



# Dig In!

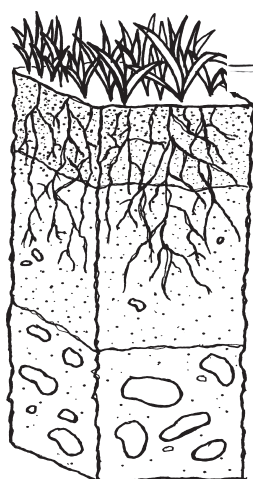
Hands-On Soil Investigations

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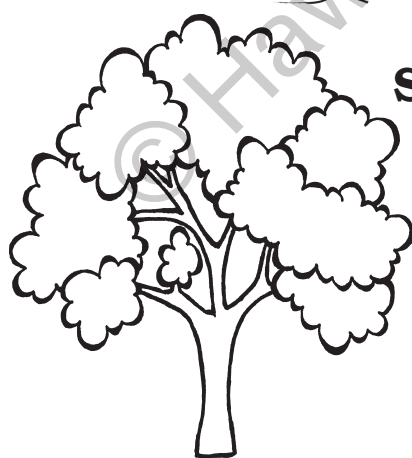
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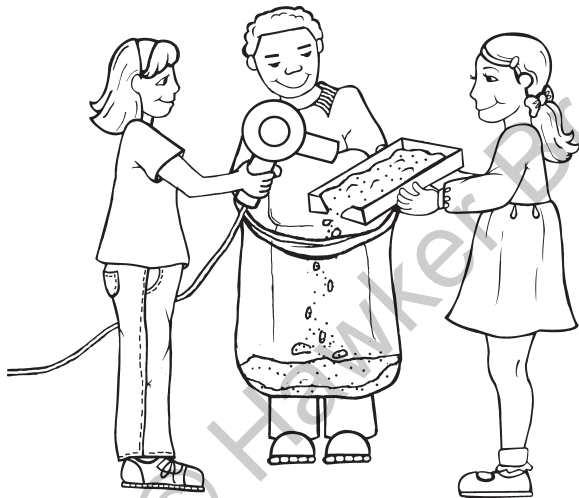
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# Preface

**N**ature offers many moods: the serenity of running water, the seasonal colour change of leaves, the violence of a howling blizzard, the movement of animals in flight, the pastoral beauty of a landscape, the kaleidoscope of colours in a desert sunset. But as we enjoy the natural world, we don't often think of one very important part: the soil. Soil is the substance in which most of our food is grown or raised. Soil is also the mud that squishes under our shoes after a rainstorm, and the grit that grazes our faces as the wind whips across a dry landscape. Soil provides space for our buildings and communities, but also is the substance that muddies our rivers when we don't properly care for the land.

Soil results from a complex series of geological, human and biological forces. It is a tangible and traceable

record of these forces. This record is illustrated by the colour, feel, odour and even the taste differences of the world's thousands of soils.

The Natural Resources Conservation Service (NRCS) has collaborated with the National Science Teachers Association (NSTA) on *Dig In! Hands-On Soil Investigations* for primary science teachers and supervisors. The activities in *Dig In!*, designed for students in F-4, introduce soil's mysteries in an enjoyable and educational way.

As you use these activities, you and your students will gain a greater appreciation for the value of soil. Such an understanding is critical if today's students are to become informed decision-makers and conservers of our natural resources.



# SECTION 1



# What Is Soil?

## Overview

Soil is the solid material on Earth's surface that results from the interaction of weather and biological activities with the underlying geologic formation. Soil is produced from broken down rocks, organic matter (decayed animal and plant life), water and air. Soil generally loosens from its parent material at a rate of one centimetre every 250 to 2500 years.

Thousands of soil types are found across the world. All soil types are made of varying amounts of three main components – silt, sand and clay – and can therefore be classified as silty, sandy or clayey soils. Many different colours can be present in soil, and depend on the minerals found in the parent material and on the chemical and biological reactions within the soil.





# Soil Searching

## Lesson Description

Students collect and handle samples of clayey, silty and sandy soil.

## Subjects

The Arts, English, Science

## Teacher Background

This lesson encourages students to think about the differences in *soil*. Soil is a naturally occurring mixture of *organic matter*, water, air and minerals that forms on the surface of the land.

At first, most young learners make no distinction between soil and *dirt*. However, the differences should become clear with more careful thought. Dirt is soil that is out of place in the human world; for example, dust on the floor or mud on your shoes is often called dirt. Soil is the useful substance in which our food grows; the outermost solid surface of Earth that supports our cities, houses and highways; and the medium that contains the minerals for plant and animal life. This thin layer of material may mean the difference between poverty and prosperity – even life and death – for all who inhabit the planet, since soil is the medium in which most of our food is grown.

There are three main components of soil: *clay*, *silt* and *sand*. Clay is the smallest particle, with less than a 0.002-millimetre diameter. Silt particles are between 0.002 and 0.005 millimetres in diameter, and sand is the largest particle, ranging from 0.05 to 2.0 millimetres. Each soil has a characteristic *texture* that

## Time

**Prep:** 30 minutes

**Activities:** 1 ¾ hours  
(not including Extensions)



Topic: soil  
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- 4 Clean up by emptying the two jars into the bucket, than dispose of the wastewater outside rather than in the sink or rubbish bin.

