

**WATER QUALITY AWARENESS IN URBAN ENVIRONMENTS**

**LESSON 4**  
**Salinity's Significance**



## Lesson 4: Salinity's Significance

**Subject Overview:** Salinity is the measurement of dissolved salts found in a specific amount of water. Scientists measure salinity to detect increases or decreases in the amount of dissolved salts in the water. Salinity in water increases as water evaporates or as additional salts are added from natural and manmade sources. Since most aquatic animals can only tolerate a narrow range of salinities, significant changes in salinity often result in the inability of an animal to grow, reproduce, and survive. Water contains varying amounts of **dissolved salts**, mainly ordinary table salt (sodium chloride).

**Dissolved salts** are solids you can see, such as table salt, until they dissolve in solution (i.e. water) rendering them invisible. Aquatic plants and animals are adapted to live in waters of a specific salinity and have a narrow **tolerance** for change in salinity. As a result, even small changes in salinity impacts their ability to grow and survive. Ocean water is very high in salinity (35,000 milligrams per liter); while freshwater is usually less than 1,000 milligrams per liter. Other dissolved salts contributing to salinity, besides sodium and chloride, include: magnesium, sulfur, calcium, and potassium.

**Activity Concepts:** salinity, tolerance

**Subject Links:** Science: chemistry, ecology

**Vocabulary:** salinity; dissolved salts; tolerance

**Purpose of activities:** Youth will have the opportunity to explore how dissolved salts in water impact aquatic organisms.

**Overview of activities:** Youth will explore salinity through a hands-on activity.

**Time Required:** Approximately 40-60 minutes

### Getting Ready:

- Divide youth into pairs or small groups no larger than 4-6 individuals.
- Fill all three glasses or beakers with water three quarters full.
- Place an egg in each glass or beaker.
- Label the first glass 'Fresh Water' and the second glass 'Ocean Water'.
- Add table salt to the third glass until the egg floats.
- Provide youth with the third beaker representing a sampling location downstream of several farms and a large city.
- Provide youth with a jar of table salt and measuring spoons.

### Materials Needed per Group:

- Glass or jar that holds 2 ½ cups of water (e.g., Mason jars).
- Potable (drinkable) water
- Three uncooked eggs
- Container of table salt (approximately 10 teaspoons)
- One measuring spoon (teaspoon)
- Flip chart or Butcher paper and markers
- **Handout:** Water Quality Scenario
- **Handout:** Data/Label Sheet

### Opening Questions:

**Ask the youth to discuss the following questions, record their thoughts on the flip chart paper provided, and share their ideas with the other groups.**

- What do they think rainwater is made of?
- What is in water we use when we water our lawns or irrigate fields?
- What happens to rain, the water we use to water our lawns, and the water used to irrigate crops?
- Where does the water go? **[Facilitator's Note:** This question is trying to get to the point of water runoff and how it carries chemical compounds applied to agricultural lands or urban impervious surfaces (sidewalks, driveway, and streets) and landscapes into a body of water.]

# Activity: Dissolved Salts

## Exploration (Procedure):

- Provide each pair/small group with 1 of the 3 scenarios provided.
- **Within their groups, ask the youth to read the scenarios aloud and follow the directions.**
- Provide the groups with the data sheet handout.
- **Ask the youth to record the amount of salt they add to the jar of water which represents a sampling location downstream, as well as record their observations.**
- **Youth should determine how many times each activity can be done before an effect on the egg is observed.**

## Sharing, Processing, & Generalizing:

- **Ask the youth to use their words to explain what happened during the activity.**
- **Ask the groups to share the data they recorded and record additional thoughts on the flip chart paper provided.**
- Ask the youth how they think dissolved salts might affect freshwater animals, marine animals, or estuarine environments (areas where freshwater and marine waters mix). **Ask them to record their thoughts on the flip chart paper provided.**

If necessary, use supplemental targeted questions as prompts to get to specific points. Additional questions might include:

- How might humans reduce their contribution of dissolved salts to fresh water stream and creeks?
- Can animals exist with the ability to exist in both high and low saline waters?

**Concept and Term Introduction:** At this point, facilitators need to ensure that the concepts and terms salinity, dissolved salts, and tolerance have been introduced.

**Note:** The goal is to have the youth develop these concepts through their exploration and define the terms using their own words and ensure that:

- The youth understand the concept of salinity and how waters differ in their dissolved salt content.
- The youth have identified (from the scenarios) major sources of dissolved salts in surface runoff from agricultural lands.
- The youth have identified (from the scenarios) major sources of dissolved salts in surface runoff from urban and suburban areas.

**Concept Application (Optional Extension Exercise):**

- Take a field trip to a lake, pond, stream, or coastal area. Have the youth observe the different plants and animals. Identify whether the animals they observe are adapted to low, intermediate, or high salinity water.
- Have the youth predict how a food web would be affected if the salinity of a fresh water stream suddenly increased during the rainy season (e.g. impact on insect population, plants, and fish).

## Water Quality Scenarios

**Scenario 1:** You live downstream from a large farm that has livestock and grows crops on its many acres. To help with crop growth, the farmer adds fertilizer to the soil. Some of the fertilizer dissolves in the water the farmer uses to irrigate his crops and runs off into the local waterways.

**Add 4 teaspoons of salt due to the excess fertilizer added to the soil.**

The farmer's dairy herd is fairly large. Runoff from unconfined dairy manure that is exposed to rain carries chemicals in the manure to the local waterways.

**Add 2 teaspoons of salt due to the unconfined dairy manure exposed to rain.**

**Scenario 2:** You live in a valley near some mountains. Although it doesn't snow in the valley, winter brings large amounts of snowfall in the mountains. Because snow skiing is very popular in this area, the roads in the mountains are kept clear by adding salt to the roads to melt the ice. In the springtime when the snow melts, this salt is carried by runoff to the local waterways and is transported to the valley through local streams.

**Add 3 teaspoons of salt due to the salting of roads in the mountains.**

You like your lawn to look nice so you add fertilizers. You do this in the early spring to take advantage of heavy rains. Some of the fertilizer dissolves in the rainwater and runs into the street where it empties into the storm drains. Water from the storm drain is carried directly to local waterways.

**Add 2 teaspoons of salt due to the fertilizing of your lawn.**

**Scenario 3:** You live near the coast. The weather is warm most of the year and you enjoy the swimming pool in your backyard. To keep the pool maintained, you have to drain it occasionally. Water drained from the pool contains salt that runs off into the local waterway.

**Add 1 teaspoon of salt from draining your pool.**

Two other situations occur in your area that are out of your control, but still have affected the quality of the freshwater: 1) Due to excess groundwater pumping, seawater has gotten into local irrigation wells (**Add 1 teaspoon of salt**); and 2) sewage that was treated at the wastewater treatment plant was discharged into the local waterway

**Add 1 teaspoon of salt).**

# Water Quality Data Collection Sheet

Scenario Number: \_\_\_\_\_

Source of Salt	Amount of Salt	Effect on Egg

**FRESH WATER**

**SALT WATER**

LESSON HANDOUT

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