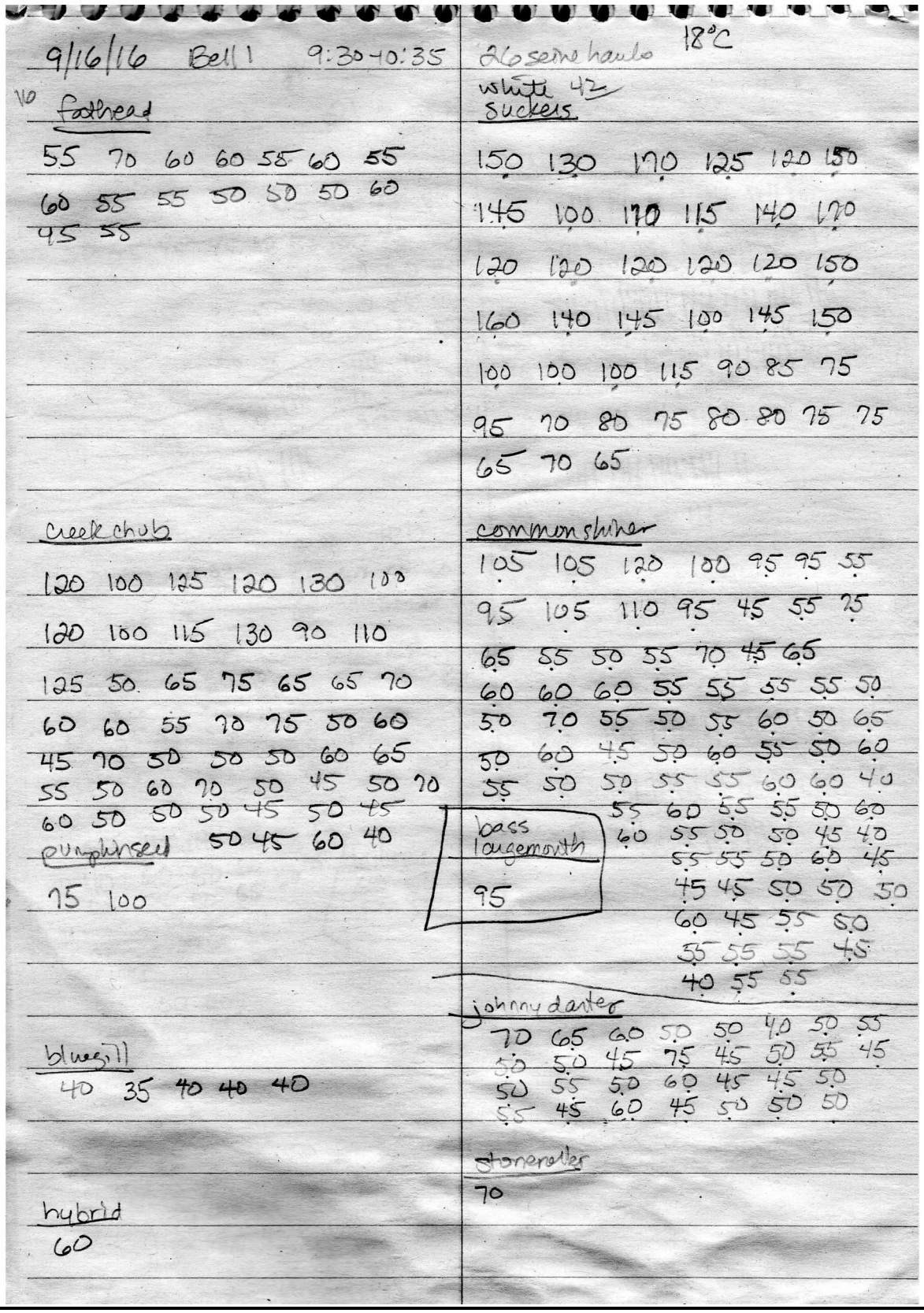
1. Once all of the trays have been "picked" (try passing picked trays around to increase thoroughness) Place ALL of the macroinvertebrates that are not crayfish, snails & large clams into the vial. Count all of the clams, snails, and crayfish.
2. Fill out the Stream Macroinvertebrate Datasheet with the count each category of crayfish, snails and large clams.
3. Mark the Site Sketch for where you sampled and note any changes to the site.
4. Gather all equipment, rinse all trays and nets and return clams, snails and crayfish 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 discuss how to get to the second site.

Leaving Site

- ☐ Clean all equipment including removing dirt and debris from wader treads and boots. If second site is not in same subwatershed and downstream from first site, all equipment must be disinfected with dilute bleach.

- ☐ Make sure to check site for all equipment as well as personal items – thermometers and specimen vials have been left at sites.

Fish Surveys – Sample Datasheet from Field Notebook



9/16/16 Bell 1 9:30-10:35 18°C

26 seine hauls

10 fathead

55 70 60 60 55 60 55
60 55 55 50 50 50 60
45 55

creek chub

120 100 125 120 130 100
120 100 115 130 90 110
125 50 65 75 65 65 70
60 60 55 70 75 50 60
45 70 50 50 50 60 65
55 50 60 70 50 45 50 70
60 50 50 50 45 50 45
unphinsed 50 45 60 40

75 100

bluegill

40 35 40 40 40

hybrid

60

white sucker 42

150 130 170 125 120 150
145 100 170 115 140 170
120 120 120 120 120 150
160 140 145 100 145 150
100 100 100 115 90 85 75
95 70 80 75 80 80 75 75
65 70 65

common shiner

105 105 120 100 95 95 55
95 105 110 95 45 55 75
65 55 50 55 70 45 65
60 60 60 55 55 55 55 50
50 70 55 50 55 60 50 65
50 60 45 50 60 55 50 60
55 50 50 55 55 60 60 40
55 60 55 55 50 60
60 55 50 50 45 40
55 55 50 60 45
45 45 50 50 50
60 45 55 50
55 55 55 45
40 55 55

bass
largemouth

95

johnny darter

70 65 60 50 50 40 50 55
50 50 45 75 45 50 55 45
50 55 50 60 45 45 50
55 45 60 45 50 50 50

stoneroller

70

Fish Surveys – Sample Excel Spreadsheet

Bell1 Bicentennial Park Sept. 16, 2016 Bell Creek - Upper Rouge																											Total Number of Fish
Temp. 18° C.																											
Species	Size Class cm																										
	≤ 3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	14	14.5	15	16	17	
Central Stoneroller									1																		1
Common Shiner			3	9	18	26	14	3	2	1				4	1	3.0	1		1								86
Fathead Minnow				1	3	6	5		1																		16
Creek Chub			1	5	13	2	7	4	5	2			1		3		1	1	3	2	2						52
White Sucker								2	2	4	3	1	1	1	5			2	6	1	1	2	3	4	1	3	42
Pumpkinseed										1					1												2
Bluegill		1	1																								2
Hybrid Sunfish							1																				1
Largemouth Bass														1													1
Johnny Darter			1	7	12	4	3	1	1	1																	30
Total Fishes Sampled																											233