Macroinvertebrate Monitoring and Habitat Assessment Procedures

Starting at 11:15

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MiCorps Stream Program Manager

Michigan Clean Water Corps






Aquatic Insects are Diverse and Interesting




Why collect “bugs”…”macros”…”benthics”… “insects”…” “BMIs…” ?

Good science

- Good indicators of stream conditions (they live there all the time!)
- Diversity and abundance = Healthy stream
- Threats to bug diversity
  - Sedimentation
  - Habitat loss
  - Chemical/organic pollution

Good for volunteers

- Easy sampling techniques
- Generally abundant communities
- It is a unique experience

How do we collect BMIs?

Outline

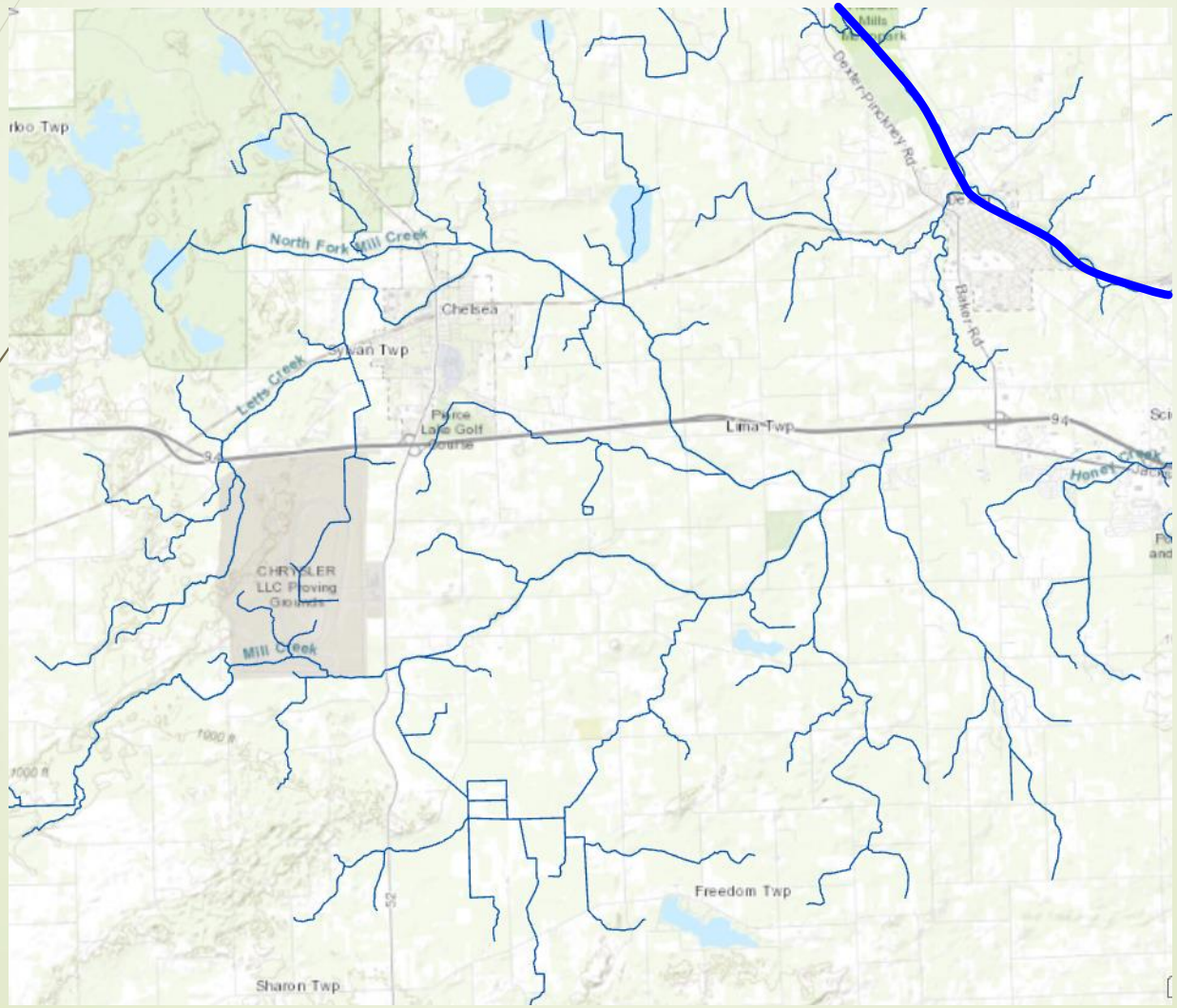
1. Survey Design
2. Teams & Equipment
3. Collection and Picking
4. Decon/Clean up
5. Identification.
6. Scoring

1. Sample Design
Pick your Sample Sites

- More sites are obviously… more better.
- But we all have money & labor & time restrictions
- MiCorps requires 6 sites to get an implementation grant
- You should try to grow this number over time

