Who Lives in the Water?

Purpose: To investigate observe and quantify macroinvertebrates through observation and charting.

Summary: In this exercise, students will, using, the Virtual Macroinvertebrate Program, observe macroinvertebrates. They will record and summarize and interpret their findings.

Background: Aquatic macroinvertebrates (insects and other organisms that live in streams and ponds) display a wide range of adaptations to different aquatic conditions. Some types of macroinvertebrates are extremely tolerant of changes in temperature, flow, food, or even the presence of pollutants, while other types are so sensitive to these changes that they may die or move to other areas. In this activity, students identify the macroinvertebrates in a stream using the Virtual Macroinvertebrate Identification Program noting which types are most abundant.

Materials:
Macroinvertebrate Tally sheet
Macroinvertebrate Pollution Sensitivities
Guide to Macroinvertebrates
Macroinvertebrate Survey and Assessment

Documents:
Biological Monitoring
Stream side science User's Manual

Presentations:
Biological Monitoring
Who Lives in the Water.

Who Lives in the Water

Introduction

Macroinvertebrates are organisms that have no backbone and are visible to the naked eye. Macroinvertebrates live their lives mostly in the water. All macroinvertebrates start their lives in the water.

Each macroinvertebrate has its own pollution tolerance. The classes of macroinvertebrates are low pollution tolerant, somewhat pollution tolerant, and high pollution tolerant (Primbas, 2005).

Macroinvertebrates that are low pollution tolerant are caddisflies, water pennies, stoneflies, and mayflies.

Somewhat pollution tolerant macroinvertebrates are dragonflies, craneflies, and damselflies.

High pollution tolerant macroinvertebrates are blackflies, aquatic worms, and midges (Primbas, 2005)

Biotic index values of macroinvertebrates can be used to determine the water quality. The Hillsenhoff's biotic index scale ranges from one to ten.

An average biotic index values ranges from 1 to 3.75 the water quality is considered

excellent. An average biotic index values from 3.76 to 5 infer good water quality

An average biotic index values from 5.1 to 6.5 infer fair water quality,

An average biotic index values from 6.6 to 10.9 infer poor water quality. (Faulds, Murray, & Neville, n.d.)

Macroinvertebrates have different preferred habitats based on the water quality they need to survive:

Riffles
Stagnant
Pools
Undercut Banks

The anatomy of a stream includes habitats such as riffles, undercut banks, and stagnant pools.

Riffles are fast moving white water with a rocky bottom that is not too deep.

Undercut banks are slow moving deep waters that flow under the edge of the stream bank. This habitat has an overhang of vegetation. When vegetation falls into the stream, it is washed downstream into stagnant pools where it stays and decomposes. (Allan, 1995).

Macroinvertebrates have different preferred habitats based on the water quality they need to survive. Many macroinvertebrates prefer or need a high dissolved oxygen level.

Many macroinvertebrates also prefer to live where the temperature is cold and the current is fast, some macroinvertebrates need or prefer warmer temperatures with less dissolved oxygen.

Macroinvertebrates such as leeches and aquatic worms are very tolerant to pollution and they do not need high dissolved oxygen levels

Macroinvertebrate Graphing Activity

PURPOSE: To describe and identify the quality of a stream site by analyzing the aquatic macroinvertebrates that live there.

SUMMARY: Students will learn about water quality indicators through the use of candy representing a "macroinvertebrate sample." Sorting the candy and evaluating what is found will tell the students about the quality of the water.

BACKGROUND: Sometimes it is easy to tell if a stream is polluted. Strange colors and dead fish are often indicators of poor water quality, but biologists need to know about water quality problems long before they reach this point. Some of their most effective partners in detecting declining trends in water quality are aquatic macroinvertebrates because they respond rapidly to changes in water quality.

To evaluate the health and productivity of a stream, biologists look at the types of macroinvertebrate species who live there. Different species have different tolerance levels to pollution. If many pollution-intolerant organisms, such as stonefly or caddisfly nymphs, are present, the water quality is probably good. Although the presence of certain species indicates good water quality, the absence of these species does not necessarily indicate bad water quality. Other factors besides pollution may account for their absence.

Sensitive or Intolerant Species:
Organisms easily killed, impaired, or driven off by bad water quality; includes many types of stonefly, dobsonfly, and mayfly nymphs and caddisfly larvae.

Somewhat Tolerant Species:
Organisms with the ability to live under varying conditions may be found in good or poor quality water; includes amphipods, scuds, beetle and cranefly larvae, crayfish, and dragonfly nymphs.

Tolerant Species:
Organisms capable of withstanding poor water quality; includes most leeches, aquatic worms, midge larvae, and sow bugs.

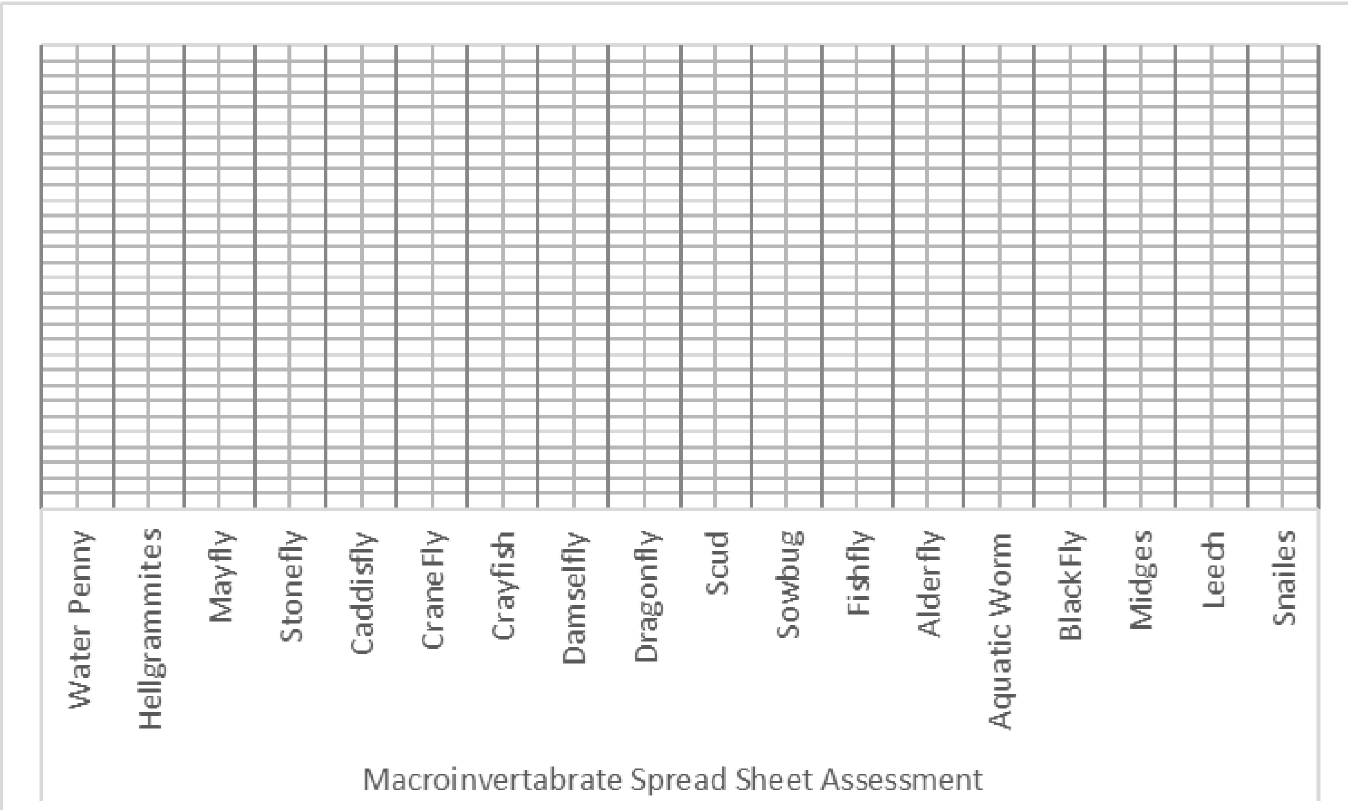
PROCEDURE:

