

Exploring Macroinvertebrates

Description:

Students will sample macroinvertebrates using a macroinvertebrate bingo card. With this tool, they will identify macroinvertebrates (macros) and learn their roles as indicator species.

Objectives:

- Identify a variety of macroinvertebrates
- Understand the role macroinvertebrates play in determining the health of an ecosystem
- Connect the importance of macroinvertebrates to trout

Vocabulary:

Aquatic benthic macroinvertebrate, biotic index, indicator species, pollution tolerance, taxonomy (e.g. order, family, genus, species), water quality

Materials:

- Macro Bingo card
- Dry erase marker or other writing utensil
- Dichotomous key (identification guide) or other identification tool of choice
- Living or preserved macroinvertebrate specimens OR photos of macroinvertebrates that align with bingo card

Background Information:

Aquatic benthic macroinvertebrates, or macros, are animals without backbones, such as insects, worms, clams, and snails that live in creeks, lakes, rivers and ponds. Macroinvertebrates are visible without magnifying glasses.

Macroinvertebrates are critical to the health and biodiversity of an ecosystem. They are an important food source for various organisms, including trout. Macroinvertebrates have specific environmental conditions that they require to live; some are more sensitive to poor environmental conditions than others. They are also an indicator species, meaning that we can understand the health of the environment by analyzing which macros are located within it. Macros such as leeches, midges, and many worms can tolerate poor water quality. However, macros such as mayflies, stoneflies, and caddisflies can only survive in pristine, clean, cool water. Examining the types of macros present in a creek, lake, river, pond, etc. provides us with an accessible way to test for water quality. Scientists at DEP calculate biotic indices for water bodies based on the types of macroinvertebrates found in samples. Because trout also require cold, clean, and clear water for their survival, monitoring the variety of macroinvertebrates present can help us determine if the stream is healthy for our trout. In this way, both trout and macroinvertebrates are indicator species that can teach us about the health of a water body.

Method:

- Introduce students to macros.
 - Do you know what a benthic macroinvertebrate is? What clues in the word can help you figure it out? (*Benthic means bottom dwelling, macro means large, the prefix "in" means without, vertebrates are animals with backbones*)
 - Macroinvertebrates are insects without backbones, such as insects, worms,

- clams, snails that live in creeks, lakes, rivers and ponds.
- Ask students what role they think macroinvertebrates play in their ecosystems, including how they're relevant to trout.
 - They are an important food source for many organisms, including trout.
 - They are good indicators of water quality. Some macros are pollution tolerant, and some are sensitive to pollutants (e.g. nitrates, chlorine, and metals)
- Provide students with the macroinvertebrate identification guide and ask if they are familiar with any of these macros?
- Inform students they will be looking at macroinvertebrates today. Using the identification guide, they will identify the macros and mark them on their macro bingo card. Students can work in groups.
- As students complete the bingo card ask them to discuss within their groups why macros are important to learn about.

If observing live macros

- Use an ice cube tray or small containers to isolate the macros for easier observation.
- Use a magnifying lens to observe the macros in more depth.
- Carefully examine the macros and identify them with the dichotomous key. As you do that, mark down the macros you've found on your bingo card.
- Encourage students to be gentle with the live animals while they are examining them!

If observing preserved macro specimens or illustrations/photos of macros

- Using the preserved macros or photos, create three simulations of streams with different types of water quality (good, moderate, and poor). For example, you can use a leech and a flatworm to represent a stream with poor water quality.

- Students can take 5-8 minutes at each of the three stations to examine each set of macros and each water quality scenario. Have students hypothesize the water quality of their stream as they work to identify macros.
- Mark down the macros you correctly identify using your Macro Bingo card.
- Whoever first completes a row wins! A second winner can also be the student who first completes the entire board.
- Encourage students to be gentle with the vials when examining the macros!

Discussion:

- Which species of macros did you find?
- From the macros you observed, what can you say about the water quality?
- Do you think your trout will do well in the ecosystem these macros were found in? Why or why not?
- What type of macros would you expect to find alongside trout?

Extension:

- Use [Learning to See, Seeing to Learn](#) to practice identifying aquatic benthic macroinvertebrates.
- Explore [Catskill Angling Collection](#) to learn more about the lifecycles of mayflies, caddisflies, and stoneflies.
- Play DEP's Go Macroinvertebrate! game with your students to learn more about macroinvertebrates and their role as indicators of water quality.
- Watch [Leaf Pack Network's Aquatic Macroinvertebrates in Motion Videos](#) to help students understand how macroinvertebrates navigate in their environments.

