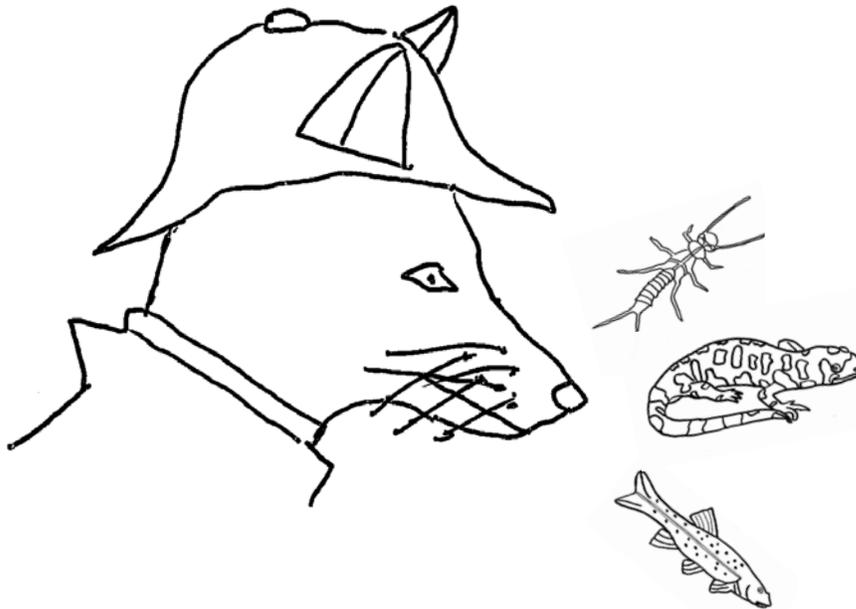


Creature Clues



Key Groups:
School groups,
families, boy
scouts (ages 12-
15)

Subjects:
Aquatic Life

Duration: 1 hour

Abilities:
Analyzing,
reasoning,
classifying,
evaluating, note-
taking/describing,
drawing

Materials:
Microscopes or
magnifying
glasses,
notebook,
pencils, coloring
pencils.

Vocabulary:
Species indicator,
population (a
group of one
species living in
the same area),
ecosystem, larval
stage (larvae)

Background: Animals can be great indicators of the environment's condition or health. There are many such species; however, this lesson will focus on aquatic animals, such as insects, fish, and amphibians. Insects are important for fish, (especially aquatic insects, those which are found in or near the water), but did you know they can also be an indicator of stream or lake health? Due to their small size, many aquatic insects are easily affected by even the smallest amounts of pollution or disturbance in the environment. Therefore,

environmental/biological professionals must watch aquatic insects closely. For if insects start to die, then fish and amphibians may die, also!

There are times when this is not always the case; some aquatic insects thrive in conditions that are not suitable for other aquatic life. In other words, they are indicators of unhealthy conditions. For example, some bugs are adapted to living in water with low oxygen. If too many of these bugs are found in a water source, then fish and insects that do need oxygen will not be able to thrive.

More than that, other plants and animals will be affected by a stream's health, as everything in the ecosystem is connected. You cannot change one thing without affecting something else; therefore, these aquatic insects indirectly allow a person to see how the rest of the environment is doing.

There are also several fish in mountain streams, and just like aquatic insects, these fish need a suitable habitat to survive, so we can understand the health or suitability of a stream by their presence or absence.

Finally, you may also find a couple amphibians during your visit and lessons about aquatic habitat health.

Method:

After assigning everyone to a group and passing out one copy of the insect paper to each group, have them prepare the nets for collecting the insects. Have them take turns going into the water. When they have captured some specimens, they can use a spoon to put what they have caught into an ice cube tray (full of stream water). Have one person or persons pass out microscopes or magnifying glasses for observation. Then have them take notes of what they observe about their insect(s). Have them also draw a picture of what they see and color the sketch. After they have gathered all they need about their insects, they should classify their insects as a group and determine if they can tolerate

pollution. Based on which insects are present in their ice cube tray, they should be able to determine if the stream is healthy or not.

Note: Not all species of aquatic life in this lesson are found in Mill Creek Canyon.

