Quality Assurance Project Plan for the

Bug Brigade Volunteer Monitoring Project

Supported by the MiCorps Volunteer Stream Monitoring Program

Date: April 17, 2024

Version: #2

Organization: St. Joseph County Conservation District

QAPP Prepared by: Kaitlin Renehan, Project Coordinator

QAPP Authorized by: Carolyn Grace, District Administrator

QAPP Reviewed and Approved by: Paul Steen, MiCorps Stream Program Manager, July 22, 2024

This QAPP is approved for a two year time period starting July 22, 2024.

A3. Document Distribution

The following individuals will receive a copy of the QAPP:

- Paul Steen, *Stream Monitoring Program Manager*, Michigan Clean Water Corps
- Carolyn Grace, *District Administrator*, St. Joseph County Conservation District
- Kaitlin Renehan, *Project Coordinator*, St. Joseph County Conservation District
- Denny Seltzer, *Scientific Supervisor for Bug Brigade*, Pfizer Inc.
- Published on the St. Joseph County Conservation District webpage

A4. Program Organization

I. Management Responsibilities

Carolyn Grace, *District Administrator*, St. Joseph County Conservation District, (269) 467-6336 ext. 5
carolyn.grace@macd.org

Commitments

- Provide administrative and budget oversight for the program
- Assist with QAPP implementation and provide oversight
- Assist with data entry and analysis as needed
- Provide all products and deliverables in hard and electronic forms
- Assist with volunteer stream monitoring training sessions
- Assist with macroinvertebrate identification as needed
- Coordinate and implement school sessions and other groups for identification
- Assist with reporting duties and authorize materials prior to submission

Kaitlin Renehan, *Project Coordinator*, St. Joseph County Conservation District, (269) 467-6336 ext. 5
kaitlin.renehan@macd.org

Commitments

- Revise and implement a Quality Assurance Project Plan (QAPP)
- Assist District Administrator with program promotion and volunteer recruitment
- Coordinate and conduct volunteer stream monitoring training opportunities
- Coordinate and implement volunteer stream monitoring data collection events
- Enter VSMP data into the MiCorps web-based Data Exchange Network
- Provide all products and deliverables in hard copy and electronic forms
- Fulfill all program reporting duties

II. Field Responsibilities

Field sampling is performed by Volunteers. Team Leaders and Collectors first receive training in data collection methods from the Project Coordinator and District Administrator. Team Leaders then organize a stream monitoring strategy and delegate monitoring roles for each team. In the field, Team Leaders fill out datasheets and explain site sampling methods, time limit guidelines, distance to be surveyed, safety precautions, and other team responsibilities. Collectors sample all in-stream habitats and provide the Pickers with stream samples to be sorted through. Pickers follow instructions provided by Team Leaders, the Project Coordinator, and/or the District Administrator. Assigned Pickers sort samples back at the District Offices, removing macroinvertebrate specimens from the sorting trays and/or ice trays, placing them into site-specific collection jars, and preserving them in 70% ethanol for subsequent formal identification performed by the Project Coordinator.

A2. Table of Contents

designated for each of the mainstem Prairie, Portage, and Fawn rivers, and Big Swan Creek. Twice a year, community members are welcomed to participate in volunteer stream monitoring events hosted by the Project Coordinator and District Administrator. Following standard MiCorps procedures, a stream sample is collected at each site listed; once in the fall season and once in the spring - for a total of 16 collections acquired per year. Trained volunteers fill out the first section of the MiCorps Stream Macroinvertebrate Datasheet on-site at each sampling location. Stream samples are sorted that same day and macroinvertebrate specimens are transferred into site-labeled collection jars filled with a 70% ethanol preservative. Jars are then handed over to the Project Coordinator, who formally counts and identifies specimens within two weeks of the collection date. At this stage, the Project Coordinator completes the Identification and Assessment section of the MiCorps Stream Macroinvertebrate Datasheet, calculating the site's Water Quality Rating and then entering information into the MiCorps Data Exchange online system. Reporting requirements are to be fulfilled by the Project Coordinator, authorized by the District Administrator, and submitted to the MiCorps Stream Program Manager through the Grantee Invoice Submission page provided by MiCorps. Results are made available to the public via the MiCorps Data Exchange platform. Collection jar contents and hard-copy datasheets are to be stored at the SJCCD Office for no less than 5 years post-collection date. It is the aim of SJCCD that an ever-increasing number of community volunteers come to participate in this program each year, and that their involvement may additionally extend to other District projects and events.

A7. Data Quality Objectives

Precision: Local streams are biologically assessed by examining diversity and abundance among collected samples of aquatic macroinvertebrate community assemblages. To ensure precision and accuracy, field data quality control is accomplished by the District Administrator and Project Coordinator whilst training and accompanying collection teams, where any divergence from standardized protocol is noted and/or corrected. Additionally, team members designated as Leaders and Collectors are required to have attended at least one prior training event. When deemed appropriate, the Project Coordinator and/or District Administrator perform independent side-by-side collections to acquire duplicate sampling for quality control purposes. Duplicate sample results may be compared with volunteer-collected sample results to determine if there is a strong divergence between measures of Stream Quality Index (SQI) and Total Diversity (TD). If either score varies beyond an 80% threshold, the Project Coordinator reviews collection methods with team members and may encourage additional training exercises.

Methods reviewed at training and collection events include:
1. Thorough dip-net collection techniques - 300ft section for 35-45 minutes.
2. The sampling of all stream habitat features and microhabitats exhibited at a given site.
3. A responsibility to count and release any clam, mussel, snail, fish, or crayfish.
4. Equipment decontamination procedures using a diluted bleach solution.
3. Meticulous picking/sorting styles for various species and material types.
5. Transfer approaches from dip-nets to buckets; buckets to sorting trays; trays to ethanol-filled jars.

The accuracy of macroinvertebrate species identification is at this time secured by the Project Coordinator, who has acquired years of formal laboratory experience identifying macroinvertebrates to the taxonomic Species level. The Coordinator utilizes a District-owned microscope for identification when appropriate, and reaches out to one of several partnering specialists for identification assistance if needed.

A given site's Stream Quality Index (SQI) score or Total Diversity (TD) measure across macroinvertebrate taxa is noted as 'preliminary' until after three fall samplings and three spring samplings have been consecutively collected at that location. As the COVID-19 Pandemic shutdown interrupted previous sequences of continued monitoring, scores will be effectively marked as 'preliminary' up until collection events held in the year 2026.