### Exploration: 30 minutes

**Prep** Cover a demonstration table with newspaper. Spread a dollop of glue on each of the three index cards. Sprinkle one type of soil on the glue on each of the cards and use a marker to label samples “silty soil”, “sandy soil” and “clayey soil”. Allow index cards to dry.

Prepare student work areas by covering tables with newspaper. Each work area should have dry paper towels, damp paper towels, a magnifier, a spoon and three labelled cups each filled halfway with the different soils.

- 1 Distribute hand magnifiers. Demonstrate how to use the magnifiers and allow students to examine clothing, newsprint or their fingers for a few minutes.
- 2 Have students put on their smocks or shirts, then dump the silty soil onto a dry paper towel and examine the soil with magnifiers.
- 3 Ask students what they see in the soil and list the discoveries on the board. Help younger students distinguish pieces of rocks, plant material and twigs. By touching the soil, students may discover that their soil samples contain moisture.
- 4 Discuss the texture of the silty soil. Ask students to suggest words that describe how the soil feels on their fingers.

### Materials Cont'd.

#### For Each Student Group

- Clayey, silty, and sandy soils
- Three clear plastic cups
- Spoon
- Small plastic hand magnifier (approximately 5x magnification)
- Paper towels
- Resealable plastic sandwich bag
- Smocks or old shirts



## SECTION II



# Who Uses Soil?

## Overview

The study of geography suggests relationships among elements of the natural world. Moving water, weather, erosion and gravity re-sculpt the land. Over the years, glaciers, volcanoes, fires, hurricanes and earthquakes have also reshaped the Earth's surface, moving materials from one place to another. Two natural forces are continuously at work on the landscape – the forces of destruction and the forces of construction. In locations of destruction, the material that is lost through natural events must go somewhere else and landforms are constructed. The landscape is continually developing.

When humans work the land, for agriculture, home building and road construction, we change the landscape to fit our purposes. Land use involves manipulating the landscape and its components – the soil, rocks and vegetation. Humans change the land but differently than how nature changes the land.



## LESSON 4



# Lofty, Level and Lumpy

## Lesson Description

Students learn about habitats and the characteristic animals and plants of those habitats.

## Teacher Background

A *habitat* is an area inhabited by animals and plants. Different habitats include: *deserts*, *forests*, *mountains*, *prairies* and *wetlands*. Each habitat supports a unique community of plants and animals, and has characteristic *landforms* and soil types.

Desert habitats are dry, hot and have sparse vegetation. Desert animals include lizards, snakes, small birds, small mammals and other animals adapted to dry, hot climates. Cacti and small wildflowers are typically found in deserts. Second, forests receive a medium amount of precipitation and are more temperate than deserts. A forest habitat is generally covered with dense vegetation, including trees, shrubs and woody plants, that shade the land from the Sun. Many small and large mammals, birds, reptiles, amphibians and insects can be found in the forest. The third habitat, mountains, are high-elevation areas often with rocky soil and steep slopes. Typical mountain dwellers include a variety of birds, small mammals, reptiles

## Subjects

The Arts, Geography, English, Science, Humanities and Social Sciences

## Time

**Prep:** 30 minutes

**Activities:** 1 ¾ hours  
(not including Extensions)



Topic: habitats  
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## Student Objectives

Students will be able to

- give examples of humans' use of the land
- demonstrate an awareness of the trade-offs involved in land use
- illustrate how a planning commission might develop a town.

## Materials

For the Class

- Apple
- Small knife
- Vegetable peeler
- Stapler
- Chart or poster paper
- Paper towels or toilet tissue

For Each Student Group

- Several paper bags of different sizes
- Several crayons or markers
- Coloured construction paper
- Tape
- Newspaper or used white paper

## Learning Cycle

### Perception: 30 minutes

- 1 Ask students to think about where their food comes from. Is their food grown nearby or far away from their home? (Answer: most food is probably grown or raised in other parts of the country, transported and then purchased at local grocery stores.)
- 2 If applicable, ask students to brainstorm foods grown locally.
- 3 Demonstrate the limited amount of land available for growing food with the model in Figure 5.1. Discuss what will happen to Earth if we lose such a precious resource as land. Relate the idea of land use to students' lives.
- 4 What is soil used for besides growing food crops? If applicable, discuss students' yards and gardens – do the gardens take up more space than the homes?
- 5 Brainstorm other uses of soil or land and list ideas on the board or poster paper. Examples of land use are:
  - surfaces for homes, schools, hospitals, businesses and airports
  - surfaces for roads and highways
  - surfaces for mining coal, ore, gravel and minerals
  - surfaces for parks, recreation and wildlife
  - land for growing food and fibre crops
  - land for raising animals for food
- 6 Explain to students that sometimes there isn't enough land for all uses and people must decide what is most important. Describe town planning commissions – people who decide how to use the land.