Activity 4 – Invertebrates: Collection, Identification & Calculation of a Biotic Index

"... it is also easy to overlook the services that ecosystems provide humanity. They enrich the soil and create the very air we breathe. Without these amenities, the remaining tenure of the human race would be nasty and brief. The life-sustaining matrix is built of legions of micro- organisms and mostly small, obscure animals in other words, weeds and bugs."

E.O. Wilson, Naturalist

At the most fundamental level, the natural environment provides us with our basic needs for survival: food to eat, clean water to drink and air to breathe. We rely on photosynthesis for our oxygen, and on the forests and oceans to absorb the carbon dioxide we produce. Forests and marshes help to keep the water cycle in balance by retaining water for a while, making it available to sustain living creatures. Plants transpire water from the soil into the atmosphere. Other species, such as the billions of soil bacteria, break down natural pollutants in the water, serving as living filters that purify it. Wetlands also contribute to water purification and to flood control. In addition, people have used many species to develop medicines.

Invertebrates are more than just "bugs". They are an essential part of a viable and sustainable ecosystem. Their presence, and numbers, in a body of water are a useful indication of the health of that body of water. Each organism has an essential niche to fill.

The following web sites provide information that may assist with your assessments.

Alberta Riverwatch http://www.riverwatch.ab.ca/how_to_monitor/macroinvertebrates.cfm

University of Guelph, CyberNatural Software Group http://www.aquatic.uoguelph.ca

University of Saskatchewan http://www.usask.ca/biology/skabugs/index.html

Wilkfred Laurier University http://www.wlu.ca/~wwwbiol/bio305/Database/FieldGuide.htm

Organic Pollution Tolerance Index For Aquatic Invertebrates

Some invertebrates are sensitive to pollution or poor water quality while others are able to survive more demanding conditions. The presence or absence of certain types of invertebrates is one indication of the quality of water in that place.

Pollution Tolerant Species: Presence of these species may indicate water of low quality, however they may be present in all types of water.

- blackfly larvae
- flatworms
- leeches
- roundworms
- midge larvae

Moderately Tolerant Species: Presence of these species in great numbers may be a sign of fair water quality.

- caddisfly larvae
- dragonfly nymphs
- damselfly nymphs

Pollution Intolerant Species: Presence of these species in great numbers may indicate good water quality.

- mayfly nymphs
- stonefly nymphs

How to use a dip net.

Dip the net into the water, being sure to scoop up some bottom mud and water plants. In a stream, place your net just down-stream of a rock as you lift the corner of the rock. Some of the critters hiding under the rock may be washed into the net. Students should work in pairs. (Put the rocks back in place when you are through.) For a better look, dump the contents of the dip net into a white pan. The insects will crawl around and be easier to spot against the white background. Look for insect larvae, nymphs, and adults, insect eggs attached to plants and floating twigs. Make sure to return all specimens to the water when the activity is over.

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Aquatic Invertebrate Data Recording Sheet

Organism	Illustration: Sketch each of the invertebrates listed in the first column. For more information visit the urls below.	Number of Organisms	Tolerance Rating	Total Tolerance Value (Organisms X Tolerance Rating)
Flatworm			6.0	
Aquatic Worm			10.0	
Leech			8.0	
Mosquito Larvae			4.0	
Dragonfly Nymph			4.5	
Damselfly Nymph			5.5	
Springtail			3.5	
Crawling Mayfly			5.5	
Stonefly Nymph			1.5	
Caddisfly Larva			5.5	
Water Bug			5.0	
Water Beetle			4.0	
Segmented Worm			11.0	
TOTALS:	**Organisms Collected**		**Tolerance Values**	

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The Macroinvertebrate Biotic Index

To arrive at an *indication* of your site's biological integrity, multiply the number of organisms collected by the tolerance rating. Add all the numbers in the organism column and all the numbers in the tolerance value column. Divide the tolerance value with the organism total. This results in a biotic index based on biological specimens collected.

Note: Sources of error are possible in a small sample size such as this, so a high index doesn't *necessarily* mean poor water quality.

Biotic Index:

What is your "Biotic Index"? _____

<6.0	6.1-7.5	7.6-8.9	> or = 9.0
GOOD	**FAIR**	**POOR**	V**ERY POOR**

Conclusion:

In the space below, summarize what you learned from your study.

1. **What features of the watershed had a noticeable impact on the water and organisms living in or near it?**
2. How did human activity impact this part of your watershed?
3. What suggestions do you have for preserving or restoring this part of your watershed?
4. **A summary statement about what you have learned about watersheds during this project.**

(Use back of page is more space is required.)