



*Revised 4/16/20
Neal Smith National Wildlife Refuge*

Prairie Soil Explorers

1st Grade

60 Minutes

Fall

Next Generation Science and Iowa Core Standards

Next Generation Science

- **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 and Resources



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- Soil Sample Data sheets (last page of this lesson)
- Bag of soil “ingredients”
- Pencils
- Spray bottle of water to do a ribbon test
- Examples of different soil types: silt, sand, and clay
- Soil samples (1 per two students)
- Paper plates or something to examine soil on

Presentation

Explain that students will have the opportunity to become soil detectives today and learn the secret recipe for soil. Discuss what they already know about soil, and record answers on the board.

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

Directions

1. Invite students to come up and pull the soil ingredients out of a bag. Once they have retrieved an ingredient, ask them to hold it up and show the class. Ask if they know what the ingredient is. If the student is unsure, ask the class. Once the class has identified the ingredient, put it on the board under the heading “soil recipe.”
2. 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.
3. Explain that today students will examine soil samples taken from outside the visitor center. They will describe the soil and decide if it is primarily made of sand, silt, or clay.
4. Predict the characteristics of the soils outside. Demonstrate how to complete the data sheet characteristics including color, moisture, organic



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matter, and the ribbon test (the ribbon test will be done last). Provide each pair with a soil sample. Remind students that they are being scientists, so they should examine their soil carefully. Demonstrate proper use.

5. Students will touch soil samples and record their observations on the data sheet using words and sketches.
6. 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.
7. 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.
8. Students return their soil sample and wash their hands.

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



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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). Clay particles actually hold 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.

- Sand
 - Feels gritty, nearly impossible to form a ball
- Silt
 - Feely floury, possible to form a ball but still difficult
- Clay
 - Feels sticky, makes the strongest ball

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



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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 supports the preservation of Iowa topsoil.



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Board Set-up Example

would do differently
15. Dismiss each student to wash their hands.
Board Set-up
Prairie Soil Explorers

What is soil?
- Dirty stuff under feet

Know	Wonder	Learned
- dark - plants need - etc.		

Soil Recipe

Silt - Like garden dirt

Sand - At the beach

Clay - Can be molded

Journal

Soil		NSNWR 10/2/19
Color	water	
Type	Type Temp.	

My soil was _____,
_____, and _____.

I think it was _____

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Resources

Journal Example

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

