



## LESSON: Prairie Soil Explorers

**GRADE: 1st**

**TIME: 45 min.**

### SUMMARY:

Groups of students will predict, explore, and record the characteristics of soil including temperature, color, and moisture content of the soil. Lastly, they will conduct a ribbon soil test. Students will draw conclusions about whether their soil sample is primarily made up of sand, silt, or clay. They will infer how soil types may affect prairie life, including humans, and how humans affect the soil.

### OBJECTIVES: Iowa Core

#### Science

#### Next Generation Standards

- **K-2-ETS1-1** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool

#### Literacy

#### Writing

- **W.1.8.** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

#### Speaking and Listening

- **SL.1.1.** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
- **SL.1.4.** Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.
- **SL.1.6.** Produce complete sentences when appropriate to task and situation.



## MATERIALS & RESOURCES:

- Soil Sample Data sheets (last page of this lesson)
- Pencils
- Clip boards
- Spray bottle of water to do a ribbon test
- Examples of different soil types: silt, sand, and clay (playdough)
- Hand shovels
- Book: *The Living Earth* by Eleonore Schmid

## PRESENTATION:

Explain that students will have the opportunity to become soil detectives today and search for clues that tell us about the soil. Discuss what they already know about soil. Use the book *The Living Earth* by Eleonore Schmid as a reference.

- In the prairie, what might use soil to live?
- Why might soil be important?
- Are all soils alike?

## DIRECTIONS:

1. Explain to students that not all soils are alike and that scientists group soils into three main types: sand, silt, and clay. Invite students to touch, observe, and explain differences between examples of each type of soil (Play-doh could be used as an example of clay). Make a class chart of the three soil types and words describing them.
2. Explain that today students will work in groups and go outside to collect a soil sample. They will describe the soil and decide if it is primarily made of sand, silt, or clay.
3. Predict the characteristics of the soils outside. Demonstrate how to complete the data sheet characteristics including color, moisture, organic matter, and the ribbon test (the ribbon test will be done last). Provide each group with a bucket and a hand shovel. Remind students that a hand shovel is a tool and not a toy. Demonstrate proper use.
4. Outside groups will use their hand shovel to put two scoops of soil in their bucket. They will touch soil samples and record their observations on the data sheet using words and sketches.



5. Share data from recording sheets with the class. What type of soil did your group sample? Ask them to describe characteristics of it such as moisture, color, plant and animal life, or texture.
6. Lastly, students will conduct the ribbon test to learn what soil particle is most common. Students gather a small handful of soil into their hands. The instructor will come by and spray one or two sprays of water into their soil sample. If they can form a ball easily as if it was play-doh, then they have clay soil. If they cannot do anything with the soil, if it just crumbles and feels gritty, then it is sandy soil. If they can mold the soil, but not that easily, then it is silt soil. Discuss their observations.
7. Students return their soil sample and wash their hands.

### REFLECTION/JOURNAL PROMPT:

Encourage students to reflect on what they learned. How is the soil in Iowa special? How does soil help people? Lastly, ask if anything surprised them. Is there anything you would do differently? Offer a sentence starter, such as, “Today I discovered ....” Or “Today I was really surprised by ....”

### BACKGROUND INFORMATION:

Soil is made up of solid particles; water and air; and plants and animals. Solid particles vary in size and are made up of mineral and organic matter. Air helps living organisms like bacteria grow and decompose other animals. Air also helps plants get nutrients from the soil. Air fills space that is not filled by water, therefore the wetter the soil, the less air it contains. Plant and animal life in prairie soils are extensive. From large animals like gophers to small microscopic organisms, they all play a role in making soil a living system. A soil scientist, Hans Jenny, once said, “I find more living biomass below ground than above it.” Among soils, there are varying amounts of these three main components. These differences are why different soil types exist.



## Solid Particles

In this investigation, students will basically be focusing on the solid particles of their soil. In classifying how much and which type of solid particles are in their soil samples. Usually, solid particles are grouped according size as sand, silt and clay. **Sand is generally the largest particle size; silt the medium; and clay the**

**smallest size.** These particle sizes largely determine the amount of other “ingredients” such as soil and water and plant and animal life available in the soil.

