

Can you ID?

How can living organisms help to determine water quality?

Use the following practice samples to gain experience with macroinvertebrate identification and stream quality assessment before collecting real samples from real streams. Each practice sample includes macroinvertebrate specimens that might be collected from different streams with water quality that will rate from excellent to poor.

Materials

- Practice samples
- Macroinvertebrate identification key
- Biodiversity index form
- Practice sample keys
- Blue plastic table clothes or tarp
- *Optional: BOD bottles or water sampling container*
- *Optional: chemical tests (nitrate, dissolved oxygen, phosphate, pH)*
- *Optional: Aqua Bugs App*

Instructions

1. Choose one of the *practice samples* (1–4).
2. Use the *Macroinvertebrate identification key* to identify each specimen just as if it were real.
3. Go to the *Biodiversity index form* and record the macroinvertebrate data to determine the water quality rating for the sample stream.
4. Check your answers for your particular practice sample (1–4).
5. Extension: Bring the stream into your classroom to mimic a natural setting and combine biotic and chemical sampling for student practice.
 - a. Set up a practice stream. Use a blue tarp to show the path of water (include bends and changes in elevation).
 - b. Place macroinvertebrate cards in pools or riffle zones.
 - c. Place coordinating water samples in matching areas for chemical testing.
 - d. Have student groups test for biotic and chemical testing and record results.

Reflection

1. What does sensitive, somewhat sensitive, and tolerant mean in terms of water quality?

Sensitive organisms can usually live in areas where dissolved oxygen is plentiful and the water is flowing or deep and cold.

Somewhat sensitive (aka somewhat tolerant) can live in areas where there is less dissolved oxygen, but still plentiful insects, detritus and larvae for food.

Tolerant organisms may be found in water of any type, but generally need less dissolved oxygen and may tolerate large amounts of sediment, chemicals, sewage or other pollutants in water.

2. Can a pollution tolerant organism thrive in excellent water quality?

Yes, because they have adaptations that allow them to live in many types of water.

3. How does farming affect water quality?

Some farming methods may disturb soil and therefore allow sediment to erode into streams. This can change the amount of dissolved oxygen and sunlight available in water. Nutrients from fields sometimes enter water sources causing an increase in plant growth which can increase food sources for macroinvertebrates in the short term, but may result in overgrowth of algae if there is too much nutrient runoff. Farmers work to reduce the amount of erosion and nutrient runoff by using best management practices.

See [encyclopedia.com/environment/encyclopedias-almanacs-transcripts-and-maps/best-management-practices](https://www.encyclopedia.com/environment/encyclopedias-almanacs-transcripts-and-maps/best-management-practices) for a short list. Students could look up one or more of these practices for agriculture to get a better idea of how they work.

Also, in Ohio, there is a new farmer incentive program called H2Ohio to reduce the amount of nutrients that enter the western basin of Lake Erie.

See ocj.com/2019/11/h2ohio-strategies-and-farm-practices-outlined-by-gov-dewine/ for an explanation.

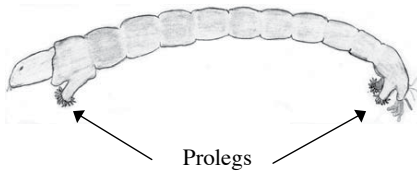
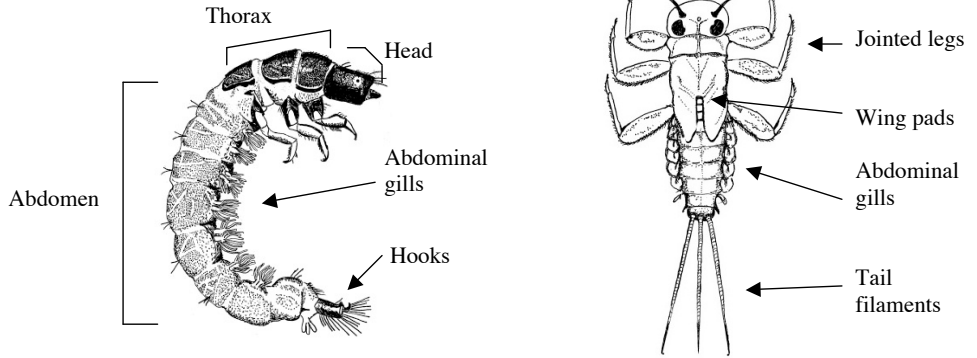
Macroinvertebrate identification key

