A1. Title and Approval Sheet

Quality Assurance Project Plan for the Eaton County Collaborative Stream Monitoring Program

Date: September 30, 2022 Version #1
Organizations: Olivet College and Eaton Conservation District

Date: January 24, 2025 Version #2
Organizations: The University of Olivet and Eaton Conservation District

QAPP Prepared by: Erin Pavloski
Title: Assistant Professor of Environmental Science, The University of Olivet

Other responsible individual: Rachel Cuschieri-Murray
Title: Executive Director, Eaton Conservation District

MiCorps Reviewer: Paul Steen, MiCorps Stream Program Manager. 4/9/2025

QAPP is approved for two years from the given date; afterwards it must be reapproved.

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A3. Distribution List

The following organizations and individuals will receive a copy of the QAPP:

- Michigan Clean Water Corps: Dr. Paul Steen
- The University of Olivet: Erin Pavloski and Dr. Susanne Lewis
- Eaton Conservation District: Rachel Cuschieri-Murray and Val Reisen
- Any future additional volunteer leads or hired interns

A4. Program Organization

1. **Management Responsibilities**:

   The University of Olivet is the grantee for the program. Erin Pavloski (epavloski@uolivet.edu) is the program and quality assurance manager for the Eaton County Stream Monitoring Program. Erin is responsible for the following:

   - Finalize, implement, and adhere to the Quality Assurance Project Plan
   - Perform program promotion and assist in volunteer recruitment
   - Purchase (with Dr. Susanne Lewis, Department Chair) necessary equipment for performing stream monitoring activities
   - Coordinate and conduct volunteer stream monitoring training (with Rachel Cuschieri-Murray and Val Reisen)
   - Coordinate and implement volunteer stream monitoring field data collection events (with Rachel Cuschieri-Murray and Val Reisen)
   - Coordinate indoor macroinvertebrate identification sessions (with Rachel Cuschieri-Murray and Val Reisen)
   - Catalog and store collected specimens
   - Perform equipment quality control
   - Perform data entry and data analysis in the absence of an Environmental Outreach Coordinator
   - Write reports to share information with volunteers and the general public
   - Report deliverables to MiCorps; all data collected will be uploaded to the MiCorps database
   - Development and submission of status and financial reports following MiCorps guidance when in contract for MiCorps grants
   - Administration and accounting of grant funds including budget oversight
   - Project evaluation and submission of final report
   - Update the QAPP every two years, and submit to MiCorps Quality Assurance Manager

   Eaton Conservation District (ECD) is a subcontractor for the program. Erin will work with Rachel Cuschieri-Murray, Executive Director

(rachel.cuschieri-murray@macd.org) as an Advisor for management, field, and reporting activities. The ECD Executive Director is responsible for the following:

- Review and assist with QAPP
- Compose grant reporting documents as needed from ECD
- Advise the Project Manager on tasks
- Oversee the Environmental Outreach Coordinator position
- Assist to coordinate and conduct volunteer stream monitoring training
- Assist to coordinate and implement volunteer stream monitoring field data collection events
- Assist to coordinate indoor macroinvertebrate identification sessions
- Serve as a Team Leader for one of the volunteer teams
- Recruit and train volunteers
- Provide guidance on data reporting

ECD employs an Environmental Outreach Coordinator, Val Reisen (val.reisen@macd.org) that has the following responsibilities:

- Attend MiCorps training session
- Perform program promotion and recruit volunteers
- Coordinate monitoring events with the Program Manager
- Serve as a Team Leader for one of the volunteer teams
- Confirm identification of collected samples
- Perform data quality control
- Perform data entry and data analysis
- Update website on an annual basis to share information with volunteers and the general public
- Assist the Program Manager with deliverables to MiCorps; all data collected will be uploaded to the MiCorps database
- Assist in updating the QAPP every two years
- Oversee any University of Olivet student environmental outreach internships in both fall and spring semesters, formal for credit or for Service Learning, as approved by The University of Olivet and ECD.

2. **Field Responsibilities**:

Field sampling is performed by program volunteers. These volunteers will be trained in field data collection methods by the Program Manager, Environmental Outreach Coordinator, and/or Advisor. Volunteers are assigned one of the following roles:

- Team Leaders - Organize a stream monitoring strategy and delegate monitoring roles for each team. In the field, Team Leaders completely fill out data sheets, explain sampling of the site, enforce the time guidelines, collection directions, and any other responsibilities

- Collectors - Sample all in-stream habitats present and provide the Pickers the samples to be identified
- Pickers - Sort at the site picking out the macroinvertebrates from the sorting trays, putting them in a collection jar, and preserving them in 70% alcohol for later identification

3. **Laboratory Responsibilities**:

   Volunteers and ECD staff will take part in collection and identification events. The identification events will be held on the The University of Olivet campus, using a department lab and microscopes. These dates and locations will be coordinated between Erin Pavloski and Dr. Susanne Lewis as Department Chair. Any sample identification that cannot be completed during the scheduled time will be completed by the Environmental Outreach Coordinator, Erin Pavloski, ECD staff, or other qualified faculty.

4. **Corrective Action**:

   The Program Manager is the primary person responsible for initiating, developing, approving, implementing and reporting corrective actions concerning data quality, with any necessary assistance by the Advisor.

A5. Problem Definition/ Background

The purpose of this project is to support an on-going stream monitoring program within the Thornapple River watershed in Eaton County. This watershed is important to monitor as it is a subbasin of the second largest drainage system in the state, the Grand River watershed.[1] The Thornapple River watershed has an approved management plan that identified multiple stream quality issues, including: sedimentation, nutrient (high levels of nitrate) and pollutant inputs, and channelization.[1] These issues reduce the watershed's ability to support coldwater fisheries and other aquatic life, inhibit aquatic recreation, and support weed and algae growth.

The Thornapple River Watershed Management Plan noted locations within the watershed that "have insufficient information regarding support of the other indigenous aquatic life and wildlife use," and the need for future studies.[1] Beyond this data gap, the plan is now six years old and is based on macroinvertebrate collection data from 2006-2009.[1]

[1] Barry Conservation District. Thornapple River Watershed Management Plan. Barrycd.org. 2016 [accessed 2021 Feb 13]. http://www.barrycd.org/home/wp-content/uploads/2016/05/TRWMP-1.pdf

The Eaton County Collaborative Stream Monitoring Program and this project will address the data gaps in the watershed and provide information to local and state organizations and agencies for potential updates to the watershed plan and other special stream or habitat improvement projects.

A6. Program Description

The monitoring program currently consists of 9 sites in Eaton County within the Upper Thornapple River watershed, including locations in the impaired waters of the Fish Creek and Milbourn, Allen & Crane Drain subwatersheds, as well as the Darken & Boyer Drain subwatershed that has insufficient macroinvertebrate data. The program staff can also consult with other organizations to select additional specific sites that could be helpful in assessing current or future watershed improvement efforts.

This collaborative stream monitoring program operates in partnership between The University of Olivet and Eaton Conservation District. The design of the monitoring program is an expansion beyond a traditional one-day collection event, focusing on cooperative learning and building relationships between community citizen scientists and students. Through this collaborative structure, the program is designed for ongoing engagement of volunteers and longevity in collecting macroinvertebrate data throughout the county each fall and spring, and aims to achieve the following outcomes:

1. Provide new and continuous macroinvertebrate collection and habitat assessment data that will assist in assessing the success of any restoration projects and updating the watershed management plan;
2. Educate and collaboratively engage Eaton County residents, students, and other stakeholders in monitoring, upholding quality, and protecting water resources; and
3. Identify or verify problem areas where degradation has occurred and where future remediation efforts or best management practices can be implemented

The University of Olivet is unique in that it offers a three-week Intensive Learning Term (ILT) each May where students can enroll in one course for credit. In these three weeks, the students will learn the field and safety skills first, then host and assist community citizen scientists on Community Collection Days held on two Fridays during the ILT. There is also an opportunity for local community citizen scientists to join in a macroinvertebrate identification session.

Volunteers for the program are recruited from the pool of adult community members by the Eaton Conservation District (past river cleanup volunteers, etc.), which will be known as citizen scientists, and college students enrolled in an annual Stream

Monitoring Intensive Learning Term (ILT) course at The University of Olivet. The college also has a commuter population and many students live in the surrounding area. Commuter students enrolled in the ILT course can invite family members and friends to volunteer in the Community Collection Days, and this provides an additional recruitment opportunity for establishing recurring volunteers from the local community, along with Eaton Conservation District's recruitment efforts.

A7. Data Quality Objectives

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

The purpose of this project is to gauge stream health by measuring the total diversity of macroinvertebrate taxa. Since there is inherent variability in accessing the less common taxa in any stream site and program resources do not allow program managers to perform multiple independent (duplicate) collections of the sampling sites, our goal for precision and accuracy is conservative. A given site's Water Quality Rating (WQR) score or total diversity (D) measure across macroinvertebrate taxa will be noted as "preliminary" until three spring sampling events and three fall sampling events have been completed.

Precision and accuracy will be maintained through following standardized MiCorps procedures. The Program Manager and any hired Environmental Outreach Coordinator must be trained in MiCorps procedures at the annual MiCorps training led by MiCorps staff. MiCorps staff also conduct a method validation review (the "side-by-side" visit) with the Program Manager/Environmental Outreach Coordinator to ensure their expertise, preferably prior to the first volunteer leader training session. This review consists of supervising the Program Manager and Environmental Outreach Coordinator's macroinvertebrate sampling and sorting methodology to ensure that they are consistent with MiCorps protocol. All cases of collecting deficiencies are promptly followed (during that visit) by additional training in the deficient tasks and a subsequent method validation review may be scheduled for the following collecting season. Upon request, MiCorps staff may also verify the accuracy of the program's macroinvertebrate identification. If a problem arises with a subset of macroinvertebrates, a thorough check may be requested. (The side-by-side visit was held on September 12, 2022 with MiCorps VSMP Manager Dr. Paul Steen).

Precision and accuracy will be maintained by conducting consistent volunteer team leader training. Volunteer team leaders will be trained upon joining the program, and retrained every three years (at a minimum). Techniques under review shall include:

- collecting style (must be thorough and vigorous);

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

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

Bias: At every sample site, a different team will sample there at least once every three years to examine the effects of bias in individual collection styles. Measures of total diversity (D) and Water Quality Rating (WQR) for these samples will be compared to the median results from the past three years and each should be within two standard deviations of the median. If the sample falls outside this range, then the Program Manager needs to conduct a more thorough investigation to determine which team or individuals is likely at fault. The Program Manager will accompany teams to observe their collection techniques and note any divergence from protocols. The Program Manager may also perform an independent collection (duplicate sample) no less than a week after the team's original collection and no more than two weeks after.
The following describes the analysis used for the Program Manager's duplicate sampling:

Resulting diversity measures by teams are compared to Program Manager's results and each should have a relative percent difference (RPD) of less than 40%. This statistic is measured using the following formula:

RPD = [(Xm - Xv) / (mean of Xm and Xv)] x 100, where Xm is the Program Manager or Environmental Outreach Coordinator measurement and Xv is the volunteer measurement for each parameter.

Teams that do not meet quality standards are retrained in the relevant methods and the Program Manager will re-evaluate their collection during the subsequent sampling event.

It is also possible that the Program Manager or Environmental Outreach Coordinator can conclude that all sampling was valid and the discrepancy between samples is due to natural variation (such as the site changing over time or unrepresentative sampling conditions).

Completeness: Completeness is a measure of the amount of valid data actually obtained versus the amount expected to be obtained as specified in the original sampling design. It is usually expressed as a percentage. For example, if 100 samples were scheduled but volunteers sampled only 90 times due to bad weather or broken equipment, the completeness record would be 90%.

Following a quality assurance review of all collected and analyzed data, data completeness is assessed by dividing the number of measurements judged valid by the number of total measurements performed. The data quality objective for completeness for each parameter for each sampling event is 90%. If the program does not meet this standard, the Program Manager will consult with MiCorps staff to determine the main causes of data invalidation and develop a course of action to improve the completeness of future sampling events.

Representativeness: Study sites are selected to represent the full variety of stream habitat types available locally. All available habitats within the study site will be sampled and documented to ensure a thorough sampling of all of the organisms inhabiting the site. Resulting data from the monitoring program will be used to represent the ecological conditions of the contributing watershed.

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

Measures of D and WQR for every sample will be compared to the median results from the past three years and each should be within two standard deviations of the median. If the sample falls outside this range, it can be excluded from the long-term data record (though can be included in an “outlier” database.).

Comparability: Comparability represents how well data from one stream or study site can be compared to data from another. To ensure data comparability, all volunteers participating in the monitoring program follow the same sampling methods and use the same units of reporting. The methods for sampling and reporting are based on MiCorps standards that are taught at annual training sessions by MiCorps staff. The Program Manager and/or Environmental Outreach Coordinator will train volunteers to follow those same methods to ensure comparability of monitoring results among other MiCorps programs. To the extent possible, the monitoring of all study sites will be completed within a two-week time frame.

If a Program Manager or Environmental Outreach Coordinator leaves the position and a new Program Manager or Environmental Outreach Coordinator is established, the new manager will attend the next available training given by MiCorps staff.

A8. Special Training/ Certifications

The Program Manager and Advisor have attended MiCorps training with additional in-the-field macroinvertebrate collection practice. Volunteer Team Leaders will be trained by the Program Manager for tasks specific to leading a collection team. All other community scientist volunteers will be trained by the Program Manager, Environmental Outreach Coordinator, and/or Advisor for Collector and Picker roles, as well as trained to use microscopes on identification day.

SECTION B: PROGRAM DESIGN AND PROCEDURES

B1. Study Design and Methods

Sites were considered throughout Eaton County in the Upper Thornapple Watershed and assessed by the Program Manager and Advisor for access and safety. The following sites are currently monitored by the program as of 2025:

Site	Name	Subwatershed	Latitude	Longitude	MiCorps Database Name
1	Church Drain @ Stewart Rd.	Butternut Creek	42.6172	-84.7684	ECCSMP -1
2	Lacey Creek @ Lamie Hwy.	Lacey Creek	42.611666	-84.96222	Barry 167, ECCSMP-2
3	Thornapple River @ Kinsel Hwy.	Milbourne, Allen & Crane Drain	42.59653	-84.71504	ECCSMP-3
4	Thornapple River @ Stewart Rd.	Milbourne, Allen & Crane Drain	42.62	-84.768	ECCSMP-4
5	Darken & Boyer @ W. Needmore Hwy	Darken & Boyer Drain	42.6831	-84.9071	ECCSMP-5
7	Shanty Brook @ Valley Hwy.	Shanty Creek	42.5813888	-85.021666	Barry 168, ECCSMP-7
10	Fish Creek @ Kinsel Hwy	Fish Creek	42.597073	-84.870936	ECCSMP-10
11	Fish Creek @ Valley and Stine	Fish Creek	42.582735	-84.895108	ECCSMP-11
12	Nye and Eaton Drain @ Shaytown	Fish Creek	42.576912	-84.974965	ECCSMP-12

A map of these sites throughout the Upper Thornapple River watershed is included in Appendix A.

Volunteers are guided to the sites with a packet that includes the site latitude and longitude, a Google Maps driving path, as well as a satellite view of the site from Google Maps. On each sheet, there is also a QR code to scan that will open up Google Maps

and guide them from the meeting site (The University of Olivet or Eaton Conservation District) to the sampling site.This is also included in Appendix A.

Macroinvertebrate Collection - Collection will occur at each program site twice annually. The benthic population is sampled within a 2-week period in early-May and mid-October. All equipment to be used for this sampling is listed in Appendix B, and the standard operating procedures (SOPs) for the program volunteers are given in Appendix C. The datasheets used for macroinvertebrate collection and ID are in Appendix D.

