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Does the salinity level of soil affect plant growth?

***Purpose:***

Students need to be able to observe and communicate that the properties of soil determines the growth of plants and that certain kinds of plants survive in certain types of soil conditions. Students will be able to classify and organize plants and soils according to their specific biome. This is important for Utah students to know because the Great Salt Lake is a unique example of a biome.

***Grade Level:*** Fourth Grade

***Duration:*** One School Day

***Lesson #1:*** Field Trip to Great Salt Lake. Observe, identify, and classify plants that grow at the Great Salt Lake. Students will predict salinity level of soil samples and then test for salinity level with conductivity meter.

***Utah State Core Curriculum***

***Standard:*** 3040-05

Students will explore and classify a variety of Utah soils.

***Objectives:***

**3040-0101**

Compare and contrast Utah biomes

- ❖ Describe Utah's biomes (e.g., desert, forest, aquatic, alpine).

**3040-0102**

Relate plants and animals to a given biome

- ❖ Identify plant and animal adaptations that are specific to each biome.
- ❖ Research examples of plant and animal interactions within a biome.

***Intended Learning Outcomes:***

In this lesson students will *identify* the plants that are specific to the GSL biome. Students will explore the soil found only at the GSL.

***Terminology:***

*Salinity*—Of or pertaining salt-sodium, magnesium, and potassium.

*Perennial*—Any plant, which lives for more than two years.

*Annual*—Any plant that grows from seed, produces its flowers, matures its seeds and dies in one season.

*Succulent*—Plants that have adapted to dry habitats that have fleshy leaves or stems or both.

*Soil Classification*—The properties of soil found in the field. Based on several properties including; wetness, climate, vegetation, pH, texture, temperature, and mineral content.

*Biome- Major ecological community type (as rainforest, grasslands, desert or GSL).*

*Saline Soil*—Saline soils have an uneven surface covered with small puffed-up salty spots a few inches high. Salts congregate in the areas that remain moist longest after the onset of drought. Usually the soil is low in organic matter (humus), because the natural vegetation cannot make much annual growth on them.

**Background information:** The Great Salt Lake (GSL) is a unique ecosystem. There are few plants that can survive the conditions of this particular environment. Students will learn there are five particular plants that have adapted to this unique ecosystem. Please see attachment. Studying the GSL is important because it illustrates a contained specific biome that plants and animals have adapted for survival.

**Materials:** Arrangements for field trip, colored pencils, and students’ individual science journals.  
**For gathering soil 3 samples:** 4-10 qt. buckets, shovel, measuring cups, tape, markers, and conductivity meter (available through Westminster College) 1 gallon of distilled water, GSL plants identification handouts (see attachments).

**Prior knowledge Assessment:**

As a class, the teacher will facilitate the student’s knowledge of the GSL through a KWL chart.

What we <b>Know</b> about GSL	What do we <b>Want</b> to know	What we have <b>Learned</b> (after lesson)

Also teacher will begin discussion about plants and soil by asking questions for example;

1. How would you describe the environment of the GSL?
2. What do you think the plants growing here have to have (what adaptations) to survive this environment?
3. If the students have specific questions about the GSL the time will be taken to answer all questions.

**Activities for lesson #1:**

Field trip to GSL. Observe plants and areas of growth at the GSL. Identify and classify plants by observation and using handouts to compare samples with pictures. Terms will be introduced and discussed. For example, the annul “pickleweed”, will be shown and its specific characteristics will be pointed out and examined. Students will illustrate their plant findings with colored

pencils and write descriptions in their science journals. Observe the specific plants that have adapted to growing in salty soil (see attachment).

***Procedures:***

•Procedures for collecting 3 soil samples: sample 1- 1foot from water, sample 2- 50 feet from water, sample 3- 80-100 feet from water. Each sample needs 1 bucket with 5 scoops of soil. 1 scoop = 2.5 cups.

