



Macroinvertebrate Survey

Let's study some bugs! In our newest watershed education video Kolleen and Alyssa visit Tumalo Creek to show you how to collect your own macroinvertebrate sample. This is a great activity to try in your local stream or river! In this activity, you will learn about macroinvertebrates, identify some of the macroinvertebrates found at Tumalo Creek, and analyze data collected at Tumalo Creek.

Essential Question: How can observing the organisms that live in a certain location tell me about the health of the ecosystem?

Learning Targets:

- ★ I can define the term: macroinvertebrate
- ★ I can use a dichotomous key
- ★ I can infer the health of the Tumalo river by looking at data that has been collected.

Step 1: Read through the following information, then write your responses in the blue boxes on page 2.

Macroinvertebrates are animals that lack a backbone (invertebrates) and can be seen with the unaided eye ("macro"). They include insects such as mayflies, mosquitoes, and beetles, as well as mussels, leeches, sideswimmers, and worms. Aquatic macroinvertebrates spend the majority, if not all, of their lives in streams, wetlands, lakes, and other aquatic environments, and depend on healthy aquatic and upland ecosystems to survive.

Aquatic macroinvertebrates are beautiful and diverse animals, with adaptations that allow them to live in different parts of streams or lakes. Some mayflies that live on rocks in fast flowing water have very flattened, streamlined bodies, and some even have a suction cup-like structure on the underside of their bodies to help them from being washed off the substrate. Black flies use hooks to anchor themselves to a little pad of silk they place on the rocks and caddisflies build a variety of cases from sand, stone, pine needles, bark, and leaves and live and feed within their protective shells.

Aquatic macroinvertebrates are animals, just like we are, and like us they need oxygen to breathe. Aquatic macroinvertebrates can acquire dissolved oxygen across the surface of their bodies, but many types such as mayflies, damselflies, and stoneflies have elaborate branched, tufted or leaflike gills that help them obtain oxygen from the water. Still others have breathing tubes or siphons that they stick up

above the surface of the water to breathe, while some water beetles capture bubbles of air at the water's surface and dive down with their own portable "scuba tank".

Aquatic macroinvertebrates are affected by multiple different physical and chemical factors in both the stream and the surrounding watershed. The structure and composition of the aquatic macroinvertebrate community tell an important story about the biological health of our rivers and streams.

Aquatic macroinvertebrates are affected by physical and chemical factors in the stream and surrounding watershed. Some macroinvertebrates require cold, clean water with lots of dissolved oxygen to survive, while others can tolerate poorer water conditions. Because of these differences in adaptations, macroinvertebrates are considered indicator species, as they indicate how healthy an aquatic environment is, often better than through just measuring water chemistry (temperature, pH, heavy metals, etc.). Because macroinvertebrates live in water all the time, they can indicate whether there are other contaminants that are making the stream environment unhealthy. Additionally, because macroinvertebrates are found everywhere, generally in large numbers, and are confined to the aquatic habitat for most of their life cycle, they provide a way to learn a lot about a stream through a fairly simple assessment. They can also be sampled over time to see how the health of a stream is changing.

What is a macroinvertebrate?

How do macroinvertebrates breathe?

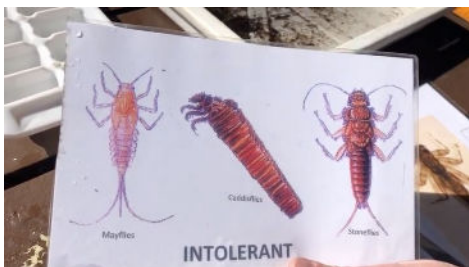
Before looking at any data, how healthy do you think the stretch of Tumalo Creek that flows through Shevlin Park is and why?



What factors might affect the health of this section of river?

