Troubled Waters

Background Information:

We know that plants need fertile soil, ample sunlight, and water to grow. In addition to watering frequency and amount, farmers also pay close attention to the quality of the water they use to irrigate their crops. Poor water quality can lead to soil conditions that are harmful to crops. In this lab, we will look at the effects of saline, alkaline, and acidic irrigation water.

In some areas, groundwater used for irrigation can be high in salts or saline. Saline irrigation water can raise the salt content in the soil, which will inhibit plants' ability to uptake water. This happens because water moves from areas of low salt concentration in the roots of plants to higher salt concentrations in the soil. Plants growing in saline soils may appear wilted even if they are being watered regularly. Plants don't germinate well in saline soils and if they do, they usually have stunted growth. One remedy for saline soils is to leach the salts out of the plant root zone by periodically over-watering the area.

The pH level of water is also important. Water with a pH above 7 is called alkaline and water with a pH below 7 is called acidic. Some areas of the United States experience acid rain, which can harm plants.

If plants are irrigated with acidic water, soils may become acidic, reducing the availability of nutrients like iron, zinc, and phosphorus. Symptoms of these nutrient deficiencies can include yellow stripes on leaves or purplish coloring of the lower leaves of the plant.

Alkaline irrigation water can lead to plant deficiencies in calcium and magnesium. Plants growing in Alkaline conditions can become yellowed in appearance or "chlorotic."

A pH level between 6.0 and 7.2 is best for most plants. It can be difficult and expensive to change the pH of soil. If soils are slightly alkaline it may be best to plant crops that are tolerant of alkaline soil. If the soil is too alkaline, a couple of methods that can lower pH include adding organic matter like peat moss or adding acidifying fertilizers to the soil. If the soil is too acidic, pH can be raised by adding ground limestone.

Water quality is a critical issue around the world. Earth's supply of fresh water is limited and it is often treated before it is consumed by people or used for agricultural purposes. This lesson will help students relate their classroom experiment to the importance of good water quality for producing the crops that provide food for us.

Troubled Waters

Name: _____

Our team will water each of our plants with a different watering solution.

Circle one watering solution for each plant and write it in the correct columns in all three charts:

- We will water plant #1 with: Control Basic Saline Acidic
- We will water plant #2 with: Control Basic Saline Acidic
- We will water plant #3 with: Control Basic Saline Acidic
- We will water plant #4 with: Control Basic Saline Acidic

	Plant #1 _____	**Plant #2** _____	**Plant #3** _____	**Plant #4** _____
My Hypothesis *(for each plant)*				

Procedure

1. Label each of your plants with the type of water you will use to water them: Saline, Alkaline, Acidic or Control.
2. Predict what will happen to each of your four plants during the experiment. Write down your hypothesis for each plant.
3. Write down your Day 1 visual observations of each of your plants and measure the height of each plant in cm.
4. Designate which group member will be in charge of watering plant #1, #2, #3 and #4. Use your measuring cup to deliver _____ amount of watering solution to each plant. Your teacher will tell you how much water to put in your measuring cup. Rinse out your measuring cup between watering each different plant to eliminate cross contamination.
5. Your teacher will have you repeat this process during specified times over the next two weeks. Record data each time.
6. At the end of the experiment, complete the results section and questions on your *Troubled Waters* handout.

Observations

	Plant #1 _____	Plant #2 _____	Plant #3 _____	Plant #4 _____
Day 1 Plant Height (cm) Visual Observations				
Day _____ Plant Height (cm) Visual Observations				
Day _____ Plant Height (cm) Visual Observations				
Day _____ Plant Height (cm) Visual Observations				

Results

	Plant #1 _____	Plant #2 _____	Plant #3 _____	Plant #4 _____
Results Was your hypothesis proved or disproved?				

1. After viewing your results, do you think crops would grow well if watered with ocean salt (saline) water? Yes/No

   a. Why or Why Not? _____

   _____

   _____

   b. Based on your results, what type of water would be best for watering corn? _____

   _____

2. Many parts of the world are affected by acid rain. Acid rain is formed when pollution in the air mixes with rain. Do you think acid rain (acidic water) could be a problem for plants? Yes/No

   a. Why or Why Not? _____

   _____

   _____

3. Explain why farmers must be concerned about the quality of water they use on their crops. _____

   _____

   _____

   _____

4. How can the quality of water available for watering crops impact your life? _____

   _____

   _____

   _____