

Biodiversity Activity 1: Identifying Insects

Scientific Background

Biodiversity, which means biological diversity, refers to the variety of life forms in any particular ecosystem. A healthy ecosystem will have large numbers of species and many individuals within those species (for example, 10 individuals from each of ten different species). Unhealthy ecosystems have fewer species, and often have a larger number of individuals from just one species (for example, 90 individuals from one species, and five individuals each from two other species). Taking a sample of the organisms living in an ecosystem can give clues to the health of the ecosystem and of the populations living in it.

Using samples of **Macroinvertebrates** from a freshwater stream or pond, scientists can draw conclusions about the level of pollution in the water. Macroinvertebrates are organisms that have no backbone and are large enough to be observed without a microscope. Many freshwater macroinvertebrates are insect larvae, while others are mollusks such as snails, clams and mussels, or worms such as leeches, flatworms and aquatic earthworms.

Scientists know that some organisms are very sensitive to pollution and survive only in clean water. Other organisms are somewhat sensitive to pollution and survive in moderately clean water. Still other organisms are tolerant of pollution and can survive even in heavily polluted water. A clean, healthy body of water will have many sensitive organisms as well as organisms that are somewhat sensitive, and organisms that are tolerant of pollution.

In *Biodiversity Activity 1: Identifying Insects*, students collect samples of insects from three different freshwater streams. Using a field guide found in their Science Journal, students identify the insects in each sample. This activity can be found by navigating to the **Blepharicerid Larva, Caddisfly, Dragonfly, Giant Water Bug, or Whirligig Beetle Screens** and then clicking the enamel dish icon at the bottom of the screen.

Vocabulary

- aquatic
- diverse
- habitat
- mollusk
- pollution
- species
- biodiversity
- environment
- macroinvertebrate
- oxygenated
- sensitive
- tolerant

*Vocabulary definitions can be found in the **Backyard Bugs Glossary**.*

Thinking Question

What water conditions might cause there to more species in Stream 1 than in Stream 3?

Exploratory and Extension Activities

Additional Exploratory and Extension activities are available in the *Backyard Bugs Teacher's Guide*.

Nature Sounds

Discuss musicians that chose to focus on nature sounds.

Water music by Händel is on tracks from a variety of CDs. Some other selections include:

Water Planet (SAS, 2003, ASIN: B00008NV7G)

Yellowstone: The Music of Nature (American Gramophone, 1989, ASIN: B0000005N7)

Have students practice listening skills by listening to the sounds of water on a music track. Ask for reactions to the listening experience.

Music that has an insect theme, such as *Flight of the Bumble Bee* by Nikolay Rimsky-Korsakov, can be used to expose students to classical music as they investigate insects in ***Backyard Bugs***.

Name: _____

Biodiversity Activity 1: Identifying Insects

Use the Aquatic Insects Field Guide to identify the number of each insect species in the stream samples.







Insects Collected	Sensitivity	Number of Insects		
		Stream 1	Stream 2	Stream 3
Black Fly Larva	T			
Blepharicerid Larva	S			
Caddisfly Larva (Species 1)	S			
Caddisfly Larva (Species 2)	S			
Caddisfly Larva (Species 3)	S			
Damselfly Larva	SS			
Dragonfly Nymph (Species 1)	SS			
Dragonfly Nymph (Species 2)	SS			
Giant Water Bug	T			
Mayfly Larva	S			
Stonefly Larva (Species 1)	S			
Stonefly Larva (Species 2)	S			
Stonefly Larva (Species 3)	S			
Water Penny	S			
Whirligig Beetle	T			

Key for Sensitivity to Water Quality: Tolerant (T); Somewhat Sensitive (SS); Sensitive (S)

For each stream, how many insects are:	Stream 1	Stream 2	Stream 3
Tolerant			
Somewhat Sensitive			
Sensitive			

For each stream, how many <i>insect species</i> are:	Stream 1	Stream 2	Stream 3
Tolerant			
Somewhat Sensitive			
Sensitive			

Biodiversity Activity 1: Identifying Insects Field Guide

<p>Black Fly Larva</p> 	<p>Black fly larvae live in streams, often in large numbers, where they attach to stones or plants. Some species of black flies live in polluted and bacteria-filled water. Black fly larvae are filter feeders. Their food comes from filtering organic materials from the water. Sensitivity to Water Quality: Tolerant</p>	
<p>Blepharicerid Larva</p> 	<p>Blepharicerid larvae use their six ventral suckers to hold on to the slippery rock surfaces beneath the fast moving water of torrential streams. Blepharicerid larvae eat microscopic algae, called diatoms. The larvae use their mandibles as scrapers to loosen the film of algae, bacteria and other organic matter from submerged rocks. Sensitivity to Water Quality: Sensitive</p>	
<p>Caddisfly Larva (Species 1)</p> 	<p>Caddisfly Larva (Species 2)</p> 	<p>Caddisfly Larva (Species 3)</p> 
<p>Caddisfly larvae are caterpillar-like. Many construct portable cases made of bits of leaves, twigs, sand grains, or small pebbles. Most feed on plant material. Sensitivity to Water Quality: Sensitive</p>		
<p>Damselfly Larva</p> 	<p>Damselfly larvae live in flowing waters and still waters. A damselfly nymph has a long, slender body. Its three, feathery gills at the tip of its abdomen enable it to breathe under water. Damselfly larvae are predators of smaller aquatic invertebrates. Sensitivity to Water Quality: Somewhat Sensitive</p>	

