COMPARE SOILS BY GROWING PLANTS

GRADE LEVEL: 6-8

SUBJECT: Science

NATIONAL STANDARD(S):
(6-8) SC: 7.1, 7.2, 7.5, 14.1-5, 15.2-6

THEME: Soil

FOOD AND FIBER TOPIC: III-A,B,C,E

LEARNER OBJECTIVES

The student will identify the difference in the rate of plant growth in three soils that vary in organic matter.

VOCABULARY

***actinomycete*—**An order of microbes common to soil; are common bacteria but resemble fungi in having mycelium. Important decomposers and sources of medical antibiotics.

***algae*—**Simple chlorophyll-containing plants. Single-celled algae add organic matter to soil by photosynthesis.

***alkali*—**A term denoting salts of sodium, calcium, potassium, and magnesium which hinder plant growth.

***fungi*—**Important soil organisms, especially as decomposers. Considered to be either primitive plants or as one of five kingdoms of living creatures.

***leached*—**The removal of nutrients from soil and other materials by percolating water.

***nematode*—**Small unsegmented worm; many are considered parasitic on plant roots.

***nutrients*—**An element or compound in a soil which is essential for the growth of a plant.

***organic matter*—**Matter found in, or produced by, living animals and plants, which contains carbon, hydrogen, oxygen, and often nitrogen and sulfur.

***subsoil*—**The part of the soil profile which lies below the usual plowing depth; the first change in depth and texture of the soil.

BACKGROUND

There are five major factors usually considered in the formation of soils; climate, parent rock, living organisms, topography and time. All five factors influence the plant productivity of the soils.

The original source of most soils is rock—the solid, unweathered material of the earth's crust. Solid rock breaks into smaller particles, which are the parent materials of soil. These parent materials are carried and deposited by wind, water, ice, or gravity.

Every acre of soil is home to two or more tons of living things (microflora, insects, worms, and animals). It has been suggested that as little as one-fourth of a teaspoon of fertile soil is home to: 50 nematodes, 62,000 algae, 72,000 amoebae, 111,000 fungi, 2,920,000 actinomycetes, 25,280,000 bacteria.

Organic matter is a versatile and beneficial component in soils. It is that portion of the soil that includes animal and plant remains at various stages of decay. In forests, it comes from fallen leaves, dead tree trunks and branches, and tree roots. In prairies, much of the organic matter comes from grass roots and tops. In farmland, crop residues add to the organic matter. In general, soils that are above average in organic matter are more productive than soils low in organic matter.

Organic matter improves soil in many ways. It increases its water-holding capacity; it serves as a reservoir for plant nutrients such as nitrogen, and it provides food for the countless bacteria and other living things in the soil. Some of these organisms produce acids that in turn help break down soil minerals. This explains why plants usually grow better in topsoil than in subsoil.

STEP-BY-STEP INSTRUCTIONS

1. Obtain three to four flowerpots, different types of soil, a record chart, three to five beans for each pot, and water. Hand out Activity sheet A.
2. Remind students that plants take mineral nutrients from the soil. The minerals found in the soil depend mainly on what was in the rock the soil came from.
3. Fill the flowerpots with soil from the following locations; topsoil from a pasture that has never been plowed, soil that has eroded from a hillside, and subsoil from a depth of three to four feet. If you live in an urban area, take samples from a flowerbed, an excavation from a building, and from an eroded road bank.
4. Plant several beans in each pot. Soak the beans overnight to hasten germination.
5. Keep pots well watered and place them in a sunny location.
6. Compare the rate of growth using the activity sheet.

RELATED ACTIVITIES

1. Obtain two clear plastic cups. In one cup place several inches of topsoil and plant a seed. In the other cup, put a small amount of soil and plant a seed. Observe growth differences in both. Note the differences in the amount of soil and the amount of room for roots to grow.
2. Place a few earthworms into a tall pickle jar full of soil. Watch the soil as it goes back and forth, fertilizing and bringing air into the soil. Ask students to write a short story or poem about the activities of an earthworm.
3. Teach students about composting. Have students bring to class some cut grass, vegetable or fruit peelings, a half pint milk container of soil and a plastic pail. Select three students to be in charge of the compost project a day before the starting the project. Ask each student to bring a small baggie of vegetable or fruit peelings or cut grass. The three students in charge will tape the name of each student on the baggies as they are brought in the morning. The three students in charge will empty each baggie into a plastic pail as they identify the contents. After every ten baggies, sprinkle a little soil. When all materials are in the compost pail, ask students to predict what will happen to the peelings and grass (decomposing), and what it is turning into (soil for growing). Also note to students that soil is formed only by nature.

RESOURCES

Student Books

McLaughlin, M. (1990). Earthworms, Dirt & Rotten Leaves. Atheneum.

Scott, M. (1996). Young Oxford Book of Ecology. London: Oxford University Press.

Van Cleave, J. (1996). Janice Van Cleave's Ecology for Every Kid. Wiley.

Teacher Resources

Riverside-Corona Resource Conservation District, 2023 Chicago Ave., B-14, Riverside, CA 92507-2305 (eight-page activity packet with hands-on soil projects. Minimal charge to teachers outside the district).

Soil Conservation Service, USDA PO Box 2890, Washington, DC 20013.

Related Internet Websites

Natural Resource Conservation Education. Website designed to help people of all ages understand and appreciate natural resources and learn how to conserve them. *http://www.fs.fed.us/outdoors/nrce/welcome.htm*

Science Mini Lessons. *http://yn.la.ca.us/cec/cecsci/sci-elem.html*

Science and Math Consortium for Northwest Schools. This site is for anyone interested in K-12 education in science and mathematics. *http://www.col-ed.org/ak/*

Environmental Education website: Mission is to spread information and ideas that will help educators explore the environment and investigate current issues with students. *http://www.nceet.snre.umich.edu/*

Bureau of Land Management Environmental Education: *http://www.blm.gov/education/education.html*

EVALUATION

Were students able to note the growth differences of seeds in the various soils and record it by drawing what they observe?

ACKNOWLEDGMENT

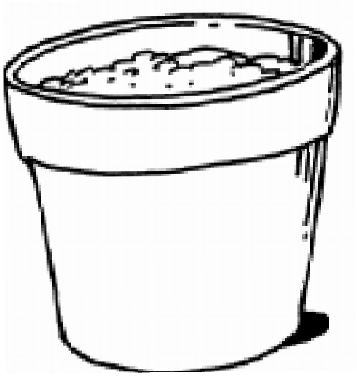
This lesson adapted from Minnesota Ag in the Classroom, Minnesota Department of Agriculture, 90 West Plato Blvd., St. Paul, MN 55107 and Soil Science and Management (1996) 3rd Edition. DelMar Publishers.

Name_____ Activity Sheet

Compare Soils By Growing Plants

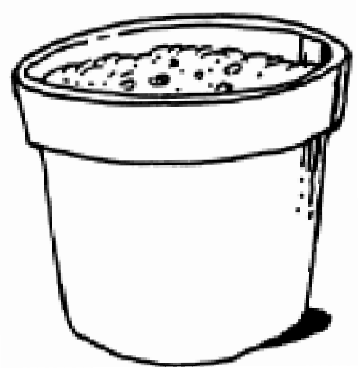
Learner Objective:
Students will be able to identify the difference in the rate of plant growth in three soils that vary in organic matter content.

Draw the growth you see in each flowerpot.



Topsoil

Eroded Soil



Subsoil