1. Sample Design

Pick your Sample Sites



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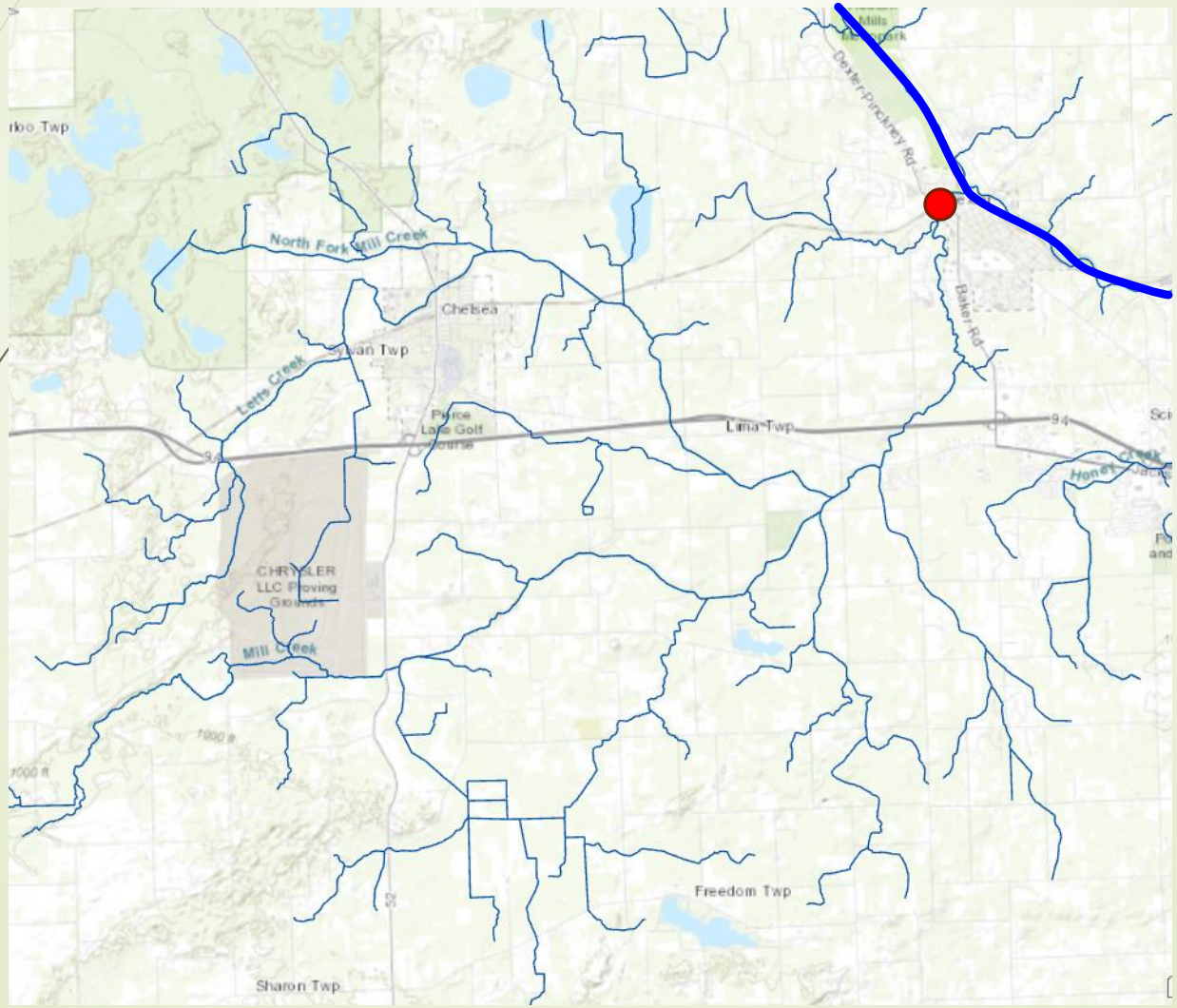

