Teacher's Guide
ACTIVITY 5 – WATERSHEDS AND POLLUTANTS

OVERVIEW:
In this workshop on watersheds and pollutants students will work in pairs. Students will use measuring skills to perform serial dilutions to simulate the procedures used in ecotoxicology, which is "The scientific study of how contaminants affect living organisms in their habitats." Students will then record data from a "pre-started" experiment that tests the effect of salt concentrations on zooplankton survival. Students will count the total number of living and dead zooplankton in their assigned treatments, calculate a "proportion surviving," and graph their results on their data sheet. During the class summary students will compare their results to other groups' results.

TERMS WE WILL BE USING:
- **Content related**—aquifer, concentration, condensation contaminant, ecotoxicology, effluent, evaporation, groundwater, pollutant, proportion, runoff, serial dilution, surface water, water table, watershed
- **Process related**—observation, experiment, hypothesis, comparison, prediction, independent variable, dependent variable, inference, data

OUTLINE OF WORKSHOP:
After a few minutes of review from Activity 4, students will be introduced to the science of ecotoxicology. The focus of the slide program will be the research of two SREL scientists, Bill Hopkins and Gary Mills, who study contaminants in wetland ecosystems. Students will be introduced to content on watersheds, point- and non-point source pollutants, and effects of contaminants on organisms. This will include a presentation of the "water cycle" and specifics about their school's watershed. The main emphasis will be that we all live in a watershed, and the activities that occur in a watershed may affect the water quality of all creeks, streams, and rivers in the watershed and downstream from it.

Examples of point source pollutants and non-point source pollutants will be illustrated by a demonstration to the class using a watershed model. This activity should take about 20 minutes.

Students will then go to their science stations in groups of four, where they will work in pairs. Students will use measuring skills to perform serial dilutions to simulate the procedures used in ecotoxicology. Using salt as a "pollutant," students will create solutions of 35 parts per thousand (PPT; the concentration of sea water), 17.5 PPT, 8.75 PPT, 4.38 PPT, and 2.19 PPT. Each pair of students will then be given a pair of beakers to which zooplankton were added prior to class—one beaker will be a control (0 PPT salt), and one beaker will be one of the salt concentrations above. Students will count the total number of living and dead zooplankton for each beaker, calculate a "proportion surviving," and graph their results on their data sheet. During the class summary students will compare their results to those of other groups.

STANDARDS COVERED:

Sci	Life Sci	Ecosystems	Populations and population interactions
Sci	Life Sci	Ecosystems	Functions and roles of organisms/niche concept
Sci	Life Sci	Ecosystems	Sun energy/photosynthesis
Sci	Life Sci	Ecosystems	resources and resource limitation
Sci	Earth Sci	Changes in surface: land and ocean	formation/SC regions/weathering processes
Sci	Earth Sci	Changes in surface: land and ocean	water cycle
Sci	Phy Sci	Mixtures and solutions	properties--mixtures vs. solutions, concentrations
Sci	Phy Sci	Mixtures and solutions	properties--solubility, pollutants
Sci	Inquiry	Process skills	observe, classify, measure, communicate, infer, predict, hypothesize
Sci	Inquiry	Inquiry skills	Plan and conduct simple investigations
Math	Alg-S1	Understand patterns, relations, and functions	Represent and analyze functions, using words, tables, and graphs
Math	Alg-S4	Analyze change	How one variable affects another
Math	Alg-S4	Analyze change	Compare varying rates of change

SUGGESTED FOLLOW-UP ACTIVITIES:

Science and Math

- **Follow up sheet**—Do the science follow-up sheet for Activity 5 on watersheds and pollutants.
- **Data collection**—Create a data table on a regular sheet of notebook paper that has two columns; one labeled Point Source Pollution and the other labeled Non-Point Source Pollution. Every time you see something that might end up in your drinking water supply decide if it is point or non-point source pollution and enter it in the correct column. Carry your data table around with you on car trips and be observant. Be aware of the water cycle in your home – where is your water going and what is going down the drain with it. Do this for an entire week. What did you discover?

Language Arts

- **Research (Reading)**—Go to the library and check out a book that will expand on your knowledge on the value of good water quality to organisms that inhabit wetlands and creeks. Read the book, and then write a book report or do an oral presentation for your class.
- **Oral presentation**—Use the PowerPoint presentation you developed (see **Technology** section) to make a presentation about the value of Upper Three Runs Creek to another class, a church or scout group, or a civic group.
- **Flashcards (Vocabulary)**—Make vocabulary flashcards from the Activity 5 definitions sheet and spend 10 minutes every day studying your cards.

Technology

- **Internet Research**—Do some research on the Internet and find out what the "Toilet to Tap" water cycle is. Draw a diagram of it.
- **PowerPoint presentation**—Work with SREL instructors to help develop educational presentations about your watershed and Upper Three Runs Creek.

Art

- **Model**—Create a watershed model using a shallow aluminum baking pan, some thin sponges and about ten cut-out watershed species that you draw on used Styrofoam trays attached to toothpicks. Stand the little "tooth pick species" up in the sponges depending on where you might find them in the wetland – near the shore, on the surface of the water, in the water. Label your species and describe the type of wetland you created: Carolina bay, swamp, salt marsh. Put a little water in it and enjoy its beauty!