Bias: Sites are sampled by different team members at least once every three years to examine the effects of bias given variations in individual collection styles. A Relative Percentage Difference (RPD) calculation between the new measure and the mean of past measures should be less than 40% for both SQI and TD. Sites which meet this data quality objective are evaluated by the District Administrator using the proper mathematical formula. If the sample falls outside of this range, the Administrator conducts a more thorough investigation to determine which team members or factors are potentially at fault. The Project Coordinator

III. Laboratory Responsibilities:

The Project Coordinator assumes laboratory responsibilities for the formal identification of macroinvertebrate specimens collected during volunteer stream monitoring events. Site collection jars are gathered and a station table is set up with site datasheets, a sorting tray, ice cube trays, forceps, identification guides, a microscope, and a squirt bottle of ethanol. All 8 samples are sorted through and each specimen present is identified and counted to be added to the appropriate section of the datasheet. Upon completing the 'Identification and Assessment' portion of the MiCorps Stream Macroinvertebrate Datasheet, species are grouped based on their associated sensitivity rating and then a site-specific Water Quality Rating is totaled. If any further assistance is needed to complete laboratory duties, the Project Coordinator may reach out to Denny Seltzer, who acts as The Bug Brigade's Scientific Supervisor for the Volunteer Stream Monitoring Program. Final data results are entered into the MiCorps Data Exchange networking system and submitted for public view on the MiCorps website - https://data.micorps.net/view/stream/. All laboratory responsibilities are completed within two weeks of the former volunteer stream monitoring event.

IV. Corrective Action:

The District Administrator and Project Coordinator are the primary persons responsible for initiating, developing, approving, implementing and reporting corrective actions concerning project efficacy and overall data quality. In the event that additional council is required, The District promptly contacts the MiCorps Stream Monitoring Program Manager for further instruction.

A5. Program Goals

1. Continue providing data for 2 sites sampled in the Prairie River over a multi-year timespan (PRAIRIE 01 & PRAIRIE 02), where results may be considered in the Michigan Department of Natural Resources' (MDNR) upcoming decision regarding the proposed reclassification of Prairie River from a designated warmwater stream to a coldwater transitional trout stream.

2. Continue providing data for 2 Portage River sites (PORTAGE 01 & PORTAGE 02), as these have been identified by both NRCS Personnel and the St. Joseph County Drain Commissioner as areas of concern for non-point source pollution inputs. Additionally, the Portage 01 location referenced in Section B1 is situated at the Parkville Dam Removal site, where SJCCD & the MDNR completed a Project to remove remnants of a diversion dam, millrace structure, and sluice gates from the Portage River in 2021. Given associated efforts to enhance the site and observe changes in water quality, SJCCD deems this as a priority site for continued monitoring.

3. Maintain partnership with Darrin O'Brien, co-coordinator of the Michigan Odonata Survey, as he works to fill in data gaps for species within suborders Anisoptera and Zygoptera found throughout the St. Joseph River Watershed region. Following SJCCD-led collection events and data submission to MiCorps, macroinvertebrate specimens may be handed over to Darrin for further analysis of collected Odonata species.

4. Monitor sections of Big Swan Creek (SWAN 01 & SWAN 02) – serving as an inlet and outlet of Palmer Lake, flowing generally northwest into Sturgeon Lake, and then emptying directly into the St. Joseph River. These stream monitoring efforts act as a follow-up to water quality measurements previously recorded on Palmer Lake by SJCCD under the MiCorps Cooperative Lakes Monitoring Program. SJCCD is working with a private land owner for access to the SWAN 01 portion of the study.

A6. Program Description

The prime objective of this program is to track changes over time regarding habitat health and water quality at select sites within the St. Joseph River Watershed region given organized data collection efforts coordinated under the MiCorps Volunteer Stream Monitoring Program. 8 sampling locations have been chosen across the jurisdictional area of St. Joseph County, where 1 upstream and 1 downstream site have been

returning volunteers, sorting through collection jars and identifying specimens, completing assessment portions of MiCorps datasheets, submitting data results through the MiCorps Data Exchange site, and fulfilling reporting duties to then be reviewed and authorized by the District Administrator prior to submission to the MiCorps Stream Monitoring Program Manager.

SECTION B: PROJECT DESIGN AND PROCEDURES

B1. Study Design

Eight monitoring locations have been designated across the St. Joseph County region; surveying tributaries of the St. Joseph River for insight regarding the health of the greater St. Joseph River Watershed (see Appendix A for location maps). Benthic populations are sampled at each site twice a year; completed within a 2-week period in both mid-April and mid-October. To sample the benthic community, collections are gathered from each habitat type present, including riffles, rocks or other large objects, leaf packs, submerged vegetation or roots, and depositional areas, while wading and using a D-frame kicknet. Trained Collectors transfer material from the net into a 5 gallon bucket held by a second volunteer (see sections B2 and B3 for equipment lists). During collection, the Collector provides information to the Team Leader in response to questions listed on the data sheet as a review of all microhabitats to be sampled, the general state of the stream, and any changes in methodology and/or unusual observations (see the first page of Appendix B for a copy of the Stream Macroinvertebrate Datasheet). Potential sources of variability such as weather/stream flow, seasonal influences, and site characteristic differences are noted for each event and discussed in submitted study results. Survey equipment including waders and dip-nets are inspected and sanitized after each stream monitoring effort using diluted bleach, boot brushes/picks, lint brushes, and towels to remove any unwanted plant/animal hitchhikers. Any variation in procedure or unexpected accidents, such as losing part of the collection by spilling, are recorded on the datasheet. Either at the office or another pre-designated location, teams meet back and Pickers gradually empty bucket contents into white sorting trays. The Team Leader, Project Coordinator, and District Administrator assist volunteer Pickers in detecting and collecting macroinvertebrates from the sorting trays; looking through detritus, under bark, and inside of constructions made of sticks or other substrates. Macroinvertebrates are picked out and placed into site-specific jars containing 70% ethyl alcohol. Finished samples are later sorted through by the Project Coordinator to count and identify specimens to the taxonomic Order level (see second page of Appendix B for Identification and Assessment section of the Stream Macroinvertebrate Datasheet). Literature utilized for proper identification includes various dichotomous keys and field guide materials provided by the Stroud Water Research Center, Huron River Watershed Council, and the Macroinvertebrates.org webpage. The Project Coordinator also uses a copy of J. Reese Voshell's book '*A Guide to Common Freshwater Invertebrates of North America*'. A table station is set up with a sorting tray, forceps, a microscope, ice cube trays, a squirt bottle of ethanol, MiCorps Datasheets, literature materials, and the 8 collection jars filled with site samples. The Identification and Assessment portion of each site's Datasheet is completed and a Water Quality Rating is calculated based on species and abundance encountered. Results are entered into the MiCorps Data Exchange system on the MiCorps website, and are then made available for public view. The approved QAPP is published on the St. Joseph County Conservation website. All field and laboratory equipment is routinely inspected prior to each monitoring event, in between site collections, and after completion of a full monitoring event before storing until the next one (see Section B2 for a detailed description of equipment maintenance protocols.)