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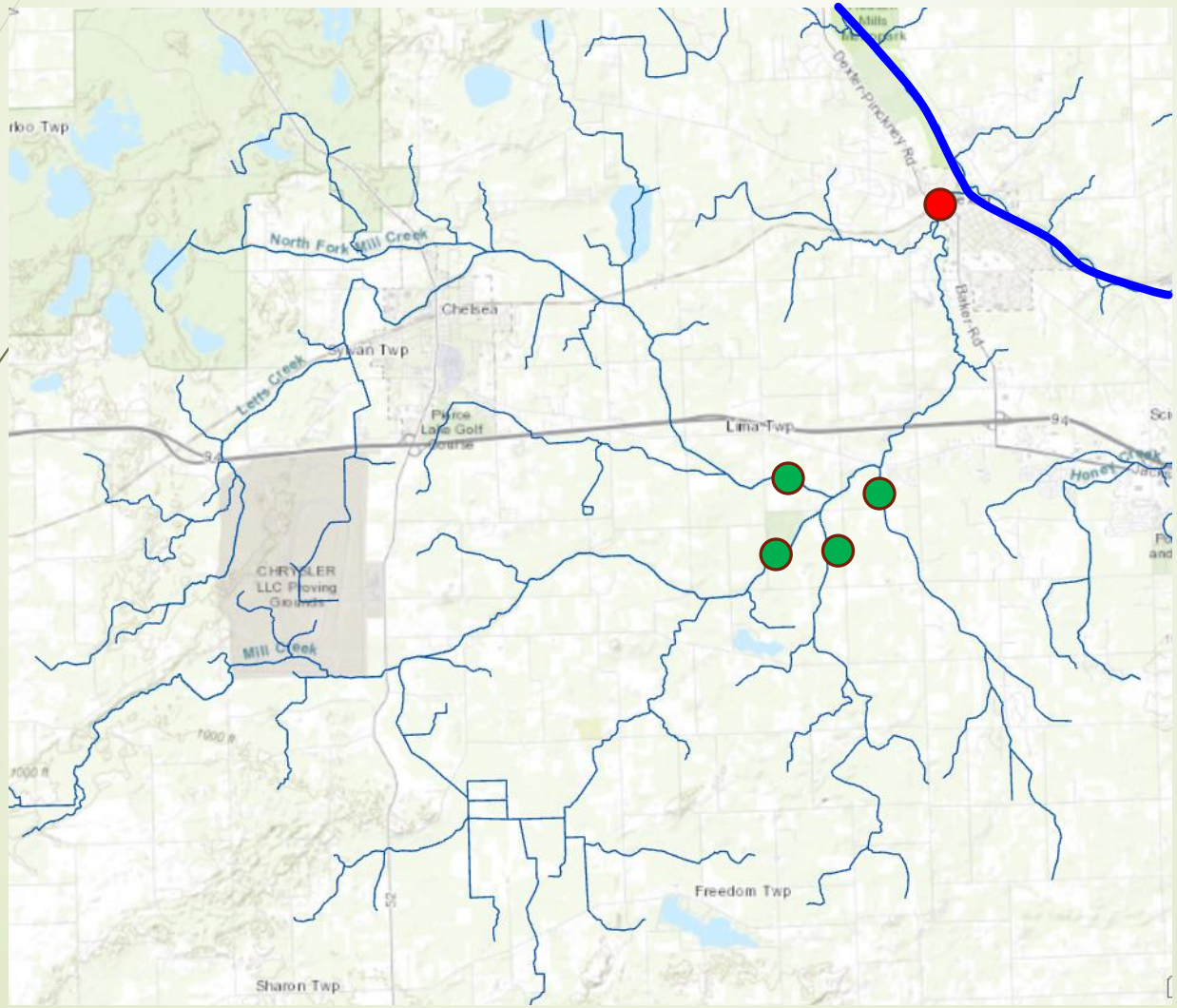

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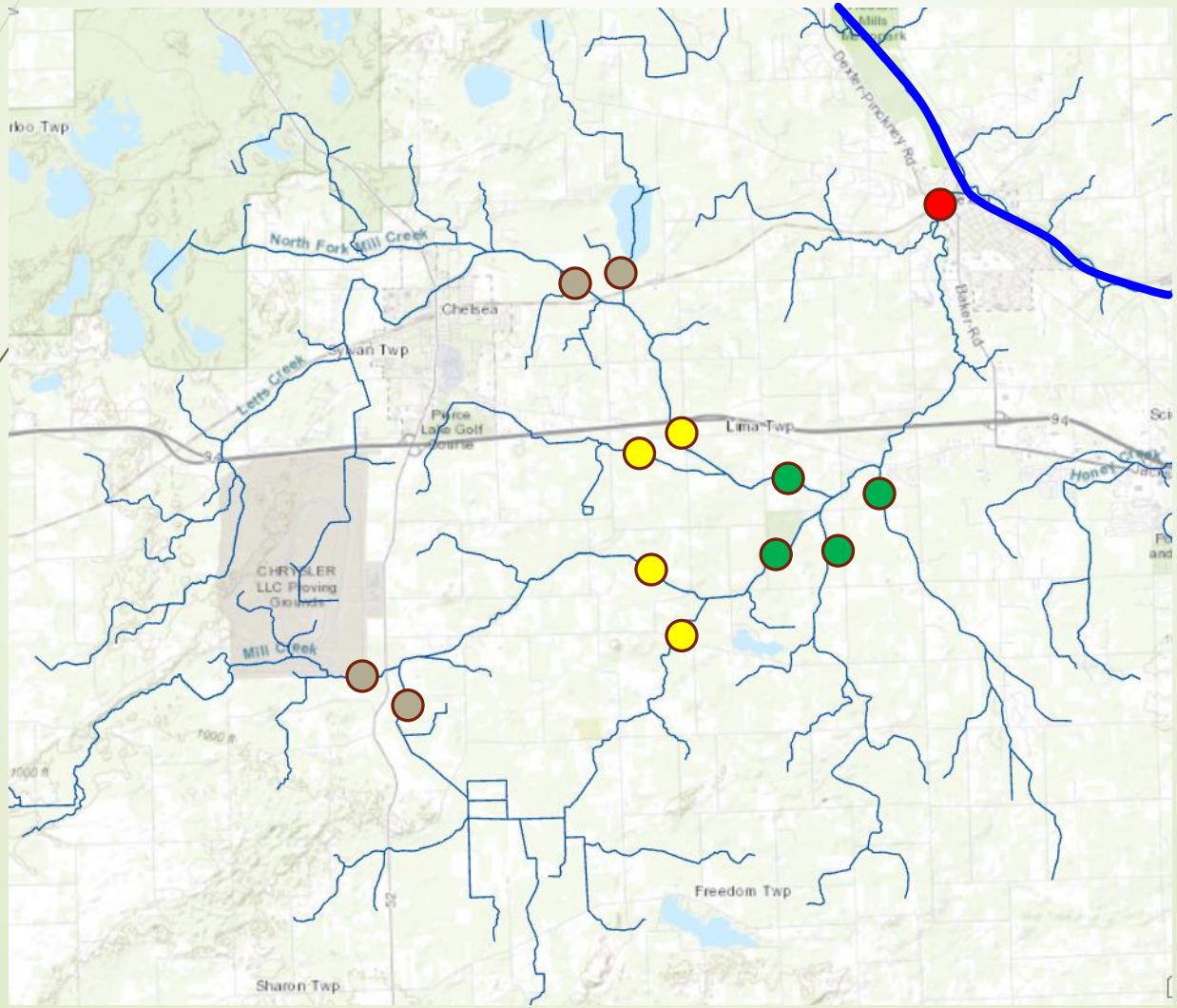