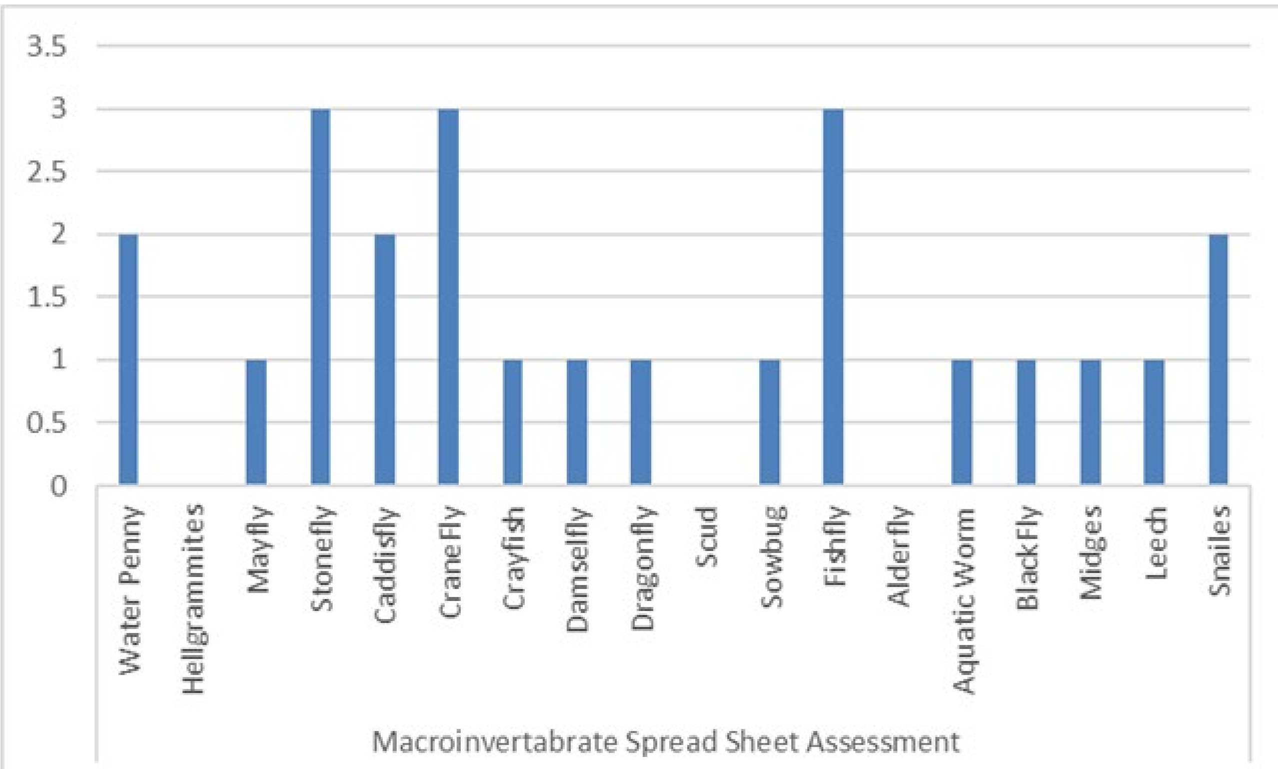
1. Distribute graph paper to each student. Have students set up a bar graph for the aquatic macroinvertebrate sample. Label the x-axis with the names of the macroinvertebrates. Label the y-axis with the number of macroinvertebrates. You can also make copies of the graph below to hand out to the students.

2. Using the Macroinvertebrate Talley Sheet Have the students count the number of each species of macroinvertebrate and graph them on the paper. Have the students try to determine the quality of the water.

BENTHIC MACROINVERTEBRATE IDENTIFICATION ACTIVITY ANSWERS

Aquatic Snails	1
Snipe flies	1
Black Fly	1
Caddisfly	1
Crain Fly	3
Crayfish	1
Dragonflies	1
Damselflies	1
Fishflies	3
Leach	1
Mayflies	1
Midges	3
Stoneflies	1
Water Penney	2
Worms	1


Water Penny
Hellgrammites
Mayfly
Stonefly
Caddisfly
Crane Fly
Crayfish
Damselfly
Dragonfly
Scud
Sowbug
Fishfly
Alderfly
Aquatic Worm
Black Fly
Midges
Leech
Snailes
Macroinvertabrate Spread Sheet Assessment


3.5
3
2.5
2
1.5
1
0.5
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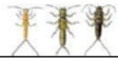
Water Penny
Hellgrammites
Mayfly
Stonefly
Caddisfly
Crane Fly
Crayfish
Damselfly
Dragonfly
Scud
Sowbug
Fishfly
Alderfly
Aquatic Worm
Black Fly
Midges
Leech
Snailes
Macroinvertabrate Spread Sheet Assessment

MACROINVERTEBRATE TALLY SHEET

Assessment Exercise

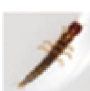
Macroinvertebrate	N0.
Mayflies 	
Stoneflies 	
Caddisflies 	
Hellgrammite/Fish Flies 	
Water snipe Flies 	
Riffle Beetles 	
Water Pennies 	
Gilled Snails 	
Net Spinning Caddisflies 	
Damselflies 	

Macroinvertebrate	N0.
Crane Flies 	
Sowbugs 	
Scuds 	
Crayfish 	
Black Flies 	
 Clams and Mussels	
Midge flies 	
Lunged snails 	
Worms 	
Leeches 	
Dragonflies 	

MACROINVERTEBRATE TALLY SHEET

Assessment Exercise

Answers

Macroinvertebrate	NO.
Mayflies 	14
Stoneflies 	1
Caddisflies 	1
Hellgrammite/Fish Flies 	
Water snipe Flies 	1
Riffle Beetles 	
Water Pennies 	2
Gilled Snails 	1
Case Building Caddis 	1
Damselflies 	1
Adler Fly 	1

Macroinvertebrate	NO.
Crane Flies 	1
Sowbugs 	1
Scuds 	
Crayfish 	1
Black Flies 	1
Clams and Muscles 	
Midge flies 	4
Lunged snails 	
Worms 	1
Leeches 	1
Dragonflies 	1

Biological Monitoring Data Sheet

Record the taxa (group) represented in your sampling by either entering the number of organisms you counted

Group 1 - Intolerant	Group 2 - Moderately Intolerant	Group 3 - Fairly Tolerant	Groups 4 - Very Tolerant
Stonefly nymph	Damselfly nymph	Leech	Aquatic worm
Mayfly nymph	Dragonfly nymph	Midge larva	Blood midge larva (red)
Caddisfly larva	Scud	Planaria/ Flatworm	Rat-tailed Maggot
Riffle Beetle	Sowbug	Black fly larva	Left-Handed or Pouch snail
Dobsonfly Larva	Cranefly larva		
Right-Handed or Gilled snail	Clam/Mussel		
Water Penny	Crayfish		
# of TAXA represented	# of TAXA represented	# of TAXA represented	# of TAXA represented
Weighting Factor (x4)	Weighting Factor (x3)	Weighting Factor (x2)	Weighting Factor (x1)

