



Macroinvertebrate Study



OBJECTIVES

Students will:

1. Learn the important roles of macroinvertebrates in streams:
 - a. as indicators of water quality.
 - b. as an integral part of the stream food web.
2. Practice scientific inquiry by collecting and identifying macroinvertebrates using a field guide.
3. Determine the health of a stream using macroinvertebrate assessments.
4. Practice scientific inquiry (follow procedures, collect and analyze data).

MATERIALS

- Small 'fish tank' nets
- Ice cube trays for sorting
- Hand lens
- Plastic spoons for picking up macroinvertebrates
- Tolerant / Intolerant to pollution ID cards
- Field guides
- Clipboard, data sheets, pencil

VOCABULARY



Ecosystem: community of plants and animals that interact with each other and their environment.



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Macroinvertebrates: animals lacking a backbone that are large enough to see without a microscope.

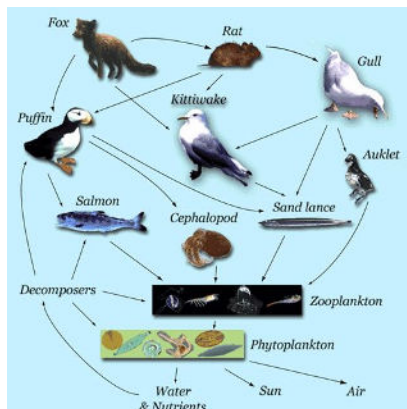
Bioindicator: a living thing that can be used as an indicator of ecosystem health.

Sensitive: cannot live in polluted water.

Somewhat sensitive: Can live in water that is somewhat polluted.

Tolerant: can survive in polluted water.

BENTHIC MACROINVERTEBRATE WATER QUALITY BIO-INDICATORS		
SENSITIVE: Good WQ	TOLERANT: Fair WQ	VERY TOLERANT: Poor WQ
CADDISFLY Case: 10-40 mm Body: 9-23 mm 	ALDERFLY LARVA 10-25 mm 	BLACKFLY LARVA 5-8 mm 
MAYFLY 3-18 mm 	CRANEFLY LARVA 10-25mm 	LEECHES 4-450 mm 
STONEFLY 8-30 mm 	DRAGONFLY NYMPH 10-40 mm 	MIDGE LARVA 3-25 mm 
WATER PENNY 3-10mm 	WATER SNIPE FLY LARVA 10-18 mm 	POUCH SNAIL 5-20 mm 



Food web: Connection of food chains in an ecosystem.

Food chain: The order in which organisms eat each other. Most food chains begin with organisms that make their own food, like plants. These are then eaten by other creatures, who are eaten by others further up the chain (for example: grass makes its own food with energy from the sun, deer eat the grass, cougars eat the deer).

Functional feeding groups: A way of classifying macroinvertebrates based on how they obtain their food.

Shredders use their mouths to take large bites of organic materials (leaves, wood).

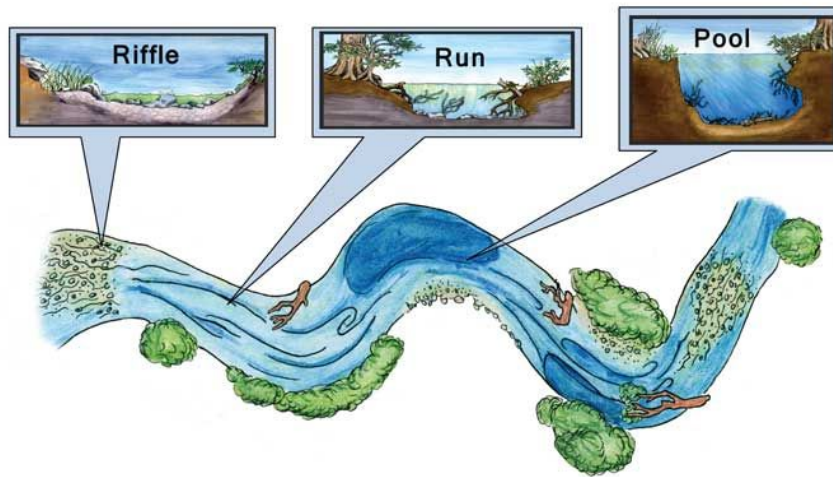
Collectors eat small organic matter, including algae, fecal matter, and pieces of plants and animals.

Scrapers & Grazers eat algae from rocks.

Predators eat other aquatic insects.



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Riffle: A rocky part of the stream with rougher water (adds oxygen to the water)

Pool: Area where the water slows down and water gets deeper.

Run: Faster moving water between riffles and pools.

INTRODUCTION

- ❖ Videos
 - <https://www.youtube.com/watch?v=BsL9m5HvJF8&feature=youtu.be>
- ❖ What is a Macroinvertebrate?
 - Macro - large; can be seen without a microscope
 - Invertebrate - no backbone (or spine). Instead, macroinvertebrates have hard exoskeletons
- ❖ Macroinvertebrates are not only an important food source for salmon, but are excellent **bioindicators** of the health of the stream; different macroinvertebrates can tolerate different conditions such as water temperature range, oxygen content, water clarity, and pollution.
 - If we find a lot of macroinvertebrates that can't tolerate pollution, what would that tell us about the water quality in the stream?
- ❖ Macroinvertebrates are an important part of the **food web**. Some are eaten directly by fish and other predators, and some break down leaves and plant material and make nutrients available in the stream for more plants to grow.
- ❖ You will be collecting macroinvertebrates from the stream and sorting them based on their **ability to tolerate pollution (tolerant, somewhat tolerant, intolerant)**



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ACTIVITY

- ❖ SAFETY IS CRUCIAL AT THE STREAM!
 - Have an adult with you.
 - DO NOT enter water above your calf, and in some cases, do not go deeper than your ankles!
 - **Avoid fast-moving water.** In a fast moving stream, 6 inches of water can knock a person off their feet!
 - Take care when walking on slippery rocks.
 - Never drink the water.
- ❖ Note where you are sampling the river. Is it a riffle, pool, or glide.
- ❖ Fill tray with water (to keep the critters alive after collection)
- ❖ Collect samples
 - Rub rocks together, kick up leaf litter, or shuffle the stream bottom using your feet.
 - Run your net through the disturbed water/ sediment that was kicked up.
 - You should see some invertebrates in your net.
- ❖ After collecting, empty the contents of the net into the tray
 - Dump the net even if you don't think there are any macroinvertebrates in the net! They can camouflage with the sediment and rocks!
 - Keep the tray with macroinvertebrates in a shady area.
- ❖ Repeat up to 3 other locations if necessary.
- ❖ Use the spoon to move individual macroinvertebrates into the ice cube tray.
- ❖ Use magnifiers to observe body parts such as different types of gills and mouth parts.
- ❖ After a few minutes of sorting, use the identification cards and begin filling out the data sheet.
- ❖ Use the field guides to help with identification. *Identifying species can be difficult and is not a priority – sorting into similar groups and understanding some of the differences is more important.*
- ❖ Count the different kinds of invertebrates in each sensitivity group and record onto the data sheet
 - Macros can also be sorted by habitat type or where found in the stream.
- ❖ After the data sheet is complete, gently return macroinvertebrates to the stream.



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CONCLUSIONS

- ❖ Based on the macroinvertebrates collected, what can you say about the health of the stream?

- ❖ What can be done to protect a stream with healthy macroinvertebrate populations?

- ❖ What measures can be taken to help restore a system that has been degraded and has lost the diversity of macroinvertebrates that are part of a healthy watershed?

- ❖ What does a healthy macroinvertebrate population mean for salmon in the stream?