

Haw River Watch

A Citizen Water Quality Project of the Haw River Assembly



Part 4: Collecting Macroinvertebrates

What are macroinvertebrates?

- ◆ Macroinvertebrates are organisms which do not have a backbone and are large enough to be seen without a microscope.
- ◆ We are collecting aquatic macroinvertebrates, which means they live in water during some period of their life.
- ◆ These organisms, which include insects, crustaceans, worms, leeches, and mollusks, occupy a variety of niches in the aquatic community.
- ◆ We use them as “indicator species” to help determine the overall health of the stream.



Why do we use macroinvertebrates as water quality indicators?

Macroinvertebrates vary in their sensitivity to pollution. In the Izaak Walton League categorization that we use, there are three groups:

- ◆ **Pollution Sensitive Organisms** (Group 1) are found only in good to excellent water quality. They include stoneflies, mayflies, caddisflies, riffle beetles, gilled snails, and dobsonflies.
- ◆ **Somewhat Pollution Sensitive Organisms** (Group 2) can live in good or fair water quality. They include crayfish, sowbugs, scuds, alderfly larvae, fishfly larvae, damselfly larvae, watersnipe fly larvae, crane fly larvae, beetle larvae, dragonfly larvae, and clams.
- ◆ **Pollution Tolerant Organisms** (Group 3) are the only indicator species which can live in extremely polluted water, but they can also be found in higher quality water. They include aquatic worms, midge fly larvae, blackfly larvae, leeches, pouch and other lunged snails.



Midge fly larvae

How do macroinvertebrates indicate water quality?

Depending on how many and what type we find, we can give our stream a Water Quality Rating.

- ◆ **Excellent Water Quality (>22)** Rating is given when a very large diversity of macroinvertebrate indicator species, both pollution sensitive and pollution tolerant, is found, with many organisms in the pollution sensitive category.
- ◆ **Good Water Quality (17-22)** Rating is given when there is a fairly large diversity of macroinvertebrates, and including some somewhat pollution sensitive organisms.
- ◆ **Fair Water Quality (11-16)** Rating is given when there is less diversity of species, and fewer of the pollution sensitive organisms.
- ◆ **Poor Water Quality (<11)** Rating is given when there are few or no pollution sensitive organisms found; many pollution tolerant organisms may be found.

Where do we look for macroinvertebrates?

- ◆ In riffle areas in the stream, where water is highly oxygenated as it flows over rocks.
- ◆ On the undersides of rocks in the stream.
- ◆ Along stream banks, using a net.
- ◆ In sandy places, where clams can often be dug up.
- ◆ In decomposing leaf packs in the stream.
- ◆ On submerged logs and woody debris in the stream.
- ◆ In the water and along stream banks, where we can often observe crayfish.



In collecting macros:

- ▶ Sample the riffle area with your net.
- ▶ Sample the stream banks with your net.
- ▶ Look on the undersides of rocks in riffle areas.
- ▶ Look in leaf packs.
- ▶ Look for clams in sandy places.
- ▶ Check for crayfish in the stream and along the stream banks.



► ***Sample the riffle area with your net.***

Macroinvertebrates thrive in riffle areas, where the stream flowing over rocks oxygenates the water.

- In the riffle area just downstream of the riffle rocks, place the net upright, with its bottom edge as flat as possible on the stream bottom.
- Make sure that the water is flowing into the net.
- Just upstream in front of the net, kick up the rocks and stream bottom, making sure that the agitated water flows into the net.



▶ *Sample a riffle area with your net (cont.).*

- ▶ You may also use your hands to lift and rinse rocks just in front of the net, again making sure that water flows into the net.
- ▶ Empty the contents of your net into a bin filled with about an inch of clear water, by turning the net inside out and rinsing it in the water in the bin.
- ▶ Remove any critters clinging to the net.
- ▶ Take several riffle samples using the net.



▶ ***Sample the stream bank with your net.***

Certain macroinvertebrates, such as dragonfly and damselfly larvae, like the stream bank habitat.

- ▶ Bring your net up from the stream bottom, under stream banks.
- ▶ Vigorously agitate upwards around roots and stream bank vegetation.
- ▶ Empty the contents of your net into a bin filled with about an inch of clear water, by turning the net inside out and rinsing it in the water in the bin.
- ▶ Remove any critters clinging to the net.
- ▶ Take several stream bank samples.



► *Look on the undersides of rocks.*

Many macroinvertebrates live on the undersides of rocks.

- Fill your bin with about one inch of clear stream water.
- Take a rock out of the riffle area. It's interesting to check the underside for moving critters, caddisfly houses made of tiny stones, and snails on the rock's sides.
- Rinse the rock off in the bin, using your hand to gently sweep water over its underside.
- Continue to rinse rocks. You may also try rocks in stiller water, as you may find different critters there.



► *Look in decomposed leaf packs.*

Many kinds of macroinvertebrates live in leaf packs; some are “detritivores” that eat decomposing vegetation.