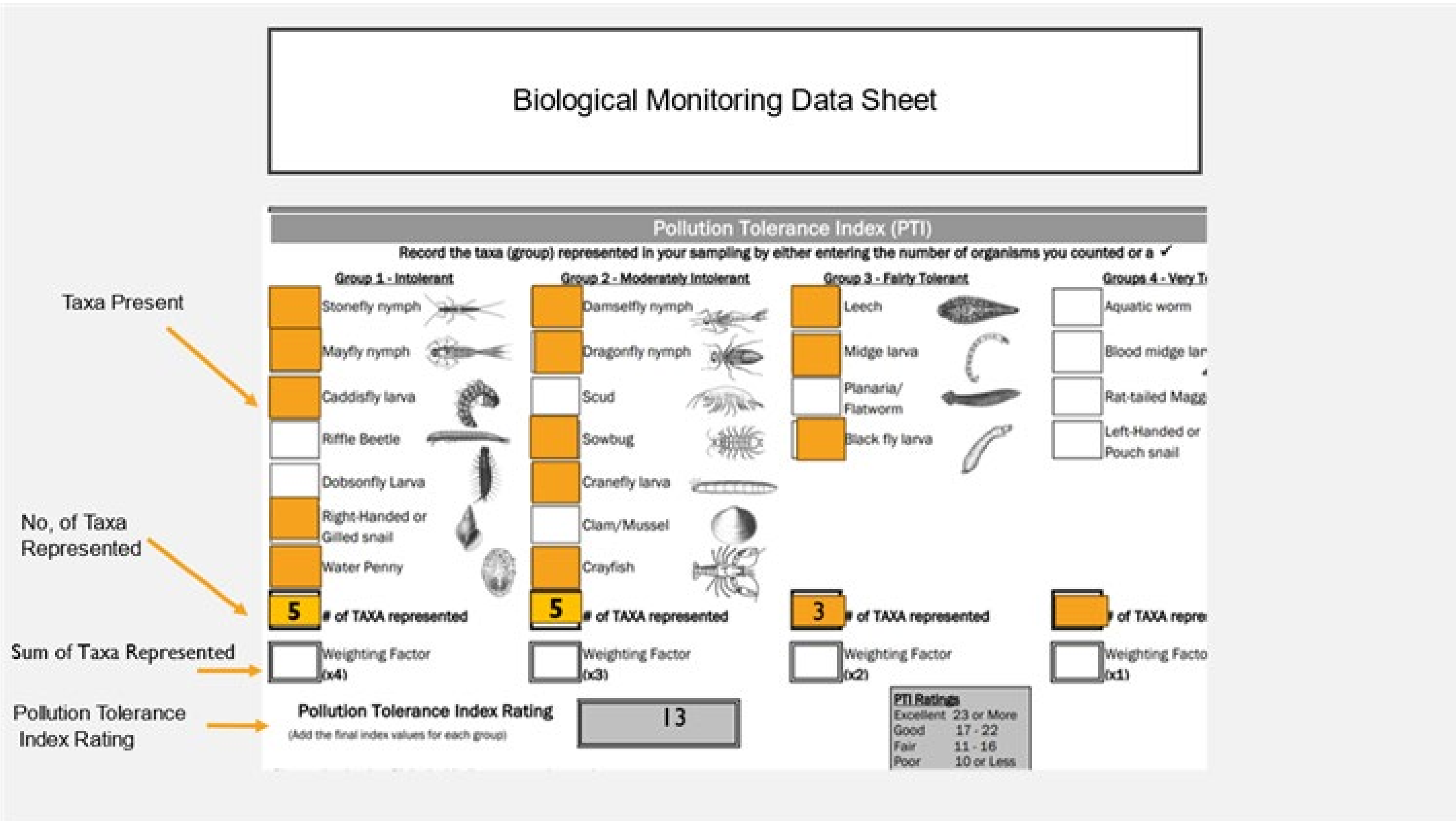
Pollution Tolerance Index Rating

(Add the final index values for each group)

PTI Ratings	
Excellent	23 or More
Good	17 - 22
Fair	11 - 16
Poor	10 or Less

Use the Pollution tolerance Index to compute the Pollution Tolerance Indices for the stream.

Enter the number of individuals for that Taxa in the box adjacent to the organism.
Enter the number of Taxa represented in each sensitivity group in the box titled #of Taxa Represented.
Sum the number of Taxa represented in each category, and enter that value in the in the Pollution Tolerance Index Rating box.



Based on a biotic index of 13 the Assessment Stream has fair water quality the predominant taxa were intolerant and moderately tolerant species

COMPARING MACROINVERTEBRATES FROM THREE HABITATS

Using the macroinvertebrate assessment data for the following

sites Riffles

Stagnant Pools

Undercut Banks

Complete a Macroinvertebrate Assessment form for each site.

Graph, construct bar graphs for each site. Compare the information from the three sites.

Discuss your interpretation of these results

Macroinvertebrate counts for Riffles

Species	Count
Caddisflies	30
Water Pennies	24
Stoneflies	12
Mayflies	6
Craneflies	6
Hellgrammites	5
Scuds	3
Aquatic worms	3
Riffle Beetles	2
Damselflies	2
Midges	2
Dragonflies	2
Fishflies	1
Blackflies	1

Macroinvertebrate counts for Stagnant Pool

Species	Count
Caddisflies	
Water Pennies	1
Stoneflies	1
Mayflies	
Craneflies	
Hellgrammites	
Scruds	
Aquatic worms	55
Riffle Beetles	
Damselflies	
Midges	24
Dragonflies	1
Fishflies	5
Blackflies	7
Leaches	7
Dragon flies	1
Lug Snails	1

Macroinvertebrate counts for Undercut Banks

Species	Count
Caddisflies	23
Water Pennies	12
Stoneflies	3
Mayflies	17
Craneflies	3
Hellgrammites	7
Scuds	2
Aquatic worms	15
Riffle Beetles	5
Damselflies	2
Midges	
Dragonflies	1
Fishflies	5
Blackflies	7
Leaches	7
Dragon flies	2
Crayfish	1
Lug Snails	1

Discuss your interpretation of these results

Habitat Scores

Riffles

Undercut Banks

Stagnant Pool

Discussion

Discuss your interpretation of these results

Habitat Scores

Based on the biotic index scale shown above the riffle habitat has excellent water quality;

The undercut bank habitat has a good water quality.

The stagnate pool had fair water quality.

Riffles

The predominant species in the riffle habitat where; caddisflies, water pennies and stoneflies (which are highly sensitive to pollution).

Moderate pollution tolerant organisms where also found: dragonflies, fishflies, blackflies and water striders where found.

The only pollution tolerant macroinvertebrate that were found in the riffle habitat was the blackfly

Undercut Banks

The primary change from an excellent site is that there were fewer taxa of stoneflies. Mayflies will be present, but fewer taxa. Beetles should still be present. A few types of caddisflies should be present depending on the type of degradation. Freshwater mollusks where absent.

There were more caddisflies and mayflies than any other macroinvertebrate at the undercut bank habitat.

A fairly large number of water pennies. Caddisflies, mayflies and water pennies where found. They are macroinvertebrates that fall under the most sensitive category.

In addition, a large number of the macroinvertebrates found in the undercut bank habitat were aquatic worms which are pollution tolerant.

Stagnant Pool

The stagnant pool had the most pollution tolerant macroinvertebrates, a few highly sensitive and hardly any somewhat sensitive macroinvertebrates.

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Findings

The purpose of this exercise was to compare macroinvertebrates found at three habitats: riffles, undercut and stagnant pool.

The comparison of the macroinvertebrates helped determine the water quality of each habitat.

The biotic index values were significantly different because the macroinvertebrates have different tolerances to pollution and nutrient levels, and different dissolved oxygen needs.

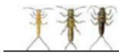
Macroinvertebrates with a higher biotic index value were found in the stagnant pools, macroinvertebrates with a lower biotic index value were found in the in the riffles, and a mix of macroinvertebrates with high and low biotic index values in the undercut banks.

Overall sensitive macroinvertebrates had the highest percent at the riffle and undercut bank habitat, and pollution tolerant has the highest percent at the stagnant pool

Displays and Handouts

MACROINVERTEBRATE TALLY SHEET

Assessment Exercise

Macroinvertebrate	N0.
Mayflies 	
Stoneflies 	
Caddisflies 	
Hellgrammite/Fish Flies 	
Water snipe Flies 	
Riffle Beetles 	
Water Pennies 	
Gilled Snails 	
Net Spinning Caddisflies 	
Damselflies 	

Macroinvertebrate	N0.
Crane Flies 	
Sowbugs 	
Scuds 	
Crayfish 	
Black Flies 	
Clams and Mussels 	
Midge flies 	
Lunged snails 	
Worms 	
Leeches 	
Dragonflies 	

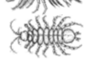
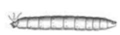
Biological Monitoring Data Sheet

Record the taxa (group) represented in your sampling by either entering the number of organisms you counted

Group 1 - Intolerant

- Stonefly nymph 
- Mayfly nymph 
- Caddisfly larva 
- Riffle Beetle 
- Dobsonfly Larva 
- Right-Handed or Gilled snail 
- Water Penny 
- # of TAXA represented
- Weighting Factor (x4)

Group 2 - Moderately Intolerant

- Damselfly nymph 
- Dragonfly nymph 
- Scud 
- Sowbug 
- Cranefly larva 
- Clam/Mussel 
- Crayfish 
- # of TAXA represented
- Weighting Factor (x3)

Group 3 - Fairly Tolerant

- Leech 
- Midge larva 
- Planaria/ Flatworm 
- Black fly larva 
- # of TAXA represented
- Weighting Factor (x2)

