Activity: It All Begins With Soil

Grades 4-8

Overview

This lesson is intended for upper elementary, and middle school students. There is an additional lesson for younger students titled ***Soil Sort***. Students examine soil to identify its components and ways that its structure affects plant growth.

Background

Most of the foods that we eat are grown in soil across the planet. These soils differ a great deal due to the rocks that eroded to create it, the temperature and temperature changes that occurred as it developed, rainfall and humidity present as it developed, and other factors. The type of soil today is determined by the composition of sand, silt, clay, and organic matter. Soil types affect the soil structure, ability to hold nutrients, water, air, structural support for plant roots, habitat suitability for animal and microbial life, and more. This activity is an introductory exploration for students. Soil science is very complicated. It is actually a science and there are careers in this field.

Groundwork

Objective: To speculate about soil and its components and obtain soil from the garden site.

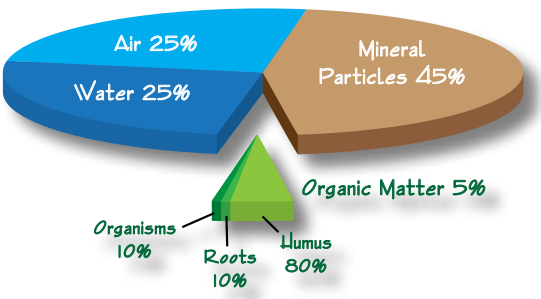
1. Ask the students what soil is. Answers will vary. Most commonly they will say that soil is dirt.
2. Explain that dirt is an unwanted item where soil is not. Soil is very important. Soil becomes dirt when it is where you do not want it but dirt and soil are not interchangeable words, although they are often used as such. Ask them if they would like to eat plants grown in the dirt that is cleaned up from sweeping the floor or vacuuming. No, but much of that dirt can be recycled back into soil that can grow plants.
3. Have students take soil samples from the garden.

Exploration

Objectives: To recognize that there are many components found in soil that determine soil type. To recognize there are different soil types and determine soil type found in the school garden site.

Soil Components

1. Have the students take a sample of soil from the garden. Weigh and use a sample that is approximately a ½ cup. Save the balance of the sample collected.
2. Ask them to identify what the components are that they can find in the soil. Make a list. (Minerals, insects, worms, leaves, etc.)
3. Ask them to separate out the different components that are large enough to see with the naked eye into separate piles.
4. Next have the students examine the remaining soil under the hand lens or microscope and separate additional components. Add these to the appropriate piles.
5. Once they are all separated, have students weigh each component and record the weight on the list.
6. Have students calculate the percentage of each component and graph the components in a pie graph.
7. Discuss their findings and explain that different soils will contain different components. Have them speculate what this may influence.



Pie Graph of Soil Composition

Time:

Groundwork: 30 minutes
Exploration: 50 minutes
Making connections: Ongoing

Materials:

- **Soil from different locations – several cups per site**
- **Scales**
- **Artificial potting mix**
- **Potting soil**
- **Hand lenses and/or microscopes**
- **Paper**
- **Tweezers or other utensils to separate components**
- **Quart jars with lids**
- **Water**
- **Rulers**
- **Writing utensils**
- **Copies of the *Soil Type Triangle***

Standards At-A-Glance

Next Generation Sunshine Standards Met:

SC.2.E.6.3, MA.2.G.5.4, SC.3.N.1.6, SC.3.N.1.7, SC.3.P.8.2, SC.3.P.8.3, LA.3.6.1.1, LA 4.6.1.1, LA.4.4.2.2, MA.4.A.2.4, SC.3.N.1.3, SC.4.E.6.3, SC.4.E.6.6, SC.4.L.17.2, SC.4.P.8.1, SC.5.P.8.3, LA.5.4.2.2, MA.5.A.2.1, MA.5.A.2.2, MA.5.G.5.2, MA.5.G.5.3, LA.6.4.2.2, MA.6.A.1.3, MA.6.A.5.2, SC.7.L.17.1, LA.7.4.2.2, LA.8.4.2.2, MA.7.A.1.2, SC.8.P.8.4, MA.8.A.1.1, MA.8.A.1.3, MA.8.A.6.4, MA.912.A.1.4, MA.912.A.2.2

