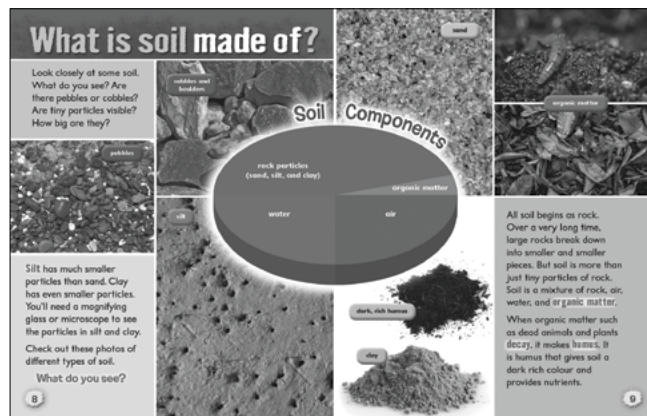


What Is Soil Made of?



Focus: Students will examine the composition of soil by looking at magnifications and using special tools.

Specific Curriculum Outcomes

Students will be expected to:

- 5.0 investigate and describe soil components [GCO 1/3]
- 6.0 use appropriate tools [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- create a bulletin board display, a digital presentation, or a foldable about the composition of soil
- explain their choice of tool for exploring soil, and evaluate its appropriateness

NOTES:

Attitude Outcome Statements

Encourage students to:

- work with others in exploring and investigating [GCO 4]
- show concern for their safety and that of others in carrying out activities and using materials [GCO 4]

Cross-Curricular Connections

Art

Students will be expected to:

- investigate the elements of design (colour, shape, line, texture, space, value, and form) in the visual environment [1.3.1]

English Language Arts

Students will be expected to:

- explore, extend, clarify, and reflect on their thoughts, ideas, feelings, and experience [GCO 1]
- use writing and other forms of representation to explore, clarify, and reflect on their thoughts, feelings, experiences, and learnings; and to use their imaginations [GCO 8]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Student Magazine, pages 8–9 • BLM <i>Sense Chart</i> • BLM <i>Foldable Template</i> Literacy Place: • <i>Dr. Bufflehead Explores Dirt</i> (Guided Reading, Level L)	• egg carton soil samples or the bagged soil samples from <i>How Are Soils Different?</i> (pages 11–19) • students' Science Folders • paper plates or clean Styrofoam trays • magnifying glasses • small paintbrushes • straws • small sponges • students' Science Journals • tweezers • graduated cylinders • spray bottles • measuring cups • strainers • very fine mesh screens, window screen, or colanders • funnels • jars • sifters or sieves • trowels • several wide-mouth containers • supply of earth from a garden (not potting soil)	• Have graphic organizers such as the following available for students who may want to use them: web, describing wheel, or a four-column sense chart. • Tape plastic tablecloths or large garbage bags to student work areas before examining soil samples.	• decay • humus • living • non-living • organic matter

Continued on next page...

Getting Organized *(continued)*

Components	Materials	Before You Begin	Vocabulary
	• elastic bands or duct tape • plastic water bottle (1 per group) • samples of soil • handmade funnel made of paper • pencil and coloured pencils • Lego pieces (assorted colours) • variety of craft materials (e.g., string, twine, buttons, glitter, markers, white glue, tape, construction paper, clean pebbles, card stock, or bristol board) • container (e.g., a glass jar, a tumbler, a fishbowl, or a small terrarium) • spruce or fir needles, leaves, twigs, and/or compost • digital camera (optional)		

Safety

- Remind students not to taste anything in the science classroom.
- Have students wash their hands with soap and water after handling soil.

Science Background

- The texture of soil can vary. It can be dry, crumbly, moist, mucky, sticky, fine, grainy, or coarse.
- Sand is granular in texture. It is made up of small particles—or pieces—of rocks and minerals.
- Clay usually contains more water than other soil types. Its minerals are very fine-grained. It has a silky texture.
- Silt is granular and comes from powdered rock or rock dust.
- Soil is made up of solids, liquids, and gases. The solid portion of soil contains pieces of different minerals and organic or living matter, which are called particles. The particles can vary in size, texture, and composition. The liquid part of soil is water, while the gas portion is air found in spaces or pores in between the particles.
- Pores in soil are important for holding water for the growth of healthy plants. Pores also make room for animals, plants, and micro-organisms.

Possible Misconceptions

- Students at this age may think that soil can only be found in certain areas, such as gardens and on farms. In truth, soil is found everywhere from construction sites, abandoned lots, and cracks in the sidewalk to roadsides, beaches, and mountain tops.

- Grade 3 students often believe all soil is brown. Soil lies in layers and these layers often have different colours. As well as brown, soil can be red, yellow, orange, or black. Wetland areas such as marshes or fens can have blue, purple, or greenish soils due to the different minerals found there.
- Students may think soil is sterile or germ-free. This is not true. Soil contains a huge number of micro-organisms.
- Many students consider soil to be a solid. In fact, soil is composed largely of empty spaces for air, water, plants, animals, and micro-organisms.