Groups 4 - Very Tolerant

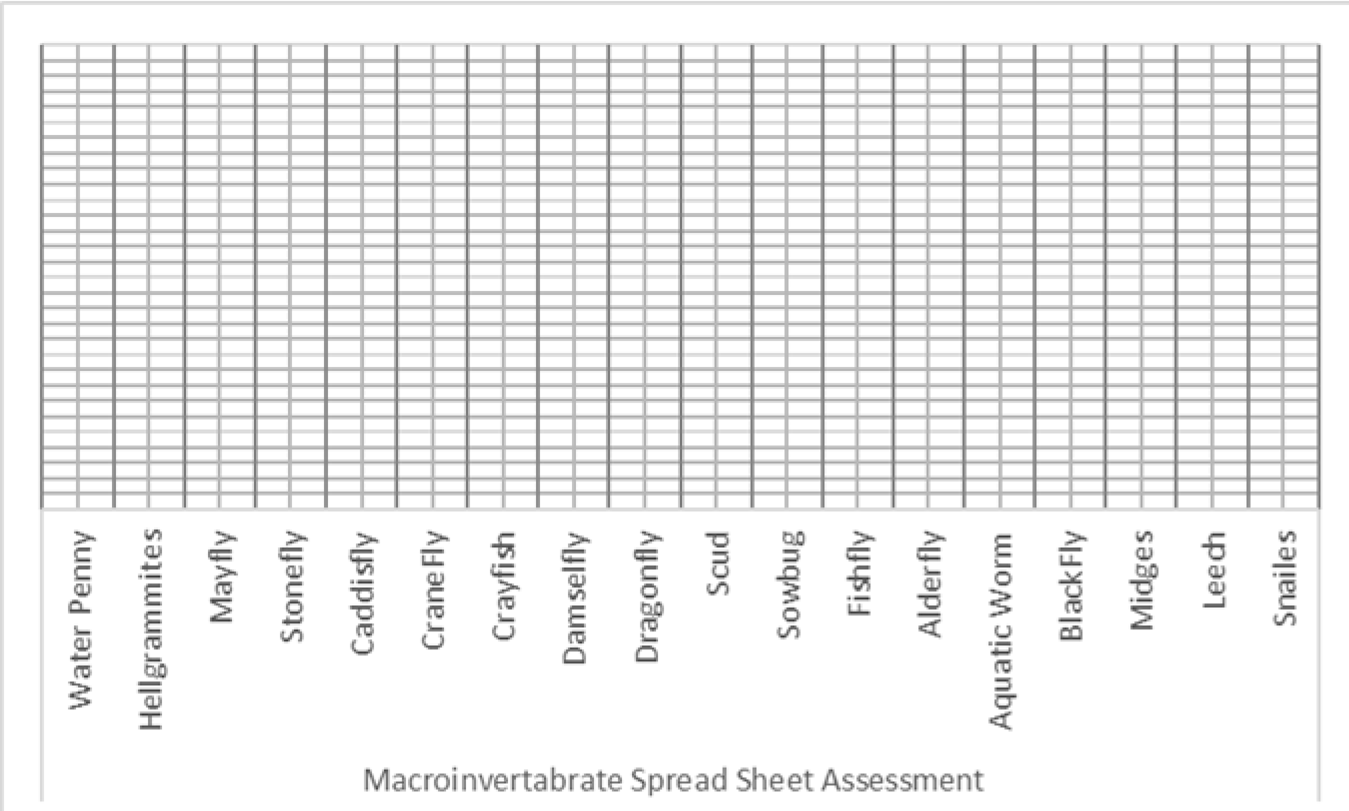
- Aquatic worm 
- Blood midge larva (red) 
- Rat-tailed Maggot 
- Left-Handed or Pouch snail 
- # of TAXA represented
- Weighting Factor (x1)

Pollution Tolerance Index Rating

(Add the final index values for each group)

PTI Ratings

Excellent	23 or More Good
	17 - 22
Fair	11 - 16
Poor	10 or Less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Damselfly
Dragonfly
Scud
Sowbug
Fishfly
Alderfly
Aquatic Worm
Black Fly
Midges
Leech
Snailes
Macroinvertabrate Spread Sheet Assessment

Guide to Aquatic Macroinvertebrates: The Basics

SAVE OUR STREAMS
IZAAK WALTON LEAGUE OF AMERICA

Riffle Beetle Larva

- Small crunchy, comma shaped body, up to 1/2 inch
- 3 pairs of segmented legs
- Gills and 2 hooks on posterior end

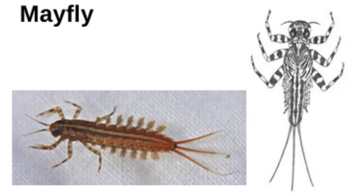
Riffle Beetle Adult

- Oblong beetle shape, long antennae
- Small, 1/16 - 1/8 of an inch
- Walks slowly underwater, doesn't swim on surface

Water Penny

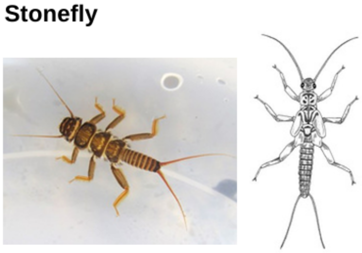
- Flat saucer-shaped body
- 3 tiny pairs of legs on the underside
- Up to 1/2 inch

Mayfly



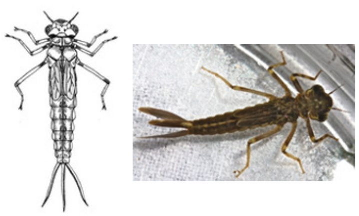
- Feather or leaf-like gills on the abdomen
- Typically has 3 tails (can have 2)
- 3 pairs of segmented legs

Stonefly



- Long antennae
- 2 tails
- No gills on abdomen
- 3 pairs of segmented legs

Damselfly



- 3 broad oar-shaped tails
- Long, narrow body with no gills on abdomen
- 3 pairs of spindly segmented legs

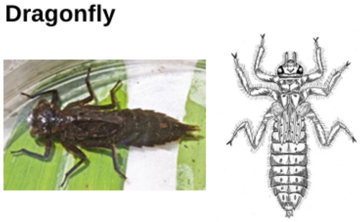
Common Net Spinning Caddisfly

- Head and first three thoraxes are hardened
- 2 fleshy, hairy hooks on the posterior
- 3 pairs of segmented legs
- Gill tufts on abdomen

Case-making/Free living Caddisfly

- May have a case constructed of sand, gravel, leaves or twigs
- Hardened head with grub-like soft body
- 3 pairs of segmented legs with hooks on the posterior

Dragonfly

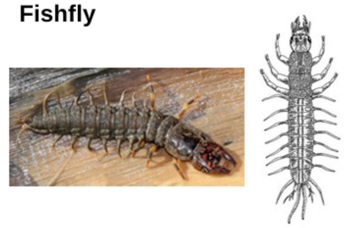


- Oval/round abdomen (may be wider than it is tall)
- Large eyes
- 3 pairs of segment legs

Dobsonfly (Hellgrammite)

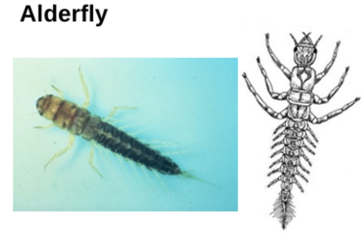
- 8 pairs of fleshy appendages on abdomen
- Cotton-like gill tufts between appendages
- Large pinching jaw

Fishfly



- 8 pairs of fleshy appendages on abdomen
- No gill tufts
- Forked posterior with 2 fleshly tails

Alderfly



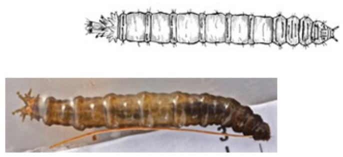
- 7 pairs of fleshy appendages on abdomen, no gill tufts
- One long thin branched tail

Guide to Aquatic Macroinvertebrates: The Basics

Midge

- Uniformly wide, segmented body
- Distinct head
- Pair of prolegs behind the head and at the posterior
- Up to 1/4 inch

Crane Fly



- Plump, caterpillar-like, segmented body
- 4 fingerlike lobes at the posterior
- 1/2 - 1 inch

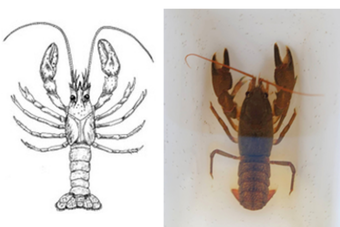
Black Fly

- Bowling pin shaped body
- Distinct head with one proleg directly underneath
- Up to 1/4 inch

Water Snipe

- Soft, fleshy body with tapered ends
- Caterpillar-like legs
- 2 feathery 'horns' at the posterior