- Collect decomposed leaves -- ideally, ones that are soft and blackened.
- Put them in a bin with some stream water.
- Rinse leaves off and look for macroinvertebrates in the leaves and water.
- Return leaves to the stream -- they are an important part of its ecology!



► *Look for clams in sandy places.*

You can often find clams buried in sandy spots.
You may have to try several spots.



- ▶ *Look for crayfish in the stream and along the stream banks.*



Once you have finished collecting macroinvertebrates, look into your bin to identify them.

See Part 5 for detailed information on how to identify what you have collected.



You will be entering your results on this section of your survey form.

Macroinvertebrate Count Search several likely habitats: look under stones in riffle areas; use net to sample bottom in several places; and sample underbank, leaf mat, and woody debris. Use letter codes to record number of organisms of each type found: A = 1-9; B = 10-99; C = 100 or more. Add up the number of letters in each column and multiply by the indicated index value.

Pollution Sensitive	Somewhat Pollution Sensitive	Pollution Tolerant
_____ Stonefly	_____ Crayfish	_____ Aquatic Worm
_____ Caddisfly	_____ Sowbug	_____ Midge Fly Larva
_____ Water Penny	_____ Scud	_____ Blackfly Larva
_____ Riffle Beetle	_____ Alderfly Larva	_____ Leech
_____ Mayfly	_____ Fishfly Larva	_____ Pouch (and other) Snails
_____ Gilled Snail	_____ Damselfly	
_____ Dobsonfly (Hellgrammite)	_____ Watersnipe Fly Larva	
	_____ Crane Fly	
	_____ Beetle Larva	
	_____ Dragonfly	
	_____ Clam	
_____ # letters times 3 =	_____ # letters times 2 =	_____ # letters times 1 =
_____ Index Value	_____ Index Value	_____ Index Value

Now add together the three Index Values from the columns for your total index value: Total Index Value = _____

Compare the Total Index Value to the following ranges of numbers to determine the water quality of your stream. Good water quality is indicated by a variety of different kinds of organisms, with no one kind making up the majority of the sample. Although the A, B, and C ratings do not contribute to the water quality rating, record them to see how your macroinvertebrate populations change over time.

Water Quality Rating			
_____ Excellent (>22)	_____ Good (17 - 22)	_____ Fair (11 - 16)	_____ Poor (<11)

***For each type of organism you find,
estimate the quantity you found.***

In the blank entry line, enter a letter code to indicate the quantity of that organism that you found.

- ▶ Enter **A** if you found 1 to 9 of that type of organism.
- ▶ Enter **B** if you found 10 to 99 of that type of organism.
- ▶ Enter **C** if you found 100 or more of that type of organism.

NOTE: Although the **A**, **B**, and **C** ratings do not contribute to the water quality rating, record them to see how your macroinvertebrate populations change over time.

Determine your Water Quality Rating.

- ▶ **For each column, count the number of letters and multiply by the index value, to compute your Total Index Value.**
- ▶ For each Pollution Sensitive type of organism you find, you get three points. Count the number of letters in this column, and multiply by three.
- ▶ For each Somewhat Pollution Sensitive type of organism you find, you get two points. Count the number of letters in the this column, and multiply by two.
- ▶ For each Pollution Tolerant type of organism you find, you get one point. Count the number of letters in this column, and multiply by one.
- ▶ Add these three Index Values together for your Total Index Value.

Determine your Water Quality Rating (cont.).

Your Total Index Value will fall into one of these ranges, to give you a Water Quality Rating for your stream.

- ◆ **Excellent Water Quality (>22)** This rating indicates a very large diversity of macroinvertebrate indicator species, both pollution sensitive and pollution tolerant, with many organisms in the pollution sensitive category.
- ◆ **Good Water Quality (17-22)** This rating indicates a fairly large diversity of macroinvertebrates, and includes some somewhat pollution sensitive organisms.
- ◆ **Fair Water Quality (11-16)** This rating indicates less diversity of species, and fewer of the pollution sensitive organisms.
- ◆ **Poor Water Quality (<11)** This rating indicates few or no pollution sensitive organisms found; many pollution tolerant organisms may be found.

You have learned how to collect macroinvertebrates and compute your Water Quality Rating.

Continue on to Part 5 to learn how to identify the macroinvertebrates you have collected.

- ◆ Welcome to Haw River Watch!
- ◆ Part 1: Overview of Haw River Watershed Issues
- ◆ Part 2: Introduction to the Haw River Watch Project
- ◆ Part 3: Measuring Water Quality, Monitoring Survey Section A *Assessing stream health using simple tests, observations, and macro sampling*
- ◆ Part 4: Collecting Aquatic Macroinvertebrates as Water Quality Indicators
- ◆ Part 5: Identifying Aquatic Macroinvertebrates
- ◆ Part 6: Assessing Stream Health, Monitoring Survey Section B *Observing stream characteristics such as condition of stream banks, shade, and land uses*