•Testing soil salinity: 1 bucket, 1 scoop of testing sample, 4 cups of distilled water, clean conductivity meter. Mix soil sample with distilled water and place clean conductivity meter into mixture for 10 seconds and determine salinity level from conductivity meter. Students should write down their findings and reactions to the results in their science journals.

***Assessment:***

Class regroups to discuss findings and share drawings. Teacher will observe students' understanding of terminology and plant adaptations. Teacher will prompt class to recall KWL chart. Teacher will ask students to answer individually "what have they learned on this field trip to the GSL". The response will be written in the science journals.

***Lesson #2***

**How garden beans react to different salinity levels in the soil?**

***Purpose:***

Students need to be able to predict and determine how garden beans react to different salinity levels in the soil.

***Grade Level:*** Fourth Grade

***Duration:*** Over a four-week period.

***Utah Sate Core Curriculum***

***Standard:*** 3040-05

Students will explore and classify a variety of Utah soils.

***Objectives:***

**3040-0102**

Relate plants to a given biome

- ❖ Identify plant adaptations that are specific to each biome.
- ❖ Research examples of plant and animal interactions within a biome.

***Terminology:***

*Germination-* Begin or cause to develop and grow.

*Growth Rate-* The speed at which plants grow.

*Biome- Major ecological community type (as rainforest, grasslands, desert or GSL).*

*Adaptation- Make or become suitable for use or conditions.*

***Background information:***

The Great Salt Lake (GSL) is a unique ecosystem. There are few plants that can survive the conditions of this particular environment. Studying the GSL is important because it illustrates a contained specific biome that plants and animals have adapted for survival. Students will use their prior knowledge of other biomes and the plants within them.

***Materials:*** For growing lima beans: The 3 GSL soil samples from the field trip and control (play sand), Plastic wrap, sunny windowsill, lima bean seeds, 12 growing containers, water if needed. Student's individual science journals.

***Intended Learning Outcomes:***

The desired outcome for teaching this lesson is to have students predict why plants grow better in certain environments over other environments.

***Prior knowledge Assessment:*** Have students recollect their experience at the GSL. Students will be asked why they think plants at the GSL do not grow in their backyards.

***Activity:*** Have student's plant beans into the three soil samples from the GSL and control group (play sand).

***Procedure for Science Journal:*** Students will write in their journals:

1. Question will be proposed, "*How garden beans grow in different salinity levels?*"
2. Prediction will be made; "*How garden beans will react in different salinity levels?*"
3. Observations of plant growth.
4. Record results of plant growth in science journal.
5. Conclusions of plant growth.

***Procedures for growing garden beans:***

- Soak lima beans in water over night.
- Use 12 planting containers (3 for each soil sample).
- 1 cup of soil for each planting container.
- 4 seeds to one planting container seeds planted approximately one half inch in soil.
- Place plastic wrap over planting containers and place in a sunny windowsill.

- Let grow for 2 weeks. During this growth period, students will predict which bean will grow best in the different soil types.

***Second part of lesson #2:*** After two weeks of plant growth students will:

- Measure the growth of the beans and determine the average growth/height of each plant sample.
- Test the soil salinity level in each of the 12 plants (dump soil from 1 plant = 2.5 cups and mix with 4 cups distilled water and take conductivity reading from gauge).
- Compare results with predictions. What were the students' conclusions?

***Closure:***

Group students according to their predictions. Have them explain in their science journals their understanding of this particular Utah biome and “why” they thought their plants grew the most, the least, or not at all. Students should explain in written communication the relationships between salinity levels and plant growth. Students should compare and contrast the bean plants to the GSL plants.

***Assessment:***

Teacher will collect and assess the students' science journals.  
Students should be able to identify plant adaptations that are specific to GSL biome.

***References:***

“The Great Salt Lake Story” Project coordinator and editor: Sandra Zicus, University Of Utah Press, 1997. Available at Utah Museum of Natural History.