Crayfish

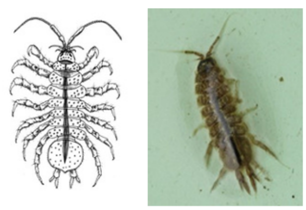


- Lobster-like body
- Two large claws near the head
- 1/2 - 5 inches

Scud

- Shrimp-like body, no hard covering
- Long antennae
- 7 pairs of legs
- Swims quickly on its side

Sowbug



- Oblong body
- 2 pairs of antennae, one longer than the other
- Armor-like appearance

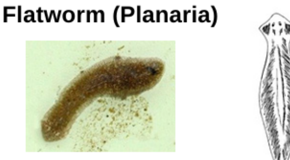
Clams & Mussels

- Fleshy body enclosed between two-hinged shells
- 1/8 - 5 inches

Leech

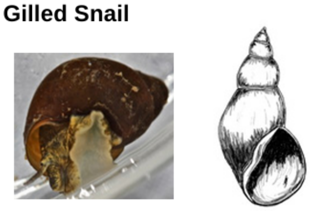
- Worm-like segmented body
- Both ends have suckers
- 1/4 - 2 inches

Flatworm (Planaria)



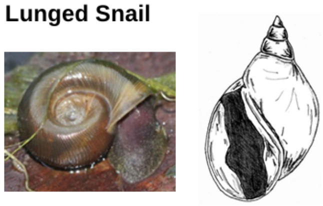
- Soft elongated body
- Triangular shaped head with eyes on top

Gilled Snail



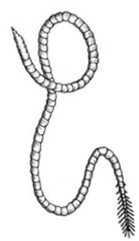
- Shell opens to the right when holding the shell with the narrow end pointing up and the opening facing you
- Has an operculum (thin plate covering the shell opening)

Lunged Snail



- Shell opens to the left when holding the shell with the narrow end pointing up and the opening facing you
- No operculum
- Shell might be in a coiled shape

Aquatic Worm

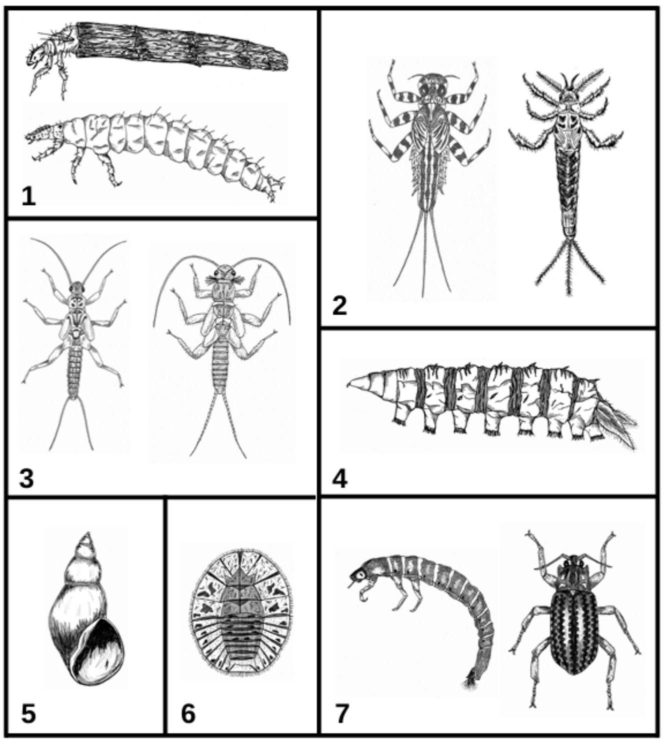


- No distinct head
- No legs
- 1/4 - 2 inches

Aquatic Macroinvertebrate Identification & Pollution Sensitivities

Sensitive to Pollution

These organisms are sensitive to pollution and indicate good water quality.



1 **Most Caddisflies: Order Trichoptera.** Up to 1”, 6 hooked legs on upper 1/3 of body, may be in stick, rock, or leaf case, no gill tufts on abdomen, intolerant of impairment.

2 **Mayfly: Order Emphemeroptera.** ¼” – 1”, plate-like or feathery gills on abdomen, 6 hooked legs, 2 or 3 long hair-like tails, tails may be webbed together, very intolerant of impairment.

3 **Stonefly: Order Plecoptera.** ½” – 1 ½”, 6 legs with hooked tips, antennae, 2 hair-like tails, no gills on abdomen, very intolerant of impairment.

4 **Watersnipe Fly: Order Diptera.** ¼” – 2”, body plump and maggot-like, caterpillar-like “legs” along body, feathery "horns" on end, intolerant of impairment.

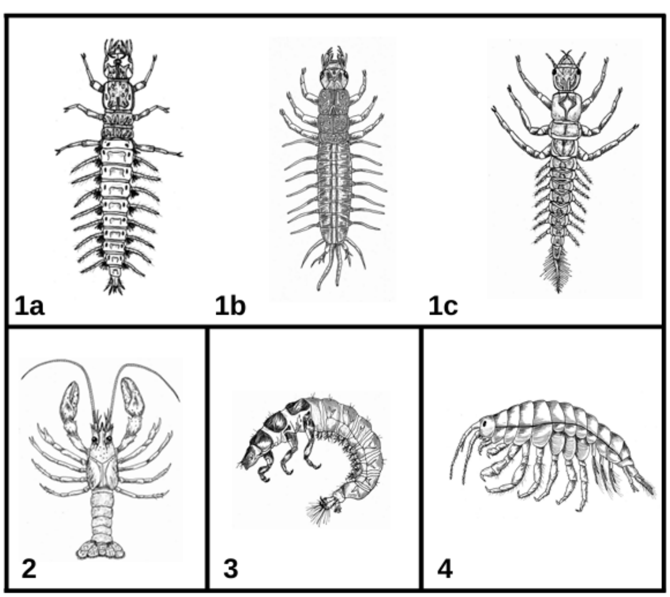
5 **Gilled Snails: Class Gastropoda.** Up to ¾”, shell opening covered by a thin plate called an operculum, with helix pointed up shell opens to the right, intolerant of impairment.

6 **Water Penny: Order Coleoptera.** ¼” – 1”, disk-like oval body with 6 small legs and gill tufts on underside, intolerant of impairment.

7 **Riffle Beetle: Order Coleoptera.** Small black beetle crawling on streambed OR comma-like brown “crunchy” body with 6 legs on upper 1/3 and possibly gill tuft on back end, intolerant of impairment.

Less Sensitive to Pollution

These organisms are somewhat sensitive to pollution and indicate fair water quality.

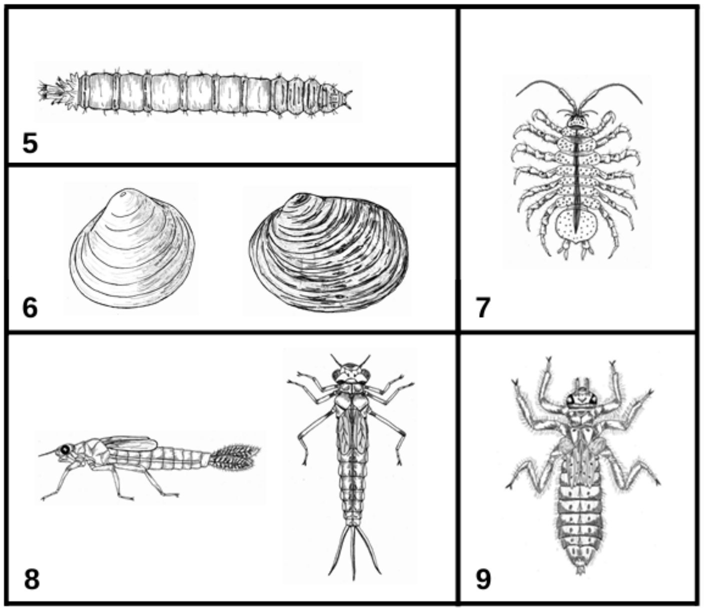


1 **Hellgrammite, Fishfly, and Alderfly: Order Megaloptera.** ¾” – 4”, 6 legs, large pinching jaws. **a)** 8 pairs of fleshy appendages along abdomen with gill tufts, 2 hooks on tail end, **b)** 8 pairs of fleshy appendages along abdomen without gill tufts, 2 tube-like appendages on tail end, **c)** 7 pairs of fleshy appendages without gill tufts, 1 single spiky tail; somewhat tolerant of impairment.

