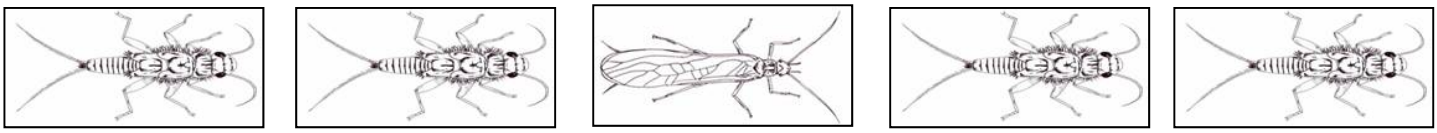


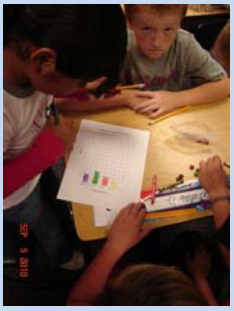
If Bugs Could Talk

Revised October 2011

Suggested Grade level: K-6

Duration: 30 minutes

Setting: Classroom



PURPOSE: To describe and identify the link between land use activities within a watershed and water quality. Students will also understand the link between aquatic macroinvertebrates and water pollution.

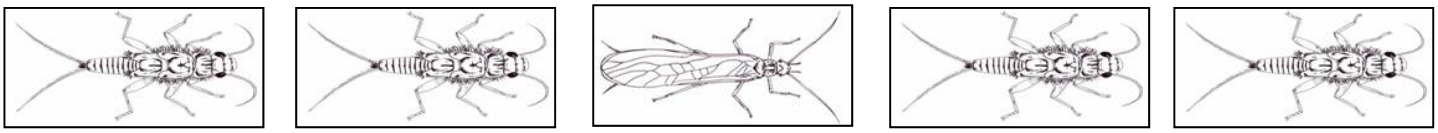
SUMMARY: Students will evaluate the quality of a "water sample" (using a bag of skittles to represent pollution and pictures of aquatic macroinvertebrates to represent invertebrates found in their sample), graph their results, and form a hypothesis about the land use near the location their "water sample" was collected.

BACKGROUND: A watershed is an area of land from which all the water drains to the same location such as a stream, pond, lake, river, wetland, or estuary. A watershed can be large, like the Colorado River drainage basin, or very small, such as all the water that drains to a small farm pond. Large watersheds are often called basins and contain many small watersheds.

Watersheds can transport non-point source pollution. Non-point source pollution is associated with rainfall and snowmelt runoff moving over and through the ground, carrying natural and human made pollutants into water sources. Examples of non-point source pollutants are fertilizers, pesticides, sediment, gas, and oil. Pollutants accumulate in watersheds as a result of various human driven and natural events. These pollutants, while sometimes inevitable, drastically alter the state of the ecosystem. If we can determine the type of pollutant and its cause, then we can classify the source of the pollutant and take preventative measures to reduce any further contaminants. Below are some examples of land use and their potential problems:

NOTE: These problems only occur because of a lack of proper management.

Land Use	Activities	Potential Pollution Problems
Agriculture	tillage, cultivation, pest control, fertilization, animal waste	sediment, nitrate, ammonia, phosphate, pesticides, bacteria
Construction	land clearing and grading	sediment
Forestry	timber harvesting, road construction, fire control, weed control	sediment, pesticides
Land Disposal	septic system	bacteria, nitrate, phosphate
Surface Mining	dirt, gravel, and mineral excavation	sediment, heavy metals, acid drainage, nutrient
Urban Storm Runoff	lack of automobile maintenance, lawn and garden care, painting	oil, gas, antifreeze, nutrients, pesticides, paints



Aquatic macroinvertebrates can indicate the level of water quality. Stoneflies, mayflies, and caddisflies (called indicator species) are not well adapted to living in water with high levels of pollution. They are pollution intolerant. Often, when these species are limited or absent in a river or stream where they typically should be found, that can be indicative of poor water quality. Aquatic macroinvertebrates can be classified by their level of tolerance to pollution.

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

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.

MATERIALS:

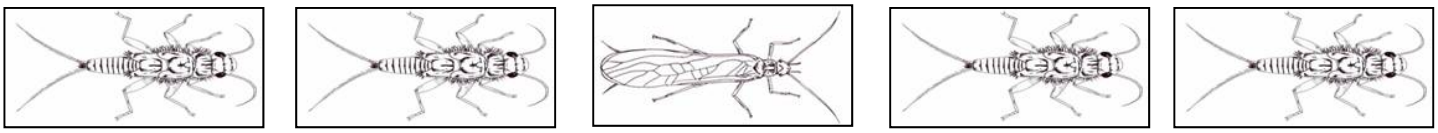
Candy (skittles)
Plastic sandwich bags
Graph paper (see page 5)
Colored pencils
Pollutant labels (pages 6-10)
Macroinvertebrate pictures (see pages 11-13)

PROCEDURE:

1. Before the lesson, divide the candy up into the sandwich bags so that each student or group of students has two “water samples”. Make sure each set is the same: one with fewer pollutants and one with more pollutants.

