Somethin's Fishy Goin On

This activity is part of the **Water Protection** theme

What's the purpose of this activity?

This activity helps students understand acidity (pH) and alkalinity. Students will gain an appreciation of the effects of acid precipitation (acid rain) and its impacts on life.

Key Messages:

- Acid rain is rain, snow or fog that is polluted by acid in the atmosphere.
- When the rain falls to the ground, it damages the environment including the lakes found in the area.
- Lakes that have high acidity levels cannot support the same variety of life as healthy lakes. As a lake becomes more acidic, crayfish and clam populations are the first to disappear and then various types of fish.
- The amount of acid in a lake is measured using a pH scale that ranges from 1 to 14. The smaller number on the pH scale, the more acidic the water is.
- Most aquatic species do well in a pH range of 6-9.
- Acid rain is a problem in the Haliburton/Muskoka region because many of the water and soil systems lack natural alkalinity such as a lime base - and therefore cannot neutralize the acid naturally.
- Alkalinity, the ability of a lake to neutralize acid, is dependent on the soil bedrock beneath - the granite bedrock of this area is less able to buffer the effects of acid rain than the bedrock in the City of Kawartha Lakes.
- While some efforts to reduce acid rain emissions have been successful the use of coal fired electrical generation plants still produce acid rain and damage our lakes.
- Energy conservation and the use of renewable energy sources can help reduce the impact of acid rain.

Materials

- Laminated Test Results Chart
- White erase markers
- Laminated pH Scale chart
- 2 lamintated pH Universal Indicator Paper
- Sample bottles
    - Fill half of the bottles with lake water
    - Fill other half with tap water
- Ketchup
- Vinegar
- Antacid
- Large waste water pail
- Paper towels
- Supply of pH strips
    - Use stips sparingly … 1 strip per group for each substance!

What will I be doing?

Put a different substance into each of the small containers.

You will briefly introduce students to the concept of acid rain and the pH scale.

1. Have a different student place a pH strip into one of the substances and have them hold it in it for a couple of minutes, or until it stops changing colour.
2. While waiting for the pH strips to turn, ask the students for, or provide, a definition of acid rain and where it comes from.
3. Ask the students for, or provide, a definition of pH and how acidity is measured. Show students the *pH Chart* on the display board.
4. Have the students take their pH strips out and compare to the pH indicator chart (the 2 laminated strips labeled 1-14)
5. Show how their results "fit" on the pH Scale Chart.
6. Inform the students that most aquatic life live in waters with pH readings of 6-9.
7. Review and compare results with this in mind. The sample with the lowest result has the

highest level of acidity.

8. Explain to the students that the impact of acid rain on lakes is greater in this area than lakes further south in Ontario. **Ask if they know why?**
9. Explain that alkalinity is the capacity that water has for neutralizing an acid solution.
10. The calcium level in the lake is like the "anti - acid" (compare to the stomach anti-acid).
11. The calcium comes from the rock under the lake and the type of rock affects the ability of the lake to reduce the impact of acid rain.
12. In this area the bedrock does not have a lot of calcium and therefore has less ability to neutralize acid rain.

Summarizing Questions:

1. Can aquatic life live in the water that has been tested? (Any reading below 6 has an impact on aquatic life)
2. Knowing that we are on the Canadian Shield, do you think that acid rain can have a negative impact on its lake life?
3. List some industries that cause acid rain to form? (Coal fired factories, etc.)
4. What are some industries that help reduce acid rain? (Hydro-electric stations, etc)
5. What does it mean for something to have a high pH and a low pH? Give an example of each.

Background Information

Two common air pollutants acidify rain: sulphur dioxide (SO^2) and nitrogen oxide (NO_X). When these substances are released into the atmosphere, they can be carried over long distances by prevailing winds before returning to earth as acidic rain, snow, fog or dust. Areas such as Muskoka, Haliburton and Quebec City receive about three-quarters of their acid deposition from the United States. Rain SO^2 is generally a by-product of industrial processes and burning of fossil fuels. Ore smelting, coal-fired power generators and natural gas processing are the main contributors. The main source of NO_X emissions is the combustion of fuels in motor vehicles, residential and commercial furnaces, industrial and electrical-utility boilers and engines, and other equipment.

On the pH scale, the smaller the number on the pH scale, the more acidic the substance is. Small number changes on the pH scale actually mean large changes in acidity. For example, a change in just one unit from pH 6.0 to pH 5.0 would indicate a tenfold increase in acidity. Clean rain usually has a pH of 5.6. It is slightly acidic because of carbon dioxide that is naturally present in the atmosphere.

Clean Up procedures

- Clean up and re-organize
- Empty and clean containers.
- Empty waste bucket.
- Ensure the pH strips are properly stored as to not get wet.
- Organize all into the provided Rubbermaid
- Replace laminated charts, etc. into volunteer folder and return to registration.
- If new supplies are needed, let your marshal know or someone else with a yellow water festival shirt.