2 **Crayfish: Order Decapoda**. Up to 6”, 2 large claws, 8 legs, resembles a small lobster, somewhat tolerant of impairment.

3 **Common Netspinners: Family Hydropsychidae.** Up to ¾”, 6 hooked legs on upper 1/3 of body, 2 hooks at back end, white gill tufts on underside of abdomen, somewhat tolerant of impairment.

4 **Scud: Order Amphipoda.** ¼”, white to gray, body higher than it is wide, swims sideways, more than 6 legs, resembles small shrimp, somewhat tolerant of impairment.



5 **Crane Fly: Order Diptera.** ¼" – 2", bodies plump and maggotlike, caterpillar like "legs" along body, four lobes one end, tolerant of impairment.

6 **Clams and Mussels: Class Bivalvia.** Up to ¾", fleshy body enclosed between two clamped together shells (if clam is alive, shells cannot be pried apart without harming clam), somewhat tolerant of impairment.

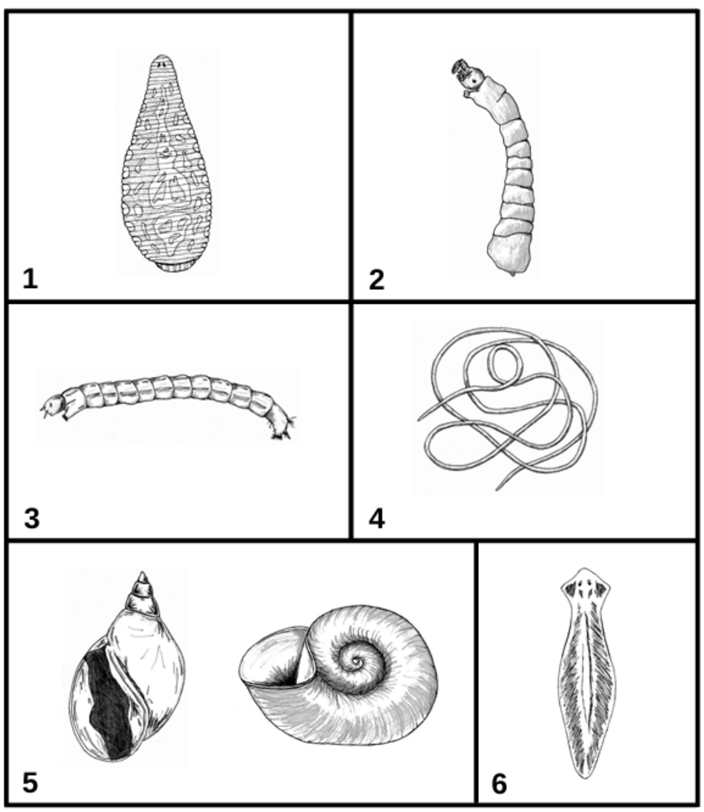
7 **Sowbug: Order Isopoda.** ¼" – ¾", gray oblong body wider than it is high, more than 6 legs, long antennae, somewhat tolerant of impairment.

8 **Damselfly: Order Odonata**. ½ " – 2", large eyes, 6 hooked legs, large protracting lower jaw, 3 broad oar-shaped tails, somewhat tolerant of impairment.

9 **Dragonfly: Order Odonata.** ½ " – 2", large eyes, 6 hooked legs, large protracting lower jaw, wide oval to round abdomen, somewhat tolerant of impairment.

Pollution Tolerant

These organisms are tolerant to pollution and indicate poor water quality.



1 **Leech: Order Hirudinea.** ¼" – 2", segmented body, suction cups on both ends, tolerant of impairment.

2 **Black Fly: Family Simuliidae.** Up to ¼", end of body wider (like bowling pin), distinctive head, sucker on end, tolerant of impairment.

3 **Midges: Family Chironomidae.** Up to ¼", distinct head, worm-like segmented body, 2 leg-like projections on each side, often whitish to clear, occasionally bright red, tolerant of impairment.

4 **Aquatic Worm: Class Oligocheata.** ¼" – 2", can be very tiny; thin, wormlike body, tolerant of impairment.

5 **Lunged Snails: Class Gastropoda.** Up to ¾", no operculum, with helix pointed up shell opens to the left, tolerant of impairment.

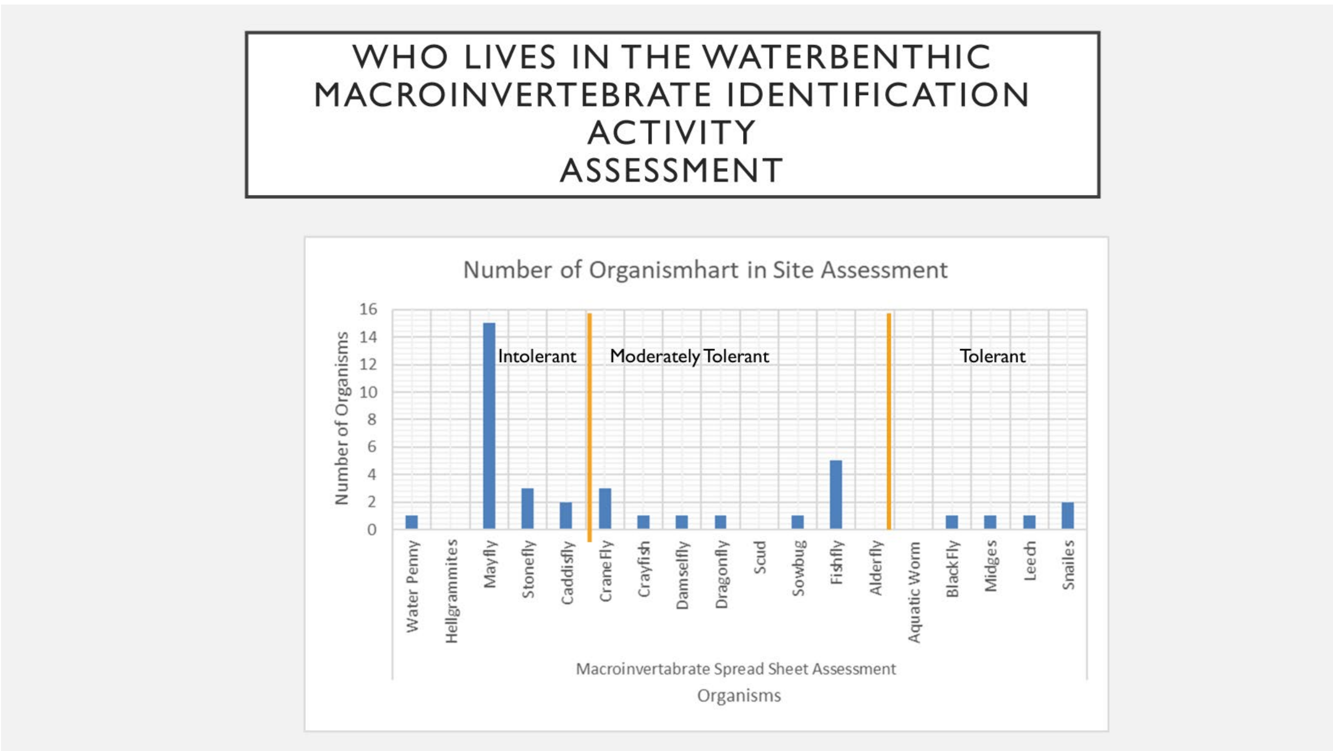
6 **Flat Worm: Family Planaridae.** Up to ¼", soft body, may have distinct head with eyespots, tolerant of impairment.

