

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*





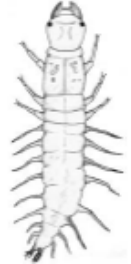





Directions

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 (includes 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 students groups test for biotic and chemical testing and record results.

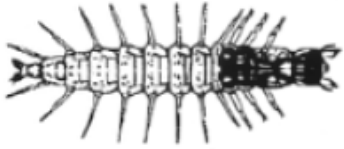







Reflection

1. What does sensitive, somewhat sensitive, and tolerant mean in terms of water quality?
2. Can a pollution tolerant organism thrive in excellent water quality?

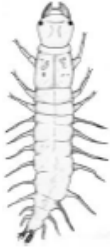





Practice sample 1

| | |
|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <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>  |





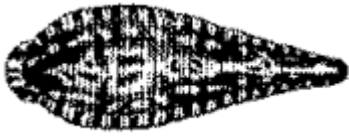

Practice sample 2

| | |
|--------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <p>3 Collected</p>  | <p>2 Collected</p>  |
| <p>14 Collected</p>  | <p>2 Collected</p>  |
| <p>1 Collected</p>  | <p>4 Collected</p>  |
| <p>2 Collected</p>  | <p>10 Collected</p>  |

Practice sample 3

| | |
|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <p>2 Collected</p>  | <p>2 Collected</p>  |
| <p>4 Collected</p>  | <p>3 Collected</p>  |
| <p>5 Collected</p>  | <p>3 Collected</p>  |

Practice sample 4

| | |
|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <p>5 Collected</p>  | <p>2 Collected</p>  |
| <p>3 Collected</p>  | <p>12 Collected</p>  |
| <p>2 Collected</p>  | <p>4 Collected</p>  |

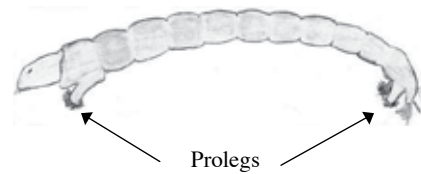
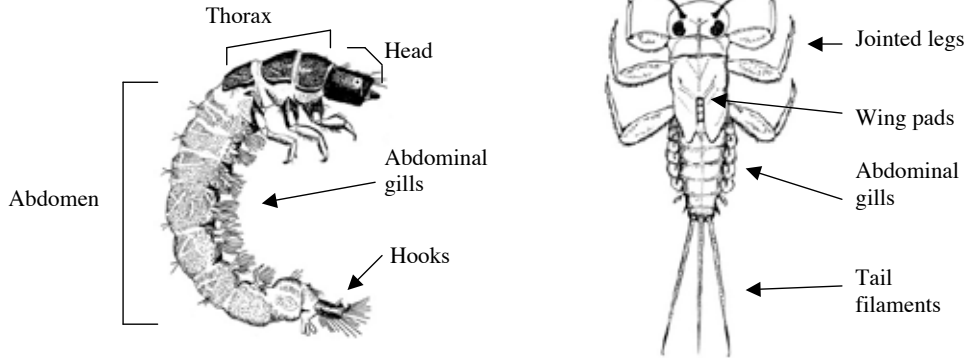
Macroinvertebrate identification key

