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 chemcial 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?

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

3. How does farming affect water quality?

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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

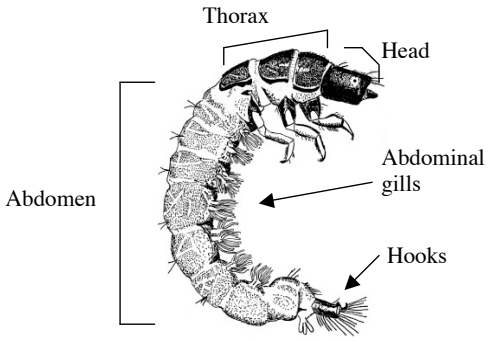
Prolegs: short, stumpy leg-like structures (not jointed)

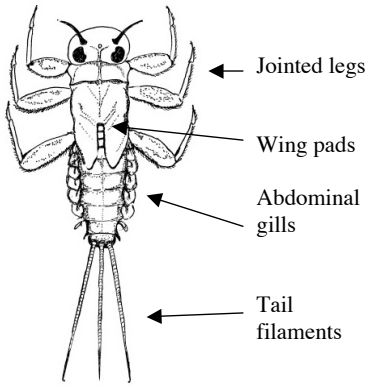
Protrusion: part of the body that sticks out

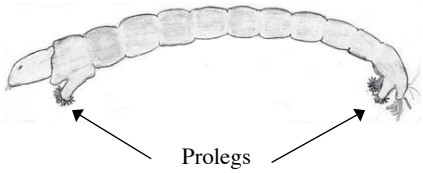
Segment: a section of body

Ventral: underside

Wing pads: developing wings, often W in shape







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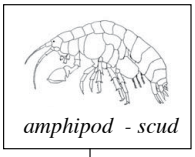
Identification Guide to Freshwater Macroinvertebrates

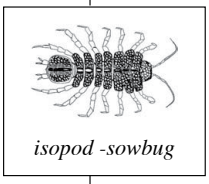
STROUD WATER RESEARCH CENTER

Jointed legs

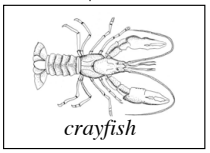
10 legs or more



amphipod - scud



isopod -sowbug



crayfish

CRUSTACEANS

8 legs

mite

6 jointed legs

Go to Page 3

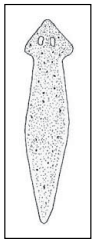
No jointed legs

Worm-like
(no shell)

Head and/or fleshy protrusions

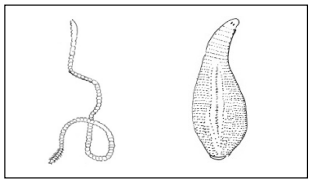
Go to Page 2

Non-segmented flat-worm



PLATYHELMINTHES
planaria

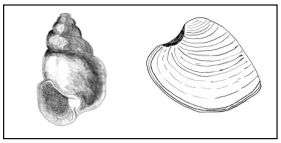
Segmented worms



ANNELIDAE
aquatic worm

HIRUNDINEA
leech

Body enclosed in hard shell



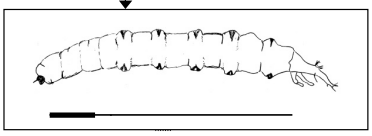
MOLLUSKS – *snail, clam*

Worm-like with distinct head or fleshy protrusion

DIPTERA – *true flies*

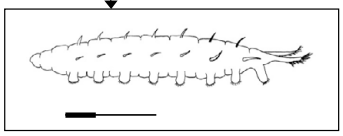
Head small, often hidden from view

Fleshy protrusions at posterior end



TIPULIDAE
crane flies

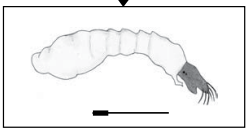
8 pairs of prolegs; posterior with 2 pointed protrusions longer than prolegs



ATHERICIDAE
water snipe flies

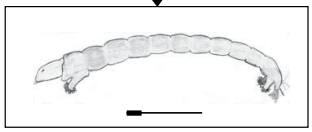
Distinct head

One end wider than the other



SIMULIIDAE
black flies

Both ends similar width



CHIRONOMIDAE
midges

Approximate size range

Minimum maximum

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Six jointed legs

Portable case (made of sand, gravel or plant material)

