

TITLE: Soil Sleuths

OBJECTIVES:

- To understand that soil is a farm's most important resource
- To be able to identify the main components of soil, and understand the derivation and the function of each
- To understand how soil structure effect drainage and water retention
- To observe erosion and loss of topsoil and to experiment with ways to prevent it

Takeaways:

- Soil is precious and easy to lose
- Soil is made up of minerals and organic mater and takes 100's of years to make
- Sustainable farming methods work to preserve and build soil
- Healthy soil=healthy plants=healthy people

TIME REQUIRED: 1 hour

PREPARATION: Several weeks before the workshop, seed 10 flats with winter rye. These will be used to demonstrate how cover crops reduce erosion and compaction and promote infiltration of moisture into the soil. Flats of onion starts work well too.

Several days before the workshop, collect soil samples from the urban lots and different places. When collecting soil samples, try to collect soil from 0-8 inches down. Fill clear quart jars with soil two thirds full and top off with water. Label the source of the soil on the top of the jar. Tighten lid and shake. Allow the soil to settle out over the next few days; distinct layers should be visible.

MATERIALS:

- Soil Makeup Brainstorm: pile of soil with decomposed organic matter, visible leaves and twigs, and lots of invertebrates in it.
- Soil Shake Up: jars of settled soil from our urban and rural farms (see above).
- Soil Snakes: some examples of soils high in sand, silt and clay
- Drainage: 40 (LB)/20 (NS) coffee filters; 5 Mason jars or large, clear plastic cups; rubber bands, kaolin (Surround) or other powdered clay; sand; soil from TFP farms
- Erosion: six trays of potting soil/crew, 1 seeded flat/crew with established seedlings (see above), hose with shower head, 5 empty flats for collecting runoff, gravel, leaves, straw, Popsicle sticks, twigs, seedlings
- Compaction: 1 flat of seeded rye/crew; 2 flats of dry soil/crew; watering can; empty five-gallon buckets.

DIRECTIONS:

Activity 1: Soil Makeup Brainstorm – What is in Soil? (10 minutes)

- Investigate a large pile of soil
- Brainstorm a list of ingredients – write them in the appropriate column on a sheet with the headings “mineral” and “living”
- Describe how the things that they identified become “soil” through the processes of weathering (water, wind, freezing, thawing) and breakdown by soil organisms. The other important ingredient in the process is time. It takes 100-200 years to make an inch of topsoil in this climate.

Activity 2: Soil Shake Up – Identify Main Components of Soil (10 minutes)

- Here are two ways to determine the components of soil. One way is by making a soil-water suspension and letting the components settle out.
- Use the jars that you have previously filled with water and soil. Remind participants not to shake the jars when they are observing them.
- Observe and identify components that are layered in jars. Gravel will be at the bottom covered by sand, silt, clay and organic matter. This is the same type of settling that happens in rivers and streams as water movement slows down. (The heaviest things settle out first).
- Which components do our soils have the most of? If you have collected soil samples from different locales, are they different? Why? Is there a difference between the soils on different parts of the farm?
- Try the snake test if time allows. This is the second way to identify the components of soil. Mix a little water with some clay and some sand. Pinch off a small amount and try to roll a snake out of each between your hands. Soils high in clay will form a good snake. Sandy soils will crumble. Silty soils will form a short snake before falling apart.
- Now ask participants to try making a snake with some of the sample soil. What happens? Is the soil sandy, silty or high in clay?

Activity 3: Drainage – How Do Soil Components Affect Plants? (15 minutes)

- Ask participants: How do plants get the water they need to live? What happens if our crops don't get enough water? What if they get too much?
- The components of the soil determine in large part how much water will be available to the plants.
- Set up two-quart jars with coffee filters seated in the jar mouths. Fill one filter with sand and one with clay.

- Have participants predict which will drain the fastest and which the slowest when we add water. Why?
- Ask two participants to pour equal amounts of water into both filters at the same time. Observe which drains the fastest. (Saying “drip” each time there is a drip can help dramatize this.) Draw a diagram illustrating the relative amounts of air space in sand (think beach balls or whole kernels of corn) and clay (think dimes or cornmeal), and show what happens to a drop of water falling on each.
- Discuss the properties of each component (sand – good for aeration and drainage, has poor moisture retention; silt – holds moisture; clay – heavy, poor drainage and aeration).
- Which farm soil might be the best for growing crops? Which would need to be watered most, which has a drainage problem?
- Have workers hypothesize how a farmer might change the texture (the relative proportion of sand, silt and clay) of soil.
- In small groups have participants measure and mix sand and clay together in different proportions and observe how the drainage changes. Which type of soil is easier to “improve”?
- Brainstorm- how does the type of soil we have effect how we farm? (Need to water, how early we can plant in the spring, where certain crops get planted).

Activity 4: Erosion – How Do Plants Affect Soils? (15 minutes)

- Fill a flat full of soil. This represents a field in the fall after the crops have been harvested and the field plowed. Also have a flat that has been seeded and has plants growing on it. This represents a field with crops growing on it. Put a block under one end of each of the two trays to raise it up and a collecting basin under the lower end to catch runoff.
- Have the participants predict what will happen when it rains. Simulate rain by pouring water from a watering can or a hose held one foot above the tray. Let it rain for 1 minute.
- Observe the soil and the runoff from the two trays. Test the soil in the trays at various depths to see how wet it is. What are the differences between the two results? What are the implications of these results to plant health and long term viability of the farm?
- Soil erosion is a major problem throughout the world - 3 billion tons of topsoil is lost each year. Topsoil is the part of the soil that is responsible for soil fertility.

Optional: Divide participants into pairs. Give each a new tray, and tell them that they must devise a technique to stop soil runoff and erosion. Give them an assortment of materials to use (mulch, twigs, Popsicle sticks, compost, pebbles, grass, leaves, seedlings). Allow them 4-5 minutes to devise a plan. Now test

them with rain. Discuss which technique works best and why. How can they erosion prevention techniques be applied to the farm?

Activity 5: Compaction – Why Is It Important To Watch Where You Step In The Garden? (10 minutes)

- Set up 2 dry flats full of soil and 1 of rye grass.
- Water one of the dry soil flats and leave the other unwatered.
- Ask three participants to stomp on the three flats. Have participants predict how this will affect how water moves through the soil.
- Repeat the erosion demonstration and see how compacting the soil changes water infiltration.
- Questions: how does compacting the soil change the drainage? Why? Why was the rye less susceptible to compaction? Why was the wet soil more susceptible? What would happen if we tried to start seeds on the compacted soil flats? How do we avoid compaction on the farm?

DISCUSSION: What will happen if we don't take care of our soil? Show pictures of the dust bowl and discuss.