Assessment:

- Kids should come up with a collective decision about the stream's health and be able to explain their reasoning.
- Kids should be observed individually as often as possible to ensure they know how to classify an insect, fish, or amphibian and how to determine if the stream is healthy or not.
- What is management (with regards to aquatic habitat and species)? Why is it important?

Further Learning:

- Repeat this process in another area to compare water sources.
- Research what different environmental agencies do to manage aquatic life and habits.
- Write a report explaining how pollution affects aquatic life and how humans can help.

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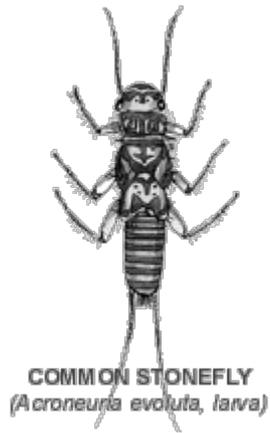
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Insects which are Highly Sensitive to Pollution

(Insect Illustrations Courtesy of Mike Simiu)



Stoneflies: These insects live in clear, cold streams with high levels of oxygen in them. They have two lengthy antennae, gills behind each leg, two lengthy hair-like tails, and two hooks at the backs of each leg to hold on to the streambed even in rapid currents.

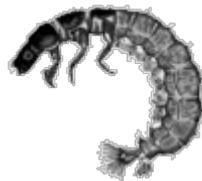


Riffle Beetle: Larva can be classified as sensitive, but the adults are highly sensitive (they have been exposed to the water environment longer than the larva). Larvae resemble long caterpillars. The adults have tiny (1/4 inches) oval bodies.



FLATHEADED
MAYFLY
(*Stenonema
interpunctatum*,
larva)

Mayflies: They typically are found on uncovered rocks in swift, clear streams or they could even live buried in soft stream beds for safety. Mayflies are a common source of food for fish, because large populations of flying adults often come out of the stream at the same time as the fish.



CADDISFLY
(*Symphlepsyche
slossanae*, larva)

Caddis fly: The larvae are fascinating because they make their own homes. There are a lot of varieties of caddis flies, and each type creates a different type of house for themselves out of different materials, like small rocks, sticks, and mud.



WATER PENNY

Water Pennies: They are found in cold, swift streams. They are frequently found on slippery rocks. Their own smooth, flattened bodies help them to withstand the force of the current and remain on the rocks.

Insects which are Sensitive to Pollution

(Insect Illustrations Courtesy Mike Simiu)



ALDERFLY
(*Sialis hamata*, larva)

Alderflies: These are carnivorous insects which have large chewing pinchers in their mouths. Alderflies have a smooth underside and one straight feather-like tail.



RIFFLE BEETLE
(*Stenelmis sp.*, larva)

Riffle Beetle Larva: These are not as sensitive to pollution as the adults, mainly because they do not live in the water environment for as long as the adults do. They move around on the streambed with small segmented legs on the top middle portion of their body.



CRANE FLY
(*Tipula abdominalis*,
larva)

Crane flies: These are large flies that seem like big mosquitoes. They have long, slim legs and wings. A crane fly larva looks like a thick worm. They can grow up to 4 inches long!



SPREADWINGED DAMSELFLY
(*Lestes congener*, larva)

Damselflies: These have big eyes and lengthy spindly legs. Their 3 fan-shaped tails are really gills!



WATERSNIPE FLY
(*Atherix pachypus*, larva)

Watersnipe fly: Just like Riffle Beetle Larva, Watersnipe fly larva seem like caterpillars. They are carnivorous and can bite! They typically are a greenish color.

Insects which are not Sensitive to Pollution

(Insect Illustrations by Mike Simiu)



MIDGE
(*Chironomus attenuatus*, larva)



MIDGE
(*Pseudodiamesa* sp., larva)

Midges: These live in extremely polluted waters. They grow up to 1/2 inch in length and have a worm-like body.

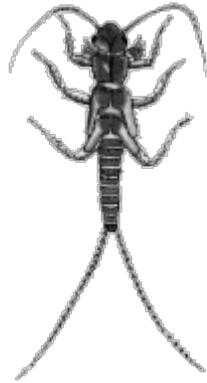


BLACK FLY
(*Simulium vittatum*, pupa)

Black fly: Larvae have tiny suckers on the backs of their abdomen, which they use to anchor themselves to rocks. They feed by filtering food from the water with their tiny gills. When they move, they drift downstream, but stay connected to their rock with silken threads, which stretch from their abdomen.