Standard Reinforced or Skill Utilized

SC.K.N.1.2, SC.K.N.1.3, SC.K.P.8.1, MA.K.G.2.1, MA.1.G.5.2, SC.1.E.5.3, SC.1.E.6.1, SC.1.L.14.1, SC.1.L.14.3, SC.1.N.1.2, SC.1.N.1.3, SC.1.P.8.1, SC.2.E.6.2, SC.3.L.14.1, LA.K.1.6.1, LA.1.1.6.1, LA.2.1.6.5, LA.2.4.2.2

Credits

Pie Graph of Soil Composition

Introduction to Soils, Physical Geography

http://www.physicalgeography.net/fundamentals/10t.html

Accessed July 25, 2010

Soil Type

1. Have the students return the components to their soil sample less any rocks, pebbles or live insects and worms. Return any living animals to the garden. Place two cups in the quart jar, fill the quart jar with water, and shake up the sample. Then place the jars in a location where they will not be jostled, to allow the soil to settle. This may happen quickly or take several days to settle completely. The water will be clear when the total sample has settled.
2. Explain that the layer closest to the bottom is the sand, the next layer is silt, and the top layer is clay. Above that will be any organic matter including dead insects and leaves that may be floating on the water surface.
3. Using a ruler, have the students measure the total of the three lowest layers and record the total number of inches. Then have the students measure and record each of the layers.
4. Have students calculate the percentage of the soil sample that is sand, silt and clay. Graph this information in a pie graph. Explain that these three components are used to determine the type of soil.
5. Have the students determine their soil type using the Soil Type Triangle (page 25).

Enrichment

1. Have the students bring in soil samples from home and repeat the process to determine their soil type at home.
2. Have students visit this website to learn more about these topics: *http://whyfiles.org/199_soil/*
3. Download this presentation to enhance this lesson: *http://soils.usda.gov/use/worldsoils/gsr/*. Recommended are the sections "Soil Under the Microscope," "Global Maps" and "Soil Quality Concepts."

Extensions for Middle and High School

1. Have students access *http://soils.usda.gov/use/thematic/* and *http://soils.usda.gov/use/worldsoils/gsr/* to examine soil issues in the United States and globally. Have them use this information to develop an opinion piece about the importance of soil to future world food production.
2. Download some soil type maps from sites such as these to examine the influence on soil development, geology, (*http://rst.gsfc.nasa.gov/Sect6/Sect6_1.html*), a variety of soil maps and conditions (*http://soils.usda.gov/use/worldsoils/mapindex/index.html*) and a comparison of soil types in Russia (*http://www.agroatlas.ru/en/content/soil_maps/Soil_types/*).
3. Have students access the Detailed Soil Survey Atlas and examine soil productivity for Florida at *http://www.ngdc.wvu.edu/soil_survey_atlas/subpage_3* and write an essay on Florida soils, their strengths and weaknesses.

Additional Materials:

1. The Natural Resources Conservation Service (NRCS) has information, educational materials and activities, as well as experts available for classroom use and/or presentations. Find it listed under United States Department of Agriculture or USDA in the phone book.
2. Use the lessons "Perc Through the Pores," "Soil's Not Trivial," "From Apple Cores to Healthy Soil," "In Harmony," and "Till We or Won't We" from *Project Food, Land & People's Resources for Learning* to conduct a full unit on soils. They can be obtained by attending a workshop.
3. The *Keeping Florida Green* curriculum developed by Florida Agriculture in the Classroom, has lessons about plant nutrients that can be used in concert with the garden. In particular, the lesson "Phosphate, the Nutrient from Florida" should be used in conjunction with this lesson. It can be obtained by attending a workshop.