Major Characteristics of Aquatic Larvae

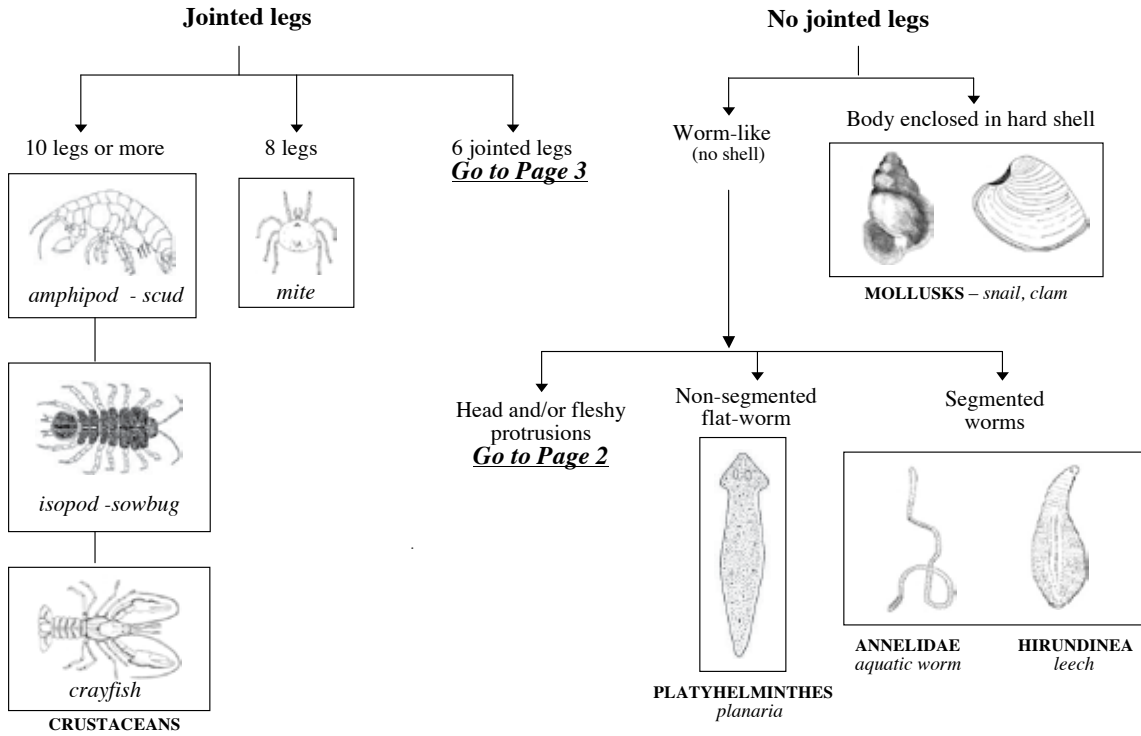


Glossary

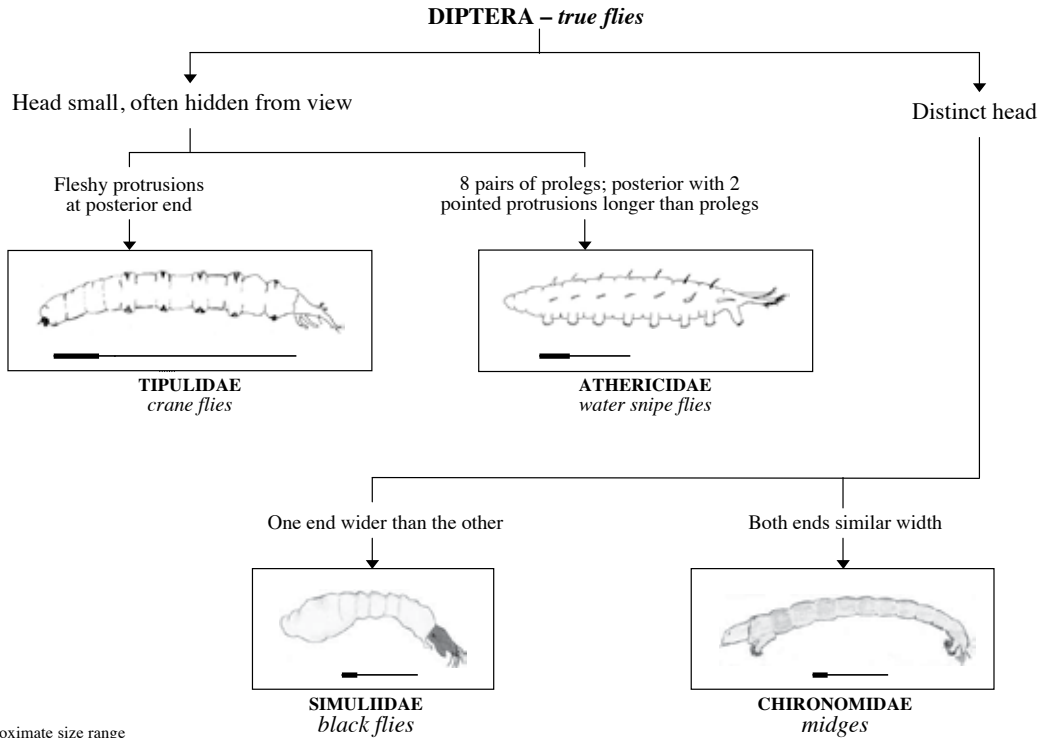
- Abdomen:** posterior body segment of insect
- Filaments:** hair-like structures
- Jointed leg:** true legs, legs capable of bending
- Lateral:** at the side
- Portable case:** structure made of leaves, twigs, or sand that some caddisfly larvae carry with them
- Posterior:** tail end of the body
- Prolegs:** 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