accompanies teams to observe their collection techniques, notes any divergence from protocols, and may choose to perform an independent collection for duplicate sampling up to 1 week after the team's original collection. Following careful consideration, the Administrator and Coordinator may determine original samples as either valid or invalid, and may determine whether discrepancies between collections can be attributed to naturally occurring variations including changes over time or unrepresentative sampling conditions.

Completeness: Measures of valid data successfully obtained versus the amount expected to be obtained are to be expressed in percentage format. For instance, if 100 samples were scheduled but volunteers sampled 90 times due to inclement weather, the completeness record would stand at 90%. Following a Quality Assurance Review of all collected and analyzed data, completeness is assessed by dividing the number of valid measurements by the number of the total measurements acquired. The data quality objective for completeness under each sampling parameter is 90% or above. If the program fails to meet this standard, the Project Coordinator will promptly consult with the MiCorps Stream Monitoring Program Manager to assess the main causes of data invalidation and to develop a course of action for improvement on completeness given future sampling efforts.

Representativeness: Monitoring sites are selected to represent a wide range of variances among local stream habitat characteristics. A section's exhibited microhabitat types and other significant characteristics are documented and thoroughly sampled for a most accurate depiction of stream health. Resulting data is used as an indicative representation of the ecological conditions for both the contributing subwatershed and larger St. Joseph River Watershed. As limited resources and time prevent the program from monitoring each subwatershed basin in its entirety, some areas may not be initially represented. Though data gaps are to be observed and addressed over time, as volunteer numbers grow and staff field capacities increase each year.

Comparability: Comparability represents how closely the data from one study site can be compared to data from another. To ensure data comparability, all volunteers participating in the monitoring program follow the same set of sampling methods and use the same equipment and units of reporting. Methods taught to volunteers are reflective of MiCorps standardized protocols demonstrated at formal MiCorps-led training programs. The District Administrator and Project Coordinator train and re-train volunteers to follow exact methods so as to ensure comparability of monitoring results among other MiCorps programs. When possible, the monitoring of all study sites will be completed within a two-day period, never exceeding a two-week time frame.

A8. Trainings and Certifications

Carolyn Grace, *District Administrator*, has received multiple rounds of formal MiCorps VSMP training. She is experienced in training Team Leaders, Collectors, and Pickers, including hands-on sampling techniques, stream assessment completion, identification assistance, and program reporting duties. Carolyn properly trains all Team Leaders prior to overseeing a sampling event. All Team Leaders are required to attend program training at least once every three years. Other team members including Pickers and Collectors are offered training prior to or the day of a given sampling event.

Volunteer Trainings include:

- An overview of program goals and objectives.
- Proper macroinvertebrate collection methods.
- Step-by-step briefing on completing field data sheets.
- A disclaimer on safety issues and signed waiver requirements.
- A general rundown on standard quality assurance practices.

Kaitlin Renehan, *Project Coordinator*, gained experience in both field and laboratory capacities while volunteering in an aquatic ecology research lab during her time at Western Michigan University earning a bachelor's degree in Freshwater Science & Sustainability. She maintains skills in collecting, sorting, identifying, and formally documenting macroinvertebrate specimens found in regional stream and wetland habitats. Kaitlin has attended one formal MiCorps VSMP training and plans to continue attending at least once every other year. She is tasked with coordinating & promoting collection events, training new and

Site Name: Sevison Bridge Crossing
Site ID: FAWN 02
Lat/Long: 41.835807, -85.603086
10-Digit HUC Code: 04050001-08
Major Watershed: St. Joseph River

IV. **Big Swan Creek**

The following sites have been chosen as a follow-up to lake monitoring efforts accomplished on Palmer Lake under the MiCorps Cooperative Lakes Monitoring Program; and as a means to address special requests from community members.

a. *Upstream Location*
Site Name: Needham Bridge Crossing
Site Name: SWAN 02
Lat/Long: 41.891699, -85.350867
10-Digit HUC Code: 04050001-04
Major Watershed: St. Joseph River

b. *Downstream Location*
Site Name: Colon Township Private Property
Site ID: SWAN 01
Lat/Long: 41.968192, -85.319147
10-Digit HUC Code: 04050001-04
Major Watershed: St. Joseph River

B2. Equipment Maintenance

In the weeks prior to a given sampling event, the District Administrator and Project Coordinator carefully examine all monitoring equipment. Field supplies for each team includes one 5-gallon bucket + lid per site to be surveyed, waders, dip-nets, a measuring tape reel, squirt bottles, a clipboard with site datasheets + pencil attached, a map of the area, and a MiCorps-supplied decontamination kit. A first-aid kit is provided to the assigned Team Leader. Either an outdoor or indoor station area is pre-prepared for subsequent sorting and picking as teams return from their sampling sites, where tables are set up with sorting trays, ice cube trays, macroinvertebrate identification keys, forceps, eye droppers, site-labeled jars filled with ethanol, extra ethanol, plastic cups to dip in buckets, small handheld magnifier lenses, and a microscope if an outlet is available. When not in use, all equipment is securely stored in the St. Joseph County Conservation District office storage closet.