ACTIVATE

Imagination Vacation

Have students sit comfortably and close their eyes if they wish. With a soft voice, explain they are going to take a trip around the province using their imagination. They will visit different places and experience the sight, smell, texture, and feel of many different soils. Begin in a familiar local environment, such as a nearby conservation area or a provincial park. Describe a hiking path up a steep hill. Ask:

- **What does the soil feel like beneath your shoes or hiking boots?**
- **Are there small objects that slide under your feet as you climb the hill?**
- **Is there dust in the air that you are kicking up as you walk?**
- **Is the air heavy with moisture, and the trail slick with mud?**
- **What else do you observe?**

Guide students down the other side of the hill toward a rocky beach. Have them imagine the feel of the loose stones under their shoes. Suggest some students may want to remove their shoes and feel the size of the stones and pebbles under their bare feet. Kneeling down, they can pick up some stones. Ask:

- **Are the stones sharp or smooth?**
- **Are all the pebbles the same size?**
- **What else do you notice?**

Have students approach the water's edge and scoop their hands down into the water. Prompt them to investigate the soil by asking:

- **What do you feel at the bottom of the lake?**
- **How do the pebbles and small particles of crushed rock feel?**
- **Are the particles hard-packed in place, or do they move easily and loosely?**

Next, describe that they are travelling to their favourite sandy beach. Have students imagine they are crouching down on the sand and feeling its texture.

Continue this type of guided imagery throughout the unit, taking students' imaginations to a variety of places, including a farmer's field, an urban flower bed, a marsh or fen, a clay riverbank, and underground to a cave or a mineshaft. You may choose to show short videos of various locations to spark discussion.



Up Close With Soil

Direct students to pages 8–9 of the Student Magazine. Allow students time to examine the spread closely and look at the magnifications. Read the title question aloud to the class: *What is soil made of?* Invite students to read the text and share what they know about rocks, cobbles, pebbles, sand, clay, and so on. Define the terms “organic matter,” “decay,” “humus,” “living,” and “non-living” and add them to the Word Wall.

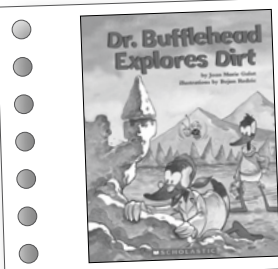
Have students view the close-up photos depicting the different types of soil. The photos show examples of boulders, pebbles, cobbles, silt, sand, clay, humus, and organic matter. Ask:

- In what ways do these soil samples look different?
- How could you describe them?
- What size are the particles in each type of soil? Small? Medium? Large?
- What colours do you observe?

Discuss the pie chart of soil components. Prompts for discussion might include:

- What is the greatest component of soil?
- What is the least?
- Do you think the amounts are always the same?

Explain to students that this chart shows an average breakdown of components. Different soils will vary somewhat in the amounts of each component.



Literacy Place Connection:

Dr. Bufflehead Explores Dirt (Guided Reading, Level L) explores the characteristics of different types of soils. Read the text aloud but pause before reading page 16 and ask students to describe the components of good garden soil and which characteristics make these components most suitable.

CONNECT

Sense Chart			
See	Touch	Smell	Taste

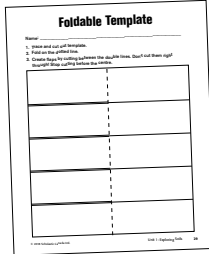


Look, Touch, Smell!

Using either the egg carton soil samples or the bagged soil samples from *How Are Soils Different?* (pages 11–19), have students work in pairs to describe five soil samples. Students can create charts with three or four columns or use a graphic organizer (e.g., web, describing wheel, or a four-column sense chart). Provide copies of BLM *Sense Chart*, if desired. Completed BLMs and other graphic organizers can be stored in the students’ Science Folders.

Archaeologists

Provide students with paper plates or clean Styrofoam trays. Spoon a small sample of soil onto each student’s plate or tray. Encourage students to



choose an appropriate tool from a wide variety of tools such as magnifying glasses, small paintbrushes, straws, and small sponges to examine their samples. Using the tool or tools, students can manipulate the particles in the soil and investigate its composition. Complete this activity by having students record their findings in their Science Journals. Have them explain their choice of tool (or tools) and evaluate how appropriate it was for the task.

Word Builder

Have students choose five adjectives to describe different kinds of soil. Provide copies of BLM *Foldable Template* and have students create a foldable with the descriptive words on the front and the definitions inside (under the flap) with a picture of the type of soil. This interactive, student-made organizer can be referred to throughout the unit and will help students remember these words.

What Are the Components?

Provide students with a wide selection of tools, such as magnifying glasses, tweezers, graduated cylinders, spray bottles, measuring cups, spades, strainers, very fine mesh screens, window screen, colanders, funnels, jars, and paintbrushes or have them choose appropriate tools from the Curiosity Centre. Have students choose a question to investigate as they examine a soil sample using some of the tools provided and analyze the different components. Students can create their own questions or you may provide more scaffolding by suggesting question-format sentence stems such as:

- **I wonder about ...**
- **How many ...**
- **What size ...**
- **How could I describe ...**

Alternatively, if some students require more guidance, you might suggest they use one of the questions from the Imagination Vacation activity in the Activate section of this teaching plan.

