

2022 Poster Contest

“Healthy Soil – Healthy Life”

Sponsored by

Butler County Conservation District

2503 Enterprise, Suite B

El Dorado, Kansas 67042

316-320-3549

Eligibility:

The Poster Contest is open to students in learning levels kindergarten (K) through twelfth (12) grades in Butler County. First place posters will be entered in the state competition in each of the following level categories: K-1, 2-3, 4-6, 7-9 and 10-12. Entrants may participate in **only one district contest**. Posters that win at the state level are eligible for the national contest.

Poster Rules:

1. Posters shall be on suitable paper, 12"x18", and arranged for horizontal display only. Poster shall not be mounted on other background materials.
2. Posters may be computer generated, in pencil, pen and ink, paint, watercolor, crayon, cut paper, etc.
3. Wrap posters between cardboard for mailing (DO NOT ROLL OR FOLD).
4. Submit posters by Monday, October 4, 2021 to Butler County Conservation District. Call 316-320-3549 if you need someone to come pick them up from your school.

Theme:

The theme for the poster contest is **“Healthy Soil – Healthy Life”**
We want the theme included on the poster!

Background Information:

Did you Know?

- A quarter of the Earth’s species are found in soils! This includes critters like small mammals, worms, fungi, and bacteria. Scientists are still learning about and discovering organisms that live in soil!
- 95% of food production relies on soil!
- Healthy soils can help the environment! Soil that’s in good shape can prevent floods and mitigate drought because they store water.
- Soil has three main particles: silt, sand and clay. These particles can combine in different ways to form different types of soils.
- Kansas has a state soil! It is Harney silt loam.

Entries:

For identification, an entry form with information containing the participant’s name, age, learning level, home address and the conservation district must be pasted or taped to **the back of the poster in the lower left-hand corner. No identification is to be on the front of the poster.** Please use the entry form provided.

Exhibiting and Awards:

For the local contest, cash awards are given to first, second and third place winners for each participating school.

State and National Poster Contest: One first place poster from each grade level from the local contest will be judged with first place posters from other conservation districts across Kansas. Poster winners from the state contest shall be exhibited at the annual meeting of the Kansas Association of Conservation Districts in Wichita at which time the winners will be announced. Awards will be presented to the top eight winners in each division. Plaques will be given to first place winners. Second place winners will receive a medal and a certificate; third place winners will receive a medal and a certificate. Certificates will be presented to five honorable mention winners. Winning posters from the state contest will be entered into the national contest. Teacher and student will be notified if poster is entered into the national contest.

Judges will select winners according to the score sheet as follows:

Conservation Message.....	50%
Visual Effectiveness.....	30%
Originality	10%
Universal Appeal.....	10%

2022 Limerick Contest

“Healthy Soil – Healthy Life”

Sponsored by: **Butler County Conservation District**

2503 Enterprise, Suite B

El Dorado, Kansas 67042

316-320-3549

ELIGIBILITY:

The Limerick Contest is open to all students in levels three (3) through eight (8); home schooled children in levels three (3) through eight (8). Butler County Conservation District is allowed to submit two (2) entries in the State Limerick Contest (levels 3-8). Entrants may participate in **only one district contest**.

LIMERICK RULES:

1. The limerick must have a name or title
2. Limericks shall be placed on a 12"x18" poster paper and arranged for horizontal display only.
3. In the limerick, the basic unit (called a foot) contains three syllables, with heavy accent or beat on the third syllable: ta-ta-TUM. Three such units (or feet) are in the first, second and fifth lines; two in the third and fourth lines. The heavy beat or accent must always fall on a syllable, which can properly be accented.
5. Wrap LIMERICKS between cardboard for mailing (DO NOT ROLL OR FOLD).
4. Submit limericks by Monday, October 4, 2021 to Butler County Conservation District. Call 316-320-3549 if you need someone to pick them up from your school.

Example Limerick

Loud and Clear
Conservation, Spread it loud and clear
Please spread it to each and every ear
Terracing, strip farming,
Windbreaks, contour farming
Finally, the right answer is here!

THEME: The theme for the limerick contest is “**Healthy Soil – Healthy Life**”

Did you Know?