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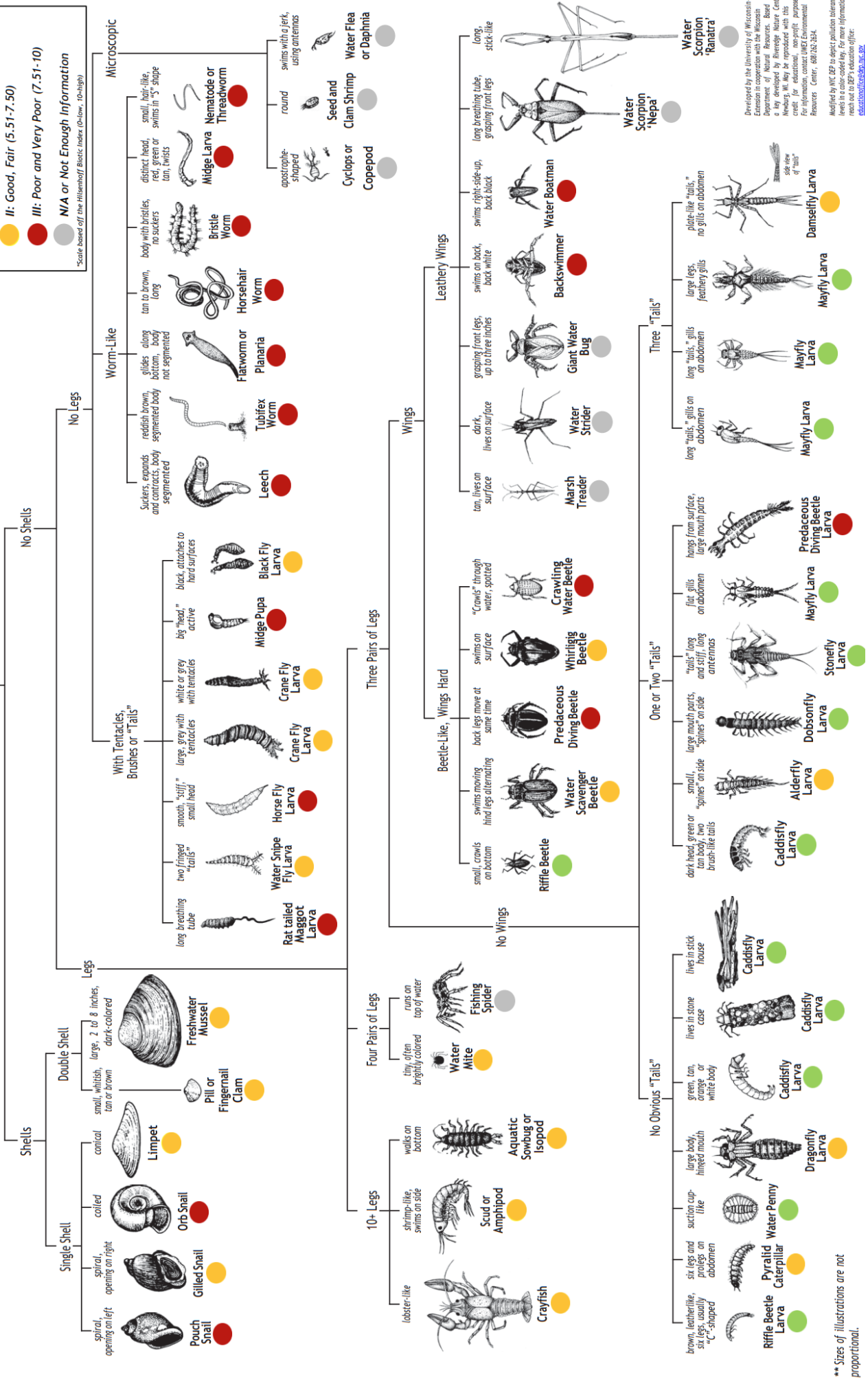
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	M	A	C	R	O
Sensitive Organisms	Mayfly	Caddisfly	Free Space	Stonefly	Dobsonfly
Moderately Sensitive Organisms	Crayfish	Scud	Free Space	Crane fly	Water Mite
Not Pollution Sensitive	Leech	Water Boatman	Free Space	Worm	Midge Larva

Key to Macroinvertebrate Life in the River

Key: Water Quality Level Required:
 I: Excellent, Very Good (0-5.5)
 II: Good, Fair (5.51-7.50)
 III: Poor and Very Poor (7.51-10)
 N/A or Not Enough Information

*Scale based off the Hilsenhoff Biotic Index (0-low, 10-high)



Developed by the University of Wisconsin-Extension in cooperation with the Wisconsin Department of Natural Resources. Based on a key developed by Riverside Nature Center, Newburg, WI. May be reproduced with this key for educational purposes. For more information, contact the Wisconsin Department of Natural Resources Center, 608.785.3634.

Modified by NYC DEP to depict pollution tolerance levels in a color-coded key. For more information, reach out to NYC's education officer: education@nycdep.net

** Sizes of illustrations are not proportional.