
STREAMWATCH SCHOOLS BIOLOGICAL TEST PROCEDURE (GRADES 3 AND UP)

Supplies:

- Water shoes (old sneakers work too...any close-toed shoes are fine!)
- D-Nets for collecting macroinvertebrates (small animals-may be referred to as “macros” for short)
- Small trays or dishes for observing macroinvertebrates. They should be at least one inch deep. White trays are preferable, so the macros are easier to see (plastic take-out containers work very well!)
- Larger containers or buckets for observing animals that may be too large for the small trays. They should also be at least one inch deep and preferably white.
- Macroinvertebrate identification key
- Small spoons, watercolor paintbrushes, and/or forceps
- Data sheet
- Clipboard and pencil

***Note:** The Watershed Institute may be able to provide some of these materials for your class. More information is available on our website or you can email dbush@thewatershed.org for more information.

Description:

This document will describe how we can study the animals living in a stream. Some organisms are more tolerant of “poor” water quality than others. The presence or absence of certain species can therefore help us determine water quality. We can then perform chemical tests to learn more about the water. **Bold either indicates vocabulary which we elaborate on at the end of the document or something important to keep in mind.**

Procedure:

- 1) Using your data sheet, perform a visual assessment of your sample site (includes weather, water characteristics, land-use characteristics, and stream characteristics).
- 2) Fill the small trays and larger containers with stream water so they're ready for the macros.

Collect macroinvertebrates.

- 3) Finding a good spot:
 - a) Try to find a location along the stream where the ground is flat and clear of slippery rocks.
 - b) Be on the lookout for **microhabitats**.
 - i) The main ones you should be aware of for this program are woody debris, vegetation, riffles, and a sandy bottom (see the bottom of this document for examples). These microhabitats often have lots of life.
 - c) The best practice is to not let students in the water deeper than their knees. If you can't see the bottom, you can stay along the edge of the water, but should not go in.

Using a D-Net:

- 4) When you find a good spot, place the flat side of the D-Net in the water so it touches the bottom of the stream.
 - a) The open side of the net should face **upstream** so that water naturally flows through the net.
 - b) Stand in front of the *open* side of the net.



- c) Begin kicking and shuffling your feet in front of the opening of the net. **Do not kick the sediment into the net.** The goal is just to get some of the sediment off the stream floor so that any macros present will get carried into the net by the current.
- d) Continue shuffling in front of the net for one minute. Then, bring the net out of the water and toward the small trays filled with stream water.
- e) Carefully turn the net inside-out so it's easier to see the macros.
- f) Use the spoons, paintbrushes, or forceps to carefully pick the macros off the net and put them into the small trays. (Look very closely for movement!)
 - i) Remember some animals you find may be too large to fit comfortably in the small trays. This is when you could use a larger container or bucket, if you have them.



- ii) If you have a hard time transferring macros from the net, you can put the (still inside-out) mesh side of the net under the water in the tray and the macros may float off the net and into the water.



- g) Repeat this process a few times. If you didn't find many macros, try a new spot!

***Note:** There may not be enough D-Nets for each student. To increase engagement, you can choose to have one student hold the net while another does the kicking and shuffling in front of the open side of the net!

Flipping rocks:

- 5) If there are lots of rocks at your stream site, you can have some students look for macros under the rocks while their classmates use the D-Nets.
 - a) Make sure they're looking closely for small movements on the rocks.
- 6) Use the spoons, paintbrushes, or forceps to move macros from the rocks to the small trays.



- a) **When someone is done looking at a rock, make sure it is gently returned to the same place it was found. Remember that these rocks are the animals' homes!**

Analysis

- 7) Use one of our **macroinvertebrate identification keys** to identify what macroinvertebrates you found (it can be hard sometimes, so do your best). **Make sure you place the macros you've collected in a shady spot so it doesn't get too hot for them. Whenever possible, try to make sure no individual stays out of the stream for more than about 10 minutes; they want to go back home!**
- 8) On the "Biological Assessment" page of your data sheet, place a check mark next to each different kind of macroinvertebrate you found. Use these check marks to determine the water quality rating. **Notice how the "sensitive" creatures give you more points than the "tolerant" creatures. If you find some sensitive macros, you might have a very healthy stream!**

Benthic Macroinvertebrate Identification & Scoring (check off all that apply)		
Sensitive	Less Sensitive	Tolerant
<input type="checkbox"/> Stoneflies <input type="checkbox"/> Case-Building and Free-Living Caddisflies <input type="checkbox"/> Mayflies <input type="checkbox"/> Gilled Snails/Right-Handed Snails <input type="checkbox"/> Crane Flies <input type="checkbox"/> Watersnipe Flies <input type="checkbox"/> Dobsonflies/Fishflies	<input type="checkbox"/> Net-Spinning Caddisflies <input type="checkbox"/> Water Pennies <input type="checkbox"/> Riffle Beetles <input type="checkbox"/> Alderflies <input type="checkbox"/> Crayfish <input type="checkbox"/> Scuds <input type="checkbox"/> Dragonflies <input type="checkbox"/> Damselflies <input type="checkbox"/> Planarians	<input type="checkbox"/> Aquatic Worms <input type="checkbox"/> Midge Flies <input type="checkbox"/> Black Flies <input type="checkbox"/> Sowbugs <input type="checkbox"/> Leeches <input type="checkbox"/> Clams <input type="checkbox"/> Lunged Snails/Left-Handed Snails/Limpets
<input type="checkbox"/> # of checks x 3 = _____	<input type="checkbox"/> # of checks x 2 = _____	<input type="checkbox"/> # of checks x 1 = _____

Add the three totals from each column for your water quality rating = _____

Water Quality Rating (check off the rating that matches your data)

Excellent (>22)
 Good (17-22)
 Fair (11-16)
 Poor (< 11)

VOCABULARY AND FAQs:

Macroinvertebrates:

This is the word we use to describe most of the animals we find in a stream. The word comes from “macro,” which means we can see the animals with the naked eye, and “invertebrate,” which means they do not have a backbone. It should be noted that this term does not apply to fish, since they have a backbone.