- **D-frame Nets**: Inspected before and after sampling to examine for any defects or tears. All nets decontaminated with diluted bleach and hosed down after each use.
- **Collection Jars**: All glass jars are opened and closed to ensure a tight fitting lid. Fresh ethanol is provided to each sampling team at time of picking. Damaged jars are disposed of, replaced with new ones, and refilled if necessary.
- **Featherweight Forceps**: Cleaned and inspected before and after sampling events to ensure no cross-contamination among collections and to make sure the tips are not damaged.
- **Sorting Trays**: Inspected and thoroughly washed both before and after sorting samples.
- **Buckets, ice cube trays and squirt bottles**: Examined for cracks and leaks, replaced as required.
- **Magnifiers/Scopes**: Cleaned and inspected to make sure they function properly.
- **Waders and Life Jackets (PFDs)**: As waders and PFDs are supplied by the District to volunteers, SJCCD accepts responsibility to inspect these items carefully for damages / tears. Team Leaders are instructed on procedures to decontaminate equipment including waders and dip-nets following each use. Items are additionally washed before storing.
- **First aid kit**: Each is continuously stocked with bandages, gauze, tape, and supplies for low risk injury.

I. Prairie River

The following sites have been chosen as high priority based on the MDNR/EGLE impending decision whether to reclassify the Prairie River as a coldwater transitional trout stream.

a. *Upstream Location*
Site Name: Burr Oak Village Park
Site ID: PRAIRIE 01
Lat/Long: 41.846949, -85.311683
10-Digit HUC Code: 04050001-07
Major Watershed: St. Joseph River

b. *Downstream Location*
Site Name: Centreville Canoe Park
Site ID: PRAIRIE 02
Lat/Long: 41.930110, -85.528579
10-Digit HUC Code: 04050001-07
Major Watershed: St. Joseph River

II. Portage River

The following sites have been chosen to fulfill needs for post-disturbance monitoring after the Parkville Dam Removal Project was completed by SJCCD & MDNR in July 2021; and as a follow-up to NRCS & Drain Commissioner concerns regarding potentially excessive inputs of nonpoint source pollution.

a. *Upstream Location*
Site Name: Parkville Dam Removal Site
Site ID: PORTAGE 01
Lat/Long: 42.014744, -85.547737
10-Digit HUC Code: 04050001-05
Major Watershed: St. Joseph River

b. *Downstream Location*
Site Name: Heimbach Bridge Crossing
Site ID: PORTAGE 02
Lat/Long: 41.998558, -85.585144
10-Digit HUC Code: 04050001-05
Major Watershed: St. Joseph River

III. Fawn River

The following sites have been chosen based on a need for preliminary data as a precursor to planned revisions of the Fawn River Watershed Management Plan.

a. *Upstream Site*
Site Name: Fawn River Kayak Guide and Rental
Site ID: FAWN 01
Lat/Long: 41.781350, -85.355168
10-Digit HUC Code: 04050001-08
Major Watershed: St. Joseph River
b. *Downstream Location*

B3. Supplies and Consumables

- **D-frame Nets:** Nets to be replaced when damaged or more are needed as the program grows. 6 nets purchased in 2016, 4 in 2018, 2 in 2023, and 2 in 2024.
- **Collection Jars:** 36 4oz and 24 2oz jars purchased in 2016, resupplied in 2018, 12 in 2023, and 16 in 2024.
- **Featherweight Forceps**: 36 purchased in 2016. No additional items needed at this time.
- **Ethanol**: 3.8 liter jug purchased June 2018, 1 jug bought in 2023, and 2 jugs in 2024.
- **Sorting Trays**: 12 trays purchased in 2016, 6 more purchased in 2018, none needed at this time.
- **Buckets, Ice Cube Trays, and Squirt Bottles**: Obtained in 2016, re-used and recycled as needed; as beverages are supplied to volunteers, bottles may be cleaned, saved, and repurposed for next event.
- **Waders and Life Jackets**: 4 waders supplied by the District, 1 purchased in 2023, and 2 in 2024. PDFs provided by the District and kept in an outdoor storage shed next to the office building; waders stored in the office supply closet.
- **Petri Dishes:** Supplied by the District for microscope use but in need of replacement; 20 purchased in 2024.
- **Tape Measure Reel:** 300 ft tape measure supplied by the District but in need of replacement; 1 purchased in 2024.
- **First Aid Kit**: To be checked after each event and restocked as needed.
- **Datasheets:** All datasheets, maps, and identification keys are printed out and attached to clipboards prior to the start of each sampling event. All collection jars are labeled and filled prior to the sampling event.

B4. Indirect Measurements

Section Not Applicable to Project.

B5. Data Management

Following each sampling event, collected macroinvertebrate data and habitat assessment data is entered by the Program Coordinator first into the MiCorps Data Exchange system and then into a shared Google Spreadsheet for District storage of at least 5 years post-collection date. Hard-copy datasheets are also filed and stored in-office for a minimum of 5 years. Event photos and digital files are stored on the SJCCD shared Google Drive and on a designated USB device. Final data conclusions alongside MiCorps resource links are to be shared on the SJCCD web page for public view with directions on how to sign up to volunteer for the next sampling event.

B6. Invasive Species Decontamination

After sampling, the monitoring teams will:

A. Conduct a visual inspection of gear before and after any sampling; thoroughly inspect and remove all plants, dirt and mud, and any other visible debris like seeds, shoots, animals, insects, and eggs from clothing and equipment.
B. If going to another site on the same sampling day, the team will disinfect all gear that touched the water with dilute bleach and allow to sit for 10 minutes before rinsing with tap water and towel drying all equipment before leaving the site.
C. After sampling is done for the day, let dry for at least 5 days before using gear again.
D. Be on the lookout for New Zealand mud snails and inform the Project Manager if they are thought to be found; St. Joseph County Conservation District should report possible discoveries to MiCorps (Paul Steen) or their local EGLE contact.
E. Additional details can be found at https://www.hrwc.org/volunteer/decontaminate/

SECTION C: SYSTEM ASSESSMENT AND CORRECTION REPORTING

C1. System Audits and Response Actions

The Volunteer Team Leaders trained by the District Administrator and/or the Project Coordinator ensure that quality assurance protocols are followed, reporting any issues possibly affecting data quality. When significant issues are reported, the Program Coordinator may accompany groups in the field to perform side-by-side monitoring for duplicate sampling to verify the quality of work by the volunteer team. In the event that a group is determined to have done a poor job sampling, a performance audit to evaluate how people are performing their jobs collecting and analyzing the data is accomplished through side-by-side sampling and identification. During side-by-side sampling, a team of volunteers and an outside expert sample the same stream (see Bias portion of Section A7 for side-by-side sampling statistics).

A system audit is conducted following each spring and fall monitoring event to evaluate the project process. The system audit consists of the Program Coordinator, a program leader, and one or two active volunteers, and is a start-to-end review of the monitoring process and how things could be improved for the next event.