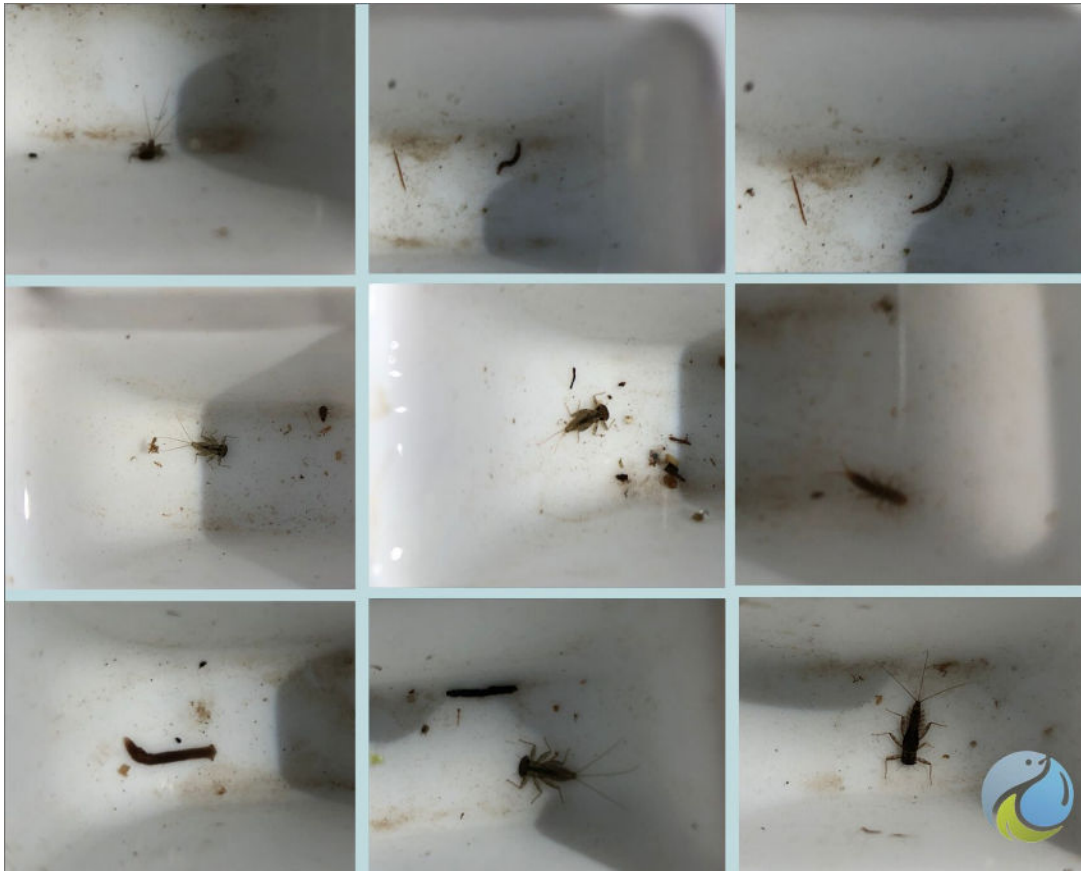


Step 2: Watch this UDWC video "[How to Take a Macroinvertebrate Sample](#)"



Step 3: In the video, Alyssa and Kolleen collected a sample of macroinvertebrates on March 19, 2020 at 11:00 am. A photo of all the macroinvertebrates they collected is below. Use this [Dichotomous Key to Stream Macroinvertebrates](#) to identify the insects in the pictures.

A dichotomous key is a tool used by biologists to identify organisms in a group through a process of answering yes or no questions about the organism. "Dichotomous" means "including exactly two choices." If you are looking at a map of your city and planning a route across town, you have literally dozens of similar options in terms of the streets you choose. But if you come to a fork in the road, you have two and only two options. The "forks" in a dichotomous key are decision points and are called couplets; each of the two choices at a couplet is called a lead. If you were told, "You are in a room, and there are two ways to leave it," the couplet could be called "exit" and the leads could be "green door" and "red door." The main idea here is that at each point, there is no uncertainty between answers. For example, you would never see "tall elm" or "short elm" when reading a key used for tree identification. You might, however, see "tree 50 feet tall or taller" and "tree under 50 feet tall." For each branch make a decision that best suits the organism. Go through the chart, if you end up with something dissimilar to your organism, spend more time observing it and start again.



Step 4: Use the Macroinvertebrate Survey Data Form below to tally the invertebrates you identify and work through the steps on the form to get an overall stream health value. The top of the form is pre-filled in for the time and day we took the video.



MACROINVERTEBRATE SAMPLING DATA FORM

School: _____ Teacher: _____

Date: 3/19/2020 Time: 11:00am Weather: Cool, overcast.

Stream/Site Name: Tumalo Creek at Shevlin Park Time spent sorting/identifying: _____



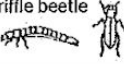



of people sorting/identifying: _____ Riffle Pool

Directions:










1. Record the number of each type of organism found in the # found column of each section.
2. Then circle the number in the score column (3, 2, or 1) if any of that organism was found.
3. Complete the equation at the bottom by adding up the circled numbers from each score column.

SENSITIVITY TO POLLUTION





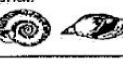

Sensitive / Intolerant

	# found	score
caddisfly 		3
mayfly 		3
riffle beetle 		3
stonefly 		3
water penny 		3
dobsonfly 		3
Sensitive TOTAL =		

Somewhat Sensitive

	# found	score
clam/mussel 		2
crane fly 		2
crayfish 		2
damselfly 		2
dragonfly 		2
scud 		2
fishfly 		2
alderfly 		2
mite 		2
Somewhat Sensitive TOTAL =		

Tolerant

	# found	score
aquatic worm 		1
blackfly 		1
leech 		1
midge 		1
snail 		1
mosquito larva 		1
Tolerant TOTAL =		

<input type="text"/>	Sensitive total
+	Somewhat sensitive total
+	Tolerant total
=	Water Quality Rating
<input type="checkbox"/>	Excellent (>22)
<input type="checkbox"/>	Good (17-22)
<input type="checkbox"/>	Fair (11-16)
<input type="checkbox"/>	Poor (<11)

Adapted from: Environmental Services
City of Portland

Step 5: Analysis

Grades 4-5 - Conclusion Questions:

- a. What water quality rating did you get and what were some of the invertebrates you identified?
- b. Why are these invertebrates important to study and how might they benefit the surrounding ecosystem?
- c. What are some things that we can all do to make Tumalo Creek a healthier stream?

Grades 6-12 - CER:

Using the data you just collected, write a CER that answers the following question: 'How healthy is Tumalo Creek?'

Extensions:

1. Research one or more of the following Macroinvertebrates. Include information about their life cycle, what they eat and what their predators are, any unique adaptations. Circle the critter you chose and add your information to the end of this document.
 - Mayfly
 - Caddisfly
 - Stonefly
2. While following proper social distancing guidelines, go with your family out to Tumalo Creek and try and find some of these amazing macroinvertebrates! Add photos you take at Tumalo Creek and/or a description of what you found.