2. Tell the students you have taken two macroinvertebrate samples from similar streams (or one taken years previous in the same location) and show them pictures of the aquatic macroinvertebrates from each sample. One sample should have pollution intolerant invertebrates; the second sample should have more tolerant invertebrates). Show them the pictures and ask them why they think the insects are different in each sample.

3. Tell the students that you also have a water sample that may help them decide why the bugs are different. Pass out the bags of skittles to each student or group of students.



4. Ask the class to define the word pollutant. Tell them that each color of skittles represents a different kind of pollutant. You can use the visual aids provided in Appendix D to hang up in the classroom.

   PURPLE = Sediment
   RED = Pesticides
   GREEN = Fertilizers
   YELLOW = Oil and Gas
   ORANGE = Toxic Waste

5. Discuss each of these pollutants with the students. Ask them where they come from, what they are used for, how they can be beneficial, and how they may be harmful. Refer back to the Land Use Chart, on page 1 of this lesson, for more information. Discuss what "land use" means, and what kind of land uses may produce the different kinds of pollution.

6. Distribute the graph paper to each student or group. Tell the students that they will be completing a bar graph to show the number of pollutants found in their "water sample". Show them the sample graph provided. Have the students label the x-axis with the pollutant types and the y-axis with the amount of pollutants.

7. Tell the students to separate and count the number of each pollutant and graph them on the paper. Remind the students that they cannot eat the skittles until they are finished with their graph!

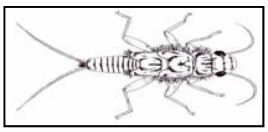
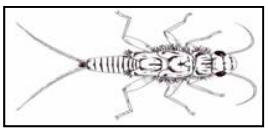
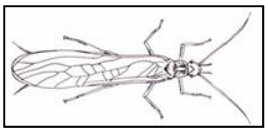
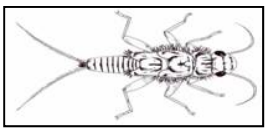
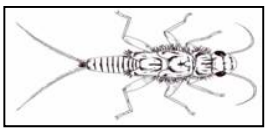
8. Go over the graphs as a class by creating a master graph in front of the classroom. Talk about what land use activities may be happening near the high pollution sample. Refer to the land use chart at the beginning of the lesson.

9. Review the pictures and ask students again why they believe the macroinvertebrates are different in each sample.

10. Discuss ways students can help reduce water pollution.

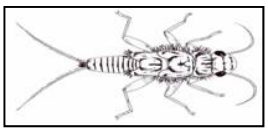
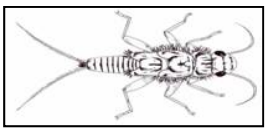
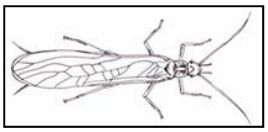
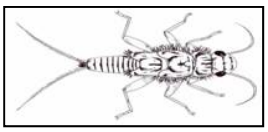
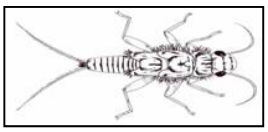
- *Don't use excessive amounts of fertilizers or pesticides around your house. They can wash into the storm drains and end up in a stream.*
- *Never put anything but water down a storm drain.*
- *Don't be a litterbug. Always dispose of trash in a proper container, not in the water.*
- *Make sure that your family car doesn't leak oil or antifreeze. This can wash into the water and be dangerous for fish, birds, even cats and dogs.*
- *Walk only on existing trails when near the water to help reduce erosion*

NOTE: Be sure the students understand that the factors (materials) we consider non-point source pollutants only become a problem when they are used incorrectly. For example, oil and gas become a problem when they are leaking onto the ground and washing into a water body. Fertilizers and pesticides become a problem when too many are applied and they run off into a water body.