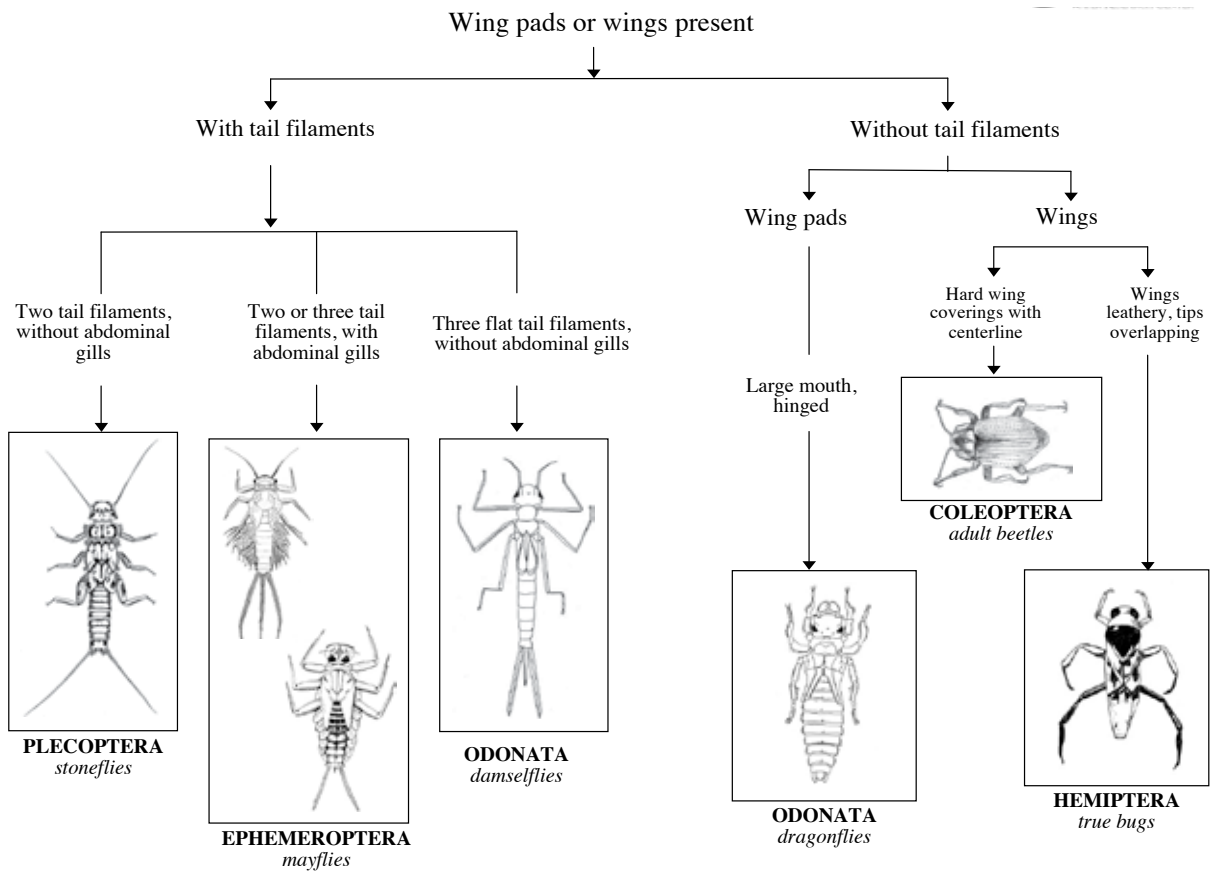
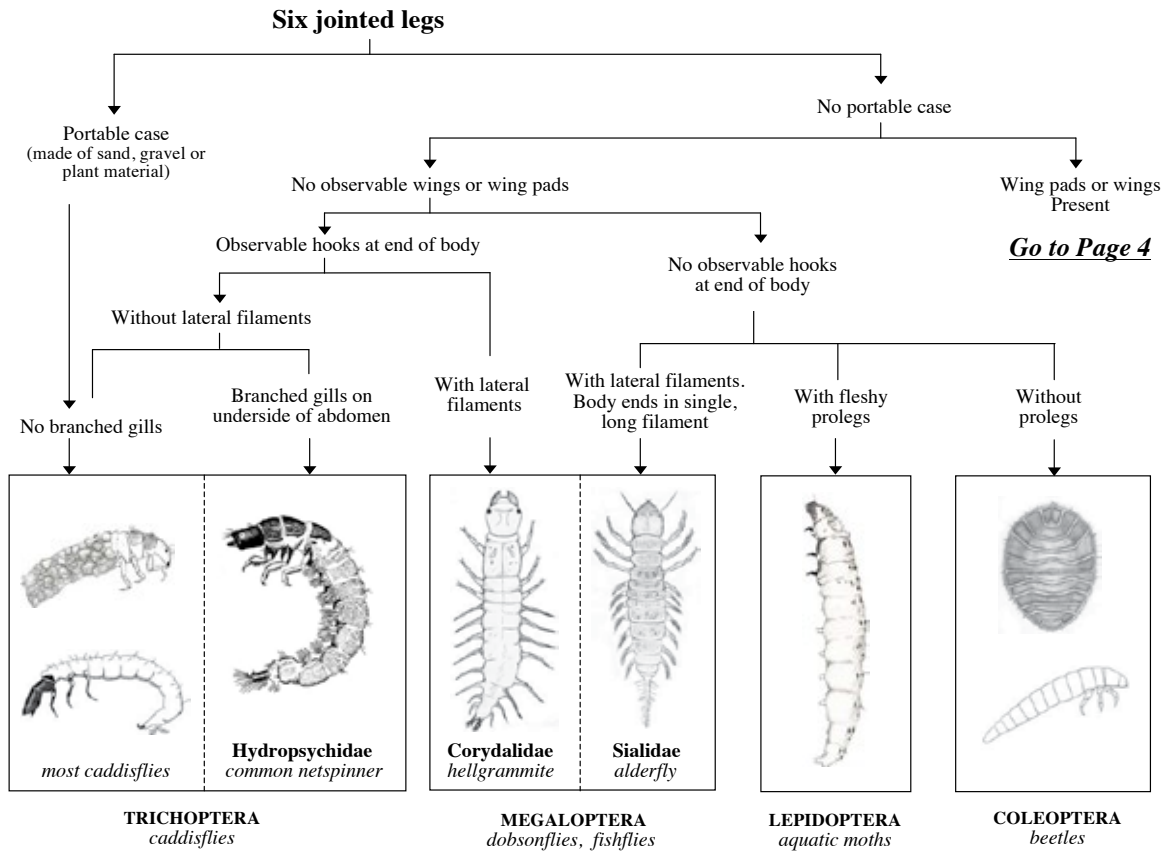
Identification Guide to Freshwater Macroinvertebrates