If deviation from the QAPP is noted at any point in the sampling or data management process, the affected samples will be flagged and brought to the attention of the Program Coordinator and the team that collected the sample. Re-sampling is conducted as long as the deviation is noted within a two week period after occurrence and volunteers are available. Otherwise, a gap must be left in the monitoring record and the cause is noted. All corrective actions are documented and communicated to MiCorps Staff (see Section A7 for details on data quality assessment and responses to quality control issues).

C2. Data Review, Verification, and Validation

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

C3. Reconciliation with Data Quality Objectives

Data quality objectives are reviewed annually to ensure that objectives are being met. Deviations from the data quality objectives are reported to the Project Coordinator and MiCorps Staff for assessment and corrective action. Also, data quality issues are recorded as a separate item in the database and are provided to the Program Coordinator and data users (see Section A7 for an outline of responses and reconciliations in the event of data quality problems).

C4. Project Reporting

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

Appendix A
Maps of Sampling Locations

Fig 1.

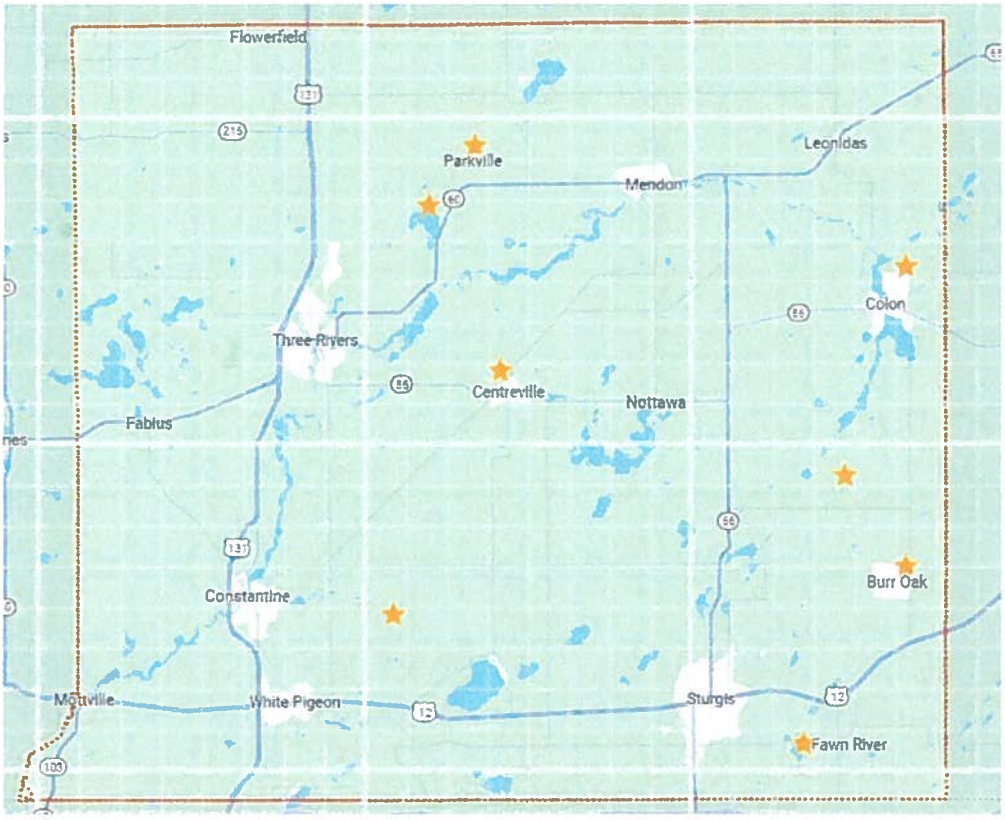
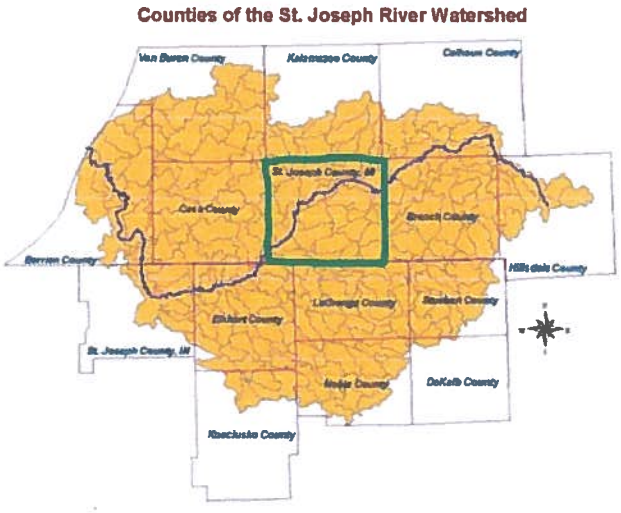


Figure 1. Map of St. Joseph County area of study including 8 sampling locations marked by star symbols.

Fig 2.

Fig 3.



Figures 2 & 3. Maps illustrating St. Joseph County's position within the greater St. Joseph River Watershed located along the southeastern section of Lake Michigan.

MiCorps Site ID#:_____

Michigan Clean Water Corps

Stream Macroinvertebrate Datasheet

Site Name: _____

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

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

Latitude:_____ Longitude:_____

Names of Team members: _____

Stream Conditions:

Average water depth:_____feet

Notable weather conditions of the last week:_____

Are there any current site conditions that may impede normal macroinvertebrate sampling? (weather, flooding, poor visibility, etc?)

Habitat Types: Check the habitats that were sampled. Include as many as possible.

____Riffles
____Rocks
____Aquatic Plants
____Runs
____Backwater areas
____Leaf Packs
____Pools
____Undercut banks/Overhanging Vegetation
____Submerged Wood

Did you see any crayfish? #:_____, Clams/mussels? #_____

remember to include them in the assessment on the other side!

Do not take crayfish, fish, clams, and mussels from the water.

