Backyard STEM

Leaf Litter for Dinner

An Introduction to Functional Groups in the River Continuum

A mature, healthy tree can have 200,000 leaves. During its lifespan, such a tree would grow and shed 3,600 pounds of leaves, returning about 70% of their nutrients to earth. These shed leaves are part of forest detritus – or dead particulate organic materials – that ultimately ends up in streams, wetlands and rivers. This detritus provides aquatic communities with energy in the form of organic matter and nutrients, forming the base of the food chain in small streams. So who eats leaves for dinner?

Benthic macroinvertebrates (BMIs) are small animals living in the benthic—or bottom—environment of water bodies, among stones, logs, sediments and aquatic plants. They are large enough to see with the naked eye and have no backbone. Many of the insects we see flying through the air started their lives in the water as BMIs.

Did you know?

Some dragonflies, butterflies and beetles start their lives in river beds and creeks as benthic macroinvertebrates.

BMIs can be classified by how they obtain energy (or food). These classifications are called functional feeding groups. The table below shows the functional group matched with the type of food they consume. Shredders breakdown dead leaves and aquatic plants, using large mouthparts to tear them apart. Collectors and filterers use nets and hairy appendages to collect fine particulate organic material. Scrapers use their mouths to scrape algae and organic material from submerged rocks and logs. Predators, of course, hunt prey, such as other insects and small fish.

Functional Group/Feeding Strategy	Food
Shredders	Dead leaves/live aquatic plants
Collectors/Filter Feeders	Particulate organic material
Scrapers	Live benthic algae
Predators	Other invertebrates and small fish

Goals:

- ⇒ Be able to describe a food web of a forested stream.
- ⇒ Be able to describe the different energy/food collection strategies and match with a functional group.
- ⇒ Be able to predict based on stream size the relative abundance of shredders/ collectors/grazers.

Words to Explore:

- ⇒ Benthic Macroinvertebrate
- ⇒ Functional Group
- ⇒ Food Web
- ⇒ Headwaters

Add Tech:

Credits: Andrea Ludwig and Jennifer DeBruyn
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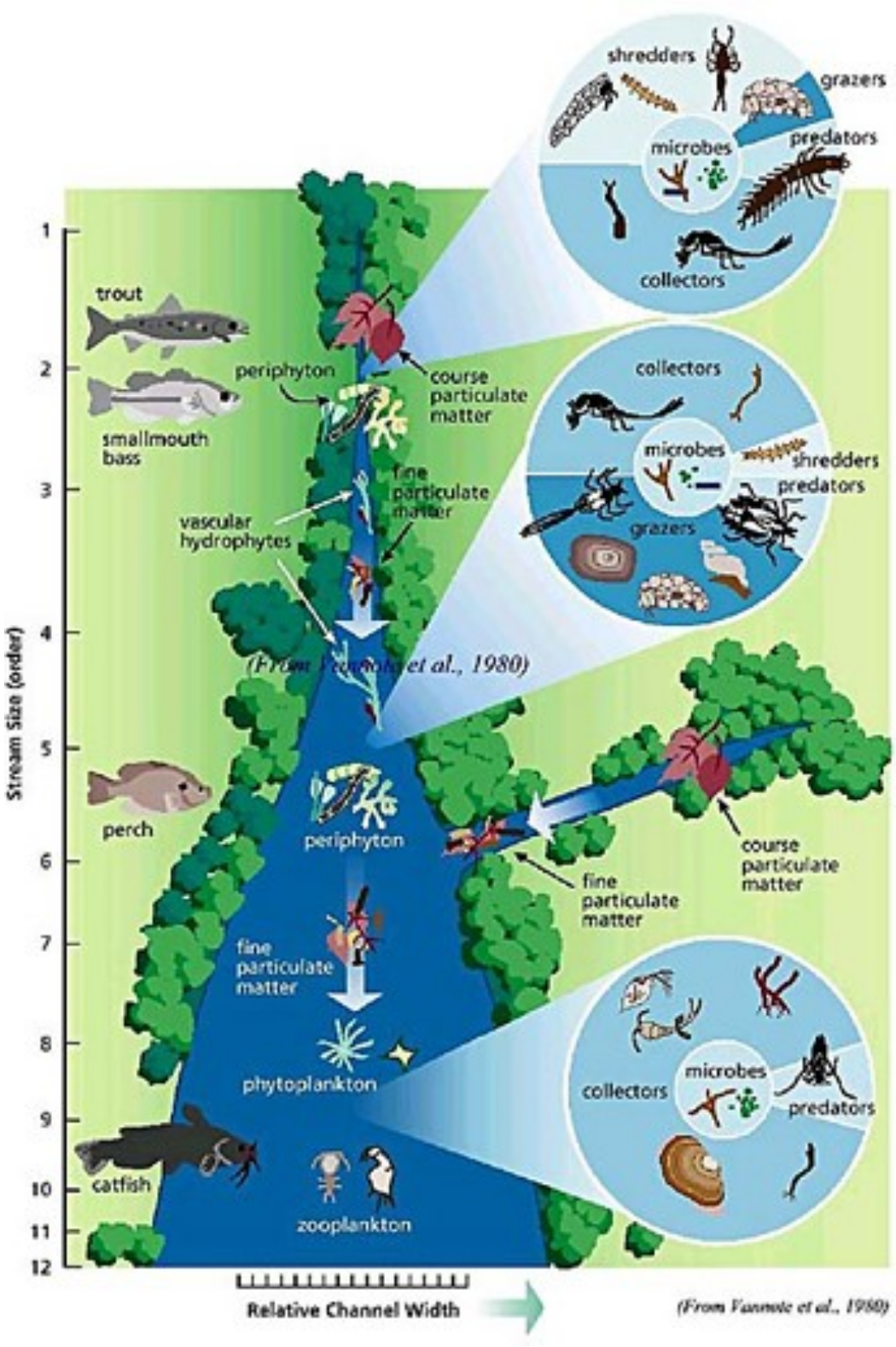
The abundance of BMIs form each functional group depends on the availability of food. Shredders can be found in greater abundance in the headwaters of creeks, where the tree canopy spans the creek. Their main food source is the falling leaves of the trees. Collectors and filterers are mainly found in the middle and lower reaches. Broken down leaves and other detritus from upstream floats downstream as fine particulate matter. Scrapers and also found in the lower reaches because as the creek gets wider, the tree canopy opens up and the sunlight gets to the bottom on the creek causing more algae to grow. Predators follow the prey, so they can be found all along the river.