To sample the benthic community, 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 kicknet. The trained Collector will transfer the material from the net into white pans. The remaining volunteers (Pickers) will pick out samples of all different types of macroinvertebrates from the pans and place them into jars of 70% ethyl alcohol for later identification. During the collection, the Collector will provide information to the team Stream Leader in response to questions on the data sheet that review all habitats to be sampled, the state of the creek, and any changes in methodology or unusual observations. The Stream Leader will instruct and assist other team members in detecting and collecting macroinvertebrates in the sorting pans, including looking under bark and inside of constructions made of sticks or other substrates. 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. Any variations in procedure should be explained on the data sheet. (See appended data sheet.)

After monitoring is done at any site, the equipment is inspected, cleaned, and sanitized with a dilute bleach solution or 409 prior to reusing.

At the collecting site, all invertebrate sample jars receive a label written in pencil, waterproof pen, or printed with a laser printer, starting date, location, subwatershed, and number of jars containing the collection from this site, which is placed on the jar. The data sheet also states the number of jars containing the collection from this site. The Stream Leader is responsible for labeling and securely closing the jars, and returning all jars and all equipment to the Program Manager. Upon return to the Program building, the collections are checked for labels, the data sheets are checked for completeness and for correct information on the number of jars containing the collection from the site, and the jars are secured together with a rubber band and site label and placed together in one box. They are stored at The University of Olivet until they are examined and counted on the day of identification (one or two weeks later). The data sheets are used on the identification day, after which they remain on file indefinitely.

Macroinvertebrate Identification - At the time of identifying the sample, the sample identifier checks the data sheet and jars to ensure that all the jars, and only the jars,

from that collection are present prior to emptying them into a white pan for sorting. If any specimens are separated from the pan during identification, a site label accompanies them. The sorting pans and ice cube trays have some tap water added to reduce specimen desiccation while identifying. For identification, volunteers sort all individuals from a single site collection into look-alike groups, identify specimens to the order level, and complete the identification sheet (Appendix D). Identification work is then checked by peers with a peer-review sheet (Appendix D). After the initial and peer review identifications, they are joined by an identification expert who confirms the sorting and provides identification of the taxa present. These identifications are then verified by the Program Manager/Environmental Outreach Coordinator per section A7. The identification data is transferred to the MiCorps datasheet. When identification of a sample is complete, the entire collection is placed in a single jar of fresh 70% ethanol with a label on the jar and stored at the program office at The University of Olivet indefinitely. The ethanol is carefully changed (to avoid losing small specimens) in the jars every few years.

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 subsample. We do not assume that a single collection represents all the diversity in the community, but rather we consider our results reliable only after repeated collections spanning at least three years. Our results are compared with other locations in the same river system that have been sampled in the same way. All collectors attend an in-stream training session, and a different team will be sent to a site at least once every two years at a minimum, but when possible collectors will be sent to different sites every collection event to diminish the effects of bias in individual collecting styles. Samples where the diversity measures diverge substantially (using the criteria in A7) from past samples at the same site are resampled by a new team within two weeks. 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 picking trays to ensure that all present families have been collected.

Habitat Analysis - Stream Leaders and Collectors, with Pickers assisting as well, will complete a Habitat Assessment at sites at least once every three years immediately following the macroinvertebrate sampling or at least within two weeks of the sampling event. The Habitat Assessment will follow the procedure and datasheet given in Appendix D. A site sketch will accompany the assessment. The Habitat Assessment is a critical piece of the monitoring process and will be used to monitor changes in stream habitat over time, which may result in changes in water quality and corresponding macroinvertebrate diversity. As many of the parameters within the Habitat Assessment are qualitative, personal bias is inherent. To account for bias and personal discrepancies, Stream leaders will have on hand a copy of MiCorps Stream Monitoring Procedures, which details the qualitative criteria, and helps clarify questions. Stream leaders will read questions aloud to their group and form consensus on question answers. Since the information reviewed in the Habitat Assessment holds considerable educational value for volunteers and the goals of the MiCorps program, it is important that Stream Leaders inform other group members of the purpose of the Assessment and encourage feedback from the group. However, final decisions on the scoring

remains the responsibility of only those team members who have undergone the volunteer training and have been certified by the Program Manager/Environmental Outreach Coordinator. All final Habitat Assessment data sheets will be reviewed by the Project Manager/Environmental Outreach Coordinator for correctness and completeness. There are places on the data sheet to record unusual procedures or accidents. Any variation in procedure should be explained on the data sheet. As a critical role of the Habitat Assessment is to inform us of any areas of habitat degradation that could impact water quality, any concerns noted in the data sheet will be reviewed by the Project Manager/Environmental Outreach Coordinator and appropriate action will be taken to resolve and/or address noted concerns including informing appropriate authorities.

The last habitat assessments conducted were May 2024.

Program Materials List for each Stream Team Bin

sampling directions for volunteers
MiCorps data sheets
waders
buckets (2)
nets (2)
labeled sample bottles with ethanol
reel measuring tape
forceps/tweezers
pipettes
spoons
strainers
pencils
wader brushes
diluted bleach solution spray bottle
rinse water spray bottle
tarps
life jacket for deep sites
ice cube trays (at least 2)
sorting trays
first aid kit
trash bags
bug spray
sunscreen
ID guides
paper towels
poison ivy wipes
tick spray - apply to waders at least 48 hours before collection events
lint roller
wader repair kit
hand sanitizer
A Guide to Freshwater Invertebrates by Voshell

dissecting microscopes used for ID day

Equipment Quality Control - The Project Manager and Environmental Outreach Coordinator will ensure the quality of monitoring equipment by following the protocols listed below:

- Check to make sure equipment is in working order and not damaged
- Clean equipment after taking it into the field (Decontamination Procedures recommended: https://www.hrwc.org/volunteer/decontaminate/)
- Label equipment with their dates of purchase and dates of last usage
- Check the expiration date of chemical reagents prior to each use
- Check the batteries of all equipment that requires them
- Make sure equipment is calibrated appropriately before conducting each test

B2. Instrument/Equipment Testing, Inspection, and Maintenance

Stream monitoring equipment is stored in the Mott 101 suite at The University of Olivet. The Program Manager, Environmental Outreach Coordinator, or supervised service learning students will test, inspect and maintain the equipment. For macroinvertebrate monitoring, the critical equipment maintenance includes checking nets, that they are firmly attached to poles and free of holes, the collection jars do not leak, the forceps have tips that meet, and waders are clean, dry and do not leak. Microscopes used by the program are owned by The University of Olivet and are on a regular maintenance and upkeep schedule through the Natural Sciences and Mathematics Department.

Any deficiencies in equipment will be reported to the Program Manager, and a list maintained by the Program Manager. Any equipment that needs to be replaced will be purchased, if funding is available.

Decontamination materials include: tarps, boot brushes, lint rollers, diluted bleach spray bottle, rinse water spray bottle, and hand sanitizer.

The bleach spray bottle is prepared to 0.05% bleach solution the morning of each sampling date, and the rinse water spray bottle is filled.

Program instructions for decontamination include:

1. Rinse the equipment with the stream water to wash away any collected material, mud, etc.
2. Inspect all clothing and equipment for any additional mud and plant material and remove it at the site. Boot brushes and a lint roller are in the bin.
3. Once everything is rinsed and inspected, and material has been removed, set a tarp away from the stream in a safe place away from traffic, and place equipment on the tarp.
4. Disinfect the equipment (buckets, trays, nets, waders, etc.) by using the spray bottle of diluted bleach. Once sprayed, let it sit for 10 minutes.
    a. As you wait, you can look at the area for trash and collect it in the trash bag in the bin.
5. Once the 10 minutes has elapsed for the bleach solution to disinfect the equipment, you can spray it all down with the tap water spray bottles.

6. Make sure all team members use hand sanitizer to clean their hands. It is recommended that they wash their hands when they return to the classroom/home.

B3. Inspection/Acceptance for Supplies and Consumables

Monitoring supplies details:

Supply	Acceptable Condition	Last Purchased	Storage/Person Responsible
Waders	Dry, no holes, clean	Fall 2022	The University of Olivet/ Erin Pavloski
Buckets	Dry, no cracks	Spring 2022	The University of Olivet/ Erin Pavloski
Nets	No holes in nets, firmly attached to poles	Spring 2022	The University of Olivet/ Erin Pavloski
Forceps/Tweezers	Tips touch	Fall 2022	The University of Olivet/ Erin Pavloski
Pipettes	Clean	Fall 2022	The University of Olivet/ Erin Pavloski
Spoons	Clean	Fall 2022	The University of Olivet/ Erin Pavloski
Pencils	Sharpened, erasers function	Fall 2022	The University of Olivet/ Erin Pavloski
Labeled Bottles	Bottles don't leak, labels applied	Spring 2024	The University of Olivet/ Erin Pavloski
70% Ethanol	Stored properly in chemistry lab storage	Spring 2024	The University of Olivet/ Dr. Susanne Lewis
Wader Brushes	Clean	Spring 2024	The University of Olivet/ Erin Pavloski
Diluted Bleach Solution Spray Bottle	Refilled day of sampling with 0.05% solution	Spring 2022	The University of Olivet/ Erin Pavloski
Rinse Water Spray Bottle	Refilled day of sampling	Spring 2022	The University of Olivet/ Erin Pavloski
Tarps	Debris removed, dry	Fall 2022	The University of Olivet/ Erin Pavloski
Life Jacket For Deep Sites	Clean	Fall 2022	The University of Olivet/ Erin Pavloski

Ice Cube Trays	Clean	Fall 2022	The University of Olivet/ Erin Pavloski
Sorting Trays	Clean	Spring 2024	The University of Olivet/ Erin Pavloski
First Aid Kit	Stocked	Fall 2022	The University of Olivet/ Erin Pavloski
Trash Bags	At least three in bin, no holes	Fall 2022	The University of Olivet/ Erin Pavloski
Bug Spray	Adequate amount left	Fall 2022	The University of Olivet/ Erin Pavloski
Sunscreen	Adequate amount left	Fall 2022	The University of Olivet/ Erin Pavloski
ID Guide	Legible, no water damage	Fall 2022	The University of Olivet/ Erin Pavloski
Paper Towels	Adequate amount left	Fall 2022	The University of Olivet/ Erin Pavloski
Reel Measuring Tape	Reel functions	Fall 2022	The University of Olivet/ Erin Pavloski
Poison Ivy Wipes	Adequate amount left, not dried out	Spring 2022	The University of Olivet/ Erin Pavloski
Lint Roller	Adequate amount left, not dried out	Spring 2022	The University of Olivet/ Erin Pavloski
Wader Repair Kit	Present in bin	Fall 2022	The University of Olivet/ Erin Pavloski
Hand Sanitizer	Adequate amount left	Fall 2022	The University of Olivet/ Erin Pavloski
ID Books	Legible, no water damage	Spring 2022	The University of Olivet/ Erin Pavloski

B4. Non-Direct Measurements

This program and any associated project does not use non-direct measurements at this time.

B5. Data Management

Data Entry and Records - Raw data will be entered and managed in Google Sheets and/or Microsoft Excel workbooks. Data will be entered into the MiCorps Data Exchange (MDE) by the Environmental Outreach Coordinator (or Program Manager in

absence of EOC). All data is backed up by being shared with MACD in Google Drive. Computer passwords provide data security.

Data will be entered from Excel data sheets directly into the online MiCorps database by the Program Manager or Environmental Outreach Coordinator for storage within the MiCorps data exchange system. Data sheets will be filed at The University of Olivet with the Program Manager indefinitely.

Metrics and Measures - Macroinvertebrates: Data are summarized for reporting into four metrics: all taxa, insects, EPT (Ephemeroptera + Plecoptera + Trichoptera), and sensitive taxa. Units of measure are families counted in each metric. The Stream Quality Index (SQI) from the MiCorps datasheet is also computed.

Habitat: specific measures are used from habitat surveys to investigate problem areas at each site. The percentage of stream bed composed of fines (sand and smaller particles) is calculated and changes are tracked over time as an indicator of sediment deposition.

The program will ensure quality control through:

- Checking all calculations twice
- Reviewing computer entered data by comparing to field data sheets

SECTION C: SYSTEM ASSESSMENT, CORRECTION AND REPORTING

C1. System Audits and Response Actions

Volunteer Team Leaders trained by the Program Manager/Environmental Outreach Coordinator ensure that quality assurance protocols are followed and report any issues possibly affecting data quality. When significant issues are reported, the Program Manager may accompany groups in the field to perform side-by-side sampling and verify the quality of work by the volunteer team. In the event that a group is determined to have done a poor job sampling, a performance audit to evaluate how people are doing their jobs of collecting and analyzing the data is accomplished through side-by-side sampling and identification. During side-by-side sampling a team of volunteers and an outside expert sample the same stream. The statistic for checking this side-by-side sample is given in the Bias section (A7).

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

If deviation from the QAPP is noted at any point in the sampling or data management process, the affected samples will be flagged and brought to the attention of the Program Manager and the team that collected the sample. Re-sampling is conducted as

long as the deviation is noted soon after occurrence and volunteers are available (two week window). Otherwise, a gap must be left in the monitoring record and the cause noted. All corrective actions are documented and communicated to MiCorps staff.

Details of the process for assessing data quality are outlined in section A7. Response to quality control problems is also included in section A7.

C2. Data Review, Verification, and Validation

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

C3. Reconciliation with Data Quality Objectives

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

C4. Reporting

Throughout the duration of this program, quality control reports are included with quarterly project reports (when under contract for MiCorps grants) 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 is made available via the MiCorps website.