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

Identifications made/supervised by:_____

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

Datasheet checked for completeness by _____ Datasheet version 11/13/2020

Data entered into MiCorps database by _____ Date _____

MiCorps Site ID#:_____

Michigan Clean Water Corps

IDENTIFICATION AND ASSESSMENT

*** Do NOT count empty shells, pupae, or terrestrial macroinvertebrates****
****Taxa are listed from most pollution sensitive to most pollution tolerant****

Count	Common Name	Scientific Taxa	Sensitivity Rating (0-10)	Count x Sensitivity
	Hellgrammite (Dobsonfly)	Megaloptera, Corydalidae	0.0	
	Clubtail Dragonfly	Odonata, Gomphidae	1.0	
	Sensitive True Flies (water snipe fly,net-winged midge, dixid midge)	Athericidae, Blephariceridae, Dixidae,	1.0	
	Stonefly	Plecoptera	1.3	
	Caddisfly	Trichoptera	3.2	
	Mayfly	Ephemeroptera	3.5	
	Alderfly	Megaloptera, Sialidae	4.0	
	Scud	Amphipoda	4.0	
	Dragonfly	Odonata	4.0	
	Beetle	Coleoptera	5.1	
	Somewhat Sensitive True Flies	Dipterans (those not listed elsewhere)	6.0	
	Crayfish	Decapoda	6.0	
	Bivalves/Snails	Pelecypoda, Gastropoda	6.9	
	True Bug	Hemiptera	7.7	
	Damselfly	Odonata	7.7	
	Sowbug	Isopoda	8.0	
	Tolerant True Fly (mosquito, rat-tailed maggot, soldier fly)	Culicidae, Syrphidae, Stratiomyidae	8.7	
	Leech	Hirudinae	10.0	
	Aquatic Worm	Oligochaeta	10.0	

	Total Abundance

Sum of (Count x Sensitivity):	

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		Degree of Organic Pollution
0.0-3.50	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 pollution likely
7.51-8.50	poor	Very substantial pollution likely
8.51-10.0	very poor	Severe pollution likely

Water Quality Rating =

Sum of (Count x Sensitivity)
Divided By
Total Abundance

= _____

Datasheet checked for completeness by:_____ Datasheet version 11/13/2020
Data entered into MiCorps database by:_____ Date _____

STREAM HABITAT ASSESSMENT

Michigan Clean Water Corps

Volunteer Stream Monitoring Program

I. Stream, Team, Location Information

Site ID:_____ Date:_____ Time:_____

Site Name:_____ Lat/Long _____

Names of Team members:_____

II. Stream and Riparian Habitat

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

MiCorps Site ID#:_____ Date:_____

II. Stream and Riparian Habitat (continued)

B. Streambed Substrate

Estimate percent of stream bed composed of the following substrate.

Leave blank if group will take transects and pebble counts (in Section IV).

Substrate type	*Size*	*Percentage*
Boulder	>10" diameter	
Cobble	2.5 - 10" diameter	
Gravel	0.1 - 2.5" diameter	
Sand	coarse grain	
Silt/Detritus/Muck	fine grain/organic matter	
Hardpan/Bedrock	solid clay/rock surface	
Artificial	man-made	
Other (specify)		
Can't see		

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

Comments:

C. Bank stability and erosion.

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

Excellent	Good	Marginal	Poor
Banks Stable. No evidence of erosion or bank failure. Little potential for problems during floods. < 5% of bank affected.	Moderately stable. Small areas of erosion. Slight potential for problems in extreme floods. 5-30% of bank in reach has areas of erosion.	Moderately unstable. Erosional areas occur frequently and are somewhat large. High erosion potential during floods. 30-60% of banks in reach are eroded.	Unstable. Many eroded areas. > 60% banks eroded. Raw areas frequent along straight sections and bends. Bank sloughing obvious.
LEFT BANK 10 - 9	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

MiCorps Site ID#:_____ Date:_____

II. Stream and Riparian Habitat (continued)

D. Plant Community

What percentage of the stream is covered by overhanging vegetation/tree canopy?

<10% 10-50% 50-90% >90%

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

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

E. Riparian Zone

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

1. Left Bank

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

Wetlands Forest Mowed Grass Park Shrubby/Grassy Field Agriculture
Construction Commercial Industrial Highways Golf Course Other_____

2. Right Bank

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

Wetlands Forest Mowed Grass Park Shrubby/Grassy Field Agriculture
Construction Commercial Industrial Highways Golf Course Other_____

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

Excellent	**Good**	**Marginal**	**Poor**
Width of riparian zone >150 feet, dominated by vegetation, including trees, understory shrubs, or non-woody macrophytes or wetlands; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	Width of riparian zone 75-150 feet; human activities have impacted zone only minimally.	Width of riparian zone 10-75 feet; human activities have impacted zone a great deal.	Width of riparian zone ,10 feet; little or no riparian vegetation due to human activities.
LEFT BANK 10 - 9	LEFT BANK 8 - 7 - 6	LEFT BANK 5 - 4 - 3	LEFT BANK 2 - 1 - 0
RIGHT BANK 10 - 9	RIGHT BANK 8 - 7 - 6	RIGHT BANK 5 - 4 - 3	RIGHT BANK 2 - 1 - 0

MiCorps Site ID#:_____ Date:_____

III. Sources of Degradation

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

2. Based on **what you can see** from this location, what are potential causes and level of severity of any degradation at this stream?

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

Additional comments:

Michigan Clean Water Corps

MiCorps Site ID#:_____ Date:_____

IV. Optional quantitative measurements

A. Transects and Pebble Counts

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

Directions:
1) Determine stream width.
2) Use the rod to measure depth (D) and substrate (S) at more than 10 but less than 20 regular intervals along the entire transect. (For streams less than 10 feet wide, measure every ½ foot, for streams about 10 feet wide, measure every foot, etc.)
3) At every depth measurement, identify the single piece of substrate that the rod lands on. If it is a mix of substrates, randomly pick one of them, and the next time you find a similar grouping, pick the other(s).
4). For every measurement, enter the reading on the tape measure, the depth, and the substrate on the data sheet on the next page.

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

B. Bank Height

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

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

V. Final Check

This data sheet was checked for completeness by: _____

Name of person who entered data into data exchange: _____

Date of data entry:_____

VI. Credits

This habitat assessment was created for the MiCorps Volunteer Stream Monitoring Program from a combination of habitat assessments from the Huron River Watershed Council, the Friends of the Rouge River, and the Michigan Department of Environmental Quality. Version 1.0, June 2009. Version 2.0, November 2020.