Tree Facts:

- ⇒ 100 different species of moss, lichen, and liverwort may grow on a single oak tree.
- ⇒ 284 different insect species may be found feeding on a single oak tree.
- ⇒ 600 lbs is the annual amount of paper consumed by an average American.
- ⇒ 5,000 years is the age of the oldest Yew trees in Scottland. The Yew can live forever as long as there is no interference.

Find more tree facts at www.livingtreeeducationalfoundation.org/tree_facts.html

Activity: Leaf Litter Scramble

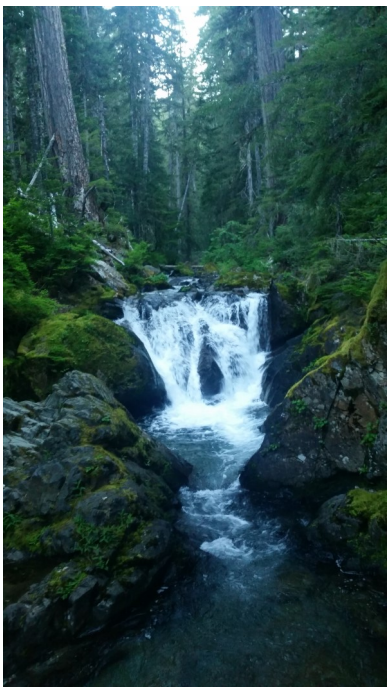
Do the leaf litter scramble with your classmates. Follow the rule on your role card to become part of the river continuum.

Reflect.

What would happen if a functional group was missing from the food web? How would the results of the activity change? Would they change?

What would happen if the trees in the headwaters were removed and not replanted? How would that change the food web?

Which of the two photos below would have the largest scraper population? The highest shredder population?



Go Further.

Start a river continuum photo log. Take pictures of different creeks, streams and rivers as you see them, whether its from the car, on a walk or even in your neighborhood. After you have collected a nice set, start to put them in order from smallest creek (headwaters) to largest rivers and maybe even the ocean. Over time, add to this log with photos of creeks and compare what you see in different parts of the landscape. Notice the trees, the benthic environment and the size of the channel. Don't forget to label your photos with a date and place so that you can remember them for years to come.