Major Characteristics of Aquatic Larvae

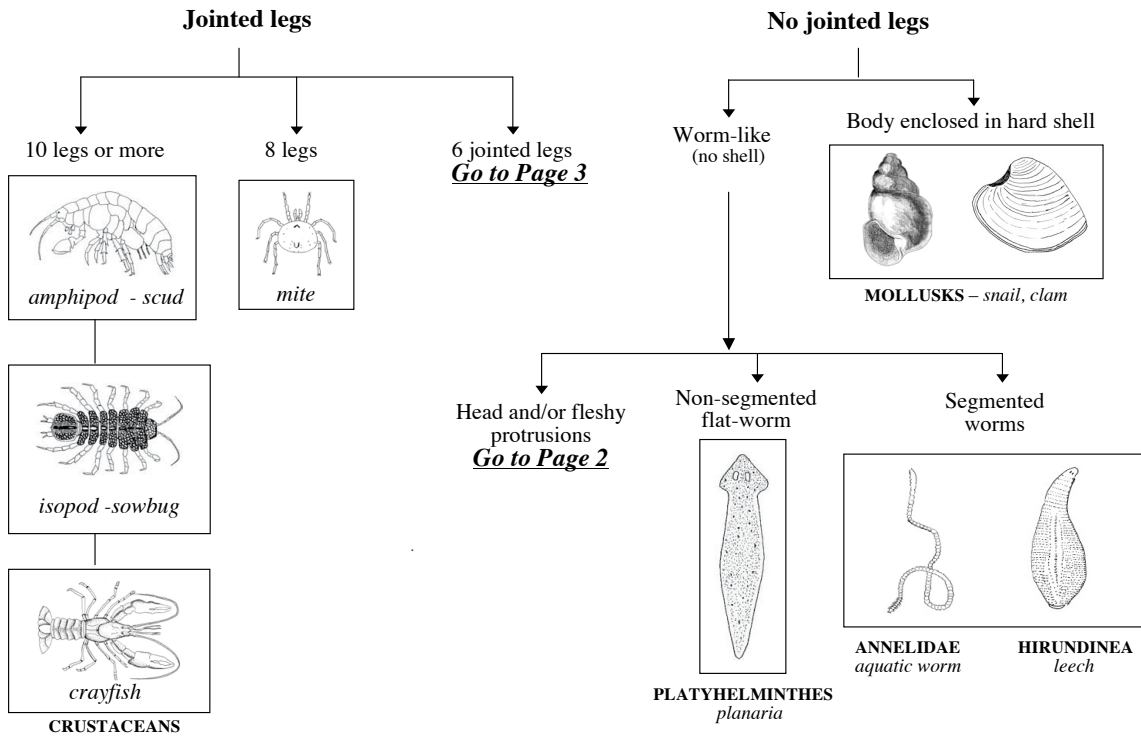


Glossary

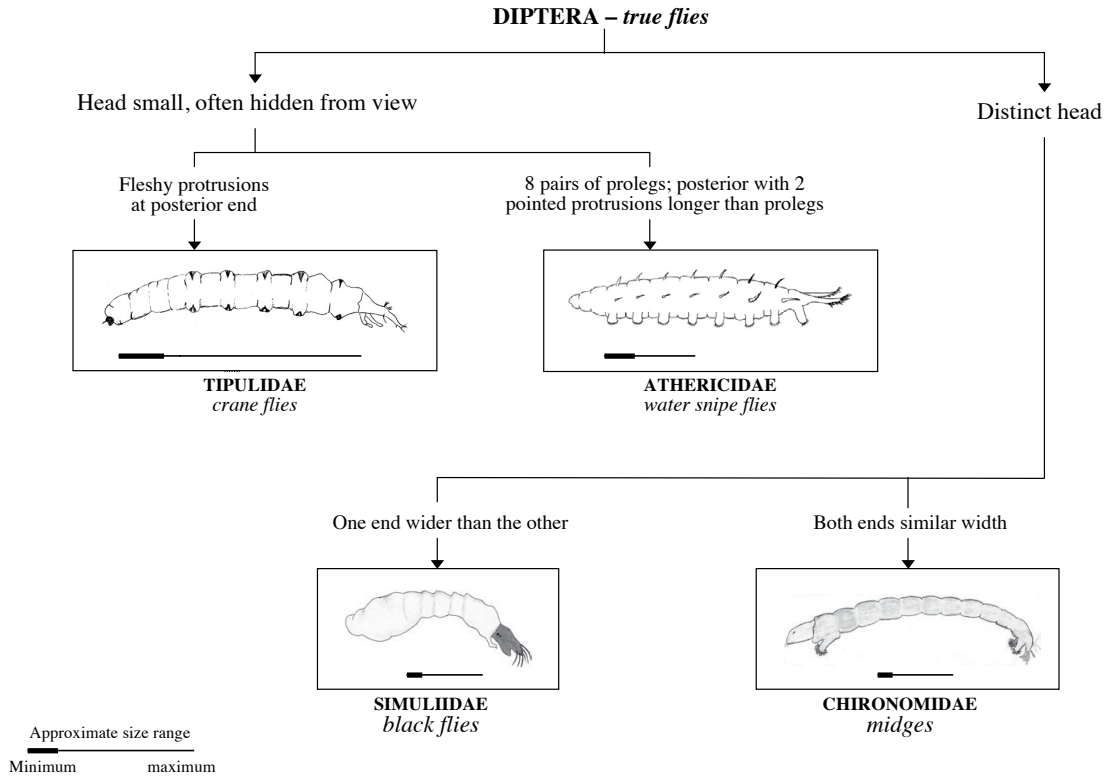
- Abdomen:** posterior body segment of insect
- Filaments:** hair-like structures
- Jointed leg:** true legs, legs capable of bending
- Lateral:** at the side
- Portable case:** structure made of leaves, twigs, or sand that some caddisfly larvae carry with them
- Posterior:** tail end of the body
- Prolegs:** short, stumpy leg-like structures (not jointed)
- Protrusion:** part of the body that sticks out
- Segment:** a section of body
- Ventral:** underside
- Wing pads:** developing wings, often W in shape



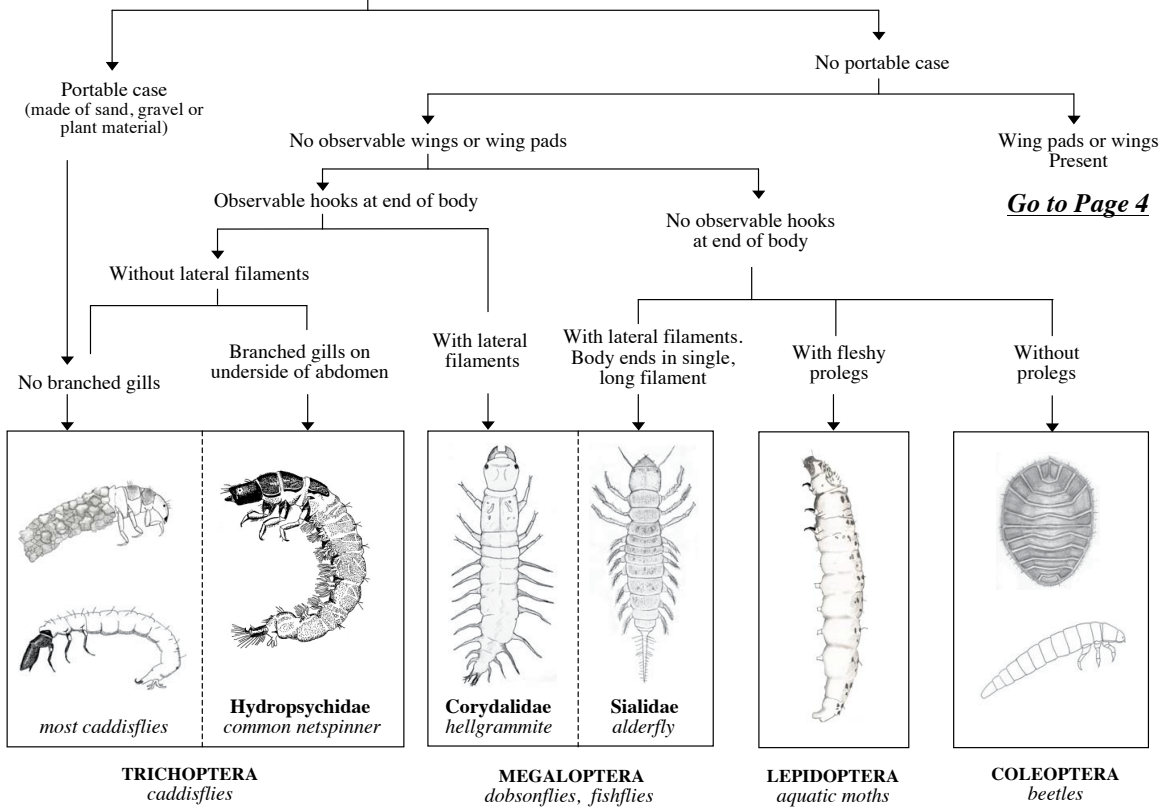
Identification Guide to Freshwater Macroinvertebrates



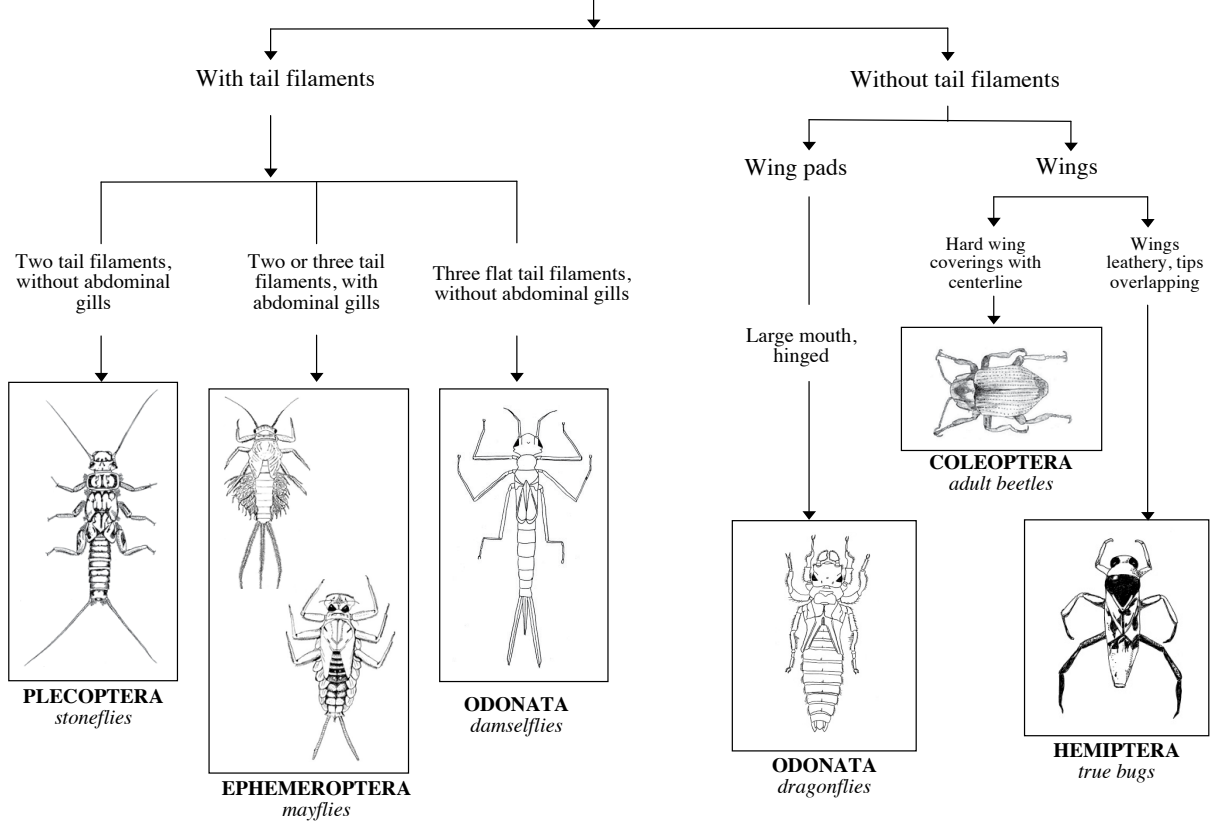
Worm-like with distinct head or fleshy protrusion