MiCorps Site ID#:_____ Date:_____

Michigan Clean Water Corps

STREAM TRANSECT DATASHEET

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

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

T= Reading on tape
D = Depth
S = Substrate

	EXAMPLE			Transect #			Transect #			Transect#		
Stream Width	13.3 feet											
	T	D	S	T	D	S	T	D	S	T	D	S
Beginning Water's Edge:	1.5											
1	2.5	0.4	G									
2	3.5	0.4	G									
3	4.5	0.4	G									
4	5.5	0.2	C									
5	6.5	0	S									
6	7.5	0.6	S									
7	8.5	0.7	G									
8	9.5	0.7	G									
9	10.5	0.6	C									
10	11.5	0.7	B									
11	12.5	0.4	G									
12	13.5	0.3	F									
13	14.5	0.2	F									
14												
15												
16												
17												
18												
19												
Ending Water's Edge:	14.8											
Bank Side	L	R		L	R		L	R		L	R	
Bank Height	1.7 feet	0.5 feet										
Does the bank have an undercut?	N	Y										
If so, how wide is it?		1 ft										
Bank Angles: Sketch												

Sketch examples:

Undercut (Acute) Obtuse Right

Benthic Macroinvertebrates of Michigan

Volunteer Stream Monitoring Program

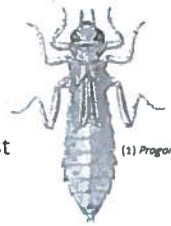
Michigan Streams – Ours to Protect

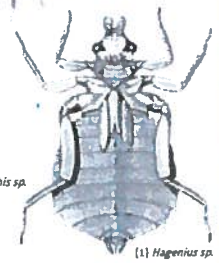
Listed from Most to Least Sensitive

Hellgrammite (dobsonfly) larvae
Order: Megaloptera
Family: Corydalidae
Size: 10 - 90 mm
- Lateral appendages and large pincers
- Often found on rocks in swift riffles


(1)

Clubtail Dragonfly
Order: Odonata
Family: Gomphidae
Size: 20 - 50 mm
- Large oval abdomen
- No external gills
- Ends of antennae robust


(1) *Progomphis sp.*


(1) *Hagenius sp.*

Sensitive True Flies
Order: Diptera
- Highly diverse, includes but not limited to:

Water Snipe Fly
Family: Athericidae
Size: 10 - 18 mm
- Tapered body, caterpillar-like pro- legs
- Pair of feathery filaments on back end


(1)

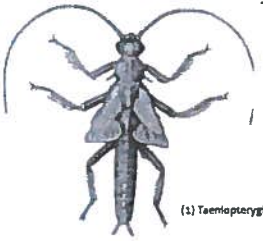
Net-winged Midge
Family: Blephariceridae
Size: 4-12 mm
- Flattened form
- Body divided into 7 sections


(1)

Dixid Midge
Family: Dixidae
Size: 3 - 15 mm
- Fine hairs on end of abdomen
- Pro-legs on first abdomen segment


(2)

Stonefly nymphs
Order: Plecoptera
Size: 5 - 30 mm
- Two tails
- Two sets of wing pads
- No gills on lower half of body


(1) Taeniopterygidae


(1) Perlidae

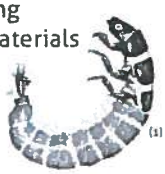

(1) Capniidae

Caddisfly larvae
Order: Trichoptera
Size: up to 25 mm cases
- Tube-case makers and free-living
- Cases constructed of varying materials

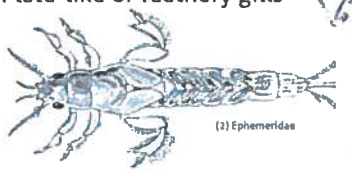

(2) Brachycentridae


(2) Helicopsychidae


(1) Leptoceridae


(1) Hydropsychidae

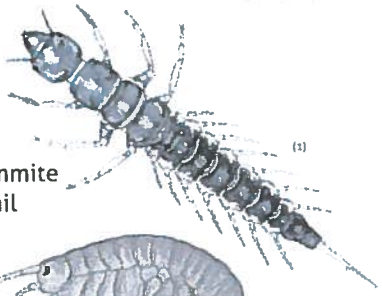
Mayfly nymphs
Order: Ephemeroptera
Size: 2 - 20 mm
- Three long, hair-like tails
- One set of wing pads
- Plate-like or feathery gills


(2) Ephemeridae


(1) Heptageniidae


(1) Baetidae

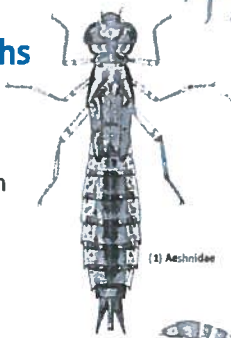
Alderfly larvae
Order: Megaloptera
Family: Sialidae
Size: 10 - 25 mm
- Lateral appendages
- Looks like a small hellgrammite larva but has a long thin tail

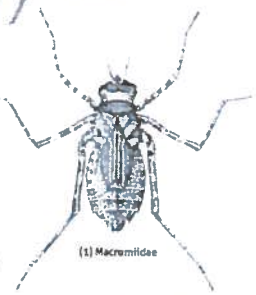

(1)

Scuds
Order: Amphipoda
Size: 5 - 20 mm
- Resembles tiny shrimp
- Swim sideways


(2)

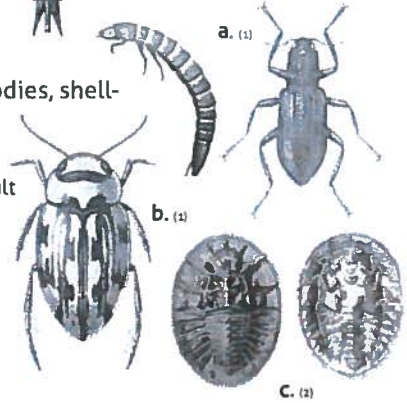
Dragonfly nymphs
Order: Odonata
Size: 10 - 40 mm
- Large eyes
- Long oval abdomen
- No external gills


(1) Aeshnidae

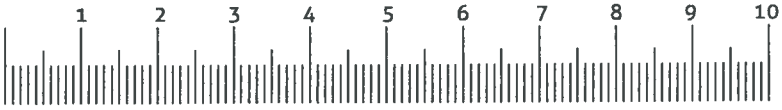

(1) Macromiidae

Beetles
Order: Coleoptera
Size: 1 - 30 mm
- Diverse in appearance
- Adults have hardened bodies, shell-like wings

Pictured:
a. Riffle beetle larvae & adult
Family: Elmidae
b. Diving beetle
Family: Dytiscidae
c. Water penny beetle
Family: Dytiscidae


a. (1)
b. (1)
c. (2)