APPENDICES:

Appendix A. Map of Monitoring Sites / Directions…….…… 18

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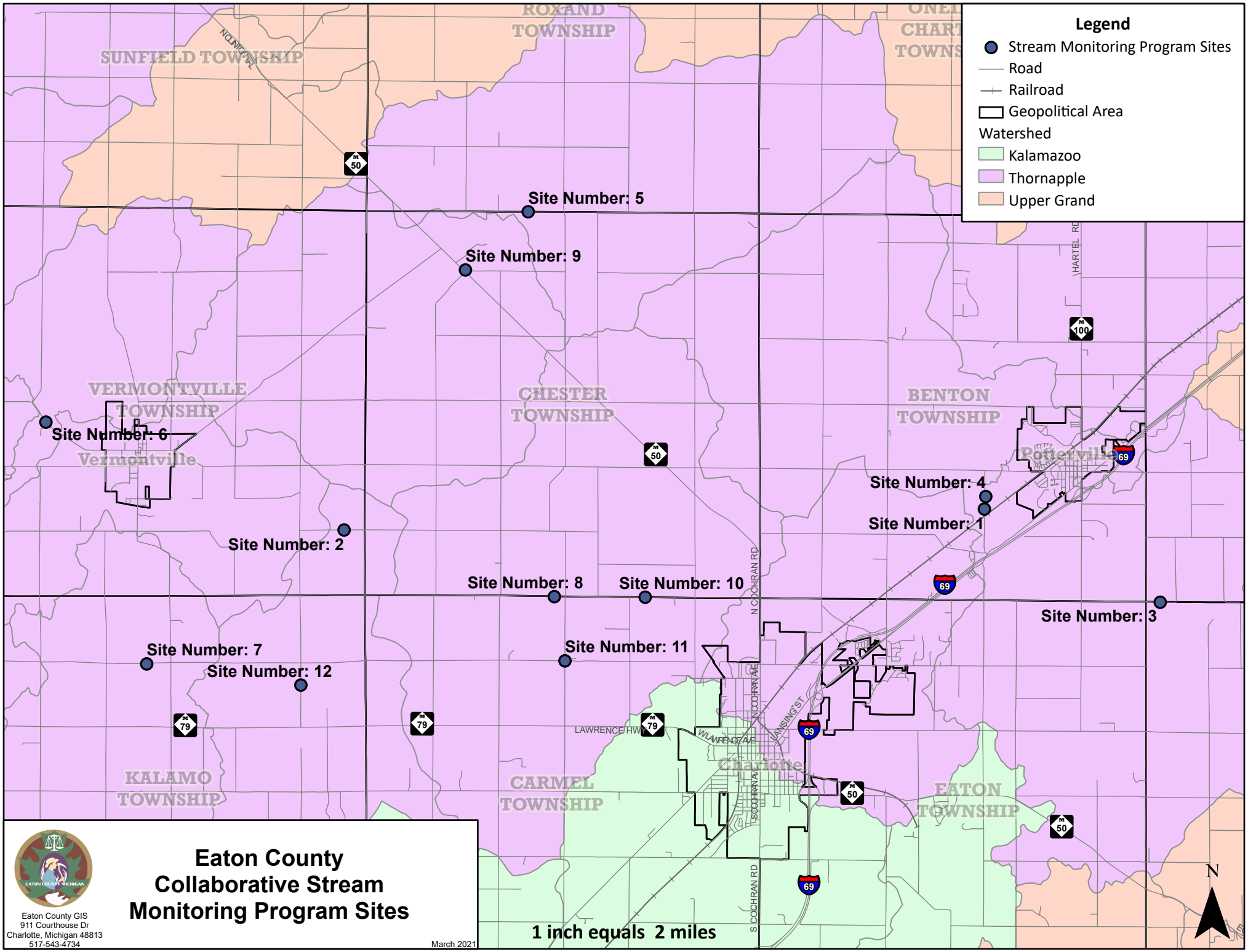
Appendix C. Collection Standard Operating Procedures……..…….. 45

Appendix D. Collection, ID and Habitat Assessment Data Sheets…… 50

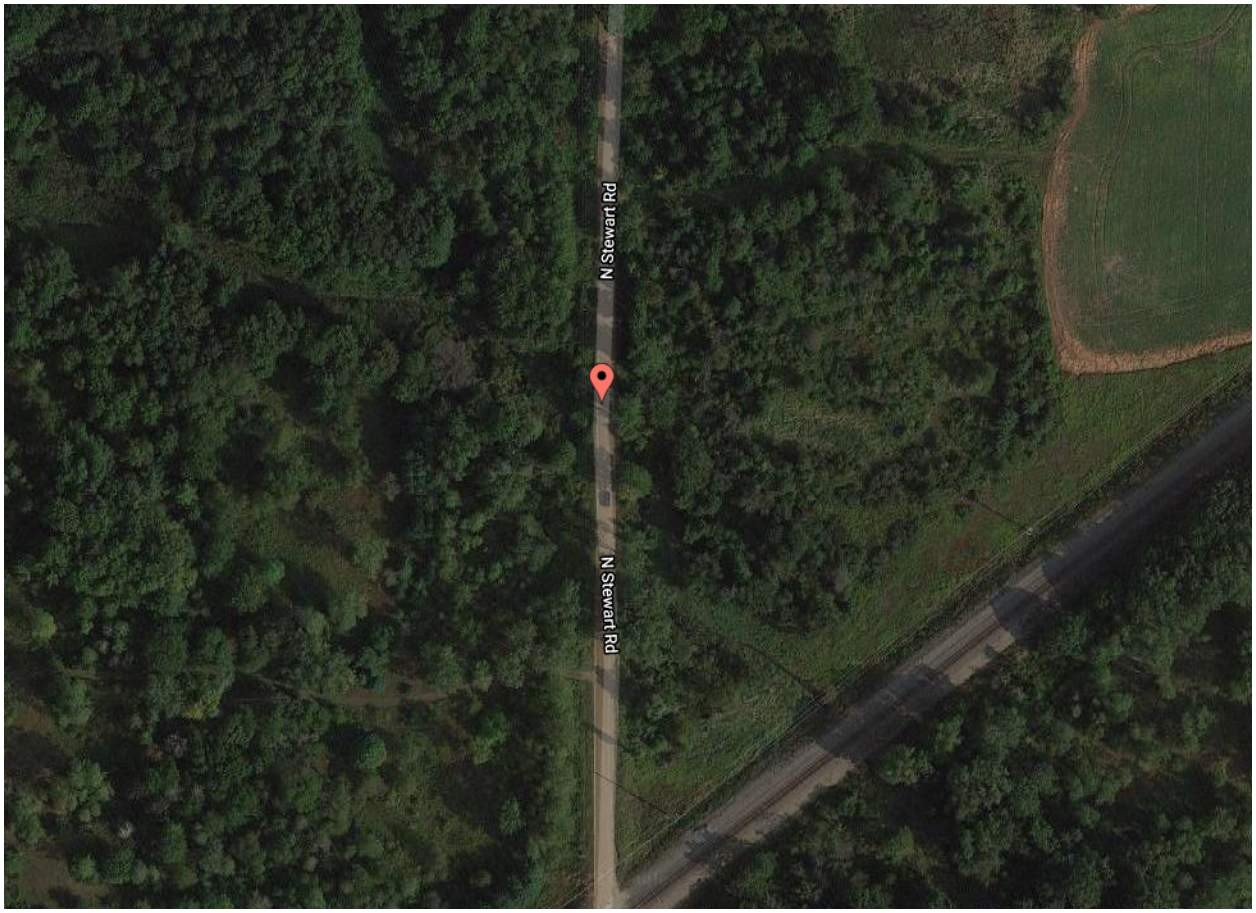

Legend
Stream Monitoring Program Sites
Road
Railroad
Geopolitical Area
Watershed
Kalamazoo
Thornapple
Upper Grand
ROXAND TOWNSHIP
SUNFIELD TOWNSHIP
VERMONTVILLE TOWNSHIP
Vermontville
CHESTER TOWNSHIP
BENTON TOWNSHIP
Potterville
KALAMO TOWNSHIP
CARMEL TOWNSHIP
Charlotte
EATON TOWNSHIP
Site Number: 5
Site Number: 9
Site Number: 6
Site Number: 2
Site Number: 4
Site Number: 1
Site Number: 8
Site Number: 10
Site Number: 3
Site Number: 7
Site Number: 12
Site Number: 11
N COCHRAN RD
S COCHRAN RD
LAWRENCE HWY
W LAWRENCE AVE
N CEDAR ST
S CEDAR ST
HARTEL RD
M-50
M-79
M-100
I-69
Eaton County GIS
911 Courthouse Dr
Charlotte, Michigan 48813
517-543-4734
Eaton County
Collaborative Stream
Monitoring Program Sites
March 2021
1 inch equals 2 miles
N

Eaton County Collaborative Stream Monitoring Program Sites & Directions

Scan the QR code with your smartphone for Google Maps directions

SITE 1

Name	Subwatershed	Latitude	Longitude
Church Drain @ Stewart Rd.	Butternut Creek	42.6172	-84.7684

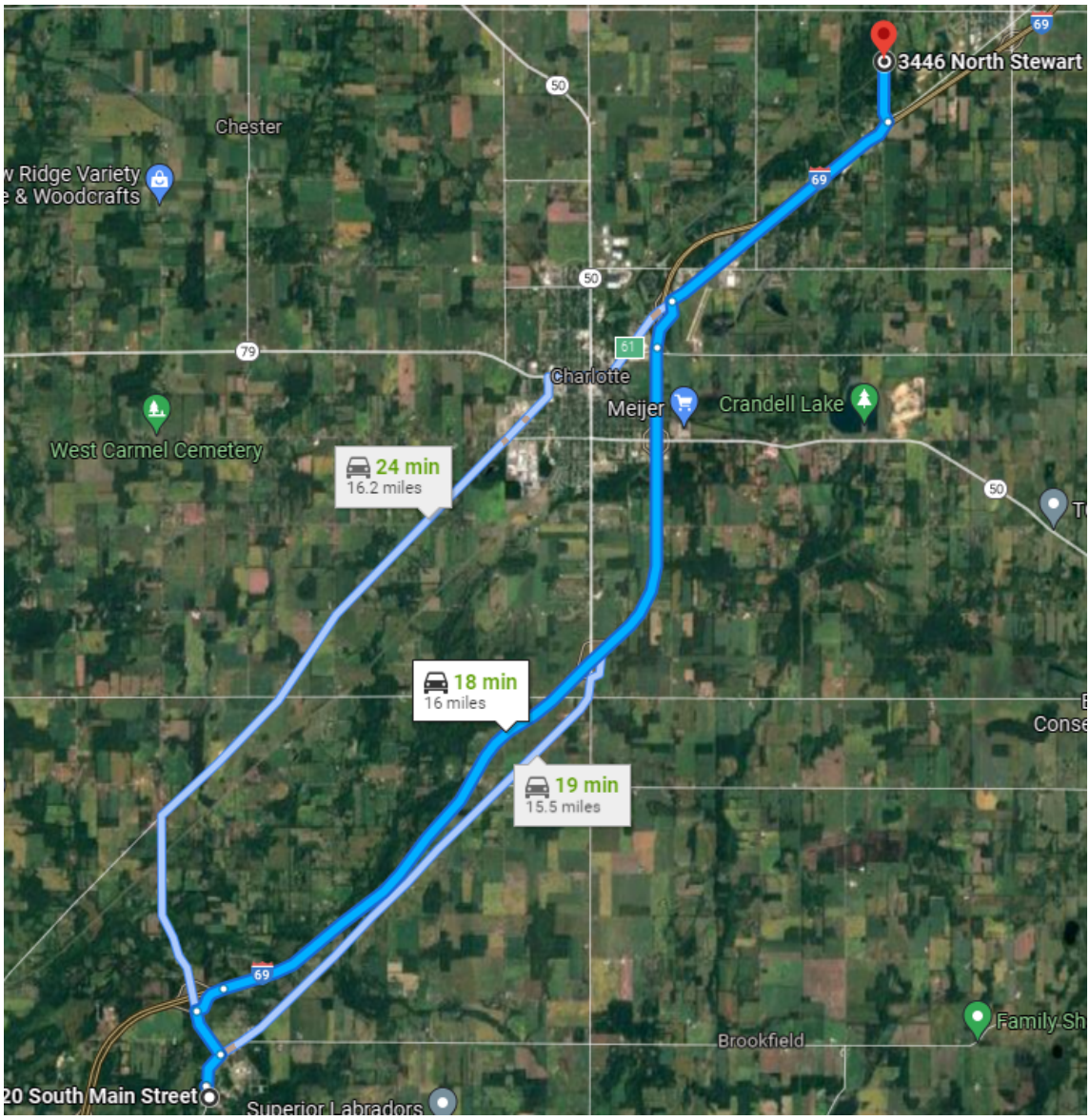


Driving Directions:

Site 1 Directions from 320 S. Main Street, Olivet, MI:

- Head north on Main St.
- Turn left onto Kalamo St.
- Turn right to merge onto I-69 N toward Lansing
- Merge onto I-69 N, Drive 9.8 mi
- Take exit 61 for Lansing Rd
- Turn right onto E Lansing Rd
- Continue on E Lansing Rd. Drive to N Stewart Rd in Benton Township
- Turn left onto N Stewart Rd, Drive ~0.7 mi

End Coordinates: 42.6172, -84.7684



SITE 2

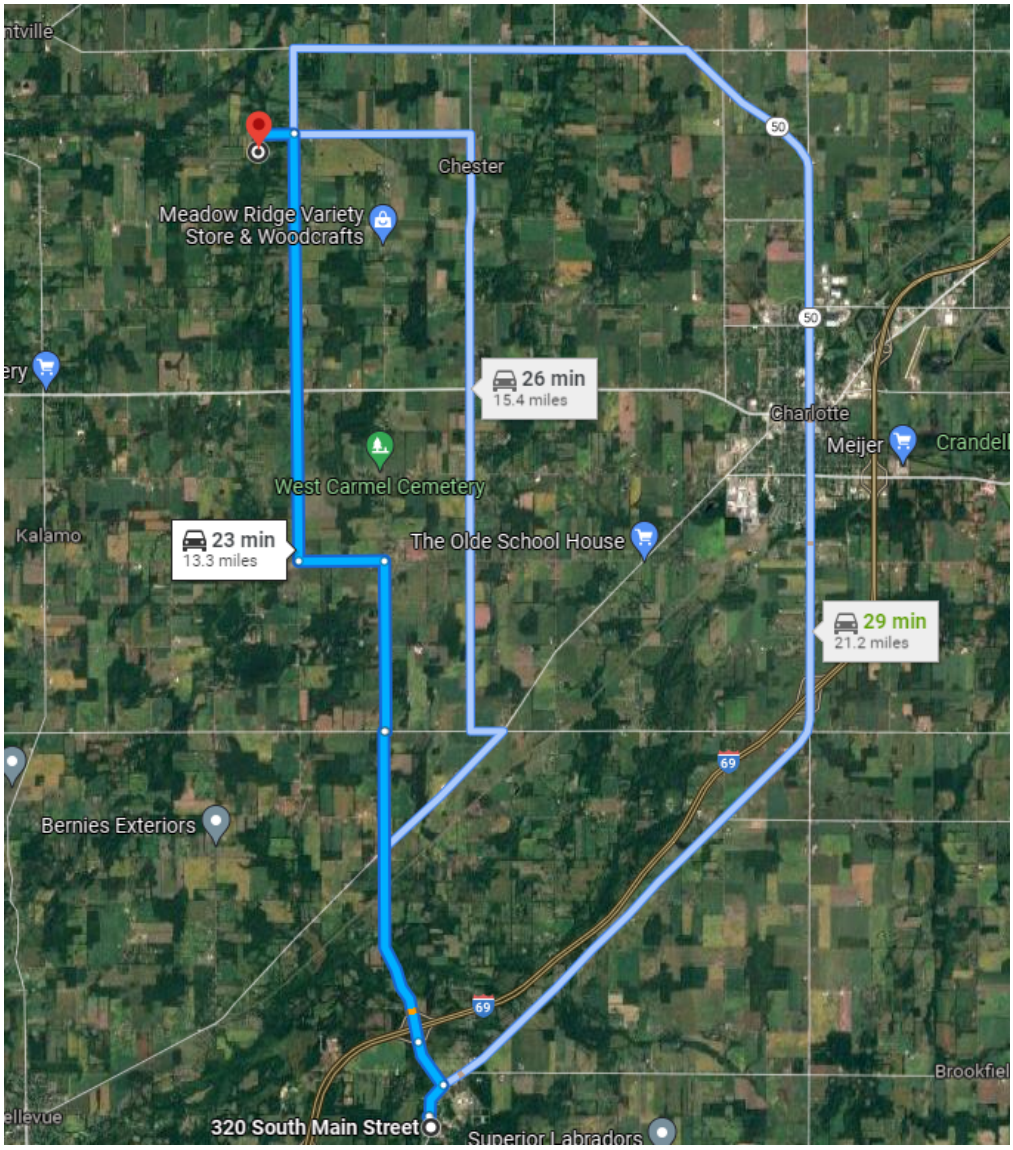
Name	Subwatershed	Latitude	Longitude
Lacey Creek @ Lamie Hwy.	Lacey Creek	42.611666666667	-84.962222222222

Driving Directions:

Site 2 Directions from 320 S. Main Street, Olivet, MI:

