# 

# Soil Characterization Lesson Plan: Elementary

**OVERVIEW**

This lesson plan on soil has been developed for elementary students to use on the BeSt plots. The students will become familiar with soil as well as what lives in soil. This can be used to help collect soil and do soil characterization.

**OBJECTIVES**

# At the end of this lesson students will be able to:

# Identify that soil is composed of different types of earth materials

# Identify different organisms that live in soil

# Know the needs of living organisms in soil

# Learn that soil on the BEST plots is different in the different school districts

**LENGTH OF LESSON**

# Soil characterization will take 30 minutes.

**GRADE LEVELS**

# This lesson is appropriate for elementary students.

**STANDARDS COVERED**

**E.SE.03.13** Recognize and describe different types of Earth materials (mineral, rock, clay, boulder, gravel, sand, soil, water, and air).

**E.SE.03.14** Recognize that rocks are made up of minerals.

**BACKGROUND**

What is soil? Soil is made up of a combination of various sized particles. Soil is made of broken down rocks and rotting plants. Soil is important for the growth of plants and many organisms live in soil. Emphasize that good soil for planting is usually a combination of sand, silt, and clay. This soil is called loam.

**MATERIALS**

See soil characterization protocol

**ACTIVITIES OF THE SESSION**

BEST Plot Introduction and Soil Characterization:

Introductions: Meet and greet your students. Let them know that these plots are going to be used for science experiments and that we have these throughout the district. Through studying the plants, animals and soil, we will learn how best to “grow our fuel and our butterflies, too”. Take your time- do not rush through these steps.

Total time= 30 minutes.

1. **Random Sampling Procedure**

Explain the procedure and why the sampling has to be random. Have students hold the rope. Have 2 students throw the dice. Take the time to explain how to use the dice and to identify the spot to take a soil core sample. Have a student step inside the plot to point out the spot. Take the soil core sample. If the soil will be used for soil moisture, nitrogen and pH, then it cannot be handled. It must be put in a ziplock and not touched with hands. Soil for soil characterization can be collected outside of the plot.

1. **Soil Characterization**

Simplified protocol (please read the full protocol for a more complete explanation) and use the soil texture by feel flow chart

1. Take soil (about the size of a small egg) and spray with a mist bottle. It should be moist but not muddy. Form a ball and go to step 2. If it does not form a ball, it is **sand.**
2. Place the ball of soil between your thumb and index finger and gently squeeze it into a ribbon.
   1. If the ribbon is longer than 2.5 cm- look at the flow chart
   2. If the ribbon breaks before 2.5 cm- look at the flow chart

|  |  |  |
| --- | --- | --- |
| Particle Size | Characteristics | Pros/Cons |
| Sand | Gritty | Drains well/Does not hold nutrients and water well. |
| Silt | Smooth and slippery |  |
| Clay | Sticky | Does not drain well. Holds nutrients and water well. Soil is easily compacted, which prevents roots from having enough oxygen. |

Also, have the students look at the different parts of the soil.

Have your students fill in the soil characterization data sheet.

1. Does the soil feel moist or dry?
2. Does the soil appear to have a structure (small pieces, large chunks, columns or platy?)
3. What color are the chunks in the soil or the soil in general?
4. Are the hunks of soil easy to break with your fingers or hard to break with your fingers? This is called soil consistence.
5. Texture (use the soil characterization protocol as above).
6. Can they see rocks?
7. Does the soil bubble if water with vinegar is added? Calcium carbonate (limestone) reacts with acid and produces carbon dioxide. This is why the soil will bubble. Soil from the plots may be from building spoils or the calcium carbonate is deeper in the soil. It may be difficult to measure this in the BEST plots.

**Final Instructions:**

- Explain to students that the dirt has to be returned to the plot.

-Use butter knife to remove soil from corer. Place sample in pie tin or other temporary container.

-Hand soil out to a couple of students. Look for animals ☺

- Show students how to add water to make a ball. Show them how to make a ribbon. Discuss what the ribbon length indicates about the soil composition using the soil characterization protocol. Try to describe what is in the soil.

**RESOURCES**

<http://gardenline.usask.ca/misc/soil.html> (This is a simple explanation of the role of different soil texture types).