Six jointed legs







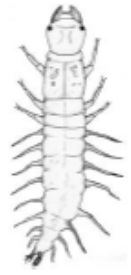

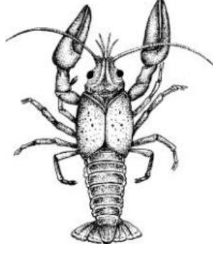



Wing pads or wings present







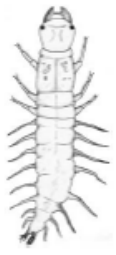

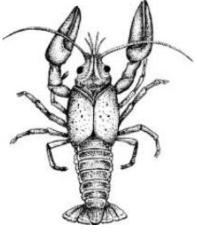



Biodiversity index form

Sensitive	Somewhat sensitive	Tolerant
<input type="checkbox"/> Caddisfly Larvae <input type="checkbox"/> Hellgramite <input type="checkbox"/> Mayfly Larvae <input type="checkbox"/> Gilled Snails <input type="checkbox"/> Rifle Beetle Adult <input type="checkbox"/> Stonefly Larvae <input type="checkbox"/> Water Penny Larvae	<input type="checkbox"/> Beetle Larvae <input type="checkbox"/> Clams <input type="checkbox"/> Crane Fly Larvae <input type="checkbox"/> Crayfish <input type="checkbox"/> Damselfly Larvae <input type="checkbox"/> Dragonfly Larvae <input type="checkbox"/> Scuds <input type="checkbox"/> Sowbugs <input type="checkbox"/> Fishfly Larvae <input type="checkbox"/> Alderfly Larvae <input type="checkbox"/> Watersnipe Larvae	<input type="checkbox"/> Aquatic Worms <input type="checkbox"/> Blackfly Larvae <input type="checkbox"/> Leeches <input type="checkbox"/> Midge Larvae <input type="checkbox"/> Lunged Snails
boxes checked × 3 = _____ index value	boxes checked × 2 = _____ index value	boxes checked × 1 = _____ index value
Water Quality Rating Total Index Value = _____	Excellent (> 22)	Fair (11–16)
	Good (17–22)	Poor (< 11)

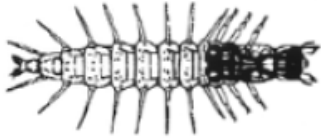





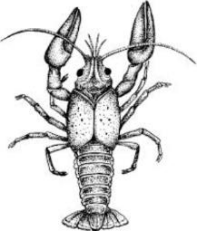

Practice sample 1

<p>10 Collected</p> 	<p>8 Collected</p> 
<p>4 Collected</p> 	<p>3 Collected</p> 
<p>6 Collected</p> 	<p>2 Collected</p> 
<p>4 Collected</p> 	<p>2 Collected</p> 
<p>12 Collected</p> 	<p>1 Collected</p> 

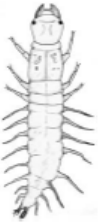



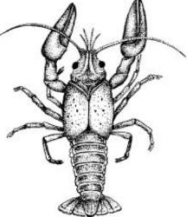

Practice sample key 1

<p>Stonefly Larva (3 Points)</p> 	<p>Mayfly Larvae (3 Points)</p> 
<p>Caddisfly Larva (3 Points)</p> 	<p>Water Penny Larva (3 Points)</p> 
<p>Hellgramite (3 Points)</p> 	<p>Riffle Beetle Larvae (2 Points)</p> 
<p>Crayfish (2 Points)</p> 	<p>Gilled Snail (3 Points)</p> 
<p>Midge Larva (1 Point)</p> 	<p>Scud (2 Points)</p> 





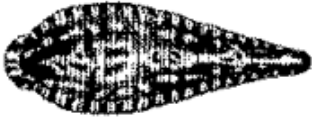
Practice sample key 2

<p>Fishfly Larva (2 Points)</p> 	<p>Stonefly Larva (3 Points)</p> 
<p>Midgefly Larva (1 Point)</p> 	<p>Cranefly Larva (2 Points)</p> 
<p>Caddisfly Larva (2 Points)</p> 	<p>Water Penny Larva (3 Points)</p> 
<p>Crayfish (2 Points)</p> 	<p>Aquatic Worm (1 Point)</p> 

Practice sample key 3

<p>Dobsonfly Larva (3 Points)</p> 	<p>Stonefly Larva (3 Points)</p> 
<p>Midgefly Larva (1 Point)</p> 	<p>Damselfly Larva (2 Points)</p> 
<p>Crayfish (2 Points)</p> 	<p>Aquatic Worm (1 Point)</p> 

Practice sample key 4

<p>Midgefly Larva (1 Point)</p> 	<p>Cranefly Larva (2 Points)</p> 
<p>Lunged Snail (1 Point)</p> 	<p>Blackfly Larva (1 Point)</p> 
<p>Leech (1 Point)</p> 	<p>Aquatic Worm (1 Point)</p> 