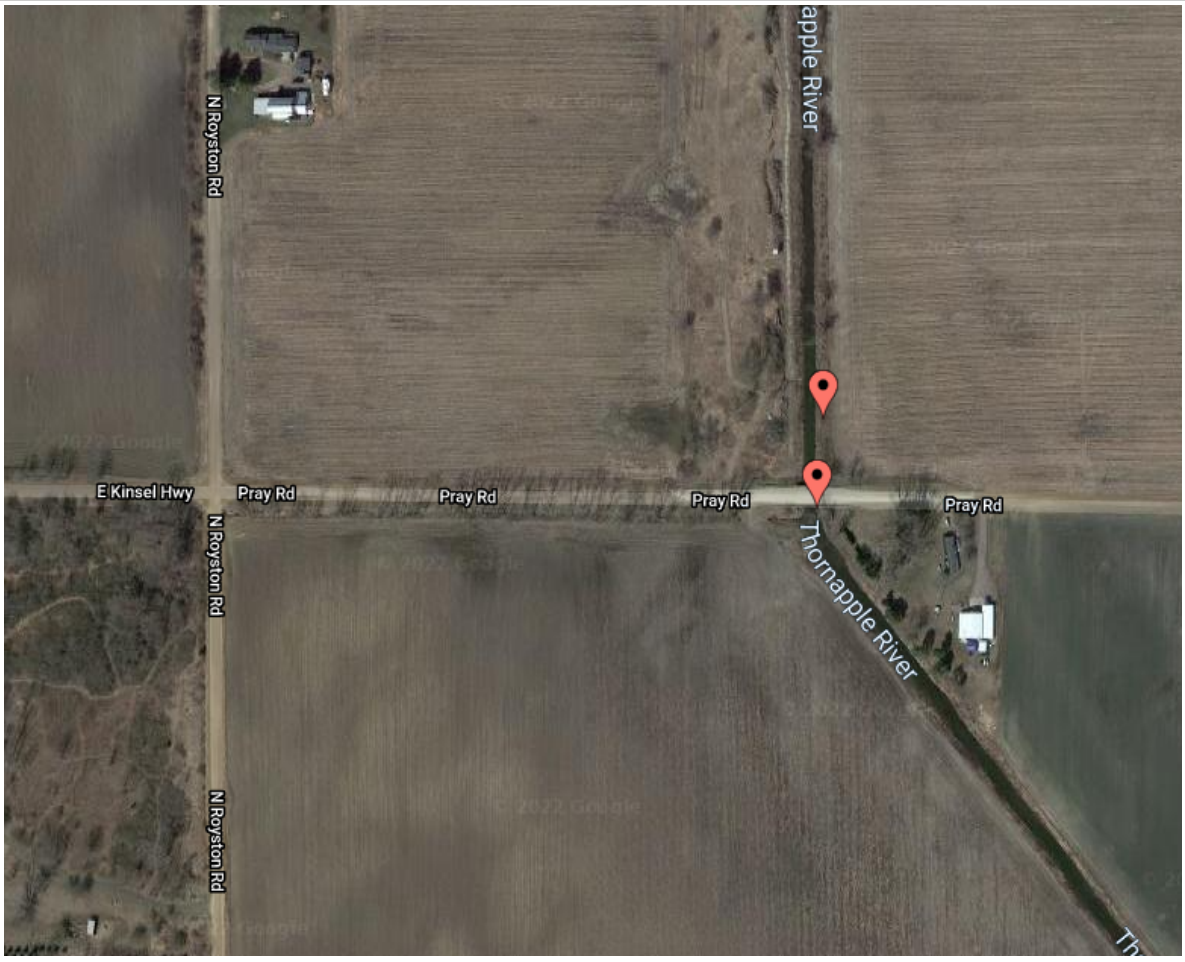
- Head North on Main St.
- Turn left onto Kalamo St.
- Continue onto Ainger Rd
- Turn right onto W 5 Point Hwy
- Turn left onto S Ainger Rd
- Turn left onto W Kalamo Hwy
- Turn right at the 1st cross street onto S Bradley Rd
- Turn left onto Lamie Hwy

End Coordinates: 42.611666666667 -84.962222222222



SITE 3

Name	Subwatershed	Latitude	Longitude
Thornapple River @ Kinsel Hwy.	Milbourne, Allen & Crane Drain	42.59653	-84.71504

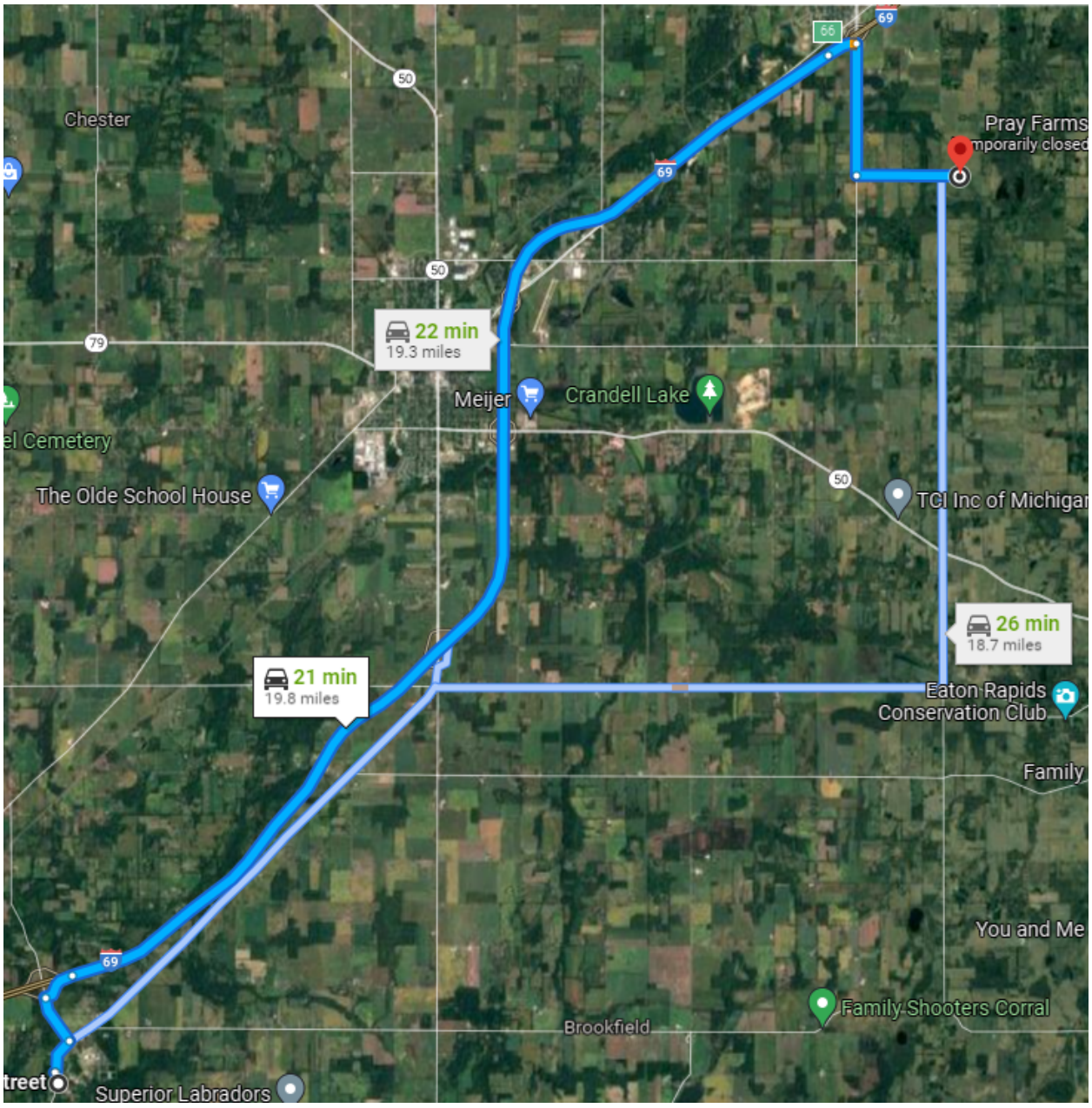


Driving Directions:

Site 3 Directions from 320 S. Main Street Olivet, MI:

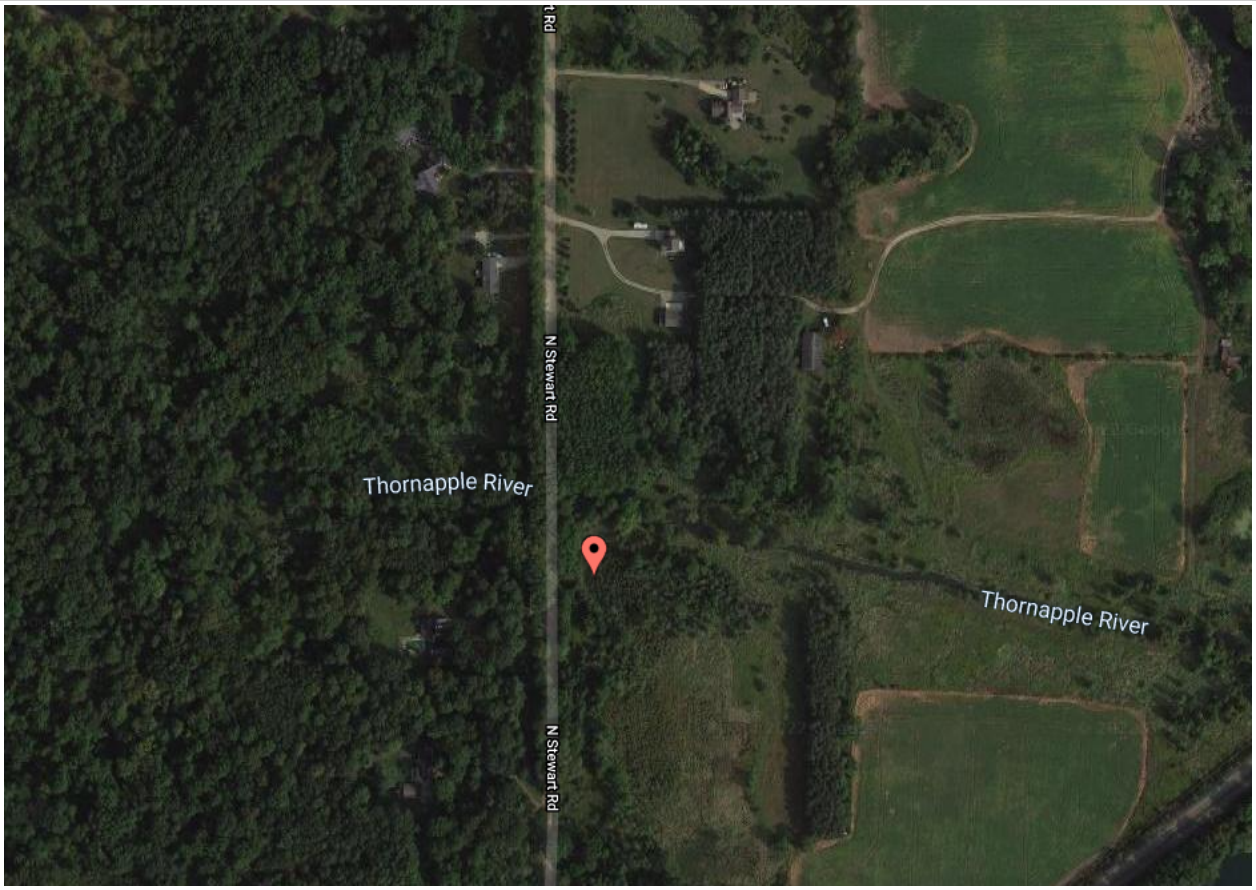
- Head North on Main St.
- Turn left onto Kalamo St.
- Turn right to merge onto I-69 N toward Lansing
- Take Exit 66 for MI-100 toward Potterville/Grand Ledge
- Turn right onto N Hartel Rd.
- Turn left onto E Kinsel Hwy.

End Coordinates: 42.59653, -84.71504



SITE 4

Name	Subwatershed	Latitude	Longitude
Unnamed Trib to Butternut @ Stewart Rd.	Milbourne, Allen & Crane Drain	42.62	-84.768

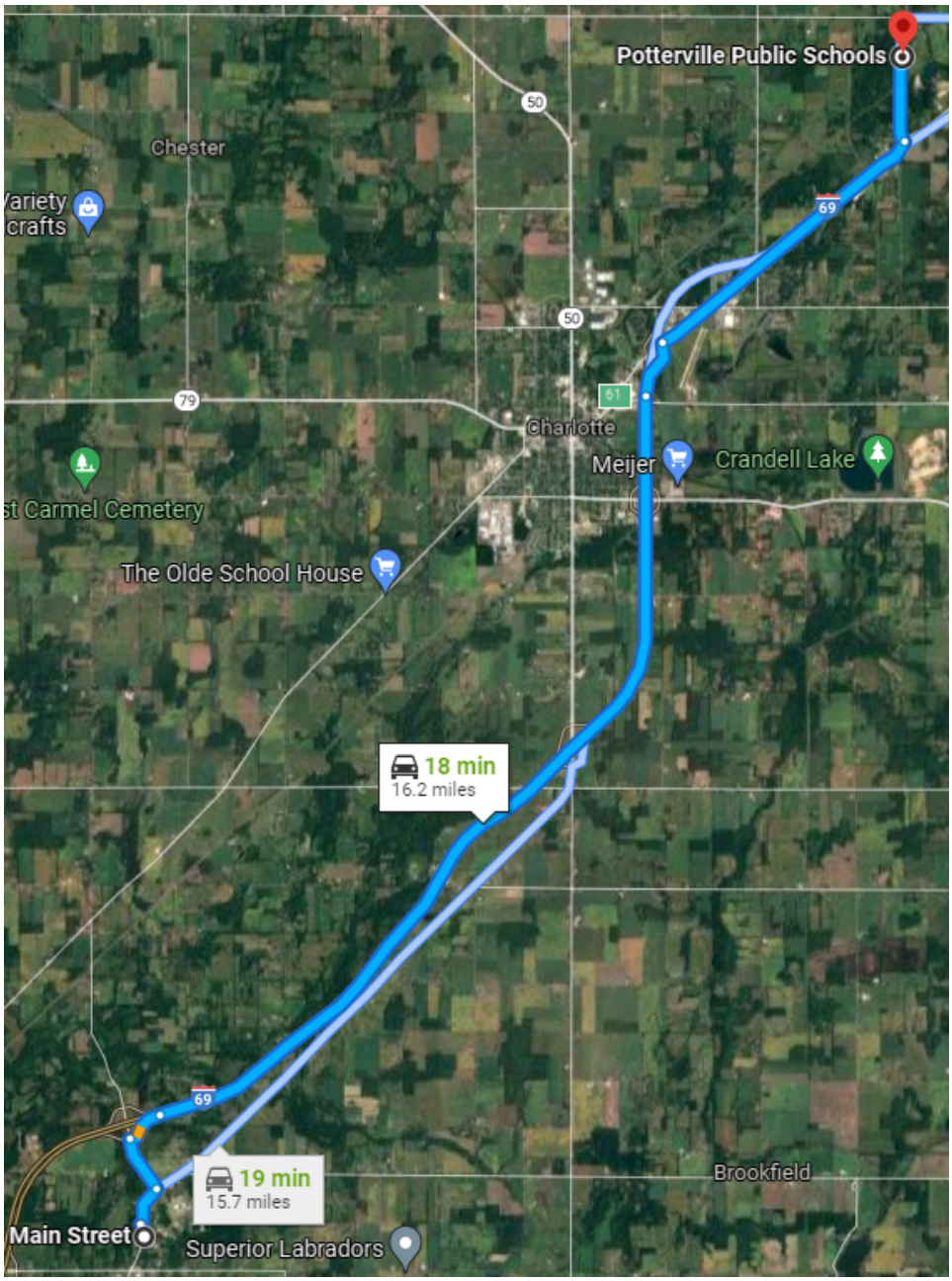


Driving Directions:

