



# ARM

CLIMATE RESEARCH FACILITY

## Education and Outreach Lesson Plan

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**Grade levels 3-5**  
Rainfall and the Water Table:  
The Salinity of Soil

## Approximate Time

Setup and initial experiment: 45 minutes, followed by several short time segments to observe, record, and add water to soil.

## Objective

The student will be able to explain how an increase of rainfall influenced by climate change can affect the water table and soil salinity underground as evidenced by completion of the experiment and student recording sheet.

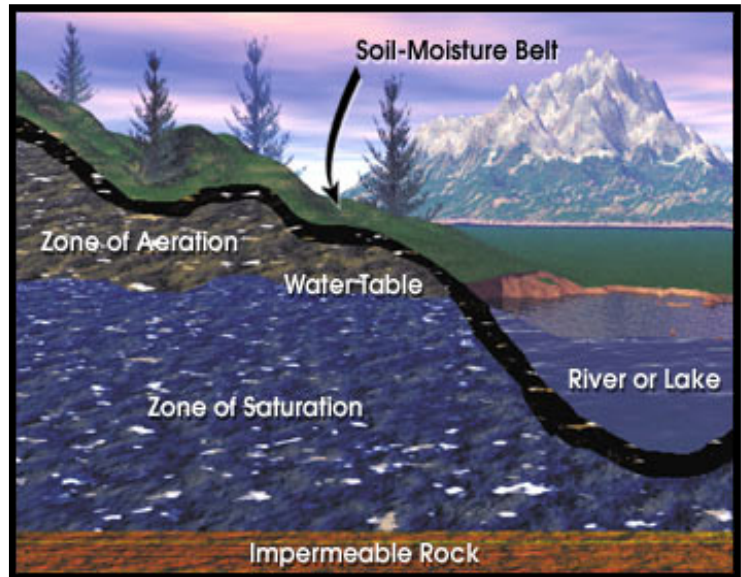
## Key Points to Understand

- An increase in rainfall due to climate change may raise the water table nearer to the surface.
- Salt may come to the surface as water evaporates.

## Background Information

Due to climate change processes, it is predicted that there may be a higher rainfall than normal in some areas and a lower rainfall than normal in others.

If rainfall increases, water flow in rivers will increase and so too will erosion by those rivers. Rivers that erode more than normal carry more silt. When the river runs into the nearby sea, that silt is deposited. An increase in rainfall may raise the water table nearer to the surface. A similar process can occur when deep-rooted trees are removed and the region is suddenly denied the water take-up evapotranspiration that the trees provided. Salt may then come to the surface as water evaporates.



## Key Vocabulary

- **Climate change:** Any long-term significant change in the weather patterns of an area. Climate change can be natural or caused by changes that people have made to the land or atmosphere.
- **Water table:** The planar, underground surface beneath which earth materials, such as soil or rock, are saturated with water.
- **Soil salinity:** The salt content in the soil. Salt-affected soils are caused by excess accumulation of salts, typically most pronounced at the soil surface.
- **Drought:** A period of dry weather, especially a long one that is injurious to crops.

- **Erosion:** The process by which the surface of the Earth is worn away by the action of water, glaciers, winds, waves, animals, or human actions such as hiking or motor biking.
- **Silt:** Earthy matter, fine sand, or the like, carried by moving or running water and deposited as a sediment.
- **Deposition:** The act or process of depositing (such as silt collecting on a river bottom).
- **Sandy loam:** Soil composed of sand, silt, and clay in a relatively even concentration (about 40-40-20% concentration respectively). Loam soils generally contain more nutrients and humus than sandy soils.

### **Materials (for each group of students)**

- 2 large, flat trays (disposable aluminum foil meal trays)
- Sandy loam (40% sand, 40% silt, 20% clay. May be purchased from hardware store)
- Salt—one large container
- Water for spray bottle
- One 16-penny nail
- Hammer
- Spray bottle
- Student recording sheet

## Preparation

- Using the nail and hammer (to be done by adults only), punch a few small holes in one of the trays for each student group. These will drain away water in a similar way to tree roots taking up water. About 10 small holes should be evenly dispersed.
- Fill spray bottles.
- Be sure all materials are centrally located or already distributed to student groups.

## Procedure

1. Ask students: What happens to the water table and the salinity of the soil when there is an increase in rainfall or deep-rooted trees are removed? Write responses on butcher paper to compare with student thoughts after the experiment.
2. Read the background information to students or make a chart with the important background points. Draw or show the water table picture and explain how rainfall and the recharging of the water table occur.
3. Focus the students by explaining the following to the students:  
*In the experiment we are about to conduct, the tray with the holes represents an environment in which deep-rooted trees take up water. The tray without holes represents both an increase in rainfall or an environment in which there are no deep rooted trees to take up water. The two-fold purpose of this experiment is to determine what happens to the soil when there is an increase in rainfall—the tray without holes representing this—and what happens to the soil in a normal environment—the tray with holes.*
4. Begin experiment: Place a 1-cm layer of salt evenly over both trays and a 5-cm thick layer of sandy loam over the salt.
5. Spray the same amount of water evenly over the soil in each tray until the soil is saturated but not soggy.
6. Students record observations on student recording sheet.
7. Place both trays outside on the grass in direct sun to dry OR in direct sun in the classroom with a tray under the tray with holes (use several blocks to suspend tray so water may drain from holes). Once dry, repeat the watering and drying process two more times. Record observations.

### **Closure/Evaluation**

1. In nature, where does salt come from?
2. What happens to the salt in each tray?
3. What can you infer from what you have seen?
4. Discuss the advantages and disadvantages of the increase of rainfall in general.
5. Release of salt and silt into the coastal ocean will have an effect: What is it?

### **Suggested Follow-Up Activities:**

- Collect current newspaper articles regarding increases or decreases in rainfall. Discuss with the class.
- Study of stream table.
- Study of rainfall in the state and how it is affected by geographical features.
- Graph rainfall using data from the newspaper for several weeks and compare/contrast data.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Rainfall and the Water Table

**Research Question: What happens to the water table and the salinity of the soil when there is an increase in rainfall or deep rooted trees are removed?**

### Hypothesis

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### Materials

- 2 large, flat trays—one with holes, one without holes
- Sandy loam
- Salt—one large container
- Water for spray bottle
- Spray bottle

### Data

#### Soil Observations: First Observation

	Observations	Sketch of Tray
Tray 1 Without Holes		
Tray 2 With Holes		

**Soil Observations: Second Observation**

	<b>Observations</b>	<b>Sketch of Tray</b>
<b>Tray 1</b> <b>Without Holes</b>		
<b>Tray 2</b> <b>With Holes</b>		

**Soil Observations: Third Observation**

	<b>Observations</b>	<b>Sketch of Tray</b>
<b>Tray 1</b> <b>Without Holes</b>		
<b>Tray 2</b> <b>With Holes</b>		

**Conclusion**

What happens to the water table and the salinity of the soil when there is an increase in rainfall or deep-rooted trees are removed? Use your hypothesis and the data collected to write your conclusion.

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