<http://soils.usda.gov/education/> (The educational website developed by the Natural Resource Conservation Service)

**EXTENSIONS & MODIFICATIONS**

Many organisms spend their lives in soil. Students can identify one soil organism and research more about its life cycle.

Water MSP-water infiltrometer lab. Students can use the soil infiltrometers (lesson plan included) to learn how water moves through the soil in the plots. The soil infiltrometer lab can also be conducted along with the landscape protocols.

**Soil characterization field worksheet**

Switchgrass = S Fertilized = F Harvested = H

Prairie = PUnfertilized = UnFUnharvested = UnH

Names:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

School District:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Instructor/Fellow:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Time:\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Weather:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

School / Location Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Block Code: \_\_\_\_\_\_\_ Plot Treatment Description (Ex: S F UnH): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many different types of plants and animals can you find near where you are taking a soil sample?

Plants: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Animals: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# You will collect soil and look at the contents of the soil using the soil protocol

# Look at the soil from the plots. List what you find in the box below.

# Can you see any tiny bits of soil or rocks? What color are they?

# Draw them here:

# Can you see any bits of sticks, plants and roots?

# Draw them here:

# How many kinds of animals make their homes in the soil? Answer below.

# Draw your picture of one animal and its home below. Also include what you think it eats.

# 

# *Soil Characterization: Middle School*

**OVERVIEW**

This lesson is meant to familiarize students with soil.

**OBJECTIVES**

At the end of this lesson students will be able to:

# Identify that soil is composed of different types of earth materials

# Identify that soil is a mixture of rocks and minerals

# Identify that different organisms live in soil

# Learn that soil on the BeSt plots is different in the different school districts

# Identify how the soil at the BeSt plots came to be

**LENGTH OF LESSON**

# Soil collection and characterization from the plots will take one 40 minute class period

**GRADE LEVELS**

# This lesson has been developed for the middle school level but earth science students will benefit the most. Some activities below can be modified for elementary students.

**STANDARDS COVERED**

E.SE.06.11 Explain how physical and chemical weathering lead to erosion and the formation of soils and sediments

E.SE.06.12. Explain how waves, wind, water and glacier movement, shape and reshape the land surface of the Earth by eroding rock in some areas and depositing sediment in other areas.

E.SE.06.13 Describe how soil is a mixture made up of weather eroded rock and decomposed organic material.

E.SE06.14 Describe different soil samples based on particle size and texture.

**MATERIALS**

See the soil characterization protocol.

**BACKGROUND**

Soil is a mixture of many things, including weathered rocks and minerals, roots of plants, fungi, bacteria, insects, and dead creatures. Just as important, the spaces between the particles allow air and water to move through the soil. This means that soil is a complicated mix of different size particles and types of materials.

The soil on the BEST plots has been formed by many processes. Soil is made through the breakdown of rocks and living things. Rocks are broken down by wind and rain and even plants! It can take thousands of years to break down completely. Living things are being broken down into smaller and smaller pieces as they decompose. Soil can be carried by wind and rivers to new places. The soil in Michigan is special because it is transported from Canada by the glaciers. When the glaciers came, they scraped all the soil down to the bedrock. The soil that we have is the dust and stones that the glaciers dropped when the glaciers melted. However, the soil around your school yard could be from sod brought from somewhere else or even from debris from when your school was built. When you collect your soil, carefully look at it because you can learn about its history.

**RESOURCES**

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**EXTENSIONS & MODIFICATIONS**

# Write a story about your school’s soil!

# Soils of Michigan

1. Activity: sedimentation for soil texture

**ACTIVITIES OF THE SESSION**

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Block Code: \_\_\_\_\_\_\_ Plot Treatment Description (Ex: S F UnH): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Go to **Block** \_\_\_\_\_\_\_\_\_\_\_\_ and  **Plot** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Mark your plot below with an X:

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How many different types of plants and animals can you find near where you are taking a soil sample?

Plants: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Animals: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# You will collect soil and look at the contents of the soil using the soil protocol

# Look at the soil from the plots. List what you find in the box below.

# Can you see any peds (hunks of soil)? How many kinds and what color are they?

# Can you see any tiny bits of rocks? Take these with you to the classroom. Can you identify any minerals in the rocks?

# Can you see any bits of sticks, plants and roots? Explain where you think they came from?