Dragonfly Nymph (Species 1)



Dragonfly Nymph (Species 2)



Dragonfly nymphs are found living in slower-flowing water, lakes, or ponds. They may also live under the bottom sediments in these fresh-water environments.

Both the nymph and the adult dragonfly are predators. Dragonfly nymphs eat insect larvae and other small aquatic invertebrates. **Sensitivity to Water Quality: Somewhat Sensitive**

Giant Water Bug

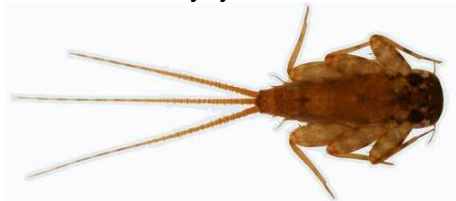


Giant water bugs live in ponds, and are very fast swimmers. They grab hold of plants near the surface of the water.

Giant water bugs have breathing tubes at the end of their abdomens. They are brownish, oval, and flattened and up to 2 inches long when fully grown.

Giant water bugs feed on other aquatic invertebrates, tadpoles, and small fish. **Sensitivity to Water Quality: Tolerant**

Mayfly Larva



Mayfly larvae are common inhabitants of ponds and streams. They have leaf-like gills along the sides of their abdomen, and three hair-like tails. They feed on detritus and algae.

Adults and larvae are an important food of many freshwater fish. **Sensitivity to Water Quality: Sensitive**

Stonefly Larva (Species 1)



Stonefly Larva (Species 2)



Stonefly Larva (Species 3)

Stonefly larvae are elongate and



flattened, with long antennae and cerci. They live in streams. Some are plant feeders and some are predators.

Adults and larvae are an important food of many freshwater fish.

Sensitivity to Water Quality:
Sensitive

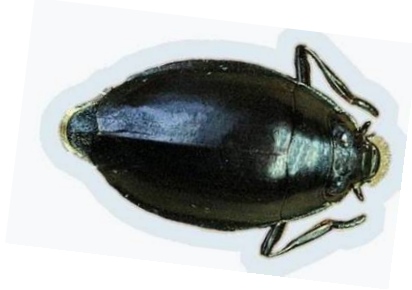
Water Penny



Water penny beetle larvae cling to the undersides of rocks in cold streams. They are tan, brown, or black. The larvae are smaller than 12 mm long, round shaped and greatly flattened. The head and legs are not visible from above. They have six small legs on their ventral side.

The larvae feed on algae scraped from the surface of rocks. **Sensitivity to Water Quality: Sensitive**

Whirligig Beetle



Whirligig beetles swim in groups on the surface of ponds, lakes, or quiet streams.

They are oval-shaped, flattened, 3-15 mm long, with two compound eyes, each split into two halves. Their hind legs are paddle-like, and their front legs are used to grab food.

Sensitivity to Water Quality:
Tolerant

Answer Key

Biodiversity Activity 1: Identifying Insects

Use the Aquatic Insects Field Guide to identify the number of each insect species in the stream samples.

Insects Collected	Sensitivity	Number of Insects		
		Stream 1	Stream 2	Stream 3
Black Fly Larva	T	0	64	83
Blepharicerid Larva	S	45	0	0
Caddisfly Larva (Species 1)	S	8	5	0
Caddisfly Larva (Species 2)	S	7	0	0
Caddisfly Larva (Species 3)	S	9	0	0
Damselfly Larva	SS	7	6	2
Dragonfly Nymph (Species 1)	SS	0	4	1
Dragonfly Nymph (Species 2)	SS	1	3	1
Giant Water Bug	T	0	1	2
Mayfly Larva	S	17	9	0
Stonefly Larva (Species 1)	S	1	0	0
Stonefly Larva (Species 2)	S	1	0	0
Stonefly Larva (Species 3)	S	1	0	0
Water Penny	S	1	0	0
Whirligig Beetle	T	2	8	11

Key for Sensitivity to Water Quality: Tolerant (T); Somewhat Sensitive (SS); Sensitive (S)

For each stream, how many insects are:	Stream 1	Stream 2	Stream 3
Tolerant	2	73	96
Somewhat Sensitive	8	13	4
Sensitive	90	14	0

For each stream, how many <i>insect species</i> are:	Stream 1	Stream 2	Stream 3
Tolerant	1	3	3
Somewhat Sensitive	2	3	3

Sensitive	9	2	0
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