Scale in centimeters (Select "Actual Size" as page size when printing PDF for accurate scale)



Somewhat Sensitive True Flies

Order: Diptera

- Highly diverse, includes but not limited to:

Black fly larvae


(2)

Family: Simuliidae
Size: 3 - 15 mm

- Body bulbous at one end
- Constricted in the middle

Crane fly larvae


(1) *Tipula sp.*


(1) *Antocha sp.*

Family: Tipulidae
Size: 3 - 100 mm

- Plump, caterpillar-like body
- No legs, small lobes at back end

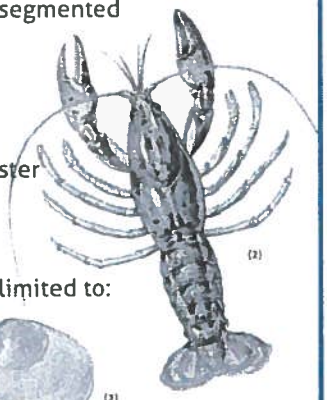
Midge larvae


(1)

Family: Chironomidae
Size: 2 - 10 mm

- Often small and very slender
- Worm-like at first glance, but segmented

Crayfish


(2)

Order: Decapoda
Size: up to 15 cm

- Crustacean, resembles small lobster
- Ten legs, two large claws

Bivalves and Snails

- Highly diverse, includes but not limited to:

Fingernail Clam


(2)

Class: Bivalvia
Size: 2 - 10 mm

- Thin shells, usually light colored

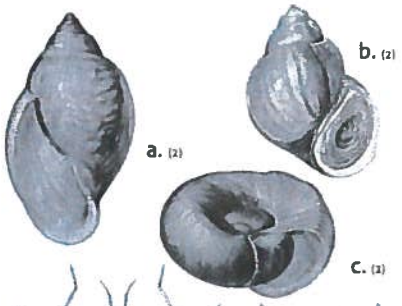
Mussels


(2)

Class: Bivalvia
Size: 30 - 250 mm

- Thick shells, usually oblong

Snails


a. (2)
b. (2)
c. (2)

Class: Gastropoda
Size: Variable

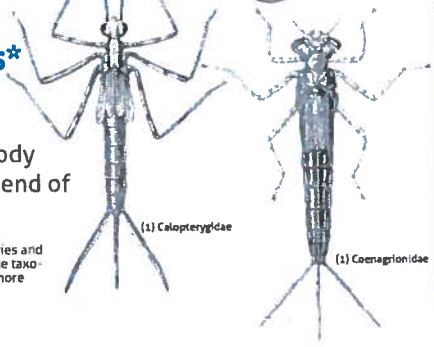
Pictured:

a. Left-handed snail
Family: Physidae

b. Right-handed snail
Family: Viviparidae

b. Planorbid snail
Family: Planorbidae

Damselfly nymphs*

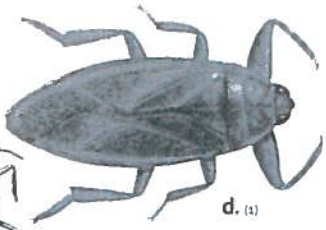

(1) Calopterygidae
(1) Coenagrionidae

Order: Odonata
Size: 13 - 40 mm

- Large eyes, slender body
- Three oar-like gills at end of abdomen

* To fit the content into the space, Damselflies and True Bugs were switched in the layout. At the taxonomic order level, Damselflies are slightly more tolerant than True Bugs.

True Bugs*


d. (1)

Order: Hemiptera

- Highly diverse in appearance
- Adults have elongate, sucking mouthparts

Pictured:

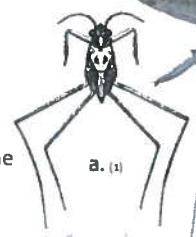
a. Water Strider
Family: Gerridae

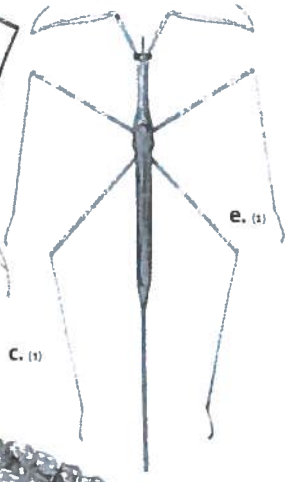
b. Back-swimmer
Family: Notonectidae

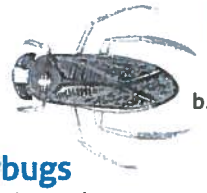
c. Water Boatman
Family: Corixidae

d. Giant Water Bug
Family: Belostomatidae

e. Water Scorpion
Family: Nepidae


a. (1)


e. (1)


b. (1)


c. (1)

Sowbugs


(3)

Order: Isopoda
Size: 5 - 20 mm

- Segmented, flat body
- Many legs, antennae

Tolerant True Flies

Order: Diptera

- Highly diverse, includes but not limited to:

Mosquito


(2)

Family: Culicidae
Size: 4 - 18 mm

- Distinct head separate from thorax
- Brushes on head and sides of mouth

Rat-tailed Maggot

(1)

Family: Syrphidae
Size: 4 - 16 mm w/o breathing tube

- Body fat, rounded
- Long breathing tube at end of abdomen

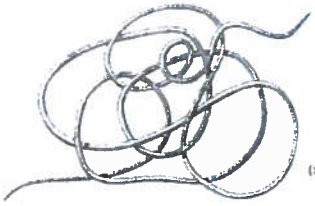
Soldier Fly


(2)

Family: Stratiomyidae
Size: 3 - 50 mm

- Skin rough, leathery
- Thorax much broader than head

Aquatic Worms


(1)

Class: Oligochaeta
Size: usually 1 - 30 mm, up to 150 mm

- Can be very thin

Leeches


(2)

Class: Hirudinea
Size: 1 - 450 mm fully extended

- External striations (stripes)
- Suckers on both ends of the body

References for Images:

1. McCafferty, W.P. 1998. Aquatic Entomology. The Fisherman's and Ecologists Illustrated Guide to Insects and Their Relatives. Science Book International, Boston, MA.
2. Voshell, J.R. 2002. A Guide to Common Freshwater Invertebrates of North America. The McDonald & Wood-ward Publishing Company, Blackburg, VA
3. Kate Laramie. 2023. *Sowbug* [graphite pencil]. Huron River Watershed Council. Ann Arbor, MI.

Michigan Clean Water Corps