D-Net:

A very useful tool for collecting macroinvertebrates. The flat side allows us to place the net against the stream floor. This flat side also gives the net the D-shape.



Upstream:

The direction where the stream water is *coming from*. Downstream is the direction the water is *flowing*

Microhabitats

Smaller habitats that can exist within a large habitat. These smaller habitats are often home to more specialized creatures that fulfill a particular niche.

Woody debris: Sticks and fallen pieces of wood. This can provide food and shelter for animals, stabilize the stream, and reduce erosion.



Riffles: Areas where you can see white on the surface due to the water breaking. These microhabitats are often shallower and display faster-moving water. This is a great spot for macroinvertebrates because the water here usually contains more oxygen. This should be distinguished from chemical pollution, which can sometimes appear as a white film coating the surface of the water. However, this pollution can occur in fast-moving or slow-moving water.



Vegetation: Areas with lots of plant life. Similar to the woody debris, these plants can provide food and shelter.

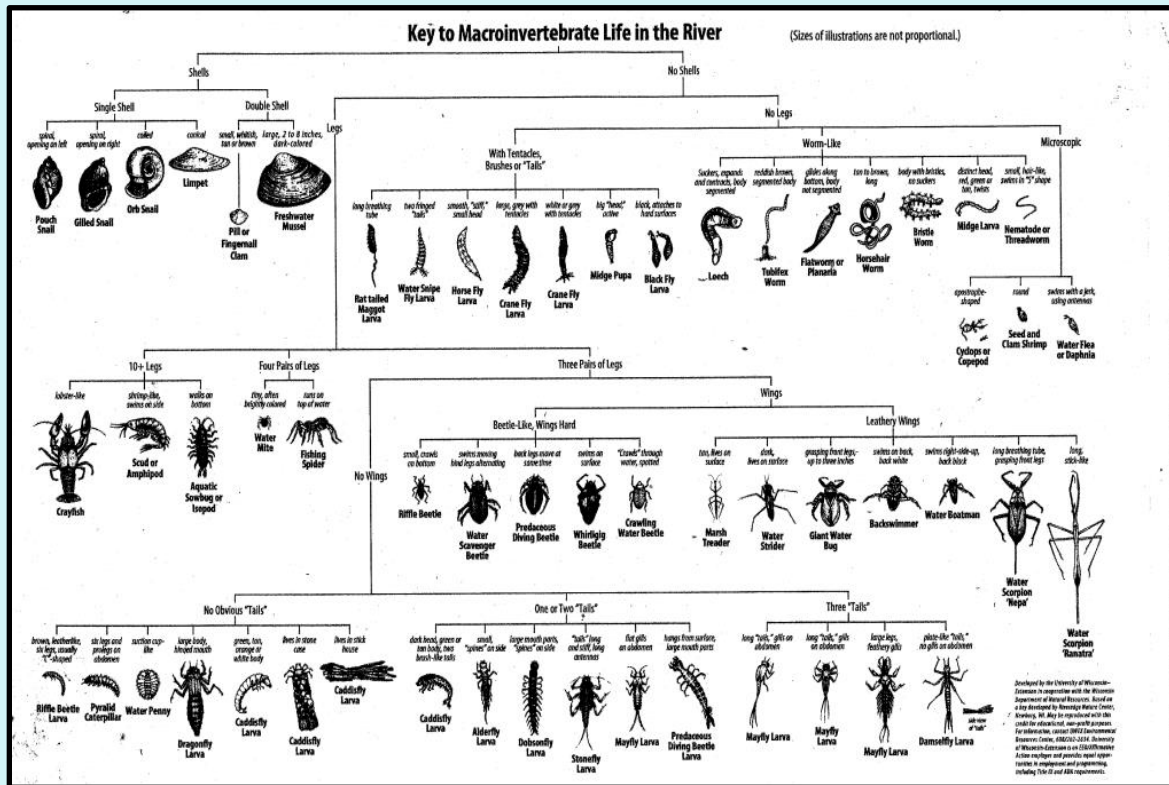


Sandy bottom: The bottom of a stream is often rocky. If you find a sandy spot, it could be a great place to look.



Macroinvertebrate identification keys:

Tools we use to identify the macroinvertebrates we find. An example is shown below.



- What can we do if we can't find any macroinvertebrates?
 - Often, this problem can be solved by looking at your nets/the rocks of your stream very closely. Look for small movements on the rocks, leaves, and sticks. If you still can't find anything, try looking in a different spot. Macros love spots where there are lots of ripples and bubbles in the water because that's where there will be more oxygen. If you still don't have any luck, there are a few other options that you can focus on instead. You can look for signs that animals passed through the area (feathers, poop, tracks, etc.). You can also put more focus on the chemical tests and see if you can use that data to explain *why* you're not finding any macros.