

Soil Science: Get the “Dirt” on Soil



Objectives: 1.) Students will be able to:

- a. Define soil and its components
- b. Describe the process of erosion and deposition
- c. Understand the two types of nutrients (Micro and Macro)
- d. Describe methods of soil conservation

Georgia Standards:

S5E1b Students will be able to identify and find examples of surface features caused by destructive processes.

S5P1ab Students will verify that an object is the sum of its parts.

Supplies:

- Samples of the three different soil particles (Clay, Sand, Silt (*you can use flour if you don't have silt. It has the same texture*))
- For optional activity, students will need access to computer with internet.

Vocabulary:

Erosion: process of being gradually worn away

Micronutrient: a chemical element or substance required in trace amounts for the normal growth and development of living organisms.

Macronutrient: a chemical element (e.g., Nitrogen, Phosphorous, Potassium) required in large amounts for plant growth and development.

Soil Horizon: A soil horizon is a layer generally parallel to the soil crust or top, whose physical characteristics differ from the layers above and beneath. There are usually three to four soil horizons.

Organic Matter or Humus: dead and decomposing natural material. Usually made up of mostly dead plant parts, living parts of plants - mostly roots and living microbes and soil animals.

Horizon A: The TOPSOIL layer – This layer is made up of mineral matter mixed with some humus. This is the most nutrient rich part of the soil.

Horizon B: The SUBSOIL layer – This is the middle layer of soil. There are some minerals and nutrients that are carried down or leached through the soil from the rain water.

Horizon C: The BEDROCK layer – This is the bottom layer of the soil. This is mostly made up of hard compacted soil and weathered material and rocks. This is also called the “parent material”.

Soil Conservation: Protecting our soil from erosion and damage using various methods including planting cover crops and windbreaks, creating riparian buffers, watching where we step and contour farming.

Introduction:

Title Slide: Begin by asking students; How many of you have ever planted a plant? What did you plant it in? (Fish for the answers: soil, dirt, ground, rocks, etc.) Tell them today we will discuss soil.

Slide 2: Where in the world does soil come from? Does soil just appear? Is it made in a factory? Explain- "Soil actually comes from broken up pieces of rock and dead leaves, tree limbs, and dead bugs."

Slide 3: Soil contains three different soil particles. A particle is one individual piece of the soil. There are three different particles that make up soil. "The amount of each type of particle determines what type of soil you have." The three different soil particles are:

Sand is the largest particle in the soil. It has sharp edges and feels rough when you rub it. Sand doesn't contain many nutrients.

Silt is a soil particle whose size is between sand and clay. Silt feels smooth and powdery. When wet it feels smooth but not sticky.

Clay is the smallest of particles. Clay is smooth when dry and sticky when wet. It is heavy, holds a lot of nutrients, but doesn't let air and water through it very well.

Slide 4: Ask your students "How big do you think each particle is? Let's compare!"

"One grain of **sand** would be the size of a basketball"

"One particle of **silt** would be the size of a baseball"

"One particle of **clay** would be the size of a golf ball"

Slide 5: Tell your students "When all or some of these particles come together they create soil. Soil can have many different types of textures. Textures means the way the soil feels when touched. Soil scientists use a special tool called a soil texture triangle to determine soil texture. "

Slide 6: Tell your students "Once you've determined the soil texture you can then give it a name! There are many soil texture names, they are:

- Heavy
- Light
- Sandy
- Clay
- Loam
- Poor or good

Slide 7: Ask your students: "Do you think you can change soil texture?" The answer is YES! "You can add different materials to change the texture and nutritive value of the soil. Explain: "changing the soil texture can help provide the right conditions needed for plant growth. (different plants need different soil textures and nutrients))

Slide 8: Ask your students: "What are some items you could add to change the soil texture? What about the nutritive value of soil? (Examples: you could add compost, peat moss, rocks, sand, perlite, vermiculite, soil moist etc.)

Slide 9: Tell your students: “Particle size affects drainage and Nutrients.” Look at the particle diameter chart. Ask your students: What particle do you think would hold the most water? Sand? Silt? Clay?

Slide 10: Explain: Different types of soil hold water and nutrients differently. There is actually more room in between the clay particles than the sand particles. (*Refer back to the soil particle diameter chart*) This is because there are more clay particles squished together than the sand particles which means clay has more “pore” space to hold water. Some soils hold water better than others. Think about the soil where you live? Does it hold water well?