Site 4 Directions from 320 S. Main Street, Olivet, MI

- Head North on Main St.
- Turn left onto Kalamo St.
- Turn right to merge onto I-69 N toward Lansing
- Take Exit 61 for Lansing Rd
- Turn right onto E Lansing Rd
- Turn left onto N Stewart Rd

End Coordinates: 42.62, -84.768



SITE 5

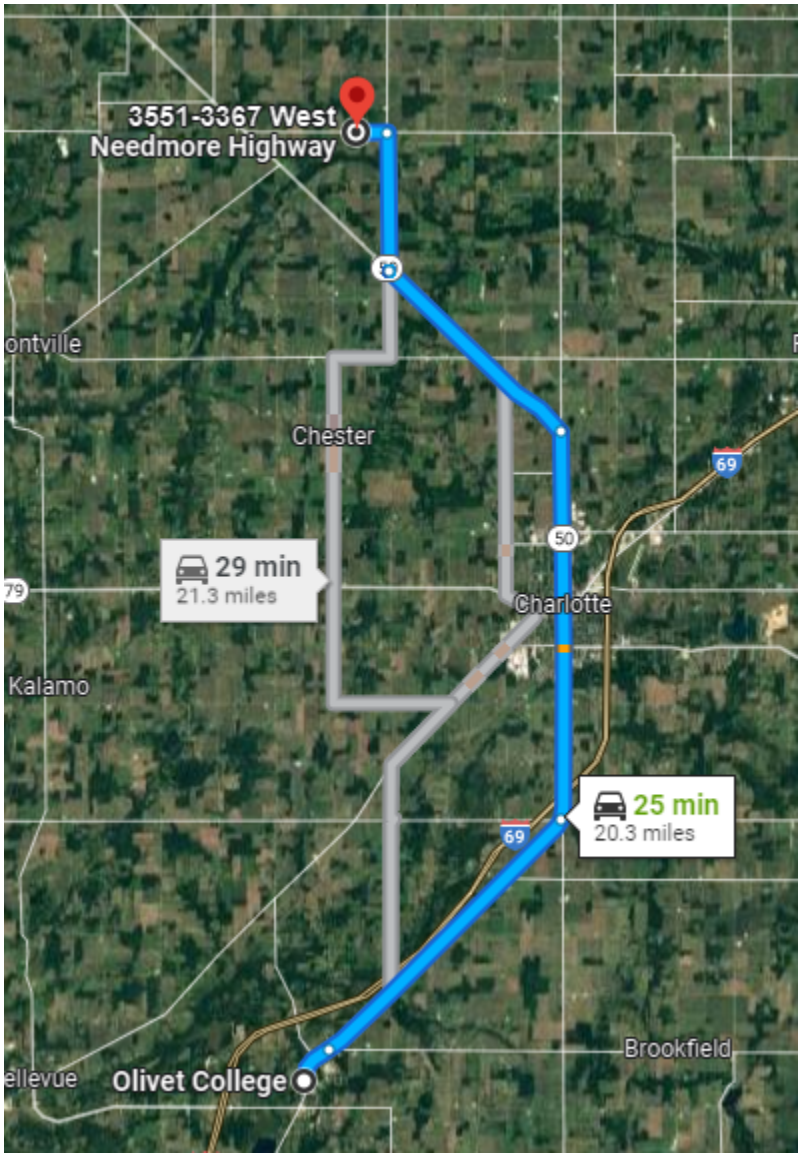
Name	Subwatershed	Latitude	Longitude
Darken & Boyer @ W. Needmore Hwy	Darken & Boyer Drain	42.6831	-84.9071

Driving Directions:

Site 5 Directions from 320 S. Main Street, Olivet, MI

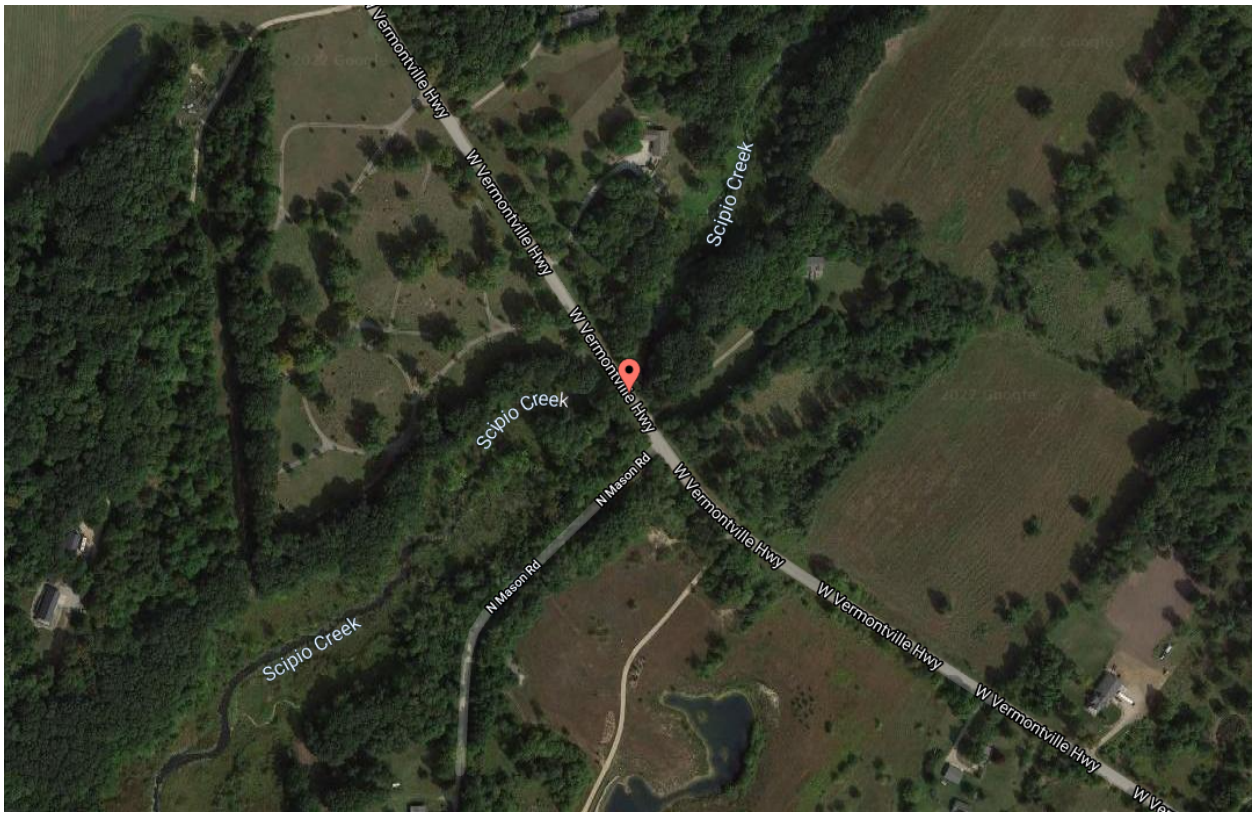
- Head North on Main St.
- Continue straight onto Marshall Rd/Old US Hwy 27
- Continue onto S Cochran Ave
- Continue onto M-50 E
- Turn right onto Mulliken Rd
- Turn left onto W Needmore Hwy

End Coordinates: 42.6831, -84.9071



SITE 6

Name	Subwatershed	Latitude	Longitude
Scipio Creek @ Vermontville Hwy.	Scipio Creek	42.63528	-85.05276

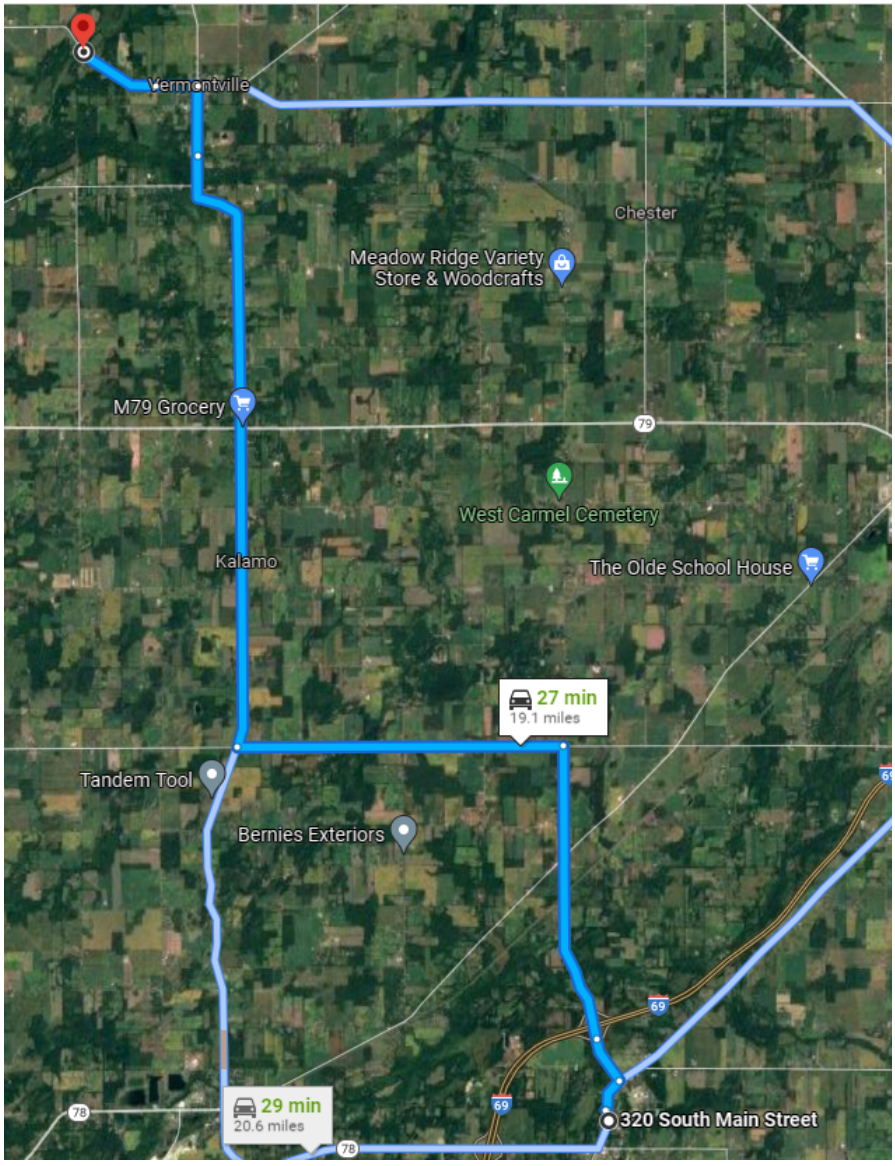


Driving Directions:

Site 6 Driving Directions from 320 S. Main Street, Olivet, MI:

- Head North on Main St.
- Turn left onto Kalamo St.
- Continue onto Ainger Rd.
- Turn left onto W 5 Point Hwy.
- Turn right onto Ionia Rd.
- Continue onto S Main St.
- Turn left onto W Main St.
- Continue onto W Vermontville Hwy.

End Coordinates: 42.63528, -85.05276



SITE 7

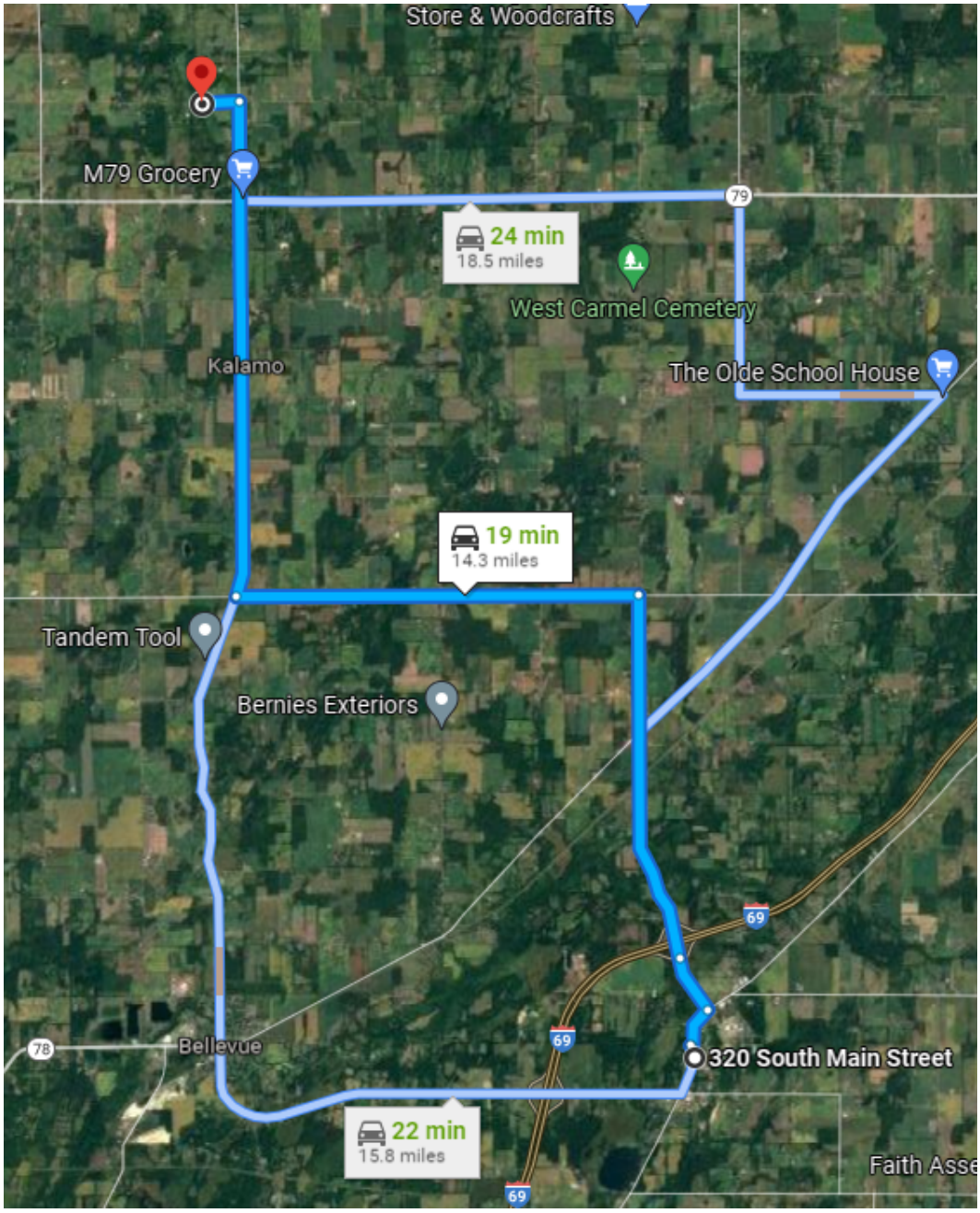
Name	Subwatershed	Latitude	Longitude
Shanty Brook @ Valley Hwy.	Shanty Creek	42.581388888889	-85.021666666667

Driving Directions:

Site 7 Directions from 320 S. Main Street, Olivet, MI:

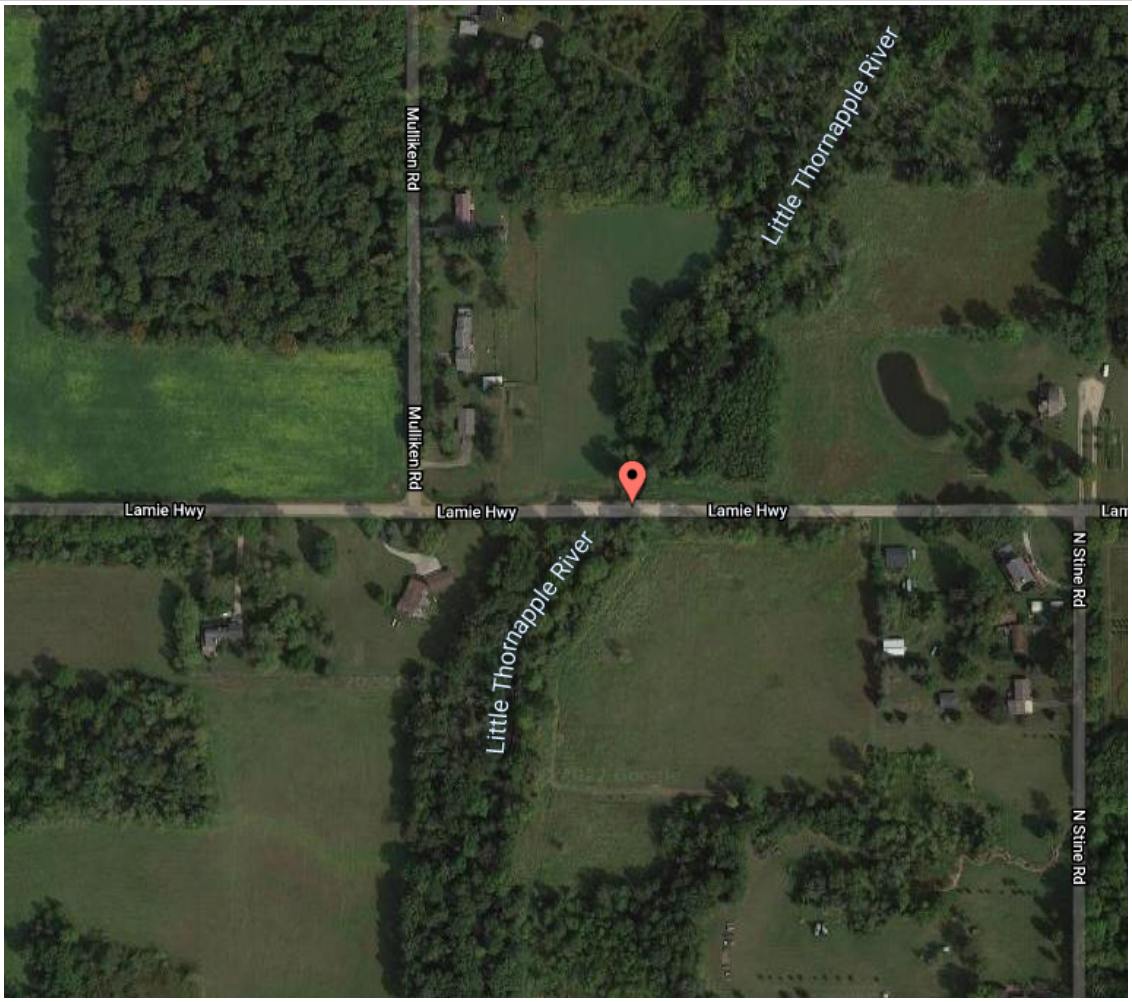
- Head North on Main St.
- Turn left onto Kalamo St.
- Continue onto Ainger Rd.
- Turn left onto W 5 Point Hwy.
- Turn right onto Ionia Rd.
- Turn left onto Valley Hwy.

End coordinates: 42.581388888889, -85.021666666667



SITE 8

Name	Subwatershed	Latitude	Longitude
Little Thornapple River @ Lamie Hwy.	Thornapple Drain	42.61172	-84.898439

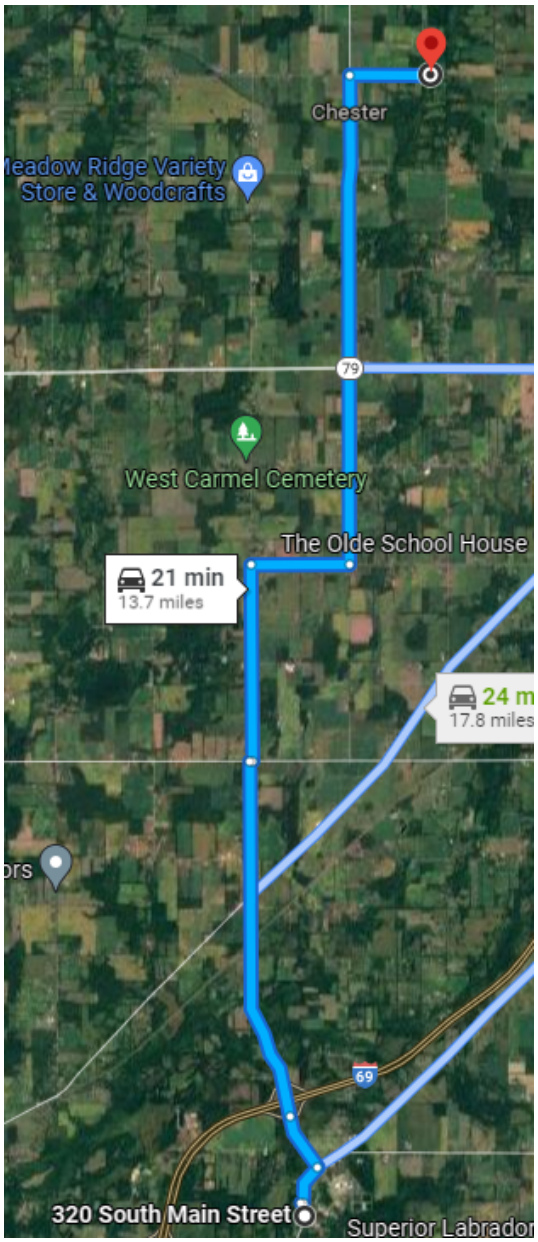


Driving Directions:

Site 8 Directions from 320 S. Main Street, Olivet, MI:

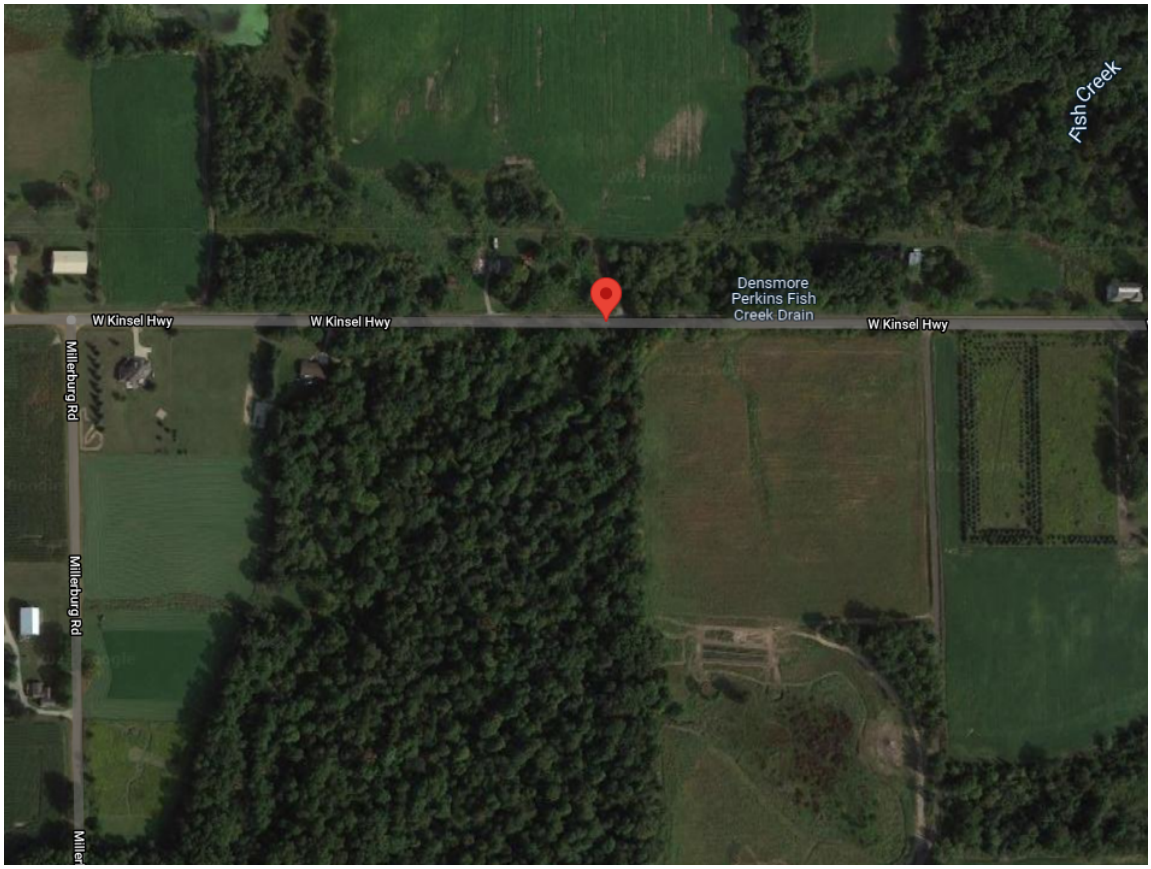
- Head North on Main St.
- Turn left onto Kalamo St.
- Continue onto Ainger Rd.
- Turn right onto W 5 Point Hwy.
- Turn left onto S Ainger Rd.
- Turn right onto W Kalamo Hwy.
- Turn left at the 1st cross street onto S Chester Rd.
- Turn right onto Lamie Hwy.

End Coordinates: 42.61172, -84.898439



SITE 10

Name	Subwatershed	Latitude	Longitude
Fish Creek @ Kinsel Hwy	Fish Creek	42.597073	-84.870936

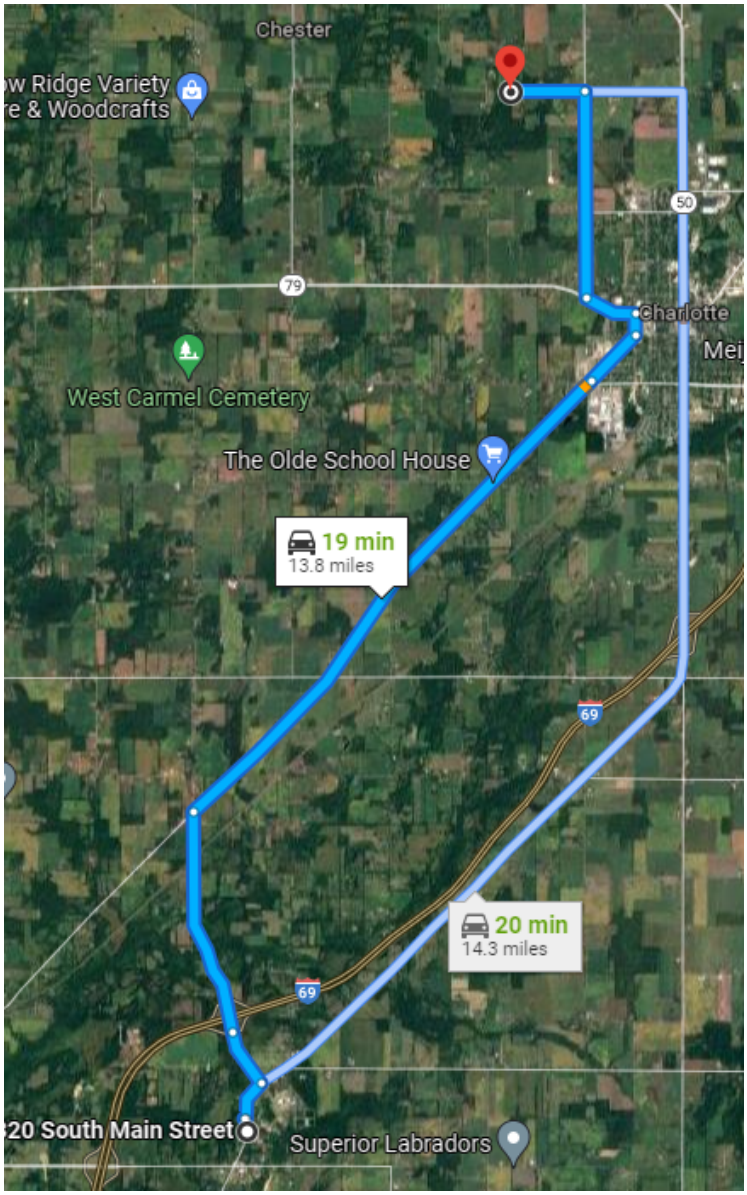


Driving Directions:

Site 10 Directions from 320 S. Main Street, Olivet, MI:

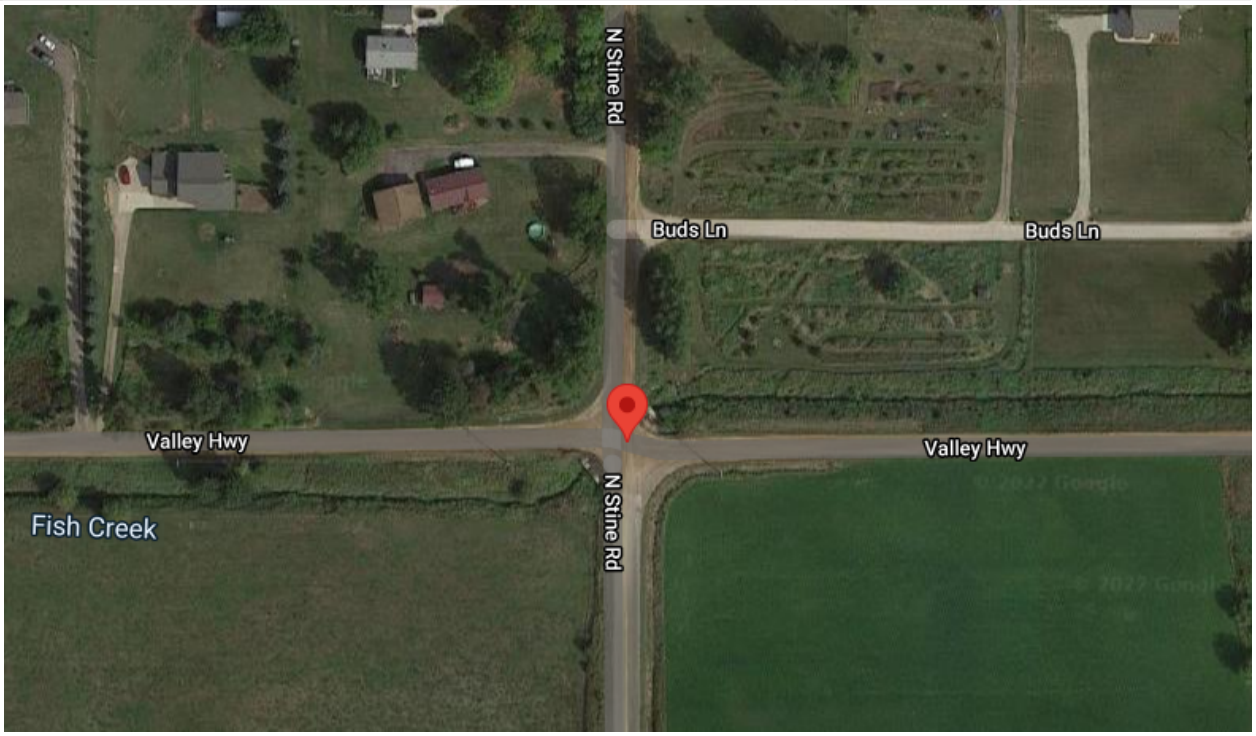
- Head North on Main St.
- Turn left onto Kalamo St.
- Continue onto Ainger Rd.
- Turn right onto Battle Creek Rd.
- Continue onto State St.
- Slight left onto S Lincoln St.
- Turn left onto W Lawrence Ave.
- Turn right onto N Wheaton Rd.
- Turn left onto W Kinsel Hwy.

