THEME:	**Water Monitoring**
SCOPE & SEQUENCE UNIT:	**Water quality measurements**
OBJECTIVE:	**Water quality protocols & stream Characteristics**
ACTIVITY 1:	**Practicing the protocols**

Notes:	In-class activity (it's a wet activity so you may want to do it outside)
Teacher Prep.:	gather equipment, see Materials; request parent volunteers to work in small student groups, if possible
Time:	60 minutes

Skills:

- Math Literacy
- Reading
- Ecological literacy
- Critical and creative thinking
- Collaboration, teamwork, leadership

Objectives:

- To experience the scientific method of sampling
- To prepare for an experience in field science

Background Information:

The water quality of a creek or river is an important consideration. With regard to the creek as habitat, its water quality will influence what lives in it. (Water quality is also of paramount interest for its potability or drinkability, but that is not the focus of this activity). Water quantity is also an important consideration. With a focus on the creek as habitat, too little water may stress or eliminate certain life in the creek, and too much water means the flow is faster. A river in flood often means there is run-off contributing to the water quality.

This activity combines water protocols of the GLOBE program to measure temperature, pH, and turbidity with the protocols of Streamkeepers (DFO Canada) to measure creek width, depth and stream flow speed.

Vocabulary:

pH – a measure of the acid content of water, and a determining factor in chemical reactions in the water and what life can be sustained in the water; measured with pH paper (or a pen or metre); most freshwater has a pH ranging between 6.5 and 8.5.

Transparency: the degree to which light is able to penetrate into the water; measured with a transparency tube for shallow waters, and by a Secchi disk for deeper waters; light is required for plants and algae to photosynthesize, transparency decreases with the amount of particles in the water column, the importance of transparency is to know the average or normal readings for a water body and to recognize when a change occurs.

Water temperature: the amount of thermal energy the water holds; it is largely determined by the amount of solar energy absorbed by the water, but other factors can also have a significant influence.

Materials:

Student page, 1 per students

Water quality sampling equipment: pH paper, transparency tube, thermometer

Creek measurement equipment: 10m tape, cork, stopwatch

Often a local NGO, like Streamkeepers or Salmon Enhancement will have this equipment for loan. Otherwise it can be purchased from scientific equipment outlets such as Forestry Suppliers. (We borrowed equipment and bought some and were able to equip four groups of students.)

Introduction Discussion:

Conduct an in-class mock creek sampling to practice the protocols and have each student gain hands-on experience in the protocols and familiarity with the data sheet. If using parent volunteers have them standing-by for assistance and to learn the protocols themselves (prior to joining the students out in the field).

Review the student page. Students can immediately enter some of the data – their name and date. Review pH with them. Introduce transparency to them. Review temperature with them, especially how to read the thermometer. Explain the cork races and wetted channel width (have an imaginary creek to do this). Review the rigour of scientific measurements: i.e. taking 3 measurements of each sampling and then calculating the average value for reliability; accurate reading of the instruments (this takes patience and practice), and using the right equipment for reliable results.

Methods:

pH – Test the accuracy of the ph paper by first dipping it in a cola drink (pH 2.5) and also tap water (pH ~ 7); dip a piece of pH paper in the water for 5 seconds, compare the colour to the colour scale and record the value (NOTE: do not average the values of pH – it must be a whole number if using paper, take the most common value, i.e. 2/3).

Transparency – use a transparency tube; one student works the stopper, one fills the tube completely full of water, one student looks down into the tube to view the black and white pattern at the bottom as the water leaves the tube at the bottom through the stopper, it is important that the sun is at the observer's back, the point at which the pattern is visible is the measurement to record being the height of water in the tube and when the stopper should be closed.

Temperature – measured with a calibrated thermometer (place the thermometer in a glass of water and ice cubes and make sure the thermometer reads within a .5 degree of 0, if not, find another thermometer that does; read the thermometer to the nearest 0.5 degree if possible.

Wetted channel width – the maximum distance between the two edges of the water flow of the creek – measured with a long tape measure (5-10 m).

Cork races – measuring the speed of the surface water of the creek; run a 10 metre length along the side of the creek edge, assign a student to remain at the end to catch the cork and to shout stop when the cork crosses an imaginary finish line, assign a student to be the timer with the stopwatch, assign a student to drop the cork into the centre of the creek channel above the imaginary start line, assign a student to shout "go" when the cork crosses the imaginary start line.

Reflection Discussion:

Dialogue on the practice of the water protocols.

Student Page:

Creek Water Stewards

Resources:

The GLOBE Program: - see GLOBE's hydrology protocols and learning activities
http://www.globe.gov/web/hydrology/protocols

see also Elementary GLOBE for K-4
http://www.globe.gov/web/elementary-globe

Streamkeepers – The Streamkeepers Handbook: A Practical Guide to Stream and Wetland Care
http://www.pac.dfo-mpo.gc.ca/education/secondary-secondaire/index-eng.htm

Creek Water Stewards

Group: _____

Date: _____ **Time:** _____

Site Name:

_____

Water State (check one)

- ☐ Normal
- ☐ Flooded
- ☐ Dry
- ☐ Frozen

Water Quality

Cloud Cover (check one)

Cloud Cover (Check One)

No Clouds	*Clear*	*Isolated*	*Scattered*	*Broken*	*Overcast*
❑ 0%-No Clouds	❑ <10% Clouds	❑ 10-25% Clouds	❑ 25-50% Clouds	❑ 50-90% Clouds	❑ >90%

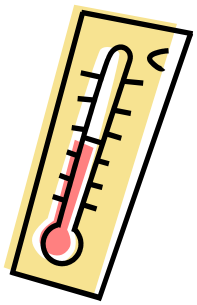
Transparency Tube

1. _____ cm or greater than tube
2. _____ cm or greater than tube
3. _____ cm or greater than tube

Total: _____ cm ÷ 3 = _____ cm
Average Transparency (cm)

Name: _____ **Date:** _____

Water Temperature



1. _____
2. _____
3. _____

Total: _____ ÷ 3 = _____
Average Temperature

pH of Water

1. _____ 2. _____ 3. _____ _____
pH

1	2	3	4	5	6	7	8	9	10	11	12	13	14

Water Flow

Wetted Channel Measurements

Wetted Channel width: _____ cm

Cork Races

Average Time (seconds)

_____ + _____ + _____ = _____ ÷ 3 = _____
1st 2nd 3rd Total Avg. time (sec)

Average Stream Speed (m/sec)

_____ ÷ _____ = _____ (m/sec)
distance (m) average time (sec) Average Stream Speed