

## Macroinvertebrates

## Teacher's Guide

**Subject:** Life Science

**Topic(s):** Classification of Living Things; Biological Indicators (bioassessment); Invertebrates

**Summary:** Students will examine different aquatic habitats, collect macroinvertebrates from each and use an index to determine water quality based on the relative presence and absence of tolerant and intolerant species of macroinvertebrates found in each sample.

After completing the field lab, students will be able to:

**Objective(s):**

1. Identify and classify common macroinvertebrates
2. Explain the meaning of biological indicators and tolerant and intolerant species
3. Understand the role of an index in the context of water quality

**Ecosystem(s):** Lakes; Freshwater Wetlands; Rivers; Springs

### Equipment:

- 3 x Dip Net (D-net)
- 12 x Trays
- Box x Latex gloves
- 3 x Squirt bottles
- 3 x Life vests (optional)
- 12 x Magnifying lenses
- 4 x Tweezers
- 3 x Buckets
- Macro reference charts
- 4 x Eye droppers
- 3 x Basting syringes

### Background:

- Reference Material: Macroinvertebrate Mayhem (Project WET), BioAssess Game, Circular 101 (LAKEWATCH), Guide to Freshwater Invertebrates <http://www.seanet.com/~leska/Online/Guide.html>
- Vocabulary: Macroinvertebrate, bioindicator, taxa, substrate
- Equipment Training: Macroinvertebrate Identification charts and cards

### Procedure (Engage; Explore; Explain)

1. Engage: Ask the students how they would determine whether or not they could drink the water from Cherry Lake?
2. Ask the students what they think aquatic bugs (macroinvertebrates) can tell us about the quality of water in which they live?
3. Ask the students to formulate a hypothesis about what bugs can tell us about water and write it down.
4. Go to one of three different locations along the lakes edge with different aquatic substrates and use the dip net to scrape the substrate for macroinvertebrates for approximately one minute.
5. Place the collected samples into buckets keeping each substrate separate.
6. From tables, distributed the samples collected in the buckets to the various trays. Students should then examine, identify and categorize the macroinvertebrates into taxonomic groups (see data sheet taxa)
7. Complete the macroinvertebrate index and then complete the student discussion/assessment questions.

### Sunshine State Standards:

**Science:** SC.G.1.3.2; SC.G.1.3.3; SC.G.2.3.2; SC.G.2.3.3; SC.G.2.3.4; **Language Arts:** LA.A.1.3.3; LA.B.2.3.1; LA.C.1.3.1; **Mathematics:** MA.A.3.3.3; MA.E.3.3.1; **Social Studies:** SS.B.2.3.9; **Climate Literacy:** 1-c,f; **Ocean Literacy:**5-f

# Macroinvertebrates

# Student Data Sheet

## General Information

Full Name:		Date:	
School (teacher):		Time:	
Latitude:		Longitude:	

## Student Hypothesis and Rationale (choose one)

- A. If the presence of intolerant macroinvertebrate species is an indicator of good water quality, then I would expect to find many intolerant macroinvertebrates in Cherry Lake because \_\_\_\_\_  
\_\_\_\_\_.
- B. If the presence of intolerant macroinvertebrate species is an indicator of good water quality, then I would expect to find few intolerant macroinvertebrates in Cherry Lake because \_\_\_\_\_  
\_\_\_\_\_.

## Field Observations/Measurements/Data

**Letter Code:** **R** = 1 to 3 found (rare)      **C** = 4 to 9 found (common)      **A** = 10 or more found (abundant)

Habitat Description:		# of sweeps (or substrates sampled): _____			
Group 1 Taxa (Intolerant)	Letter Code	Group 2 Taxa (Somewhat Tolerant)	Letter Code	Group 3 Taxa (Very Tolerant)	Letter Code
Mayfly		Gyraulus Snail		Aquatic worm	
Caddisfly		Scud		Midge	
Stonefly		Water Mite		Leech	
Riffle Beetle		Crane Fly		Pouch Snail	
		Sowbug			
		Damselfly			
		Dragonfly			
<b>Number of Different Taxa for Group 1:</b>		<b>Number of Different Taxa for Group 2:</b>		<b>Number of Different Taxa for Group 3:</b>	
Multiply by	3	Multiply by	2	Multiply by	1
<b>Index Value:</b>		<b>Index Value:</b>		<b>Index Value:</b>	
<b>Total Number of Taxa</b> (sum of number of taxa in each group):					
<b>Cumulative Index Value</b> (sum of index values for each group):					
<b>Stream Quality Assessment:</b> (Check box corresponding to Cumulative Index Value)					
<b>Excellent</b> (>22) <input type="checkbox"/>	<b>Good</b> (17-22) <input type="checkbox"/>	<b>Fair</b> (11-16) <input type="checkbox"/>	<b>Poor</b> (<11) <input type="checkbox"/>		

# Macroinvertebrates

# Assessment

1. Of the three groups of macroinvertebrates, in which one did you find the highest diversity?

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2. Calculate the percent of taxa that were from the intolerant group?

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3. Does your data support your hypothesis? Whether your hypothesis is supported or not, what can you infer from your observations and results?

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4. What advantages and disadvantages would looking at macroinvertebrate populations have over a direct examination of physical and chemical parameters of water quality?

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5. List some of the environmental stressors that originate from human activities. Identify one option for each that might minimize the stressor from the environment.

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6. Think about the lab activity you just completed. Write a question (starting with what, how, or why) that address something that you'd like to learn more about.

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# Macroinvertebrates

# Reference Chart

















<p><b>Caddisfly Larva</b></p>  <p>(2-40mm)</p>	<p><b>Mayfly Nymph</b></p>  <p>(3-10mm)</p>	<p><b>Damselfly Larva</b></p>  <p>(10-50mm)</p>	<p><b>Cranefly Larva</b></p>  <p>(10-25mm)</p>
<p><b>Gyraulus Snail</b></p>  <p>(2-10mm)</p>	<p><b>Pouch Snail</b></p>  <p>(2-5mm)</p>	<p><b>Riffle Beetle</b></p>  <p>(2-4mm)</p>	<p><b>Stonefly Nymph</b></p>  <p>(5-35mm)</p>
<p><b>Dragonfly Larva</b></p>  <p>(15-50mm)</p>	<p><b>Sowbug</b></p>  <p>(5-22mm)</p>	<p><b>Midge Larva</b></p>  <p>(2-15mm)</p>	<p><b>Leech</b></p>  <p>(5-40mm)</p>
<p><b>Scud (Amphipod)</b></p>  <p>(5-22mm)</p>	<p><b>Water Mite</b></p>  <p>(1-3mm)</p>	<p><b>Midge Adult</b></p>  <p>(3-10mm)</p>	<p><b>Freshwater Worm</b></p>  <p>(1-30mm)</p>

Chart courtesy of: <http://www.learnnc.org/lp/media/lessons/EddieHamblin3252003179/Macrokey.ppt>