Miscellaneous Insects

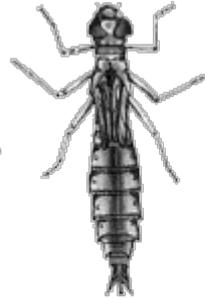
(Insect Illustrations by Mike Simiu)



NEMOURID BROADBACKS
(*Amphinemura nigritta*, larva)



CLUBTAIL
(*Gomphus*
va sius,
larva)

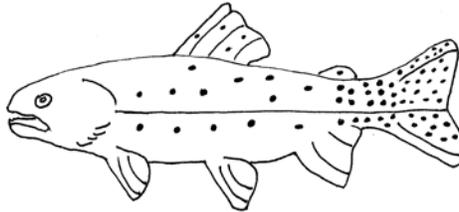


DARNER
(*Anax junius*,
larva)

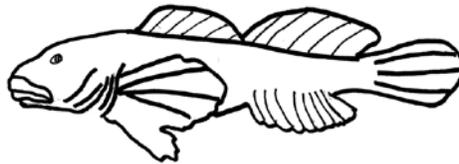


**PREDACIOUS
DIVING
BEE TLE**

Fish which are Highly Sensitive to Pollution

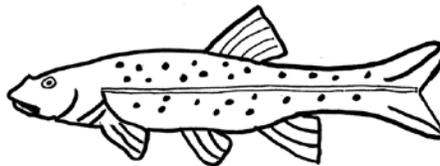


Bonneville Cutthroat Trout: They need an intact riparian zone, which provides them with cover, shade, and stable banks. The water has to be cool and contain high levels of oxygen. The well-sorted, clean gravel must have little to no fine sediments.

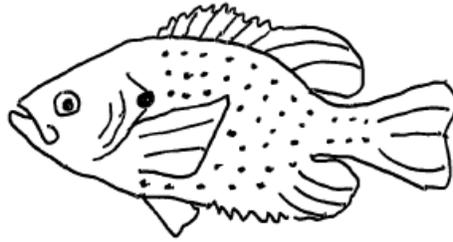


Mottled Sculpin: They like cool clear streams, but can tolerate warmer waters. They have a tolerance for many kinds of environments. They are sensitive to zinc, copper, and cadmium, that can be present in their waters due to mining, steel production, smelting metals, and the burning of coal.

Fish which are Sensitive to Pollution



Longnose Dace: These fish are small and live in somewhat cool streams, hiding among rocks and gravel during the day. The water must be shallow and swift, providing plenty of oxygen for them. They can handle an intermediate amount of pollution in the water.



Rock Bass: They prefer clear, vegetated, rocky stream pools, where the water flow is slow to still. They hang out in submerged plants or tree roots.

Fish which are Tolerant of Pollution

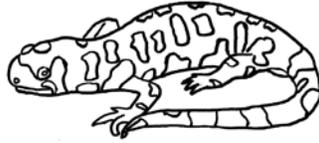


Creek Chub: They are found in small streams and can handle a wide variety of water types. The water is slightly cloudy to clear, and the stream bed is gravelly.

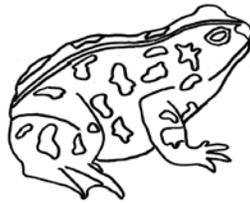


White Sucker: They can be found on the bottom of streams and lakes, where they feed. These fish are adaptable to different habitats and changing conditions, as they have no real preference for food.

Amphibians which are Very Sensitive to Pollution



Tiger Salamander: These guys spend much of their time in burrows, where it is cool. They are great swimmers but they have no defense against water pollution.



Western (Boreal) Toad: They spend their day above the soil on the forest floor or underground; under rocks, logs, stumps, or other objects. Pollutants are one of the threats to them and cause a decline in their population.

Name: _____

Creature Clues

Record What Animals You Found

Animal Name	Picture	Number of Species	Pollution Tolerance Level	Habitat Description

Conclusions about Stream Health: