Have Orange Will Travel

(20 minute activity)

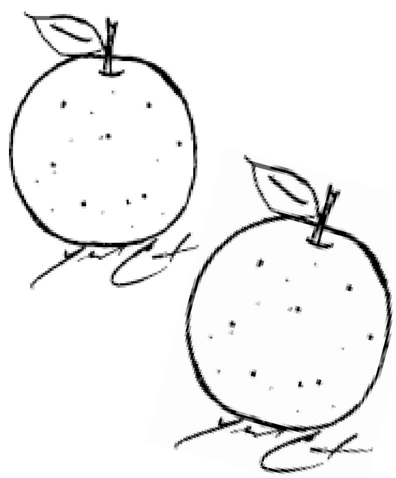
Objectives

The student will able to:
1) Demonstrate the tie between water quality and dynamics
2) Measure stream flow through a classroom simulation activity

Materials

- ❑ 6 timers or watches with chronometers
- ❑ 1 measuring tape
- ❑ 3 oranges

Background



Water dynamics give a stream its character. Woody debris, boulders, slope steepness or gradient, and other factors influence velocity, or how fast a stream moves, and the volume of water. Greater *velocity* affects dissolved oxygen amounts, temperature, and nutrient levels. As flow speeds increase, so do DO amounts. When velocity decreases, there may be less erosion and sediments settle while nutrients and temperatures increase. The volume of surface water varies between watersheds because of the gradients and natural geology. Some rock formations allow water to run over surfaces in such a way that the majority of the water is visible. Other rock formations allow water to percolate through the soil and substrate to ground water. Aquifers then recharge creeks and other bodies of water. Surface water in a stream is visible and can be measured. Similarly, ground water levels can be measured in a well. The water level in a well corresponds to the surrounding water table.

Procedure

1. Since students will be measuring velocity during the field trip, practice your own stream flow determination in the halls of school! All you need are timers or watches with chronometers, a measuring tape, and oranges. Determine whatever distance you want the oranges to travel and set up three lanes.

2. Assign at least one student at the start and the finish of each orange lane equipped with timers/ watches.

3. Start the clocks, roll the oranges, and stop the time as each orange crosses the finish line.

4. Determine the velocity of each orange: **<u>length</u>** ÷ **<u>time</u> = velocity**.

5. Add the three results together, and divide by 3 to find the average velocity.

6. Since you are simulating measuring a stream, make up a depth and width for the calculation. Calculate the discharge or stream flow: **velocity x depth x width = stream flow[3].** The answer will be in cubic feet per second. Your students are now prepared for the real thing!

Assessment

Ask the students to:

- ❑ Determine the flow of a local waterway
- ❑ Teach *Have Orange will Travel* to younger students
- ❑ Summarize the relationship between water quantity and DO quantities

Preparing for the Field Study Station

Familiarize students with station equipment listed in the Resource Specialist section.

Copy *Water Chemistry* (DO, pH, temperature) and *Stream Flow* worksheets, one per student; use waterproof paper, if available.

Students must save worksheets for post work!

Classroom Post-work

1. Explore the EPA standards for water quality testing and compare the methods used during *What s in that H_20*?

2. Go to a local creek or other water body and sample the temperature, macroinvertebrate, pH, and dissolved oxygen levels. Compare with the water quality data collected from the *Kids in the Creek* stream. Will the water quality found in the results support wildlife? Write a report on the stream s status. Include rehabilitation ideas, to benefit the situation if needed. Turn it into a class project.

3. If possible, borrow an Enviroscape* model to demonstrate non-point and point source pollution. Non-point source pollution is the more detrimental because everyone contributes to it and it cannot be traced to or controlled at a single location. What point and non-point sources of pollution might be affecting your local creek? Automobile oil leaks, fertilizers, septic leaks, animal wastes, silt from

clear cutting vegetation, soaps used in washing cars and many other factors contribute to non-point source pollution. Industrial waste emerging from a pipe is an example of point source pollution. Many inputs of pollution are triggered by rain, which releases the substances down the stream and into the hydrologic cycle.

4. Test the water above and below suspected pollution sites, remembering that due to natural geology, nutrients and other substances may be normally high or low. Note the differences and create scenarios about what and who polluted the area, and when. Study your local watershed and notice what is being swept downstream!

Wrap Up

Discussion ideas:

- Where does your drinking water come from? The majority of Washington s drinking water comes from ground water.
- Why are watershed influences so important? Refer to Watershed Wonders.
- How do changes in water quality and quantity affect stream ecology? Water temperatures and chemistry, affected by water quantity and pollution, can drastically alter stream quality.
- What changes might affect stream ecology? *Temperature, turbidity, levels of dissolved oxygen, nitrogen, phosphorous, pH*
- What aquatic species would be found in different water quality scenarios? Refer to Riparian Rx, Invert Investigator.

Assessment

Ask the students to:

- ❑ Discuss requirements of aquatic life and influences of local land use practices.
- ❑ List examples of natural and human activities that positively and negatively influence levels of turbidity, dissolved oxygen, pH, and temperature.
- ❑ Discuss answers relating to this section in the *Kids in the Creek Scavenger Hunt.*

Extension

Write a land use plan that improves the future water quality of a local stream. Contact an area conservation district, state department of fish and wildlife, or Natural Resources Conservation Service office for comparative data.

** To borrow an Enviroscape, call USFWS 509.548.7641 or to purchase one call: 703.631-8810*