Worm-like with distinct head or fleshy protrusion







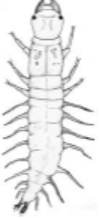





Approximate size range
 Minimum maximum



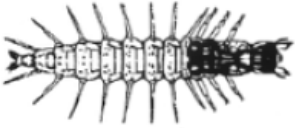







Biodiversity index form

| 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) Good (17–22) | Fair (11–16) Poor (< 11) |







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>  |





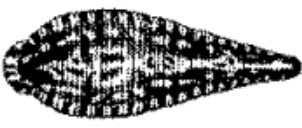

Practice sample key 2

| | |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <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>A detailed black and white illustration of a dobsonfly larva, showing its segmented body, numerous pairs of legs, and a prominent head with large mandibles.</p> | <p>Stonefly Larva (3 Points)</p>  <p>A detailed black and white illustration of a stonefly larva, characterized by its three pairs of long, jointed legs and a segmented body.</p> |
| <p>Midgefly Larva (1 Point)</p>  <p>A black and white illustration of a midgefly larva, showing a segmented, worm-like body with a distinct head and tail.</p> | <p>Damselfly Larva (2 Points)</p>  <p>A black and white illustration of a damselfly larva, showing its three pairs of legs, a segmented body, and a pair of long, thin gills at the end of its abdomen.</p> |
| <p>Crayfish (2 Points)</p>  <p>A black and white illustration of a crayfish, showing its two large pincers (chelae), several pairs of legs, and its segmented body.</p> | <p>Aquatic Worm (1 Point)</p>  <p>A black and white illustration of an aquatic worm, showing its segmented body and a curved, S-shaped posture.</p> |

Practice sample key 4

| | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Midgefly Larva (1 Point)</p>  A small, segmented, worm-like larva with a curved body and small appendages at the ends. | <p>Cranefly Larva (2 Points)</p>  A larger, segmented larva with a more robust body and visible head appendages. |
| <p>Lunged Snail (1 Point)</p>  A snail with a prominent, rounded shell and a visible siphon extending from the top. | <p>Blackfly Larva (1 Point)</p>  A curved, segmented larva with a textured surface and small appendages. |
| <p>Leech (1 Point)</p>  A flat, segmented leech with a textured, patterned surface. | <p>Aquatic Worm (1 Point)</p>  A thin, segmented worm with a curved, looping body. |