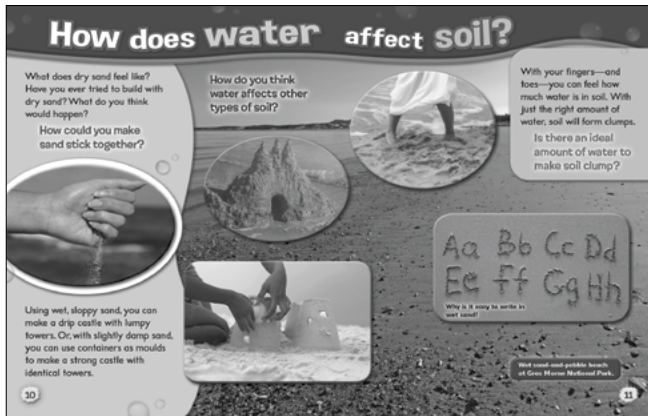


How Does Soil Change When It Gets Wet?



Focus: Students will explore through investigations how the properties of soil change when it is moistened. They will make observations, compare data, analyze the results, and discuss.

Specific Curriculum Outcomes

Students will be expected to:

- 7.0 describe the effect of moisture on the characteristics of soil [GCO 1/3]
- 8.0 sequence or group materials and objects [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- sequence given soil samples from wettest to driest by using appropriate senses

NOTES:

Attitude Outcome Statements

Encourage students to:

- be open-minded in their explorations and investigations [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- interact with sensitivity and respect, considering the situation, audience, and purpose [GCO 3]
- respond personally to a range of texts [GCO 6]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Student Magazine, pages 10–13 • <i>The Sandcastle Contest</i> (Read Aloud) • IWB Activity 2	• students' Science Journals • basin or small wading pool with sand • small and large yogurt containers • spray bottles • variety of different soil samples • basins of soil (1 for each group) • protective plastic sheeting • selection of cookie cutters • clay soil • variety of tools (e.g., sponges, eyedroppers, watering cans, measuring cups, paper towels, lamps, hair dryers) • funnels • jars or graduated cylinders • tissue paper • bowls • spoons or paint stir sticks	• Make arrangements to visit a classroom with a sandbox or an outdoor sand pit (optional). • Invite an Elder or Indigenous Knowledge Keeper to visit the class and share oral traditions such as stories, myths, and songs related to healthy soil.	• absorption • moisture • particles

Safety

- Remind students of the procedure of washing their hands with soap and water after handling soil.
- Have students wipe up any spills, especially with water, to prevent slip hazards.
- Ensure students exercise caution around any electric devices such as electric fans or hairdryers.

Science Background

- Adding water to soil can help it hold its shape. By adding water to sand, for example, people can form sand into structures (i.e., sandcastles) that will hold their shape.

- As moisture is added to the soil it will appear darker and become easier to clump, provided the soil components are small enough.
- Different compositions of soil hold water in different ways. For instance, water flows through sand quickly and sand doesn't retain water very well. In contrast, clay has a very high water-holding capacity. Silt has a good capacity for holding water. Soil mixtures with a high percentage of clay and silt will hold a high quantity of water. In this way, common soil mixtures such as sandy loam soils have low water-holding capacities, while clay loam soils have high water-holding capacities.

Possible Misconceptions

- Students may think that soil that contains organic matter, such as leaves, will repel, rather than absorb water. This is not true. Soil that contains a large amount of organic matter and humus will have a high water-holding capacity.

ACTIVATE

Read Aloud: *The Sandcastle Contest*



Summary

When Matthew enters the sandcastle contest at the beach, he builds something unbelievably amazing.

Before Reading

Show students the cover of the book and explain that you are going to read a book about a sandcastle contest. Ask:

- **Has anyone ever built a sandcastle before?**
- **If so, where did you build it?**
- **Did you use any tools to help you build it?** (shovel, pail)
- **What do you think the criteria might be for winning a sandcastle contest?**

If possible, have students examine some dry sand. Have them describe the sand's properties. Ask:

- **How does the sand feel? Is it wet or dry?**
- **Does it pack together or fall apart?**
- **Could you build a sandcastle with dry sand?**

During Reading

As you read the story to students, pause frequently to discuss the text and illustrations. Alternate by asking students to respond in a whole group or with a partner. Prompts for discussion could include:

- What do you think Matthew might build with his sandbox?
- What tools do people use to help them build with sand?
- How did Matthew's sand house fool the judges?
- Do you think it's possible to build all the items (including a dog) from sand?
- Why did kicking the sand house make it collapse? (the sand had probably begun to dry out and hitting it caused the dry grains of sand to fall apart)

After Reading

Discuss with students how they could make sand stick together. Ask:

- How does water affect sand?
- Does it make it easier or harder to build with? Why do you think that?
- Can you build with other types of soil? What can you build?
- Do all types of soil need to be wet in order to clump together?
- Why do you think that building sandcastles, and other items, is popular at the beach? (sand by the water is wet and it clumps together making it easy to build with)
- What would happen to a sandcastle over time? (unless it is washed away by water, it will dry out over time and collapse)



Sandy Beach

Have students read pages 10–11 of the Student Magazine. Read the title question aloud: *How does water affect soil?* Invite students to respond to this question, based on what they already know. Permit some class time for sharing stories about wet sand and mud.

Sandcastle Fun

If possible, have students visit a classroom with a sandbox or an outdoor sand pit. Alternatively, half fill a basin or small wading pool with sand and provide an area for students to build sandcastles. Using small and large yogurt containers, have students create their own sandcastle. Have a spray bottle available so students can dampen the sand to produce different effects. Ask:

- How did the dry sand feel?
- Did it feel different after it was wet?
- How does wetting the sand make it easier or harder to build with?



Invite students to share their recipes for the best combination of sand and water and compare them. Add the terms “moisture” and “absorption” to the Word Wall.

Feel It

Provide students with 2–4 different soil samples. Have students feel and describe the soils. Ask:

- What do the soils look like?



- **What do they smell like?**
- **How do they feel?**

Then have students add a small amount of water from a spray bottle to each soil sample and describe the soils. They will observe that sandy soil, when moistened, feels gritty. This is because the particles are spaced far apart from each other, leaving lots of space for water to flow freely. In contrast, clay soil, for example, feels sticky and clumps together. The particles in clay are small so they stick together easily.

Muddy Trail

Introduce pages 12–13 of the Student Magazine by reading the title question aloud: *What happens when soil is too wet?* Have students examine the photos and read the captions. Then have students share their own stories about walking or hiking in the rain or in mud. Ask:

- **What is the soil like?**
- **What do you need to protect in these conditions?** (clothing from mud stains; try not to slip and fall)

Contrast this with walking in dry conditions. Ask students what they need to protect when it's dry and dusty. (their eyes)

Mud Pies

In an outdoor area or using basins of soil in the classroom (1 basin per group) with protective plastic sheeting, have students make mud pies. Have them observe what happens to the shape of their pie as they add water to the soil. Remind students to wash their hands with soap and water after handling soil. Ask:

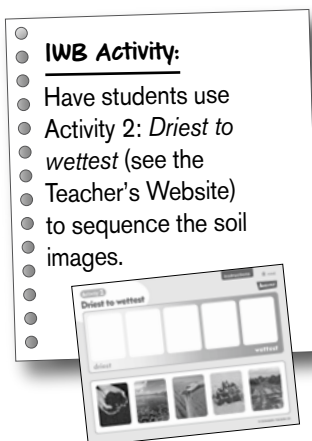
- **Does the soil that is really wet hold its shape?**
- **What do you observe happening to the edges of the mud pie?**
- **Where does the wet mud go?**
- **What do you observe in the runoff?** (water and bits of soil)

CONNECT

Cookie Cut-Outs

Supply students with an array of cookie cutters in different shapes. Have students manipulate a sample of clay-like soil, adding just enough water to make it workable. Next, have students pat the soil smooth, flattening it to about the thickness of their hands. Then cut out cookie shapes and put them on a tray. Ask:

- **How did the amount of moisture in the soil affect the “cookies”?**
- **Did they hold their shape?**
- **How could you change the soil to make it more firm?**



Quick-Dry Soil

In small groups, have students place a measured sample of soil into a funnel at the mouth of a jar or graduated cylinder. Students then pour a measured amount of water into the funnel and leave this set-up for a day to let the water collect in the jar or cylinder.

The next day, have students use tissue paper to test the moisture content of their soil sample by touching the tissue to the soil. Does the tissue paper dissolve? (very wet soil) Does the tissue paper stay dry? (dry soil) As a class, devise a descriptive (or numbered) scale to describe the soil, for example: wet (1), moist (2), slightly moist (3), dry (4), very dry (5). Have students create a chart for their sample and record the moisture rating each day for a week. After the initial watering, students should not add more water to the soil.

CONSOLIDATE

You Crack Me Up!

Have students roll out a slab of clay into a round, flat shape. (Or, you may use the cookie cutter shapes from the Cookie Cut-Outs activity.) They can carve their names into the top, if desired. Next, bake the clay in an oven or leave it to dry on a sunny windowsill, until it hardens. Let the clay cool. Have students analyze the baked clay. Ask:

- **How much moisture is in this clay?** (none)
- **What did heating the clay do to the moisture content?** (took it away)
- **What do you observe about the clay now that it has been baked?** (it feels dry and contains cracks)
- **Have you seen soil that looks like this? Where?** (dry, cracked mud at a construction site)

Wet and Dry Soil

Provide a variety of tools, such as sponges, eyedroppers, spray bottles, watering cans, measuring cups, paper towels, lamps, and hair dryers for students to moisten and dry soil samples. Invite students to explore and observe changes in appearance/colour, texture, and coherence (ability to clump) as the soils are moistened and dried. Ask:

- **What happens when water is added to different soil samples?**
- **Does their colour or texture change?**
- **Does the moist soil clump or stick together?**
- **Can you add too much water to soil?**
- **What happens to the soil samples when they dry?**

Have students sequence the soil samples according to one or more attributes such as lightest to darkest or least to most sticky.



Enough Is Enough!

Have small groups of students mix soil in a bowl with a spoon or a paint stir stick. After mixing, have them add a measure of water. Have them observe the difference in the soil and record their observations with notes in their Science Journals. Ask them to add another measure of water and stir again. Now what happens? Has anything changed? Encourage students to observe the clumping stage where soil binds together in small clumps or balls. Have them add another measure of water and continue doing this until the soil is quite watery.

Have students repeat this investigation with a soil high in humus. Again, have students record what they observe. Ask:

- **What is different?**

Have students collect the observations from their own investigations and those of other groups so they can work together to create a sequence of soil samples, based on the amount of water or moisture in each. Encourage students to think of a way to represent this sequence visually. Remind students to consider a variety of factors in sequencing the amount of moisture in the soil samples including colour (lightest to darkest), ability to clump (least to most sticky), and particle size (smallest to largest). Have students label their visual representations using science vocabulary, such as moisture, absorption, particles, sand, clay, loam, and silt.

Stories, Myths, and Songs

Indigenous peoples often have close relationships to the land and may have stories, myths, songs, and other oral traditions that speak to the impact and importance of soil. Invite an Elder or Indigenous Knowledge Keeper to share with the class any oral traditions relating to soil.

EXPLORE MORE

Too Much or Not Enough?

Discuss as a class the effects of too much water, or too much heat and a lack of water, on soil and the environment. Encourage students to share stories about soil and water from their own gardens, from family or friends, or from the news.