

# Soil Stories

**Essential Guiding Question: What is soil—what can we learn about soils that tells us about it's past, health, and uses?**

In this lesson, students will learn about soil texture through observation and a ball / ribbon test of differing soil types, collected ahead of time by the teacher from various locations. Some potential collection sites include wetlands, streams, farm fields, forest, etc. Students will then learn about certain field observations and soil testing on a hike. This will tell a bit more about nuances in soil health, textures, and types. The stops and testing you complete on this hike depend on the area and what specific topics you'd like to cover.

To conclude, briefly explain the Dust Bowl era to describe a time when soil health played a major role in American History, economics, and law. This also offers the opportunity to explain the origin of Conservation Districts. Close with a discussion on this era and soil's importance in our everyday lives

**Estimated time: 1.5—2 hours      Ages: 12-18**

## Materials:

- Four or five soil samples, numbered with Index cards in pans. Allow these to dry slightly over two or three days.
- Water bottles, and cups and stirrers if necessary
- Soil Triangles, soil ID flowchart
- Shovel, penetrometer, Kelway soil pH tester, Soil probe, wetland soil and plant ID sheets

## Learning Objectives

- 1) *Students will explore soil texture and evaluate each sample to identify overall composition*
- 2) *Students will be challenged to evaluate areas of land for their texture and general soil type*
- 3) *Students will understand historical events leading to the creation of Conservation Districts and the beginning of the environmentalist movement in America*

## Set Up:

- 1) Place your soil samples in the center of tables, in wider, open pans, so multiple students can inspect it at once.
- 2) Place clipboards with pens and question sheets near each pan.
- 3) Label each pan with a numbered index card. Be sure students fill out their question sheets beginning with the appropriate soil pan they are seated at. Make Note of the number you give each sample,
- 4) Place water bottles and spoons aside until students are ready for ball and ribbon test.
- 5) Your other instruments for field testing can be pre-planted at specific sites or carried by students on the hike.

## Activity 1—Soil Observations (30-40 minutes)



### Opening question: What is soil made of?

Briefly explain soil is a mixture of air, water, and particles; particles are referred to as silt, clay, and sand; soil texture is one test that helps us learn about soil of an area.

Break students into teams of 2-4, and allow up to five minutes at each soil sample. Students will rotate through all four soil samples. Observations will be recorded on the "Soil Observations" sheet.

When students are finished, ask each team about one of their hypothesized soil origins. Ask them to explain why they came to this conclusion.

Let students know the correct answers to their soil origin hypotheses and explain a bit about each soil site type.

# Soil Observations

TEAM NAME(S): \_\_\_\_\_

## SOIL PAN #1

What colors do you see?

What visible organic matter (plant material, rocks, bugs) do you see?

What does this soil feel like to you? (KEEP SOIL IN THE DISH! Pretty please?)

Where do you think this soil came from?

## SOIL PAN #2

What colors do you see?

What visible organic matter (plant material, rocks, bugs) do you see?

What does this soil feel like to you? (KEEP SOIL IN THE DISH! Pretty please?)

Where do you think this soil came from?

## SOIL PAN #3

What colors do you see?

What visible organic matter (plant material, rocks, bugs) do you see?

What does this soil feel like to you? (KEEP SOIL IN THE DISH! Pretty please?)

Where do you think this soil came from?

## SOIL PAN #4

What colors do you see?

What visible organic matter (plant material, rocks, bugs) do you see?

What does this soil feel like to you? (KEEP SOIL IN THE DISH! Pretty please?)

Where do you think this soil came from?

## YOUR TEAM'S FINAL SOIL BAG #:

Using the flow chart on your clipboard, which general soil type do you have?:

Try using the soil triangle to guess which percentages of silt, clay, and sand make up your soil type. Write one possible combination of percentages here:

Given this information, where do you think your soil came from? : \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

# Ball and Ribbon Test

**Start:** Place soil in palm of hand. Add water drop-wise and knead the soil into a smooth and plastic consistency, like moist putty.

**Does the soil remain in a ball when squeezed?**

Yes

No

Add more water

Add dry soil

Yes

Yes

Is the soil too dry?