CONTINUED LEARNING:

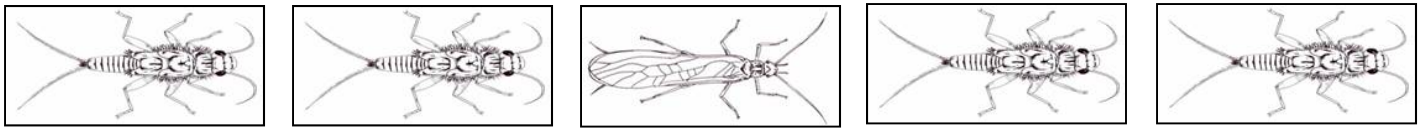
- Make each sample different to compare different land uses (see land use table in the background section).
- Talk about how pollutants or contaminants affect our water supply.
- Discuss the adaptations of different aquatic macroinvertebrates and why some are more tolerant to pollution.
- Talk about how pollutants or contaminants might affect the food chain.
- Prepare the second group of macroinvertebrates with fewer bugs or no bugs rather than just different bugs
- For older students, have them do research on different pollutants and macroinvertebrates at the library or on the internet to help them determine the water quality of their sample. They can also research what other factors might affect there being no pollution in the water.
- See Stream Side Science manual for more lesson ideas on watersheds and water quality.

If Bugs Could Talk Graphing Activity

Amount

Sediment **Fertilizer** **Pesticides** **Gas and Oil** **Toxic Waste**

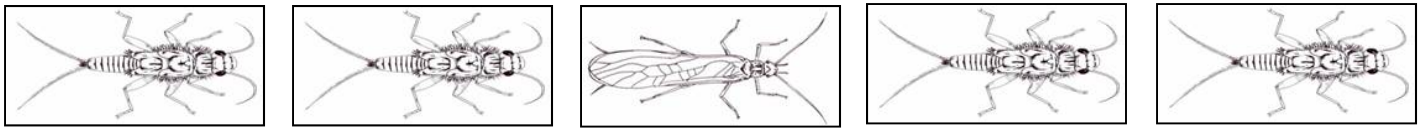


SEDIMENT

http://extension.usu.edu/waterquality

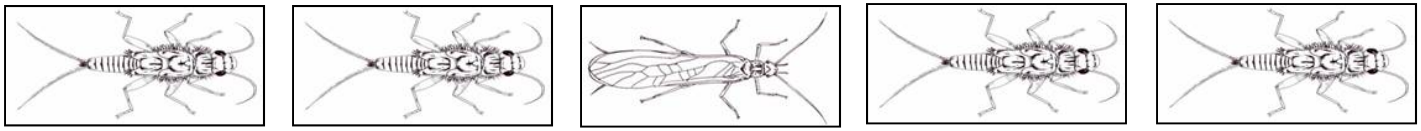
UtahStateUniversity
WATER QUALITY EXTENSION

NR/WQ/2011-10



FERTILIZERS/ NUTRIENTS

NR/WQ/2011-10



PESTICIDES

http://extension.usu.edu/waterquality

UtahStateUniversity
WATER QUALITY EXTENSION

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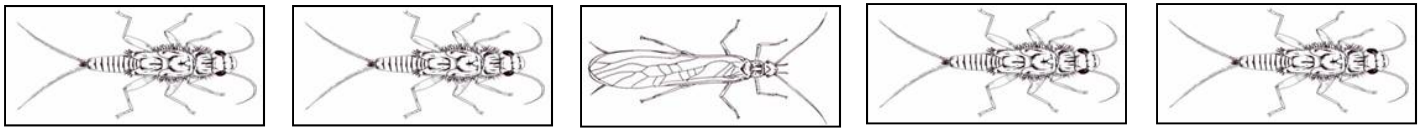

TOXIC WASTE

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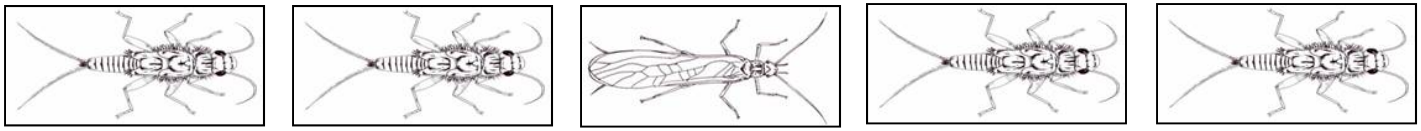
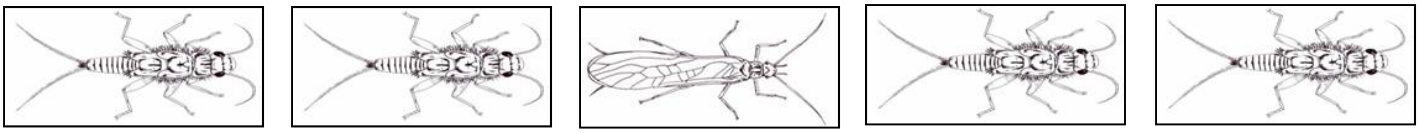
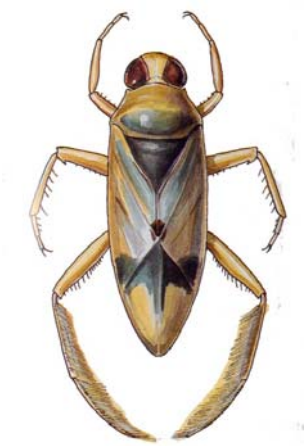