End Coordinates: 42.597073, -84.870936



SITE 11

Name	Subwatershed	Latitude	Longitude
Fish Creek @ Valley and Stine	Fish Creek	42.582735	-84.895108

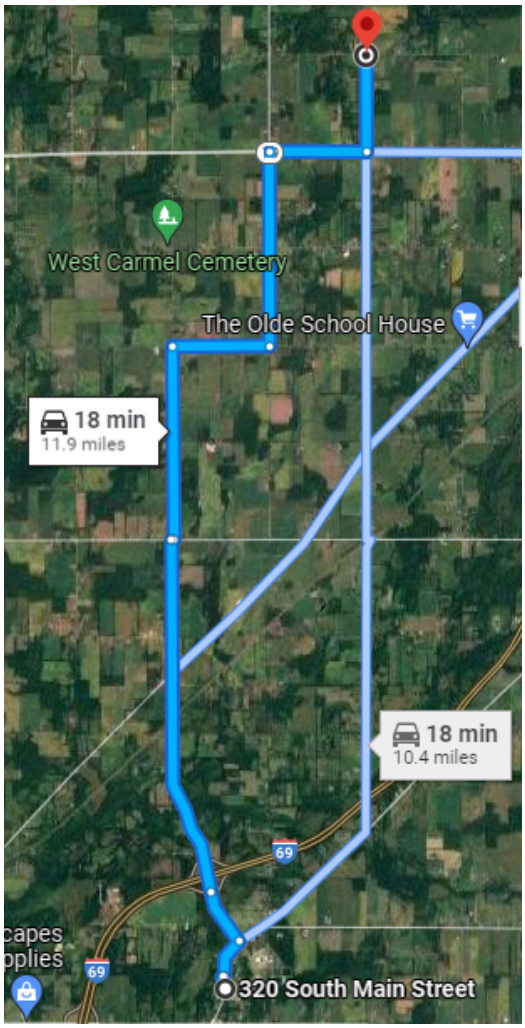


Driving Directions:

Site 11 Directions from 320 S. Main Street, Olivet, MI:

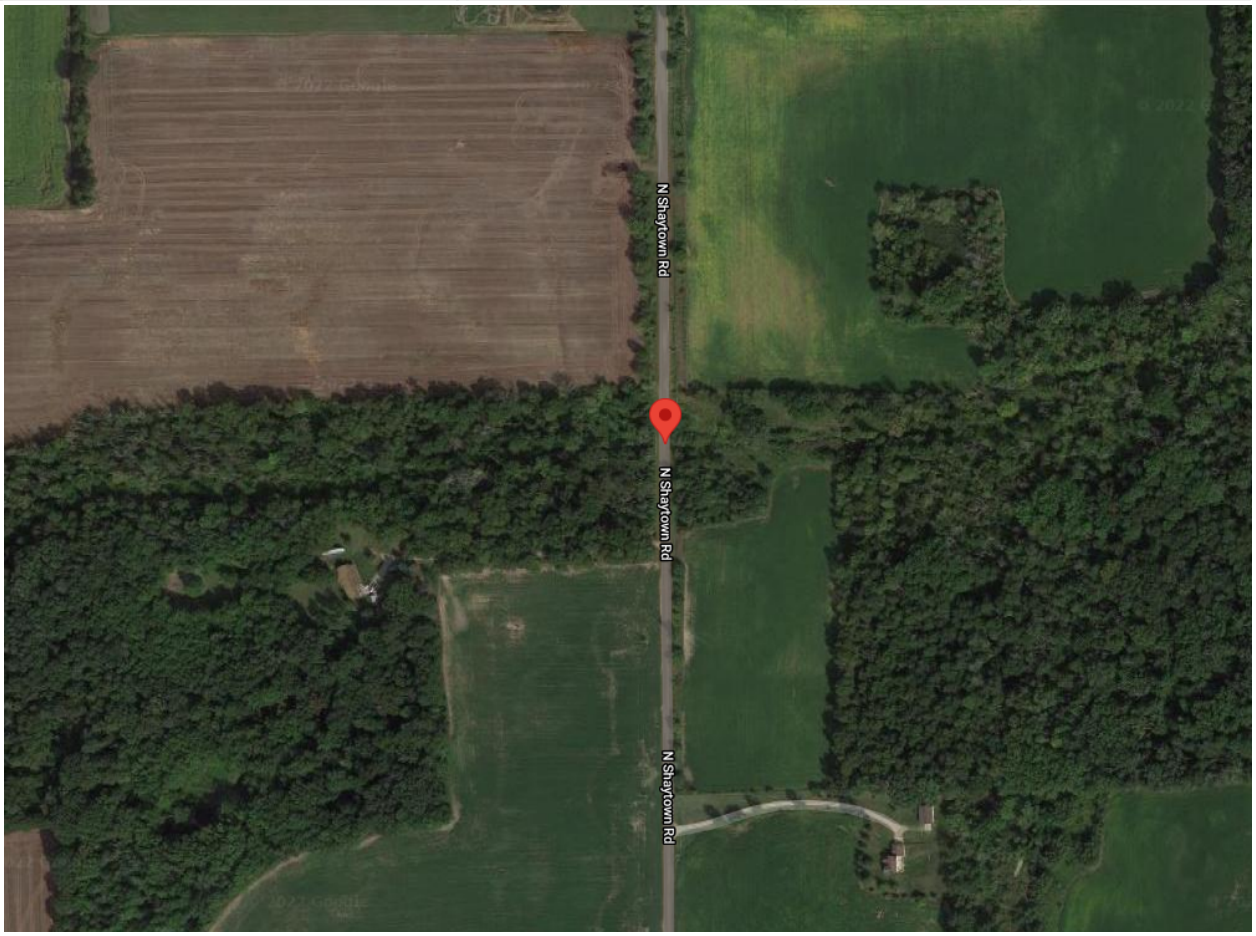
- Head North on Main St.
- Turn left onto Kalamo St.
- Continue onto Ainger Rd.
- Turn right onto W 5 Point Hwy.
- Turn left to continue on S Ainger Rd.
- Turn right onto W Kalamo Hwy.
- Turn left at the 1st cross street onto S Chester Rd
- Turn right onto M-79 E
- Turn left at the 1st cross street onto N Stine Rd.
- Turn right at the 1st cross street onto Valley Hwy.
- Site is the stream at the crossroads

End Coordinates: 42.582735, -84.895108



SITE 12

Name	Subwatershed	Latitude	Longitude
Nye and Eaton Drain @ Shaytown	Fish Creek	42.576912	-84.974965

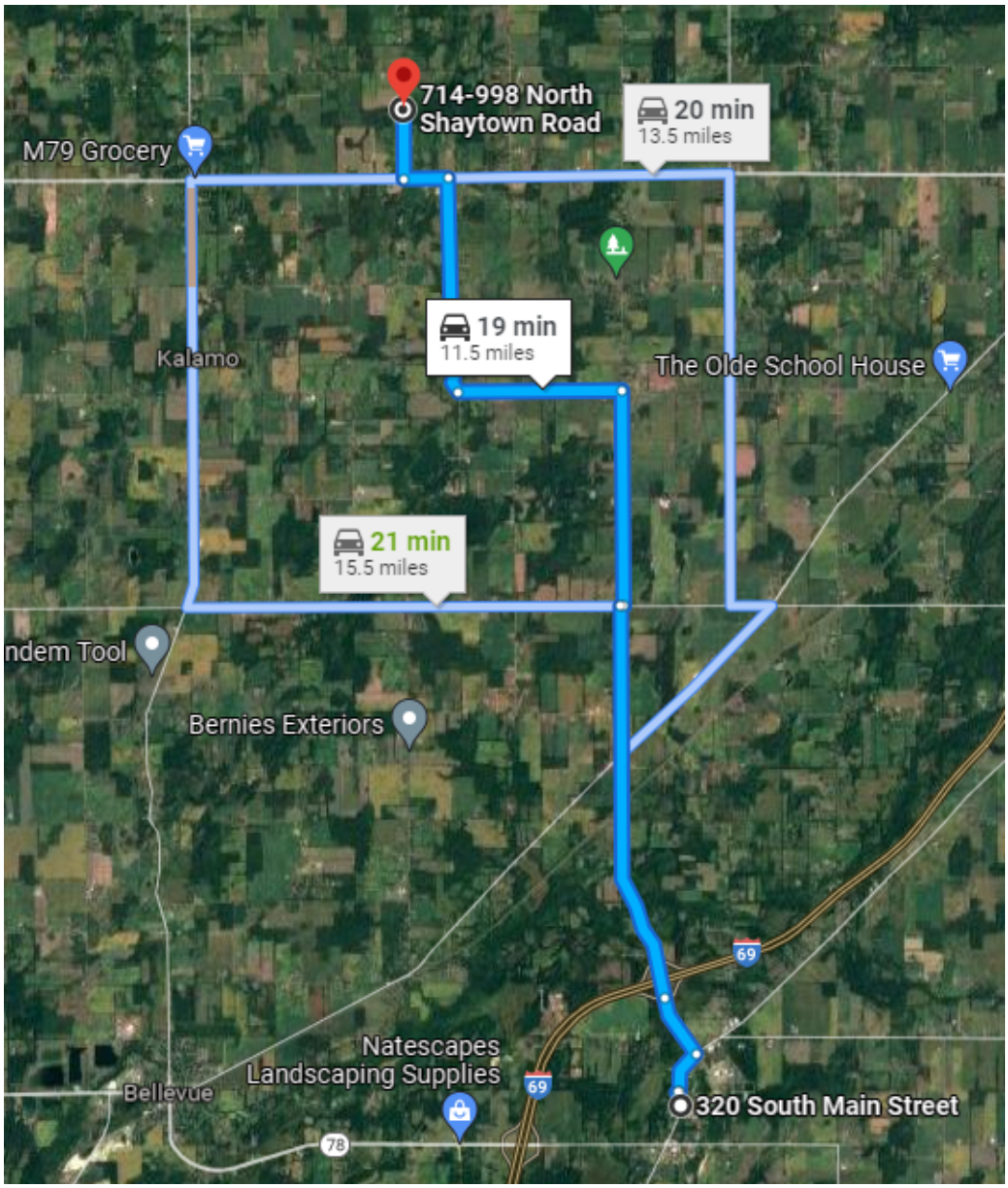


Driving Directions:

Site 12 Directions from 320 S. Main Street, Olivet, MI:

- Head North on Main St.
- Turn left onto Kalamo St.
- Continue onto Ainger Rd.
- Turn right onto W 5 Point Hwy.
- Turn left onto S Ainger Rd.
- Turn right onto S Lacey Lake Rd.
- Turn left onto M-79 W
- Turn right onto N Shaytown Rd.

End Coordinates: 42.576912, -84.974965



Eaton County Stream Monitoring Program Materials List

- sampling directions for volunteers
- MiCorps data sheets
- waders
- buckets (2)
- nets (2)
- labeled sample bottles with ethanol
- reel measuring tape
- forceps/tweezers
- pipettes
- spoons
- pencils
- wader brushes
- diluted bleach solution spray bottle
- rinse water spray bottle
- tarps
- life jacket for deep sites
- ice cube trays (at least 2)
- sorting trays
- first aid kit
- trash bags
- bug spray
- sunscreen
- ID guides
- paper towels
- poison ivy wipes
- lint roller
- wader repair kit
- hand sanitizer
- *A Guide to Freshwater Invertebrates* by Voshell
- dissecting microscope

Monitoring Supplies Details:

Supply	Acceptable Condition	Last Purchased	Storage/Person Responsible
Waders	Dry, no holes, clean	Fall 2022	Olivet College/ Erin Pavloski
Buckets	Dry, no cracks	Spring 2022	Olivet College/ Erin Pavloski
Nets	No holes in nets, firmly attached to poles	Spring 2022	Olivet College/ Erin Pavloski
Forceps/Tweezers	Tips touch	Fall 2022	Olivet College/ Erin Pavloski

Pipettes	Clean	Fall 2022	Olivet College/ Erin Pavloski
Spoons	Clean	Fall 2022	Olivet College/ Erin Pavloski
Pencils	Sharpened, erasers function	Fall 2022	Olivet College/ Erin Pavloski
Labeled Bottles	Bottles don't leak, labels applied	Fall 2022	Olivet College/ Erin Pavloski
70% Ethanol	Stored properly in chemistry lab storage	Fall 2022	Olivet College/ Dr. Susanne Lewis
Wader Brushes	Clean	Fall 2022	Olivet College/ Erin Pavloski
Diluted Bleach Solution Spray Bottle	Refilled day of sampling with 0.05% solution	Spring 2022	Olivet College/ Erin Pavloski
Rinse Water Spray Bottle	Refilled day of sampling	Spring 2022	Olivet College/ Erin Pavloski
Tarps	Debris removed, dry	Fall 2022	Olivet College/ Erin Pavloski
Life Jacket For Deep Sites	Clean	Fall 2022	Olivet College/ Erin Pavloski
Ice Cube Trays	Clean	Fall 2022	Olivet College/ Erin Pavloski
Sorting Trays	Clean	Fall 2022	Olivet College/ Erin Pavloski
First Aid Kit	Stocked	Fall 2022	Olivet College/ Erin Pavloski
Trash Bags	At least three in bin, no holes	Fall 2022	Olivet College/ Erin Pavloski
Bug Spray	Adequate amount left	Fall 2022	Olivet College/ Erin Pavloski
Sunscreen	Adequate amount left	Fall 2022	Olivet College/ Erin Pavloski
ID Guide	Legible, no water damage	Fall 2022	Olivet College/ Erin Pavloski
Paper Towels	Adequate amount left	Fall 2022	Olivet College/ Erin Pavloski
Reel Measuring Tape	Reel functions	Fall 2022	Olivet College/ Erin Pavloski
Poison Ivy Wipes	Adequate amount left, not dried out	Spring 2022	Olivet College/ Erin Pavloski
Lint Roller	Adequate amount left, not dried out	Spring 2022	Olivet College/ Erin Pavloski
Wader Repair Kit	Present in bin	Fall 2022	Olivet College/ Erin Pavloski
Hand Sanitizer	Adequate amount left	Fall 2022	Olivet College/ Erin Pavloski
ID Books	Legible, no water damage	Spring 2022	Olivet College/ Erin Pavloski

Stream Monitoring Operating Procedures

1. Once at the site, look at the stream to check depth and current. Is it safe to enter the stream today?
2. Observe if there is any poison ivy or sumac, or other potential issues that could affect monitoring that day.
3. Look at the stream to see which direction the water is flowing. Remember that Collectors will work downstream to upstream.
4. Have two people measure 300 feet of stream reach for your sampling.
5. Lay down the tarp in a good place for the Picker team members to work.
6. Get the data sheet prepared, and have the Collectors prepare to get in stream in the DOWNSTREAM area. They will work moving UPSTREAM.
7. Once the Collectors are ready, mark the start time on the data sheet and set a timer on your phone.
    a. If one person is collecting, set a 45 minute timer.
    b. If two people are collecting, set a 30 minute timer.
8. Complete the data sheet as you go, noting the different stream habitats sampled or if you see evidence of clams, crayfish, or fish (make a side note about fish).
    a. DO NOT DISTURB OR COLLECT CLAMS OR MUSSELS. PLACE THEM GENTLY BACK WHERE YOU FOUND THEM.
    b. DO NOT COLLECT CRAYFISH OR FISH. PLACE THEM GENTLY BACK WHERE YOU FOUND THEM.
9. The Team Leader should ensure that the Collector(s) are keeping up with the sampling time. They should be halfway through the 300 ft. sampling halfway through the time. (If it is mucky and slow-moving, you can add some extra time to sampling.)
10. Have the Collector Assistants run material back and forth to the Pickers.
11. Pickers should pick for one hour, or until all of the collected material has been picked through.
12. Add the macroinvertebrate specimens to the labeled collection jar (check label to ensure it's the correct site number).
13. Once Picking time is done, record the end time and make sure the data sheet is complete.
14. Once sampling is done, you can rinse the equipment with the stream water to wash away any collected material, mud, etc.
15. Inspect all clothing and equipment for any additional mud and plant material and remove it at the site. Boot brushes and a lint roller are in the bin.
16. Once everything is rinsed and inspected, and material has been removed, set a tarp <u>away</u> from the stream in a <u>safe place away from traffic</u>, and place equipment on the tarp.
17. Disinfect the equipment (buckets, trays, nets, waders, etc.) by using the spray bottle of diluted bleach. Once sprayed, let it sit for 10 minutes.
    a. As you wait, you can look at the area for trash and collect it in the trash bag in the bin.
18. Once the 10 minutes has elapsed for the bleach solution to disinfect the equipment, you can spray it all down with the tap water spray bottles.
19. Make sure all team members use hand sanitizer to clean their hands. It is recommended that they wash their hands when they return to the classroom/home.

Questions: Erin Pavloski's cell # 906-440-7211

Stream Macroinvertebrate Monitoring Protocols

Developed by MiCorps

A. TEAM COMPOSITION

Macroinvertebrate collection is carried out by teams of staff and/or volunteers consisting of no fewer than 3 people and up to 6 or 7. More people than that is acceptable but as more join a team, crowding and equipment issues can hamper team effectiveness.

Team Member Roles:

- **Collector** - Must be trained in collection techniques. This person is the only one to enter the water and use the net to pull out debris and macroinvertebrates. However, on larger rivers or streams with overgrown banks it is helpful to have a Collector's Assistant
- **Collector's Assistant** - In waders assisting the Collector by carrying trays back and forth from the Collector to the Pickers
- **Team Leader** - Preferably been to a special training but at a minimum has participated in the monitoring previously. The Team Leader directs the rest of the team, the Pickers, who do not have to be trained ahead of time. On-site directions are sufficient as the Picker role is very easy and done under direct supervision of the Team Leader.
- **Pickers** - Sit on the bank of the stream to pick insects out of the trays and put the specimens in the sample vials. The Team Leader will help pick and also fills out data sheets, watches the time, and keeps the team organized.

B. SAMPLING

The sampling effort expended to collect benthic macroinvertebrates at each 300 foot site should be sufficient to ensure that all types of benthic invertebrate habitats are sampled in the stream reach. This generally will be about 35-45 minutes of total sampling time per station (1 person = 45 minutes, 2 people = 30 minutes). You should be flexible on the timing for Collectors who move slowly in the water, because of either tricky wading and walking conditions or inexperience. If sampling goes slow, sample longer than 45 minutes at your discretion; the goal is to keep the total effort the same across all sampling outings.

Macroinvertebrate samples should be collected from all available habitats within the stream reach using a dip net with a 1-millimeter (mm) mesh, or by hand picking bigger items like logs and rocks.

Available habitat types can include but aren't limited to riffles, pools, cobbles, aquatic plants, runs, stream margins, leaf packs, undercut banks, overhanging vegetation, and submerged wood. Habitat and substrate types from which macroinvertebrates were collected (or collections were attempted) should be recorded on the form; include as many as possible. People on the bank can aid the Collector by reminding them of the different habitat types to sample.

As the Collector obtains debris in their net, the debris is dumped into white trays along the bank. The Pickers will then sort through the debris and place the macroinvertebrates into jar(s) of 70% ethanol preservative for later identification. The Team Leader should show Pickers how to sort through the tray, and to inspect rocks and other debris, emphasizing hidden locations under bark and in caddisfly cases. The Team leader should stress patience. Use some water to get things moving as a dry sample is nearly impossible to pick through.

Be sure that every jar has a laser printer label (or handwritten with pencil) to avoid the ink running.

The Pickers should work for about one hour in total or until they have gone through all the debris provided by the Collector, whichever comes first. The team should set a timer or mark the start time in order to be accurate. Teams must strive to get at least 100 specimens. They are not expected to count it, but generally they should have a good sense as they go if they are meeting that benchmark. The Water Quality Rating (WQR) is designed to be most accurate with sample sizes of at least 100 specimens.

C. COLLECTING TECHNIQUES IN DIFFERENT HABITATS

General Techniques:

1. Collecting should begin at the downstream end of the stream reach and work upstream.
2. Please note that many mussels are endangered or threatened. Don't collect mussels and clams; don't even take them out of the water or dislodge them. Make a note on the datasheet if they are found.
3. While crayfish are not endangered, they are too big usually to fit in sample jars. Make note of crayfish and then release them as well. Make note of fish too.
4. Remember - BE AGGRESSIVE- the animals are holding on tight to rocks, branches, and leaves to avoid being carried downstream and you want to shake them loose!
5. Always point the opening of the net upstream so the current does not wash out your net.
6. Lift up carefully in sweeping motions to avoid losing organisms.

Here are sampling techniques for a variety of stream habitats:

Riffles/Runs:

1. Keep in mind that flow has a big impact on the types of animals that can live there. Both riffles and runs are areas of faster moving water. A riffle (white water present, larger rocks) and a run (no white water, smaller gravel sized rocks) will likely yield different animals.
2. Put the net on the bottom of the stream, stand upstream, and hold the net handle upright.
3. 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. 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.
2. Don't oversample muck. Not much will live here, and it is difficult to sort through. Process one or two nets worth and then don't go back to this habitat.

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.

Rocks/Logs:

1. Small logs and rocks can be pulled out of the water by hand and given to the team to search for animals.
    a. Hint for Logs: Be sure to check under bark.
    b. Hint for Rocks: Caddisfly homes often look like small piles of sticks, clumps of small gravel, or even tiny circular pieces of algae 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 them apart and look for animals.
2. Sometimes a little water in the pan with the leaves will help dislodge the animals.

D. CLEANING YOUR GEAR (Decontamination Best Practices)

Remember to clean the net and pans before leaving the site to avoid transporting animals or plants and invasive species.

If you plan to use the gear again within the next month, air drying is not sufficient. In that case, you must clean out the treads of the waders, get all dirt or debris out of the equipment, and use a dilute bleach or similar disinfectant to sanitize the gear. For full instructions on decontamination processes, see https://www.hrwc.org/volunteer/decontaminate/

E. STREAM MACROINVERTEBRATE DATASHEET (Front)

- *MiCorps Site ID#*: You should create a unique numbering system for your sites. A suggested approach would be to use your organization's abbreviations and combine it with a number. For example, HRWC-1. You want to pick a numbering system that won’t accidentally copy another organization’s numbering system. MiCorps staff will contact you if your numbering system is not unique.

- *Site Name*: Use a combination of the stream name and location from which you access the study site. For example, Arms Creek at Walsh Road.

- *Stream Name*: Use the stream or river name found on the U.S. Geological Survey (USGS) topographic map for the area and note also the local name if it is different. For tributary streams to major rivers, record the tributary stream name here, not the major river name. If the tributary is an unnamed tributary, record as “Unnamed Tributary to” followed by the name of the next named stream downstream. For

example, a station on an unnamed tributary of Hogg Creek would be recorded as “Unnamed Tributary to Hogg Creek”.

- *Location*: This is often the name of the road from which you access the study site, or name of the public park. It is very important to indicate whether the site is upstream or downstream of the road. If the same road crosses a single stream two or more times, it is sometimes desirable to record the road name relative to the nearest crossroads (e.g. “Green Road between Brown Road and Hill Road”).

- *Date*: Record the month, day and year. Collection Start Time: Record the time when the monitoring activity began. Major Watershed: Record the name of the major watershed where the study site is located (e.g., Grand River Watershed, St. Mary’s River Watershed), and the corresponding HUC Code, if known.

- *Longitude and Latitude*: Record the latitude and longitude coordinates of the study site. Ideally, these coordinates will correspond to the midpoint of the stream study reach.

- *Names of Team Members*: Record the name of all the team members participating in the assessment, and circle the one recording the data, in case questions come up later.

- *Stream Conditions*: This section is important for interpreting the data after the collection and identification. If results are much worse than normal, this information will help the program manager conclude that conditions on the sample day were not representative of the stream’s normal range of conditions and may flag the site for resample or strike the results from the long-term dataset.

- *Average Water Depth*: This value can be taken from the Stream Habitat Assessment datasheet, if completed at the same time. Otherwise, to measure average water depth (ft), three measurements should be made at random points along the representative reach length being surveyed, and these values averaged for a mean depth.

- *Notable weather conditions of the last week*: Substantial rainfall or drought especially can cause fluctuations in macroinvertebrate results.

- *Are there current site conditions that may impede normal macroinvertebrate sampling?* This is left open for volunteers to comment on anything that would affect the study (for example, weather, flooding, poor visibility like high turbidity, difficult wading conditions, etc).

- *Habitat Types*: A list of stream microhabitats are provided so that the Streamside Leader can remind the Collector of what different places to sample. Sample as many of these as possible, checking them off as you go.

- *Did you see any crayfish or clams/mussels?* Do not collect these, but record the number that you see so you can use them in your water quality rating.

- *Collection Finish Time and Picking Finish Time*: Record the time the collector stops their work in the stream and the time when Pickers put the last specimen in the collection jars.

- *Identifications Made/Supervised*: Record who was responsible for giving the final identification of the specimens.

MiCorps Site ID#:_____

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 9/30/2024
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	
	Stonefly	Plecoptera	1.6	
	Sensitive True Fly (water snipe fly,net-winged midge, dixid midge)	Athericidae, Blephariceridae, Dixidae,	1.9	
	Caddisfly	Trichoptera	2.6	
	Mayfly	Ephemeroptera	3.0	
	Dragonfly	Odonata	3.4	
	Alderfly	Megaloptera, Sialidae	4.0	
	Beetle	Coleoptera	4.4	
	Free-living Caddisfly	Hydropsychidae, Trichoptera	4.5	
	True Bug	Hemiptera	5.5	
	Somewhat Sensitive True Fly	Dipterans (those not listed elsewhere)	5.9	
	Scud	Amphipoda	6.0	
	Crayfish	Decapoda	6.0	
	Damselfly	Odonata	6.2	
	Bivalve/Snail	Pelecypoda, Gastropoda	7.1	
	Sowbug	Isopoda	8.0	
	Tolerant True Fly (mosquito, rat-tailed maggot, soldier fly)	Culicidae, Syrphidae, Stratiomyidae	8.5	
	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 9/30/2024
Data entered into MiCorps database by:_____ Date:_____

Identification and Data Sheet Information

Developed by MiCorps

A. IDENTIFICATION

Identification can be performed in the field or in an indoor setting (recommended), as desired by the monitoring organizations. Volunteers who lack identification experience must be overseen by an identification expert or program's scientific advisor; in any case, the final identification must be confirmed by this person(s). The organisms in the collection should be identified to order, sub-order, or family, as indicated on the MiCorps datasheet, using taxonomic keys. The abundance of each taxon in the stream study site should be recorded on the datasheet.

B. STREAM MACROINVERTEBRATE DATASHEET (Back):

Identification and Assessment: MiCorps requires stream monitoring programs to identify macroinvertebrates to the Order level primarily, sometimes sub-Orders, and sometimes Family. This system was built to be a balance between scientific accuracy and the ability of volunteers to learn how to identify insects with a moderate level of effort. While requiring genus-species level identification would be most scientifically accurate, it would prevent the program from being conducted as a volunteer program.

With counts and identifications complete, it is possible to produce a single score for the site. This scoring system is based on the Hilsenhoff Biotic Index, a scheme established by Dr. William Hilsenhoff, a famous (for this field) entomology professor from the University of Wisconsin Madison. Hilsenoff and those who took up his work afterwards have assigned pollution sensitivity ratings to most macroinvertebrate species, genera, and families. Using the sensitivity ratings, a type of weighted average can be calculated to generate the pollution tolerance rating (or water quality rating) for macroinvertebrate samples on a scale of 0 (very pollution sensitive) to 10 (very pollution tolerant).

In MiCorps protocols, we are not identifying macroinvertebrates to the lower taxonomic levels, so leeway had to be taken with Hilsenhoff's sensitivity score to produce an average sensitivity rating for each of the taxonomic groups on the datasheet. This was done by averaging the sensitivity ratings of the different families and assigning the result to the larger taxonomic group. For example, the sensitivity ratings for the eight families of stoneflies found in Michigan were averaged for a result of 1.1. Thus 1.1 is the sensitivity for the MiCorps Stonefly group.

In other words, the sensitivity ratings that MiCorps uses are best estimates for that taxonomic order but are not perfect. Again, this loss of accuracy is because of the balance that needs to be met between identification and volunteer/program leader ability.

The final MiCorps score given to each site is called the WQR (Water Quality Rating).

To calculate the WQR, follow these steps:

1. As you identify your macroinvertebrates, record the number you found for each type in the left column marked “Count”. When you are done, add up all the “Count” columns to get a total abundance.
2. Multiply the “Count” by the given Sensitivity Rating for each taxa group and record it in the column “Count x Sensitivity”. For example, if you found 30 mayflies you would multiply 30 x 3.4 and record 102 in the “Count x Sensitivity” column.
3. Add up all the values in the “Count x Sensitivity” column and record this in the box “Sum of (Count x Sensitivity).
4. Divide the “Sum of (County x Sensitivity)” by the “Total Abundance.” The result is the site’s Water Quality Rating (WQR). The lower the score, the more pollution sensitive insects are found, and the better the water quality.
5. Important Note about Abundance: This rating scale does not work when macroinvertebrate abundance is low, as a few sensitive taxa can pull the score down to very healthy levels, biasing the results. To correct for this:
    a. If abundance is less than 30, the site is automatically given a WQR of 10 (very poor).
    b. If the abundance is less than 60, the site is automatically given a WQR of 7 (poor rating). Teams should be striving to collect at least 100 specimens from each site.
    c. If the team collects from 60-99 specimens, then score the site as normal and input it into the MiCorps data exchange as normal but consider the rating to be somewhat tentative and strive for higher abundances in future visits.

Stream Monitoring
Identification Chart
Initial Identification and Count

Names:

Sample Number:

Identify the individuals in your sample. Use your ice cube tray and enter in your initial ID and counts using the table below. Each cell represents a well in your tray:

Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:
Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:	Common Name: Order: Count:

Once complete, another pair will review your IDs and counts.

Stream Monitoring
Identification Chart
Peer Review Identification and Count

Names:

Verify Sample Number:

Look at the initial identifications. Verify the common name, order, and count of each species in each well of the tray for the entire sample. Write in your data below. Please make sure you note any differences you had from the initial ID and counts.

Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?
Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?	Common Name: Order: Count: Difference?

Once done, DO NOT MOVE YOUR SPECIMENS FROM THE TRAY. Please have the ID verified by Prof. Pavloski. Once verified, you can transfer the count data to the MiCorps Data Sheet and calculate the water quality rating.

Verification Name:

STREAM HABITAT ASSESSMENT

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

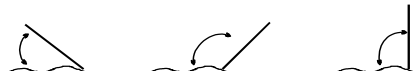
STREAM TRANSECT DATASHEET

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