No

Is the soil too wet?

No

**Sand**

Place ball of soil between thumb and forefinger, gently pushing the soil between with the thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow ribbon to emerge and extend over the forefinger, breaking from its own weight.

**Does the soil form a ribbon?**

Yes

No

**Loamy Sand**



**What kind of ribbon does it form?**

Moisten a pinch of soil in palm and rub with forefinger

Does it feel very gritty?

Yes

Does it feel equally gritty and smooth?

Yes

Does it feel very smooth?

Yes

Forms a weak ribbon less than 1" before breaking

**LOAM**

**Sandy Loam**

**Loam**

**Silt Loam**

Forms a ribbon 1-2" before breaking

**CLAY LOAM**

**Sandy Clay Loam**

**Clay Loam**

**Silty Clay Loam**

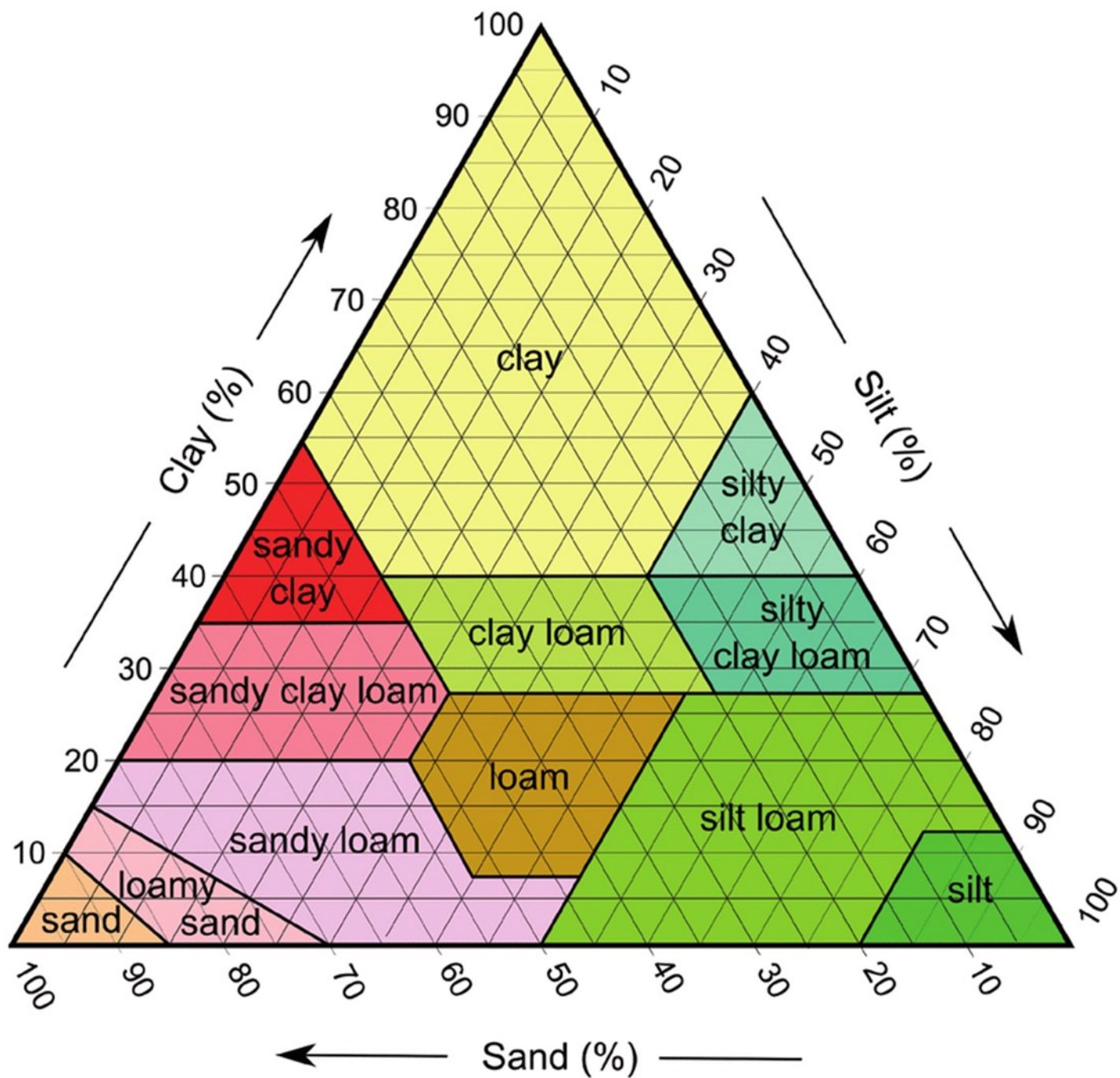
Forms a ribbon 2" or longer before breaking