SAVE OUR STREAMS

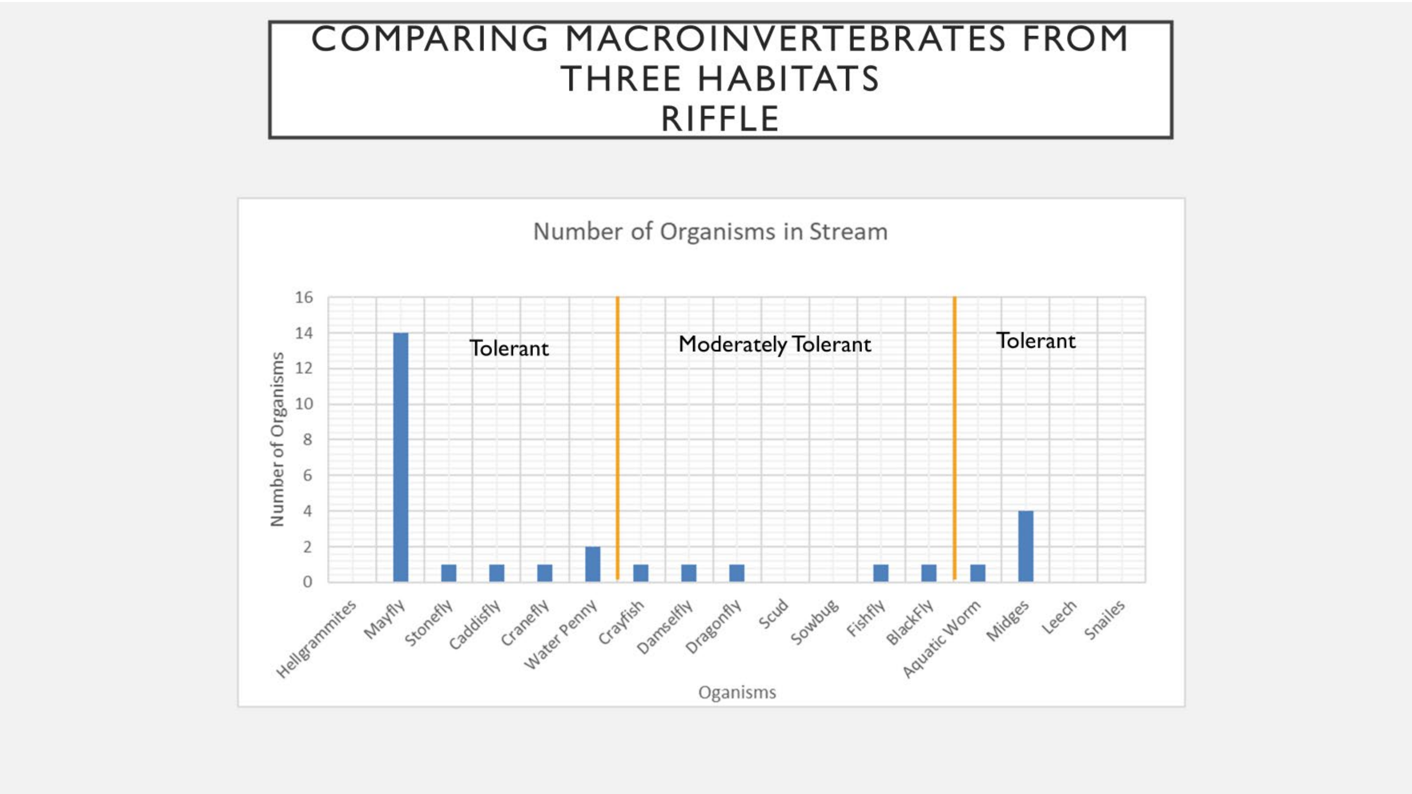
Charts and Graphs

Charts and Graphs

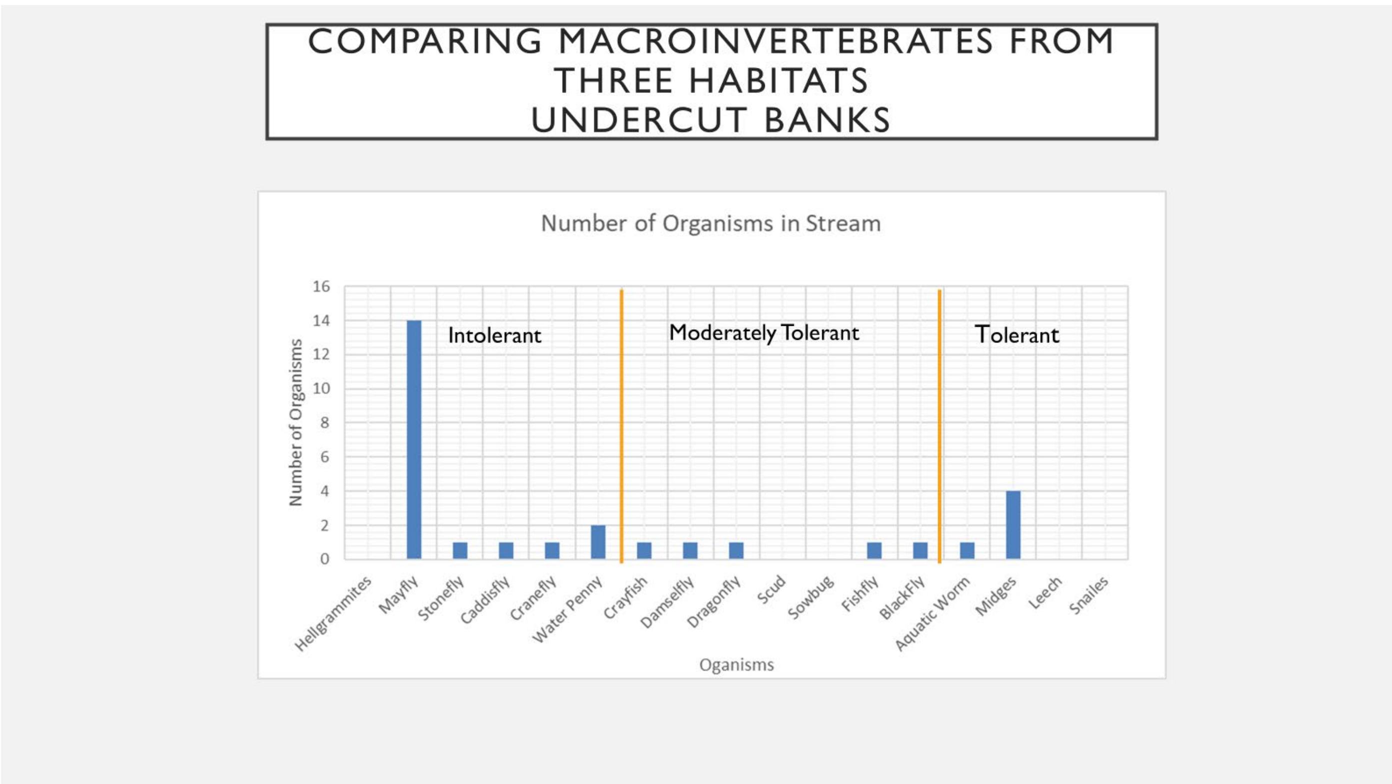
Macroinvertebrate Assessment



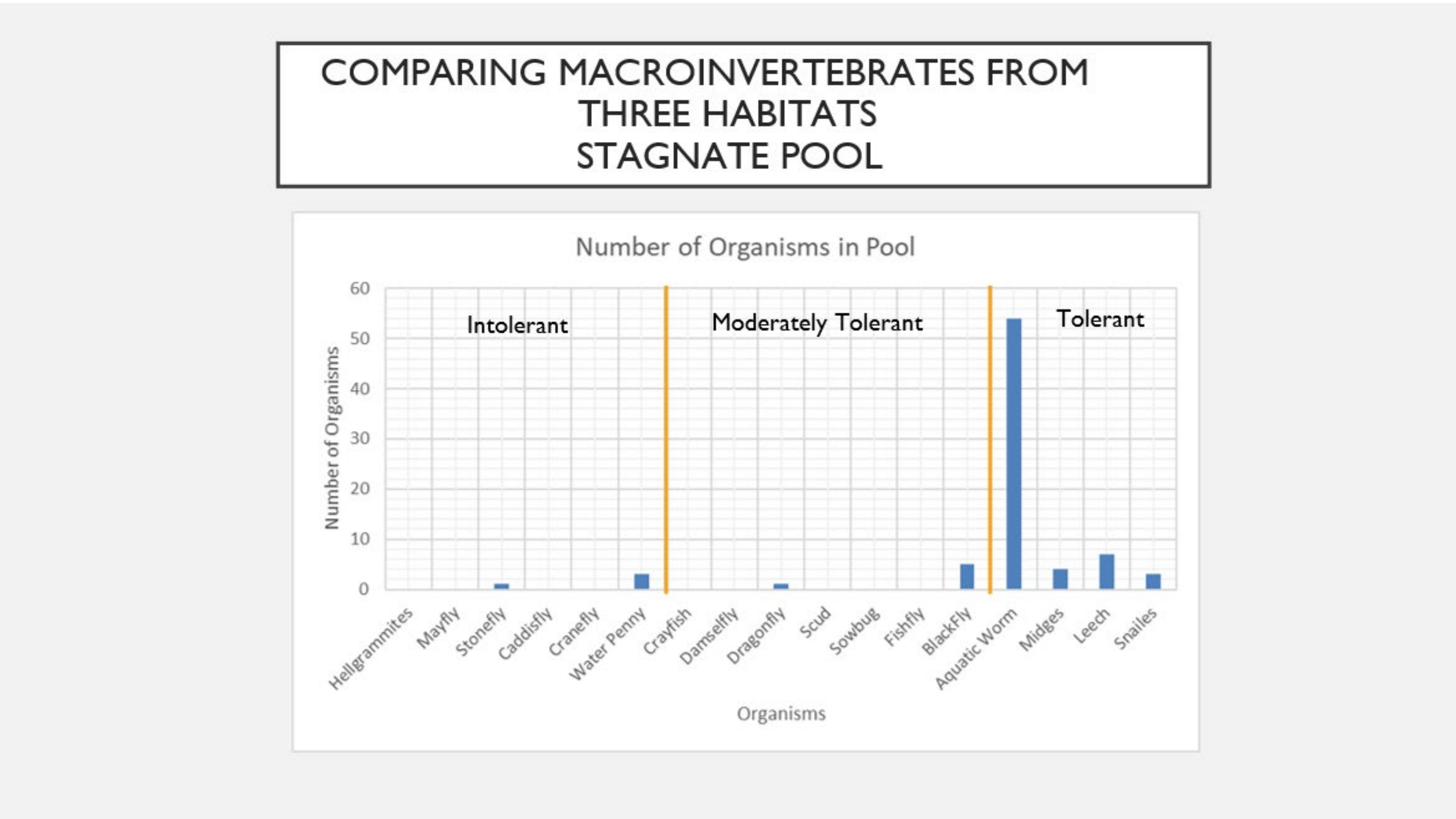
Macroinvertebrate Assessment - Riffles



Macroinvertebrate Assessment - Undercut Bank



Macroinvertebrate Assesssment-Pool



Wetland Vs Stream Macroinvertebrates

Purpose: To investigate various biomes through observation and comparison of the diversity of life, in particular, the specific number of species, biomass, and type of organisms.

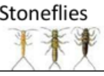
Summary: In this exercise, students will use data from to compare macroinvertebrate living in a stream Vs a wetland site.

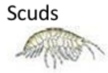
Activity: Construct a graph comparing the macroinvertebrate living in a stream Vs a wetland site.

Discussion: answer the discussion Questions

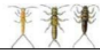
MACROINVERTEBRATE TALLY SHEET

Stream

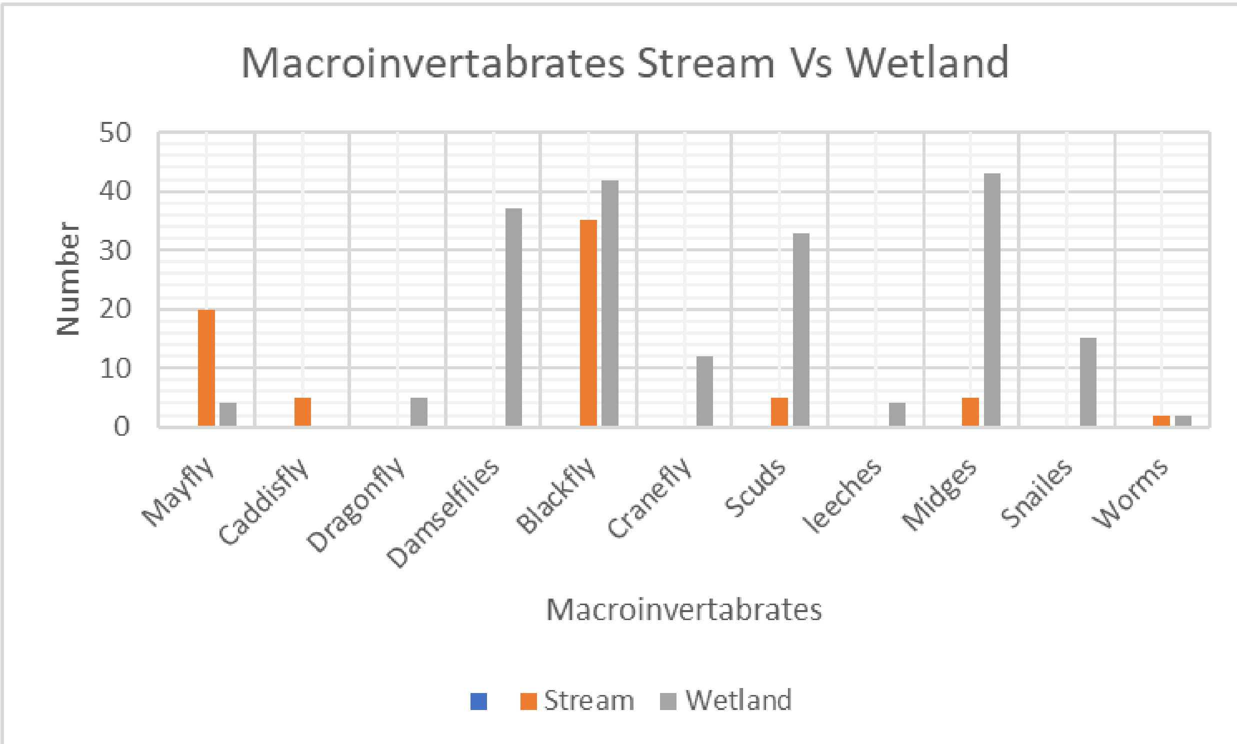
Macroinvertebrate	No of Organisms
Mayflies 	20
Stoneflies 	
Caddisflies 	5
Hellgrammite 	
Water snipe Flies 	
Riffle Beetles 	
Adler Fly 	
Snails 	
Net Spinning Caddisflies 	
Damselflies 	

Macroinvertebrate	No of Organisms
Crane Flies 	
Sowbugs 	
Scuds 	5
Crayfish 	
Black Flies 	35
Clams and Mussels 	
Midge flies 	5
Worms 	2
Leeches 	
Dragonflies 	

MACROINVERTEBRATE TALLY SHEET
Wetlands

Macroinvertebrate	No of Organisms
Mayflies 	4
Stoneflies 	
Caddisflies 	
Hellgrammite 	
Water snipe Flies 	
Riffle Beetles 	
Adler Fly 	
Snails 	15
Net Spinning Caddisflies 	
Damselflies 	37

Macroinvertebrate	No of Organisms
Crane Flies 	12
Sowbugs 	
Scuds 	33
Crayfish 	
Black Flies 	42
Clams and Mussels 	
Midge flies 	43
Worms 	2
Leeches 	4
Dragonflies 	5


Macroinvertabrates Stream Vs Wetland
Number
50
40
30
20
10
0
Mayfly
Caddisfly
Dragonfly
Damselflies
Blackfly
Cranefly
Scuds
leeches
Midges
Snailes
Worms
Macroinvertabrates