Sand particles are so large that they have a lot of space between them so that air and water travel through them very quickly. This explains why sand is often drier and takes a lot of water to create plant life (example- beach castles being destroyed). Oppositional, clay particles actually holds water almost too well. Since clay particles are so small (they are microscopic) they absorb water and do not easily release it for plants and animals to use. Lastly, silt particles are the medium size so they both retain some water like a reservoir and release water and nutrients pretty easily for plants to use. So while there are specific plants that are adapted to live in these entirely different soil particle types, silt soils are one of the easiest soils to use to grow plants. Tallgrass prairie soils are primarily composed of silt particles and the ability of silt soils to easily grow agricultural crops is one of the reasons why Iowa soil is considered the “the black gold”.



The type of solid particles in the soil can be tested by exploring the texture of the soil. If one takes a handful of soil, and sprays about a teaspoon of water into it, the way the soil reacts to the water will determine its solid particle type.

<b>Solid Particles</b>	<b>Texture/Ribbon Test</b>
<b>Sand</b>	<b>Feels gritty, nearly impossible to form a ball</b>
<b>Silt</b>	<b>Feels floury, possible to form a ball but still difficult</b>
<b>Clay</b>	<b>Feels sticky, make the strongest ball</b>

### Plant and Animal Life

In this field investigation, students will also be exploring color. Color can provide information about the soil characteristics. Generally the darker the soil, the more fertile in it is and the more living organisms are using it. However, color is not always an indicator of fertility. Below is a chart about the possible meanings of soil color. It should be clearly noted that a more in depth investigation than just physical color appearance is needed to accurately determine the amount of fertility, organic matter, erosion, aeration, and available nitrogen.

<b>Condition</b>	<b>Color</b>		
	<b>Dark</b>	<b>Moderately dark</b>	<b>Light</b>
<b>organic matter</b>	<b>high</b>	<b>medium</b>	<b>low</b>
<b>erosion factor</b>	<b>low</b>	<b>medium</b>	<b>high</b>
<b>aeration</b>	<b>high</b>	<b>medium</b>	<b>low</b>
<b>available nitrogen</b>	<b>high</b>	<b>medium</b>	<b>low</b>
<b>fertility</b>	<b>high</b>	<b>medium</b>	<b>low</b>

\*chart source: <http://www.rain.org/global-garden/soil-types-and-testing.htm>



Students will also record living organisms or signs of living organisms in their soil sample.

## Moisture

The amount of water in soil differs greatly depending on the type of soil, climate and the amount organic material within the soil. The amount of water found in the soil is one of the determining elements in the type and animal of animal and plant that can survive in that habitat. For accurate tests on soil moisture, soil samples need to be sent to a lab and they determine the amount of water by measuring the beginning weight, then dehydrating the sample, and then measuring the dehydrated sample for comparison. For this investigation, students will simply report on how wet their soil sample feels. As noted earlier, sandy soils tend to be the driest and clay soils are the wettest. Students can also use the amount of moisture in the soil to discuss variables such as weather patterns and climates too.

## Plant and Animal and Human Connection- Conserving Soil

The average depth of topsoil in the United States has decreased from eight to five inches in just 150 years of mechanized cultivation. In Iowa around 1850, the first surveyors recorded around 14-16 inches of topsoil. Currently, we average around six to eight inches. This means in 150 years, Iowa has lost over half of its topsoil. It would take approximately 250 to 1000 years for nature to rebuild one inch of topsoil and it only took 150 years for humans to take away approximately eight inches. If we continue at the rate of the past 150 years, in the next 100 years, one lifetime, and all the topsoil could potentially be gone.

Fortunately, many farmers are using various conservation practices to minimize erosion. They use terraces that act as steps and slow the movement of soil and water, which before would have rushed down hillside. They also use filter strips, which are strips of grass or trees planted along streams to filter the sediment and pollutants before they enter the waterways. City residents can also plant native trees and vegetation in their yards to filter sedimentation and pollutants and help preserve topsoil. Purchasing from farmers that use these practices and other sustainable farming techniques is one way to support the preservation of Iowa top soil.



**Data Sheet**

Name \_\_\_\_\_

Temperature:

Hot , Warm, Cool, Cold,

Does the temperature change at different depths?

Color:

Black, Brown, Grey, White

Does the color change at different depths?

Water:

Wet, Damp, Dry

Type:

Clay



Silt



Sand

