Macroinvertebrates Teacher's Guide

Subject: Integrated Science (Life; Earth-Space; Physical)

Topic: Biological indicators of water quality; tolerant and intolerant organisms

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.

Objective(s): After completing the field lab, students will be able to:

1. Identify common macroinvertebrates
2. Explain the meaning of tolerant and intolerant species
3. Understand the role of an index as a tool for generating a single number for comparison of diverse entities.

Ecosystem(s): Freshwater Wetlands; Rivers/Springs

Equipment:

- Dip Net (D-net)
- Trays
- Latex gloves
- Squirt bottles
- Life vests (2 sizes)
- Magnifying lenses
- Tweezers
- Buckets
- Macroinvertebrate reference charts
- Eye droppers
- 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. Board the specially outfitted glass bottom boat at Wakulla Springs State Park.
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 river with different aquatic substrates (cypress knees, eel grass, sandy/rocky bottom) and use the dip net to scrape a predetermined amount (e.g., 1 square foot) of the substrate for macroinvertebrates.
5. Place the collected samples into trays keeping each substrate separate.
6. Categorize the macroinvertebrates into taxonomic groups (see data sheet taxa)

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

This field lab was produced jointly by the Florida Department of Environmental Protection, UF-IFAS Leon County Extension (Natural Resource Management) and Riversprings Middle School.

Macroinvertebrates Student Data Sheet

General Information

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

Student Hypothesis and Rationale

If the presence of intolerant macroinvertebrate species is an indicator of good water quality, then I would expect to find (circle one: more / less) intolerant macroinvertebrates in Wakulla Springs because…

Field Observations/Measurements/Data

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		Shrimp		Aquatic worm	
Stonefly		Scud		Midge	
Caddisfly		Water Mite		Leech	
Riffle Beetle		Crane Fly			
Snail		Crayfish			
		Clam			
		Sowbug			
		Water Penny Beetle			
		Damselfly			
		Dragonfly			
		Hellgramite			
Number of Different Taxa for Group 1:		**Number of Different Taxa for Group 2:**		**Number of Different Taxa for Group 3:**	
Multiply by	3	Multiply by	2	Multiply by	1
Index Value:		**Index Value:**		**Index Value:**	

Total Number of Taxa (sum of number of taxa in each group):	
Cumulative Index Value (sum of index values for each group):	

This field lab was produced jointly by the Florida Department of Environmental Protection, UF-IFAS Leon County Extension (Natural Resource Management) and Riversprings Middle School.

Stream Quality Assessment: (Check box corresponding to Cumulative Index Value)	
Excellent (>22) ☐	**Good** (17-22) ☐
Fair (11-16) ☐	**Poor** (<11) ☐

Macroinvertebrates Assessment

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

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

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

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

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.

This field lab was produced jointly by the Florida Department of Environmental Protection, UF-IFAS Leon County Extension (Natural Resource Management) and Riversprings Middle School.

Macroinvertebrates Portfolio Journal Prompt

Macroinvertebrate organisms require certain water conditions in order to survive. Think about how macroinvertebrates are indicators of water quality. Create a designer macroinvertebrate with special adaptations. Explain how this organism will tell us about the quality of the water just by looking at it.

This field lab was produced jointly by the Florida Department of Environmental Protection, UF-IFAS Leon County Extension (Natural Resource Management) and Riversprings Middle School.

Macroinvertebrates Reference Chart pg 1

Mayfly Larva

Clam

Caddisfly

Riffle Beetle

Riffle Beetle Larva

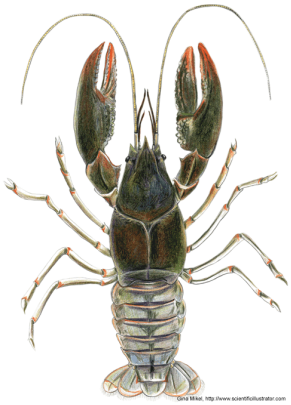
Water Mite

Hellgramite

Dragonfly Larva

Damselfly Larva

Crane Fly



Crayfish

Stonefly Larva

IMAGES BY: Gina Mikel; http://www.scientificillustrator.com/images.html

This field lab was produced jointly by the Florida Department of Environmental Protection, UF-IFAS Leon County Extension (Natural Resource Management) and Riversprings Middle School.

Macroinvertebrates Reference Chart pg 2

Sowbug

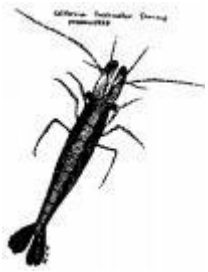
Water Penny Beetle

Scud (Amphipod)

Tubiflex Worm

Leech

Midge

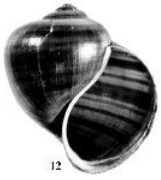


Shrimp

© Rob Hutchinson

Blackfly Larva

Midge Larva



Florida Apple Snail

Melania

Sprite

IMAGES BY: Gina Mikel; http://www.scientificillustrator.com/images.html

This field lab was produced jointly by the Florida Department of Environmental Protection, UF-IFAS Leon County Extension (Natural Resource Management) and Riversprings Middle School.