**CLAY**

**Sandy Clay**

**Clay**

**Silty Clay**





## Activity 2—Ball and Ribbon Test (10-15 minutes)

Each group from Activity #1 will receive a bag of soil (one of the four samples you brought) or will take soil from the last pan they examined from Activity #1. \*\*\*OR\*\*\* if you choose to hand out bags, do not number them, and challenge students to match up their sample with one of the samples from Activity #1.

Instruct students to add water slowly to a palm-full of soil. They will knead the water in until they can mold the soil into a damp ball. Travel from table to table to ensure they do not over-water the soil. When all groups are ready, demonstrate how to make a soil ribbon. Explain that sand is hard to work with, loamy soils are somewhat easier, and clay soils are the easiest to mold and make a strong ribbon with. Reiterate soil particle types, and why the particles' characteristics play a role into the findings of the ball and ribbon test.

Ask the students to use their flow chart as they go through this exercise, to discover which soil type they have.

If there is extra time, explain how to use the soil triangle and ask students to deduce a potential mixture of clay, silt, and sand % that their soil samples could have. This and the soil type will be recorded on the "Soil Observations" sheet.

## Activity 3—Soils Hike (1 hour)

After washing up, students will learn other field testing that can be done when assessing soil types / health. If necessary, visit your site prior to your lesson to plan for the appropriate tools and pit stops on your hike. At each planned stopping point, demonstrate how to use your tool, and use the findings to explain one facet of soil type / health. Students can take a try with equipment as well, where time allows. Some examples of appropriate interpretive stops include:

- 1) Wetland area—dig or probe for gleyed or rusted soil. Tell students about what has happened to the saturated soil, and briefly explain the ecological and environmental importance of wetland areas. Land use and appropriate management can be discussed here as well. Vegetation can be identified as an additional challenge for students.
- 2) Trail—use a penetrometer on a compacted trail, take a reading, and use again off-trail. Compare readings and explain the effect compaction has on soil health. Mention ways compaction can occur, and explain how various agriculture operations especially benefit from BMP's to prevent compaction.
- 3) Gun Range—pH reading where lead or clay fall-out is evident.
- 4) Field—prepare a soil test kit. Explain how landowners and farmers alike can benefit from assessing their soil, and applying certain amendments.

## Conclusion (10-15 minutes)

The conclusion of any lesson is crucial to an educator's success. This short time facilitates synthesis of the ideas you worked to convey in the last hour or more. Refer to the [Teaching Toolkit Assessment Guide](#) for ideas on how to prose your conclusion!

For the Soils lesson, you might be interested in concluding with a brief history lesson—mention the Dust Bowl era and the Great Depression. This time conveys a hard lesson learned by many struggling farmers, and brings to light many facets of politics and economics of the time. A simple way to introduce the history is showing a picture of a dust storm, and the iconic photograph, "The Migrant Mother." From this, build a discussion on why maintaining is important. Key points you can make include:

- 1 cm of soil = 200-400 years to form, often up to 2,000 to become especially fertile, depending on location on Earth
- Tropical climates undergo a more rapid soil formation, however even in these areas, soil is a non-renewable resource
- Conservation Districts and Soil Conservation Services were born from the Dust Bowl Era, Potter County being the first in PA
- Through drought, overuse, over-plowing, and wind, the Dust Bowl Era left 35 million acres of prairie useless and lifeless

Here, complete the lesson with a technique from the [Assessment Guide](#).