Slide 11: Explain: Just like soil holds water it also holds nutrients! There are three main nutrients plants need to grow. These nutrients are needed in BIG quantities. They are Called MACRO Nutrients. They are: Nitrogen (N), Phosphorus (P), and Potassium (K). There are also nutrients that are needed in SMALL quantities. These are called MICRO Nutrients. The Micro Nutrients that plants need to grow are: Calcium, Magnesium, Sulfur, Iron, Manganese, Zinc, Copper, Molybdenum, Chlorine.

Slide 12: All of these nutrients are held in the soil dissolved in the water in between each soil particle. The roots of the plant absorb this water and use the nutrients to grow.

Slide 13: What does our soil grow? In Georgia, we grow many different crops. These five are the most grown in GA. Blueberries, Peaches, Vidalia Onions, Pecans, and Peanuts. All of these crops are mostly grown in the southern part of the state where the soil has more sand and is well drained. (Optional: You could show some of the GFVGA commodity videos included on your USB to showcase some of the fruits and vegetables grown in GA.)

Slide 14: Ask your students: Is all soil the same age? Answer: NOPE! Explain: Soil is made slowly over time. In fact, it takes 1000+ years to make 1 inch of topsoil! There are 4 different layers that make up soil. They are:

- The ORGANIC MATTER layer (dead and decomposing natural material. Usually made up of mostly dead plant parts, living parts of plants - mostly roots and living microbes and soil animals.)
- A – The TOPSOIL layer (This layer is made up of mineral matter mixed with some humus. This is the most nutrient rich part of the soil.)
- B - The SUBSOIL layer (This is the middle layer of soil. There are some minerals and nutrients that are carried down or leached through the soil from the rain water. This layer is hard for plants to get through)
- C – The PARENT MATERIAL layer (This is the bottom layer of the soil. This is mostly made up of hard compacted soil and weathered material and rocks. This is also called the “parent material”.)

Slide 15: Let’s do the Topsoil Dance! Have your kids get up and stretch. Explain to them that when they hear the word **topsoil** they will waive their arms up high. When they hear the word **subsoil** they will waive their arms in the middle like they are jiving. When they hear the word **bedrock** they will squat down and shake it out. Be prepared! Most kids are too embarrassed to do this so get in there and do it with them! *Find the Topsoil Dance Song Here:* <https://www.youtube.com/watch?v=J6l2dMdAx5M>

Slide 16: Explain: Soil does not form very fast. That means we have to do all we can to protect it! Practicing this is called Soil Conservation. Some of the ways we can protect our soil are:

- **Cover crops/pine straw** (Planting a crop to anchor down the soil until we are ready to plant something else. A lot of farms plant hay or grass as cover crops.)
- **Windbreaks** (This is basically a wall of trees that blocks the wind from blowing across the soil and eroding it away.)
- **Riparian buffer** (A row of trees or bushes planted on the side of a body of water to prevent the soil from being eroded away.)
- **Refrain from trampling soil** (Use the sidewalks or designated paths! Ask your students: How many particles of soil have you taken (in other words eroded) with you on the bottom of your shoes?)
- **Contour farming** (Instead of farmers planting their crops in straight rows they plant it with the contour or curve of the land. This practice prevents the water from flowing straight down and taking all of their soil with it. Instead the water flows against the plants which slows it down and allows the water to soak into the ground instead of washing the soil away.)

Ask your students: What are some ways you can stop soil from eroding away at home?

Answers could be: Plant grass, use sidewalks instead of walking on bare ground, Improve drainage, etc.

Explain: Soil is a very fragile resource on earth. We have to take care of it to ensure it will always be there. If we didn't have soil we could not grow the food that we eat or buildings that we use every day. (You could use the "The apple as Planet Earth" Video by Dr. Dirt to give students a visual of how little soil there is left on earth and why we need to protect it with conservation practices (*See link below for video/activity*))

Slide 17: Optional Activity: What can you grow in your soil?

Review with your students the types of soil that were discussed. Have students split up into small groups and research either online or in the library what kind of plants or crops they could grow in the soil they have where they live. They could also research their favorite fruit or vegetable and determine what type of soil and growing conditions that crop requires. Let them tell you a little bit about the crop they chose.

Other Helpful Resources and Activities:

Soil Science society of America – Teacher Resources: <http://www.soils4teachers.org/lessons-and-activities#General5>