No portable case

No observable wings or wing pads

Wing pads or wings Present

Go to Page 4

Observable hooks at end of body

No observable hooks at end of body

Without lateral filaments

No branched gills

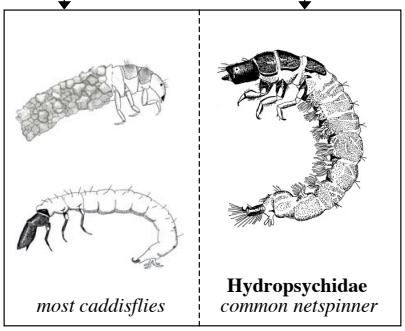
Branched gills on underside of abdomen

With lateral filaments

With lateral filaments. Body ends in single, long filament

With fleshy prolegs

Without prolegs



most caddisflies

Hydropsychidae
common netspinner

Corydalidae
hellgrammite

Sialidae
alderfly

TRICHOPTERA
caddisflies

MEGALOPTERA
dobsonflies, fishflies

LEPIDOPTERA
aquatic moths

COLEOPTERA
beetles

Wing pads or wings present

With tail filaments

Without tail filaments

Two tail filaments, without abdominal gills

Two or three tail filaments, with abdominal gills

Three flat tail filaments, without abdominal gills

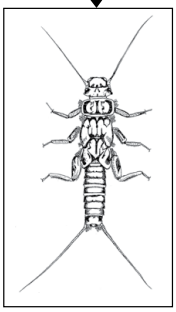
Wing pads

Wings

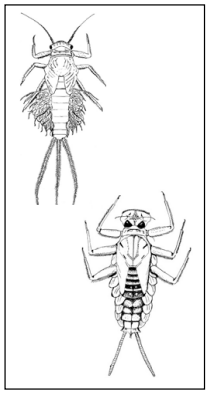
Large mouth, hinged

Hard wing coverings with centerline

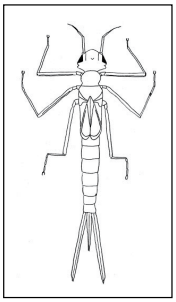
Wings leathery, tips overlapping



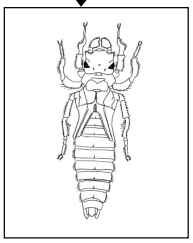
PLECOPTERA
stoneflies



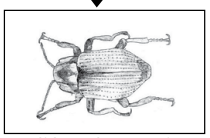
EPHEMEROPTERA
mayflies



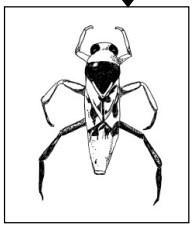
ODONATA
damselflies



ODONATA
dragonflies



COLEOPTERA
adult beetles



HEMIPTERA
true bugs

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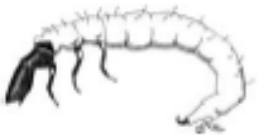
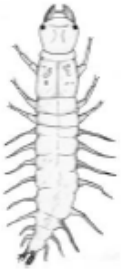
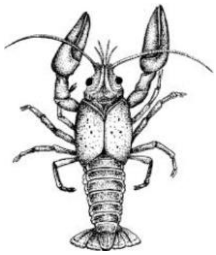
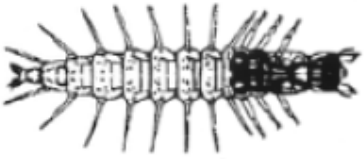
Biodiversity index form

Sensitive	**Somewhat sensitive**	**Tolerant**
☐ Caddisfly Larvae ☐ Hellgramite ☐ Mayfly Larvae ☐ Gilled Snails ☐ Rifle Beetle Adult ☐ Stonefly Larvae ☐ Water Penny Larvae	☐ Beetle Larvae ☐ Clams ☐ Crane Fly Larvae ☐ Crayfish ☐ Damselfly Larvae ☐ Dragonfly Larvae ☐ Scuds ☐ Sowbugs ☐ Fishfly Larvae ☐ Alderfly Larvae ☐ Watersnipe Larvae	☐ Aquatic Worms ☐ Blackfly Larvae ☐ Leeches ☐ Midge Larvae ☐ 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

10 Collected 	8 Collected 
4 Collected 	3 Collected 
6 Collected 	2 Collected 
4 Collected 	2 Collected 
12 Collected 	1 Collected 

Practice sample 2

3 Collected 	2 Collected 
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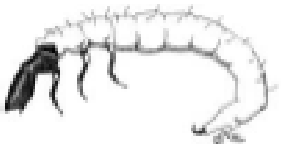
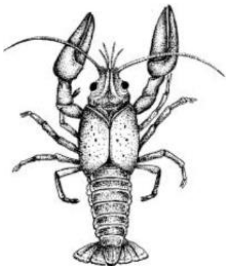
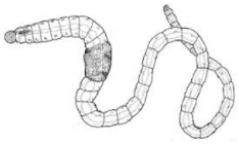
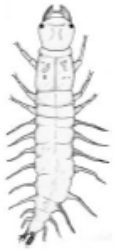
1 Collected 	4 Collected 
2 Collected 	10 Collected 

Practice sample 3

2 Collected 	2 Collected 
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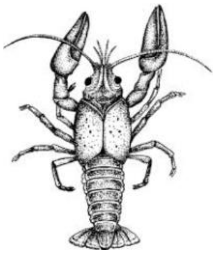
5 Collected 	3 Collected 

Practice sample 4

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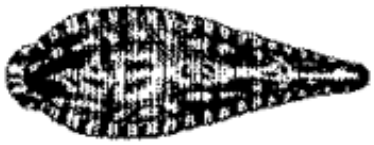
2 Collected 	4 Collected 

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