PONDS AND STREAMS, Level 2

ACTIVITY 1 - Water Cycle Crossword Puzzle

**ANSWERS:**

ACROSS: 2) rivers  6) runoff  9) precipitation  10) vapor  11) liquid  13) rain  
DOWN: 1) snow  3) evaporation  4) transpiration  5) condensation  7) cyclic  8) spring  12) ice

ACTIVITY 2 - Mapping your watershed *(Self Explanatory)*

If you have access to the internet, the United States Environmental Protection Agency has an outstanding watershed website:  [http://www.epa.gov/surf](http://www.epa.gov/surf).

ACTIVITY 3 – Charting - *(Charts should look something like the below pie charts)*

ACTIVITY 4 – Find the Hidden Pollution

ACTIVITY 5 – What’s in the Water? - Categories of Non Point Source Pollution

**ANSWERS:**  
Sources of Pollution: B;A;C;D  
Causes of Pollution: A;B;D;C

ACTIVITY 6 – Water Properties Crossword Puzzle

**ANSWERS:**

ACROSS: 2. alkaline  5. dissolves  6. pH  7. neutral  8. tension  
DOWN: 1. water  3. acid  4. molecule

ACTIVITY 7 – Acid Rain Crossword Puzzle

**ANSWERS:**

ACROSS: 1. NPS  5. sulfur oxides  7. rural  8. acid  9. conservation  
DOWN: 2. pure  3. nitrogen  4. nitric  5. sulfuric  6. urban
ACTIVITY 8 - Investigating Labels  (Self Explanatory)

ACTIVITY 9 – Looking for More Information – Research
Teacher tip: This activity is intended to inspire the student to further study an aspect of water quality. The example given is nitrate, which can cause human health problems. Perhaps each student (or group of students) can study a different water quality parameter.

Specifically in terms of nitrate, here is some fundamental background information for classroom discussion:

Nitrate is a major ingredient of farm fertilizer and is necessary for crop production. When it rains, varying nitrate amounts wash from farmland into nearby waterways. Nitrates stimulate the growth of plankton and water weeds that provide food for fish. This may increase the fish population. However, if algae grow too wildly, oxygen levels will be reduced and fish will die.

Nitrate also may get into waterways from lawn fertilizer run-off, leaking septic tanks and cesspools, manure from farm livestock, animals wastes (including fish and birds), and discharges from car exhausts. In nature, they generally are formed by the action of bacteria on ammonia and nitrogen-containing compounds.

Nitrites are relatively short-lived because they’re quickly converted to nitrates by bacteria. Even though they don’t exist for very long in the environment, nitrites produce a serious illness (brown blood disease) in fish. Nitrites also react directly with hemoglobin in the human blood to produce methemoglobin, which destroys the ability of blood cells to transport oxygen. This condition is especially serious in babies under three months of age as it causes a condition known as methemoglobinemia. Many babies have been seriously poisoned by well water containing more than 10 mg/L of nitrate-nitrogen.

Because nitrates may be reduced to toxic nitrites in the human intestine, the US Public Health Service established 10 mg/L of nitrate-nitrogen as the maximum contamination level allowed in public drinking water. Water with nitrite levels exceeding 1.0 mg/L should not be used for feeding babies. Nitrite concentrations in drinking water seldom exceed 0.1 mg/L.

**Effects of nitrates and nitrites on fish and aquatic life**

Nitrate-nitrogen levels below 90 mg/L and nitrite levels below 0.5 mg/L seem to have no effect on warm-water fish, but salmon and other cold-water fish are more sensitive. The recommended nitrite minimum for salmon is 0.06 mg/L.

ACTIVITY 10 – Acids and Plants

This experiment takes several days, but allows students to see first hand the effects of pH (acids) on plant growth. It can help the student understand the actual effects of acid rain.

ACTIVITY 11 – The pH of Water

This activity is intended to encourage additional testing and comparison of various water sources. Use your (and your students’) imagination. If additional test strips are needed, they are available through selected science education suppliers and/or Hach Company at a nominal price.

ACTIVITIES 12,13,14 – Testing the claims, Nitrate and Phosphate Testing
Teacher Tip: These experiments can produce extremely variable results depending on the materials being tested. Be sure to try this prior to teaching it in class—If the results are beyond the range of the test strips (too high), you can dilute the solution with water. This experiment or process can help students realize the (small) size of a milligram per liter or ppm.