Encourage students to make jot notes and sketch their observations in their Science Journals. Then invite students to share key observations with the class. You may wish to create a web diagram to display students' observations and discoveries. Add any new questions to the I Wonder Wall.

Sort It, Sift It

Have students work in groups of two or three to divide soil from a garden (not commercial potting soil) into piles of differently sized pieces with the aid of a sifter, a trowel, and several wide-mouth containers. Tell students the aim is to display four different sizes of soil pieces: large, medium, small, and fine. For the largest pieces, students can dig into the hard-packed soil to break off some large chunks.

To separate out the other three sizes, a sifter or sieve can be used. You might provide several squares of standard window screening from a hardware store, at least one for each group of students. Provide some elastic bands



or duct tape for students to secure the screen over the top of a container. Using this handmade sieve, students can sift a sample of soil to separate out and capture the finer particles. They will need to shake the container gently to encourage the small particles to pass through the mesh of the window screening material. The chunks of soil that are left on top of the screen (too large to pass through) can be collected for the medium-sized soil pieces. Have students sift some more of the soil to collect the particles in the bottom of the container. Pour out this sifted soil—the small particles. Then, have students sift once more to separate out the finest particles of soil. Remind students to wash their hands with soap and water after handling soil.

To conclude, challenge students to come up with their own method for displaying the different-sized pieces of soil. They may wish to photograph the results and use them in an instructive bulletin board display, digital presentation, or foldable about soil.

Shake It Up

Have students work in groups of two or three to explore how soil particles settle. Each group will need a plastic water bottle, a sample of soil, and a handmade funnel made of paper. Have students pour soil into the funnel on top of a bottle that is already half-full of water. Have students shake up the bottle for 30 seconds, and then let its contents settle. At this point there will be distinctive layers of different types of soil visible in the bottle. The heavy particles—composed of rocks, pebbles, and coarse sand—sit at the bottom. Above is finer sand and then silt. Next is water with particles of clay. Bits of decaying plants and animals (organic matter) float at the surface. Remind students to wash their hands with soap and water after handling soil.

To communicate their understanding, have students use pencils and coloured pencils to make a diagram in their Science Journals showing the layers in the bottle. Remind them to label the layers and include a title.



Lego Layers

Provide Lego pieces in assorted colours. If possible, provide pieces in green, dark brown, light brown, beige, white, and grey to resemble the colours of layers that appear naturally in soil. Have students create a 3-D model in the shape of a cube showing layers in soil with the coloured Lego pieces. After, ask students to explain their model or provide a legend with colours corresponding to the Lego pieces in the model (e.g., grey = pebbles; white = sand).

CONSOLIDATE

Get Arty

Have a variety of craft materials available such as string, twine, buttons, glitter, markers, white glue, tape, construction paper, and clean pebbles. On small sheets of card stock or bristol board, have students create an artistic picture of soil. Encourage them to add labels describing the various parts in their soil, such as “larger particles like pebbles,” “small particles of sand,” and “bits of dead plants and animals.”

Soil Layers

Students can use the different sizes of soil collected and sifted from Sort It, Sift It (see the Connect section of this teaching plan) to create a model showing the layers in soil. They will need a glass jar, a tumbler, a fishbowl, or a small terrarium to use as a container. Have students add gravel to the bottom. Next, have them add the large chunks of soil, followed by the medium, small, and fine particles. Last, have students sprinkle some spruce or fir needles, dried leaves, twigs, and/or compost to the topmost layer. Again, after handling soil, remind students to wash their hands with soap and water.

Invite students to share their soil models and discuss what they found interesting—or challenging—about making them. This may be a good time to check in with students to see if their thinking about soil has changed through this investigation and others. If so, how?

EXPLORE MORE

Local Soil

Have students imagine that a family friend from the Prairies is coming to visit their family. Explain that this friend lives on a wheat farm and is interested in learning about soils. Students will need to describe the different types of soils this visitor is likely to find in some popular Newfoundland and Labrador tourist destinations, such as a favourite beach or a scenic hiking trail. Encourage students to use descriptive adjectives from the list created during *How Are Soils Different?* (pages 11–19). Students may wish to work in partners and set this up as a role-playing dialogue, which could be audio recorded or filmed. For students who require more scaffolding or guidance, provide sentence stems such as “If you travel to _____, you will find _____ soil” or “Most beaches have either _____ or _____ soil.”

Magnified Soil

Using print resources (books or Web-based materials), have students investigate soil that has been magnified 200 times. Point out clay particles and organic materials—living plants and animals, non-living or decaying plants and animals, nutrients—that may be evident. Have students discuss why there are pores between particles in the soil and what these pores might fill up with (e.g., air, water, insects, plant roots).

Sense Chart

Name: _____

See	Touch	Smell	Hear

Foldable Template

Name: _____

1. Trace and cut out template.
2. Fold on the dotted line.
3. Create flaps by cutting between the double lines. Don't cut them right through! Stop cutting before the centre.