1. Sample Design
Pick your Sample Sites

- Permission Constraints
  - Private Property: Don't sample where you don't have permission
  - Generally speaking you should have inherent permissions on public lands but it is something you should confirm.
  - Always consider safety/ease of parking and volunteers (avoid deep & mucky areas)
  - Aside: Macroinvertebrate Monitoring does not require permitting.
- You may have a specific water quality concern at a certain location which overrides my hypothetical example.

1. Sample Design
Time of Year/Frequency

- MiCorps groups monitor Twice a Year.
  - Autumn
    - September or October
  - Spring
    - April, May, or June
    - Southern Michigan– last week of April or first week of May
    - Northern Michigan– often in late May/ early June
- Ask other groups with your approx. latitude what they do
- Pick a two week timeframe and stick with it so your samples can be compared year to year.

2. Teams and Equipment
Train first… But only the Collectors!

- Hold a special session for those who want to be Collectors.
  - You don't want a Collector's first-time experience holding a net to be the official collection!
  - Go over procedures, show them microhabitats, and they should get into a creek and practice.
  - "I've done this so much… I have done this and that…."
    - Respond: "Great! We would love to have you. Come to our training to make sure you know our specific sampling constraints..." (feel free to blame MiCorps)

- Don't make newcomers sit through a long training to be a Picker. A 10-15 introduction is all they need, and then they can learn by doing!
  - Putting unneeded barriers on participate will lower participation.

2. Teams and Equipment
Team Makeup

- Team size: Preferably 4-6;
  - Doable with 2-3 but not recommended and they may have to pick longer than the set length.
  - Never send out a single person (safety considerations)
  - >6 and they will start tripping over each other and run out of tweezers and trays; though it depends on the site & how much you give them of course.