Stream
Wetland

Discussion:

1. Were there some types of organisms found in both biomes and other types of organisms not found in one or the other?

2. What features of those habitats might have caused these differences?

Discussion: Answers

1. Were there some types of organisms found in both biomes and other types of organisms not found in one or the other?

The most obvious difference in large macroinvertebrates in a wetland is the presence of dragonfly and damselfly larvae. These are rarely found in moving streams becausethey require emergent vegetation such as cattails for resting, and for laying their eggs. You may also find considerably more swimming beetles (Order Coleoptera) or boatmen and backswimmers (Order Hemiptera) in a wetland than in a stream, because they do better in still water.

Zooplankton are also typically found in wetland ponds. Look for Daphnia and other microscopic animals swimming in the water.

Animals found in moving water may be more stream lined or have adaptations for clinging to rocks compared to animals who live in still water. They may be less streamlined and have adaptations for swimming.

2. What features of those habitats might have caused these differences?

The most obvious difference between the two habitats is flow. Water slowly moves through a wetland, but there is not any measurable velocity. Materials settle in these conditions, typically resulting in a soft, mucky bottom rather than the rocky bottom of many fast streams.

Standing water may warm up faster than running water, resulting in changes in oxygen. Both systems have standing plants and mats of plants that cover some of the surfaces, but a pond/wetland is much more likely to have an abundance of suspended single celled plants (algae).

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Hilsenhoff, W.L. 1987. An Improved Biotic Index of Organic Stream Pollution. Michigan Entomology Society 20(11):9-13