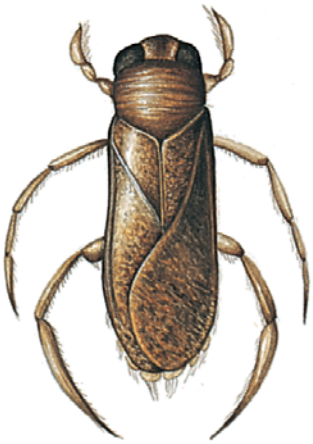
OIL AND GAS



Aquatic Macroinvertebrates with high pollution tolerance



Back swimmer

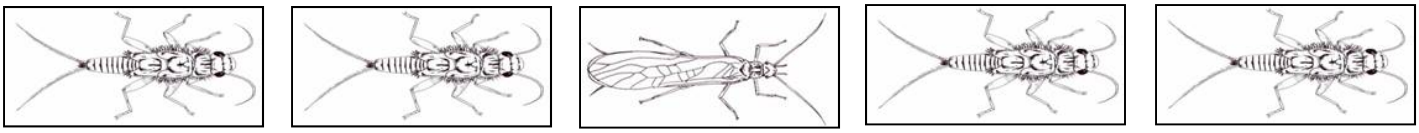


Water boatman

Water Strider

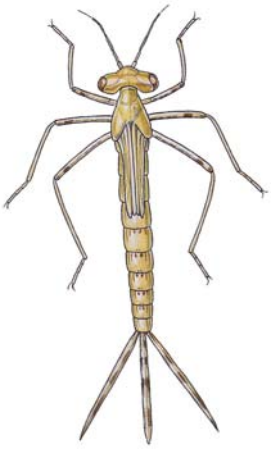
Diving Beetle

Rat-Tailed Maggot



Aquatic Macroinvertebrates with medium pollution tolerance

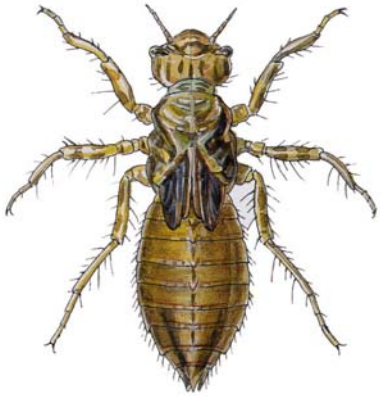
Blackfly



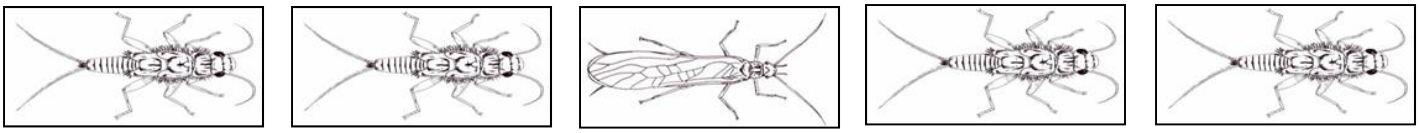
Damselfly

Cranefly

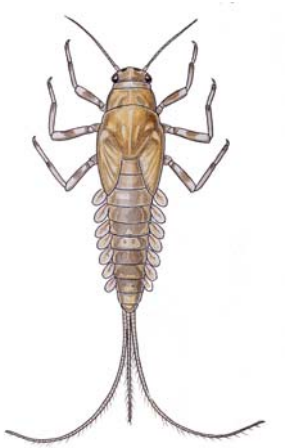
Flat worm



Dragonfly



Aquatic Macroinvertebrates with low pollution tolerance

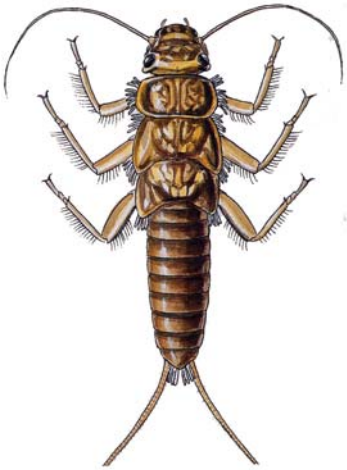


Mayfly

Caddisfly

Stonefly

Mayfly



Stonefly

NR/WQ/2011-10