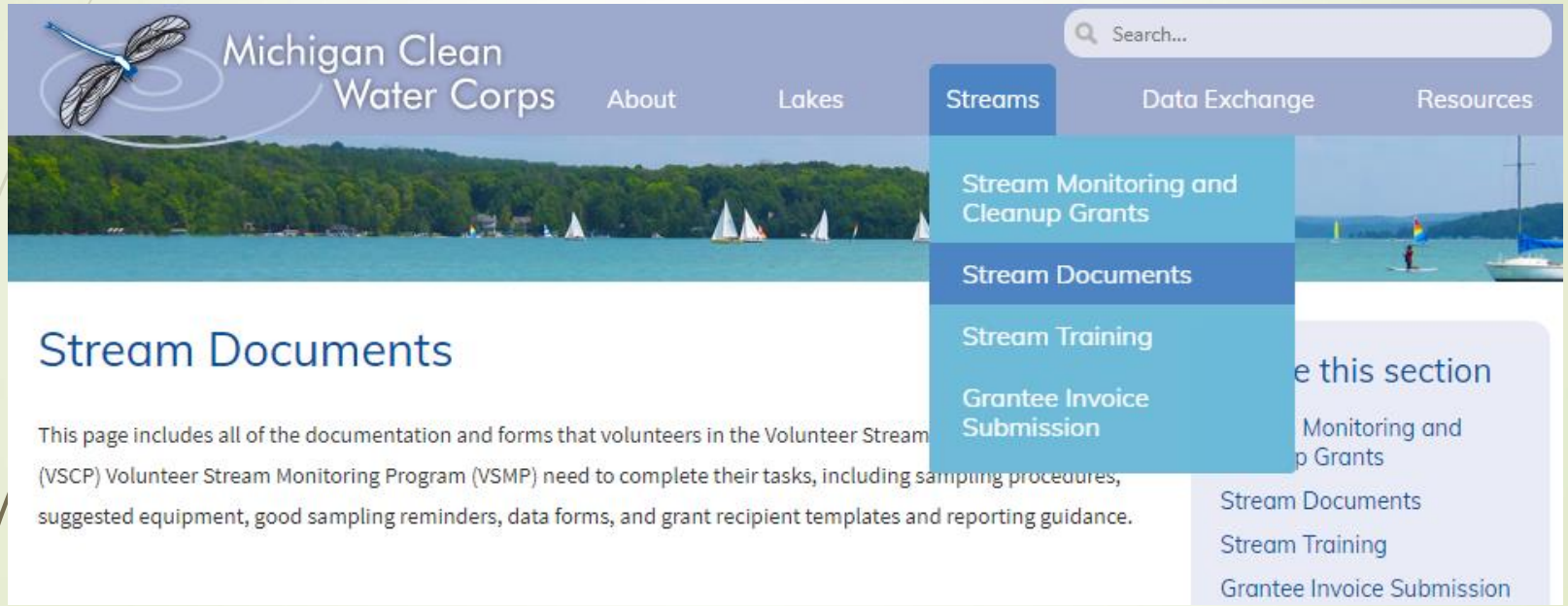
Optimal Team of 5:

- 1 Collector
- 1 Leader
- 1 Collector's Assistant/Picker
- 2 Pickers

2. Teams and Equipment
Equipment

- See list of equipment:

micorps.net



- Visiting a different group can be a way of learning what other types of equipment may be helpful for your organization.

Safety Guidelines for Stream Work

Tell your teams:

- Keep your collector in sight
- Move slowly and cautiously
- Beware of instream items that could be scientific equipment, or dangerous (like rebar and chunks of concrete)
- To wear life jackets if appropriate

Prior to going out, the coordinator should:

- Obtain permission from landowners & let them know when you are coming
- Contact Health Department/EGLE for specific stream warnings
  - You may have streams with known E.Coli or PFAS problems or Endangered Species or NZ Mudsnails
- Send teams out with first aid kit
- Have volunteers sign waivers

3. Collection

The Collector gets in the water….

- Wadable water
- 35-45 minute total effort.
- 300 foot stream section.
- Work upstream, always heading toward clean water (for visibility purposes)
- Collectors gets to as many microhabitats as they see
  - Riffles
  - Pools
  - Cobbles
  - Aquatic Plants
  - Runs
  - Stream Margins
  - Leaf Packs
  - Undercut banks
  - Overhanging vegetation
  - Woody debris

3. Collection

- Shuffling, pulling, scraping, dragging, grabbing with hands
- The Collector is not stopping to examine their net and never dumps debris back into the river…. That's not their job!
- Collector brings debris over to the team for immediate picking or put debris into a bucket for later picking
- Muck is miserable. Minimize muck mass.

3. Direct Your Pickers to…

- Place macroinvertebrates into small jars of 70% ethanol or 70% isopropanol.
- Strive for at least 60 creatures(>100 preferable)
- They don't need to count them, just have a good general sense…
- Keep everything found, within the 60 minute picking time limit.

- Aside: A head Picker or Leader (with experience or trained), is a very helpful person to have on the stream bank.

3. Direct Your Pickers to…

- Don’t prefer one type of creature over another
- Optional: If they pass >150 insects, you can have them stop.
- Count them and release: Any clam, mussel, snail, fish, & crayfish
  - Exception: Give them New Zealand Mudsnail pictures. They should keep these snails and tell you about them, if they think they saw them.
  - What you should do: Get in touch with an EGLE biologist (you can email me too and I can help find the right person)

4. Decontamination

- New in 2021: Equipment decontamination with dilute bleach or other chemical like 409 is a required component of MiCorps sampling.
- Decontamination procedures must be listed in any approved QAPP (quality assurance plan)
- https://www.hrwc.org/volunteer/decontaminate/

DECONTAMINATE YOUR MONITORING GEAR!

Scientific monitoring is essential for learning more about our environment, but scientists and volunteers can transfer invasive species from one place to another and cause more harm than good!

HRWC is equipping our volunteers with decontamination kits that will be used to stop invasive species spread. Kits have been given to MiCorps partners across the state to do the same!

Download and read this Invasive Species Prevention Kit (pdf) for more detailed information: kit contents, procedures, and bleach information. All volunteers should watch this video and follow these few simple steps! Inspect, Remove, Disinfect and Dry.

5. Identification

- You can do ID after collection, or hold a different event in the following weeks.
- Volunteers are welcome to do their own identification, in the field or office, for educational purposes, but this can NEVER be the official ID.
- Don’t do ID during picking except for light education purposes; the goal of this time is to pick.
- You need to have an ID expert confirm or do all identifications.
- You can judge who qualifies as ID experts.
- You should NOT…
  - Do the official ID in the field.
  - Do the official ID on live creatures.
  - Have the volunteers only save a few insects of each type (structure your monitoring in a way to minimize volunteers making judgement calls)
- Aside: Save all samples for at least 5 years.

6. Scoring

Hilsenhoff methods measures sensitivity to organic pollution (0-10)

- Pollution delivered to a stream through both point and non-point method; from natural, agricultural, and urban sources
- Waste-water; fertilizers & nutrients; pesticides
- Strongly connected to oxygen levels

- Secondarily connected to habitat quality and flow
  - Areas with higher organic pollution will have degraded habitat through landuse/development impacts
  - More bank erosion; fine sediment; flashy water flows

6. Scoring

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
	Helgrammite (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)	Cuclidae, Syphridae, Stratiomyidae	8.7	
	Leech	Hirundinae	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
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8.51-10.0	very poor		Severe pollution likely

Water Quality Rating =

Sum of (Count x Sensitivity)
Divided By
Total Abundance

= _____

MiCorps Site ID#:_____

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1. Add Total Abundance.

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1. Add Total Abundance.

< 30 -- these are the worst of the worst samples. If you can't get 30 bugs in an hour's work, the stream is heavily degraded. (10, Very Poor)

< 60 -- Certainly a problematic stream that should not be given a good score. (7, Poor)

60+ – No penalty, but always strive to get over 100 insects at site.

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	Stonefly	Plecoptera	1.3	
35	Caddisfly	Trichoptera	3.2	112
15	Mayfly	Ephemeroptera	3.5	52.5
	Alderfly	Megaloptera, Sialidae	4.0	
	Scud	Amphipoda	4.0	
	Dragonfly	Odonata	4.0	
6	Beetle	Coleoptera	5.1	25.5
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	True Bug	Hemiptera	7.7	
15	Damselfly	Odonata	7.7	115.5
	Sowbug	Isopoda	8.0	
	Tolerant True Fly (mosquito, rat-tailed maggot, soldier fly)	Cuclidae, Syphridae, Stratiomyidae	8.7	
3	Leech	Hirundinae	10.0	30
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1. **Add Total Abundance.**
2. **Multiply: Count x Sensitivity for each line**

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75	**Total Abundance**	**Sum of (Count x Sensitivity):**	**335.5**

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1. **Add Total Abundance.**
2. **Multiply: Count x Sensitivity for each line**
3. **Sum the Count x Sensitivity Column**

WaterCorps Site ID#:_____

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Divided By
Total Abundance

= 4.47

1. **Add Total Abundance.**
2. **Multiply: Count x Sensitivity for each line**
3. **Sum the Count x Sensitivity Column**
4. **Divide that Sum by the Total Abundance**

Family level Identification

ANNELIDA-Segmented Worms

	Hirudinea	10	
	Oligochaeta	10	

COLEOPTERA- Beetles

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

DIPTERA- True Flies

	Athericidae	2	
	Blephariceridae	0	
	Ceratopogonidae	6	
	Chaoboridae	8	
	Chironomidae	6	
	Culicidae	8	
	Dixidae	1	
	Dolichopodidae	4	
	Empididae	6	
	Ephydridae	6	
	Muscidae	6	
	Psychodidae	8	
	Ptychopteridae	9	
	Sciomyzidae	6	
	Simuliidae	6	
	Stratiomyidae	8	
	Syrphidae	10	
	Tabanidae	6	
	Tipulidae	4	

CRUSTACEA- Crustaceans

	Amphipoda	4	
	Decapoda	6	
	Isopoda	8	

EPHEMEROPTERA- Mayflies

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

GASTROPODA- Snails, Limpets

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

Variations in procedure and logistics

MiCorps allows for a range of preferences; any of these choices are acceptable.

- Amount of training done ahead of time (very little to a lot)
- Two collector vs. One collector
- Using kick-screens (work well in riffle areas)
- Different sizes of white trays
- Picking on a bank vs. Putting everything in a bucket and picking later.
- When ID happens (right after collection vs. few weeks)
- Collect everything on one day vs. two week time period

Variations in procedure and logistics

BUT… somethings are a must.

- Collectors must be trained ahead of time
- Follow MiCorps collection procedures:
  - Total collection effort should be 35-45 minutes no matter the collector number,
  - 300 foot stream sections
  - Don’t pick for more than an hour, and it can be less if it isn’t needed.
- Collectors need a field training or at least a practice sampling session before official collection.
- All macros must be collected in a 2 week window that is similar year after year.
- Don’t do your official ID’s out in the field. Kill the specimens in alcohol, ID in a controlled setting with an expert, keep the specimens.
- QAPPs and side-by-sides are the way to ensure generally consistent procedures from group to group.

Habitat Assessment
What is it?

- The habitat assessment is the complement study to the Macroinvertebrate monitoring.
  - You know what the insects are… the habitat study can help you understand WHY you are finding these macroinvertebrates or why their populations are changing.
- It is a qualitative assessment, not quantitative.
  - Your team will fill out a form answering questions on:
    - Stream Size
    - Flow
    - Presence of Foam/Oil/Trash
    - Stream Bank Condition
    - Plant Community
    - Size/condition of riparian zone
    - Sources of Degradation
    - Optional Pebble Count

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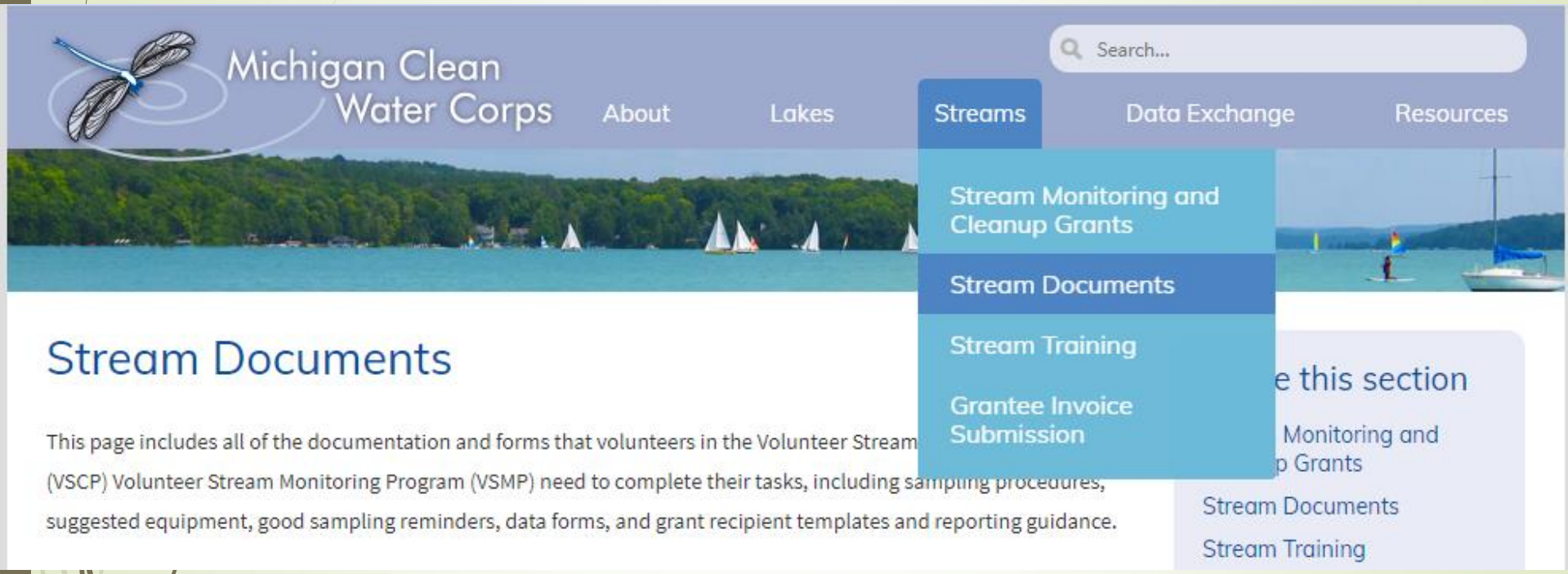


Macroinvertebrate and Habitat Stream Monitoring Procedures

Stream Habitat Datasheet

Habitat Assessment
Training Volunteers

- Assessments aren't hard to do but can be initially confusing.
- Add it to your Collector Training, or go out with volunteers yourself to do a couple with them and show them how to do it.
- You want at least 2 people on the team to be experienced in them. Don't hand off Habitat Assessments to newbies.

Habitat Assessment
How often?

- Conduct the study at least once on each site during the course of a 2 year MiCorps grant

- If not funded by the Implementation Grant, there is no hard rule on how often.
  - HRWC does a habitat assessment at every site once every 5 years.
  - You can do it more often if you feel the site is actively changing.

Habitat Assessment
When to hold it?

- Teams can do the habitat assessment after collecting macroinvertebrates
- Or hold the habitat assessment at a different time of year and treat it as a different event.
- Summer is a good time to conduct a habitat assessment. (Seeing vegetation types and density is part of a habitat assessment).

