Class 6 Outline
Water Class

I. Recap of Acid Rain Issues and Transition to Water Pollution.

A. What is acid rain?
B. How is it formed? SO2 emissions from coal burning power plants.
C. Why is it a problem? Critters and plants that live in water may be harmed.
D. How do we measure whether water is affected by acid rain? We measure its pH.

II. Experiment: Measuring the pH of water.

A. pH ranges. Scale from 0-14. 7 is neutral. 0-6 is acidic. 8-14 is basic.

B. Place 3 cups in front of students. Put tap water in each cup.

C. Take piece of red and blue paper. Place in any one of the three cups. See what happens.

D. Place lemon juice or vinegar in one of the cups. Keep track of which one. Then place blue paper in the cup where the vinegar was inserted. What happened? Changed the pH. Made it more acidic. That's why paper changed from blue to red.

E. Place baking soda in one of the other 2 cups, not the same cup that help the baking soda. Place piece of the red paper in the cup. What happened? Change pH. This time made it more basic.

1. Now what is the actual pH of the water? Pass out the pH paper (orangish, tan).

2. Dip pH paper in the cup with no additives. What is the pH on the scale?

3. Dip another piece of pH paper in the cup with the acid. What is the pH on the scale?

4. Dip another piece of pH paper in the cup with the base. What is the pH on the scale?

Materials: 5 sets of each. Litmus/pH paper and color charts. Plastic cups. Water. Acidic insert (vinegar, lemon juice). Basic insert (baking soda).

III. Affect of pH on Wildlife.

A. As lakes and streams become more acidic, the numbers and types of fish, other animals, and plants that live in water may decrease.

B. pH in most lakes and streams is 6-8.

C. Lowest pH ranges for various species.

1. Trout - down to 5
2. Bass - down to 5.5
3. Perch - down to 4.5
4. Frogs - down to 4
5. Clams - down to 6.
6. Mayfly - down to 5.5.

D. At pH of 5 or below, most fish eggs can't hatch. At lower pH levels adult fish may die. Young fish are more sensitive to pH than adults. Although frogs can tolerate lower pH, insects they eat like mayfly cannot.

1. Can any of our species live in the clean cup, the acid cup, the base cup?

2. Ecosystems & food chain. If certain species sensitive to acid die off, other species and whole ecosystem is affected.

IV. Overview of water systems (using maps)

A. Surface water: saltwater & fresh water.

B. Groundwater.

C. Streams, lakes, rivers, bays, estuaries, marshes, wetlands, oceans.

D. Orientation: Anacostia and Potomac Rivers and Chesapeake Bay. (Using topographic map).

E. Explanation of watersheds and how they work. Rainwater flows downhill.

V. Experiment: Outlining a watershed.

A. Where does water from Birney School go? The Anacostia River or Oxon Run.

B. Give each student an individual map. Color copy of topographic map.

C. Explain how a topographic map works. Contour lines.

D. Find Birney School on the map. Find the nearest waterway to Birney School. Find Anacostia River and Oxon Run.

E. Start at Anacostia River. Find Anacostia Park. Look for the first contour line below the Anacostia River. Brown line with a number on it. Between the Anacostia Freeway and the River. 10 or 20.

F. Find Oxon Run on map, towards bottom. Find the first contour line above Oxon run.

G. Try to find the contour lines with the highest elevation between Oxon Run and Anacostia river. Trace the line. Water below line goes into Oxon Run and then the Potomac River. Water above the line goes into Anacostia River and then to the Potomac.

Materials: Color copies of segment of USGS quad sheet covering Birney school area. Magic markers, pens.

VI. Wildlife that lives in waters (Pictures and examples if possible)

A. Fish
B. Crabs - Chesapeake Bay Crab Fishery
C. Clams
D. Oysters.

VII. Water Pollution Sources

A. Types of Pollution

1. Sewage - Toilets.

2. Process Wastewater - Factories. Soap & detergent. Food products. Paper mills. Pharmaceuticals (medicines). Iron and steel. Metal finishing.

3. Cooling Water - Heat. Power Plants.

4. Stormwater.

a. Storm drains. Oil and grease. Trash. Motor oil dumped down drains.

b. Runoff from agriculture. Nitrogen. Phosphorous. Fertilizers. Nutrients. Chesapeake bay agriculture. Chicken farms. Animal waste.

B. Types of Pollutants

1. Oil & grease.
2. Bacteria
3. Nutrients - Nitrogen and Phosphorous.
4. Toxics - Chemicals, Metals, Lead, Zinc, Dioxin, Pesticides.
5. Biological Oxygen Demand.
6. Heat.
7. Sediment/Turbidity.

C. Point Sources.

1. Sewage Treatment Plants - Blue Plains sewage plant. Show it on Map. Bacteria and nutrients.
2. Factories - Nutrients, toxics, BOD.
3. Power Plants - Heat.

D. Nonpoint sources.

1. Farms - Nutrient, sediment.
2. Tree Farming - sediment.

VIII. Homework. Read the vocabulary list. If time permits, go over the list with the students.