Soil Type Triangle

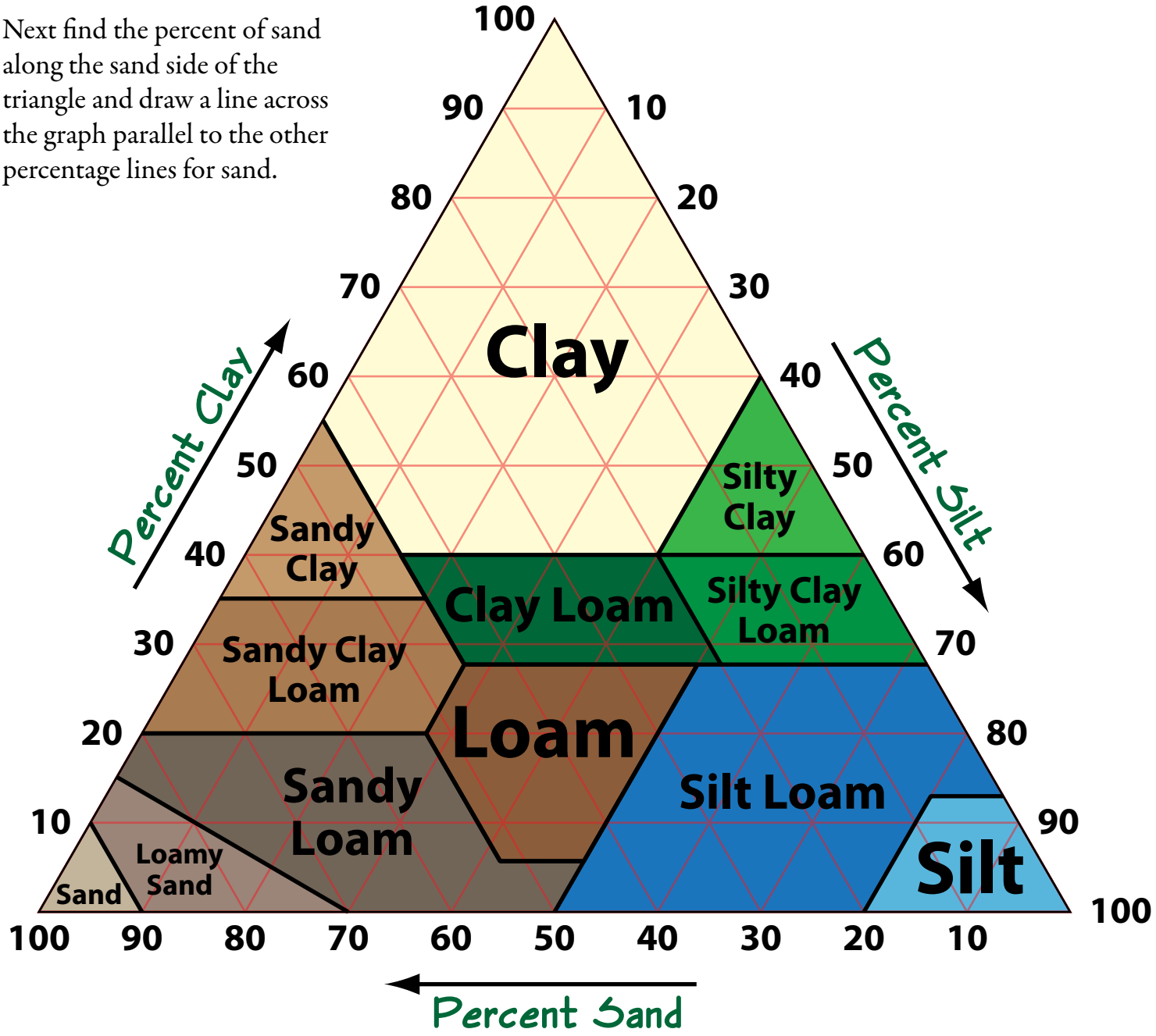
1. First find the percentage of clay in the soil sample along the clay side of the graph triangle. Using a ruler, draw a line across the graph parallel to the other percentage lines for clay.

2. Next find the percent of sand along the sand side of the triangle and draw a line across the graph parallel to the other percentage lines for sand.

3. Third, find the percentage of silt along the silt side of the triangle and draw a third line parallel to the percentage lines of silt.

4. The intersection of these three lines on the graph will fall within a soil type.

5. Have the students indicate the type of soil they have.



It All Begins With Soil

Sample Pre-Post Assessment

1. Soil is made of:

2. The process for creating soil begins with :
    a. The weathering of rocks
    b. The ocean
    c. Sandy beaches
    d. Microorganisms

3. Soils differ around the world because:

4. List the mineral components of soil in order of largest to smallest:

5. Soil is alive. True False