Habitat Assessment
How to hold the assessment

- 1) The group needs to spend some time at the stream before answering the habitat questions. Explore and poke around the entire 300 foot reach.
- 2) One person walks the group through the data sheet.
- 3) The group, by consensus, rates different aspects of the habitat.
- 4) If the group can't agree on the answer, you take averages (when numbers) or record comments.

Example– Riparian Width

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

Example– Sources of Degradation

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

Remember, for all of these questions, it is what you can see, not what you know or think… but you can add comments with that.

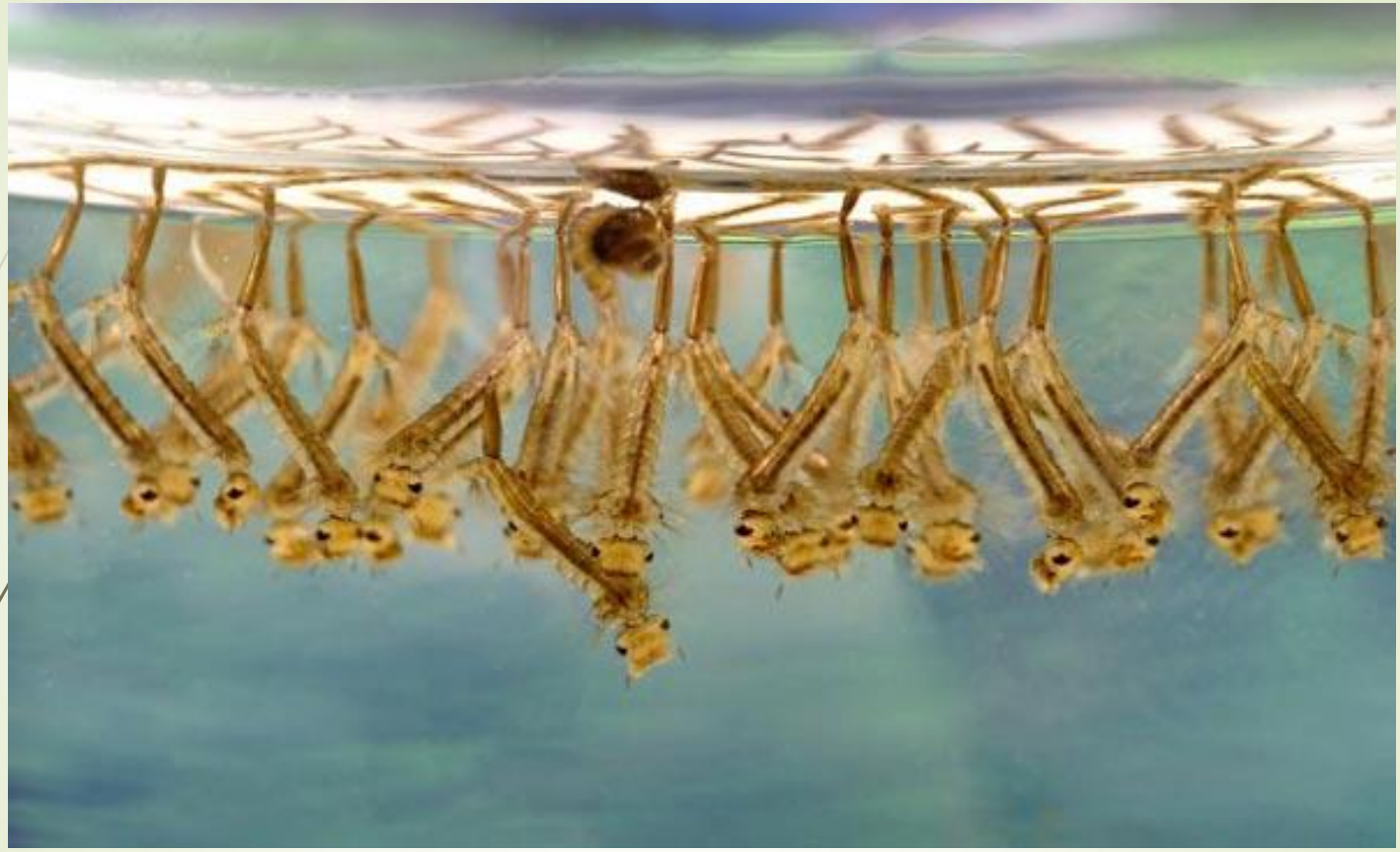
Habitat Assessment
How to hold the assessment

- Stream Size
- Flow
- Presence of Foam/Oil/Trash
- Stream Bank Condition
- Plant Community
- Size/condition of riparian zone
- Sources of Degradation
- Optional Pebble Count

- We normal conduct this training by being out in the field and doing the analysis together to talk through each of these parameters.
- That remains the best way…

- For the one group on the hook to do this during this grant cycle, we'll do it together during a Side by Side visit in August/September.

Questions?



Presentation on Macroinvertebrate ID will start at 1 pm.