- A quarter of the Earth’s species are found in soils! This includes critters like small mammals, worms, fungi, and bacteria. Scientists are still learning about and discovering organisms that live in soil!
- 95% of food production relies on soil!
- Healthy soils can help the environment! Soil that’s in good shape can prevent floods and mitigate drought because they store water.
- Soil has three main particles: silt, sand and clay. These particles can combine in different ways to form different types of soils.
- Kansas has a state soil! It is Harney silt loam.

ENTRIES:

For identification, an entry form with information containing the participant’s name, age, learning level, home address, and the conservation district must be pasted or taped **to the back of the limerick in the lower left-hand corner**. **No identification is to be on the front of the limerick**. Please use the entry form provided.

EXHIBITING AND AWARDS:

Local cash awards are given to first, second and third place winners.

State and National Limerick Contest: First place limericks from the local contest will be judged with the first place limericks from other conservation districts across Kansas. Limerick winners from the state contest shall be exhibited at the annual meeting of the Kansas Association of Conservation Districts in Wichita at which time the winners will be announced. First Place winner will receive a plaque and certificate, second place a medal and certificate, and third place a medal and certificate. Certificates will be presented to five honorable mention winners along with medals. There is no national limerick contest.

The judges will select winners according to the score sheet as follows:

Conservation Message.....	50%
Visual Effectiveness.....	30%
Originality	10%
Universal Appeal.....	10%

Kansas Association of Conservation Districts 2022 – THEME: Healthy Soil – Healthy Life

Entry Blank for Poster and Limerick Contests

Student Name _____ Age _____ Student's Grade Level _____

Home Address _____

Parent's Name _____

Name of School _____ Teacher's Name _____

Title of Limerick _____

Butler County Conservation District, 2503 Enterprise, Suite B, El Dorado, KS 67042; 316-320-3549

Kansas Association of Conservation Districts 2022 – THEME: Healthy Soil – Healthy Life

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Butler County Conservation District, 2503 Enterprise, Suite B, El Dorado, KS 67042; 316-320-3549



2022 POSTER CONTEST

Healthy Soil: Healthy Life

Butler County Conservation District
Healthy Soil ~ Healthy Life
Information, Rules,
Poster Ideas and Tips



2022 Poster Contest

THEME:

Healthy Soil: Healthy Life



The Poster Contest is open to all public, private and homeschooled students in grades K—12.

Contest Categories

K-1st Grade 2nd-3rd Grade 4th-6th Grade 7th-9th Grade 10th-12th Grade

Drop off entries at the Butler County Conservation District Office at
2503 Enterprise, Suite B, El Dorado, Kansas,
or call 316-320-3549 and we'll pick them up.

Entries are due by Monday, October 3, 2022

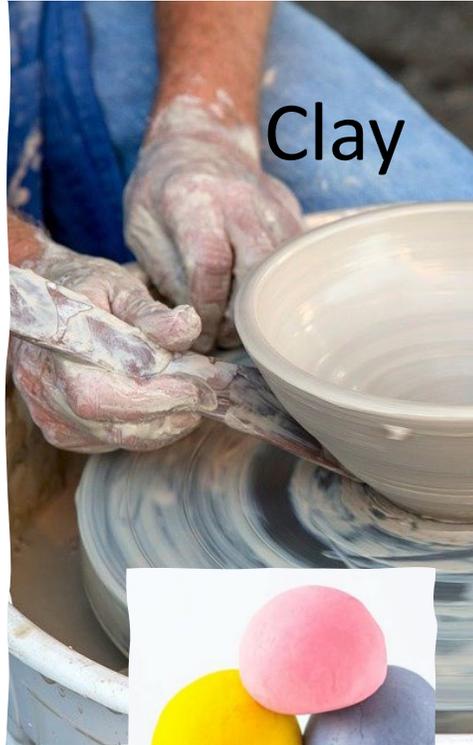
What is Soil?

Soil is the top layer of the earth's surface where plants can grow. Soil is a mixture of rock and mineral particles mixed with decayed organic matter, gases, liquids and living organisms that work together to support life.



Fun Fact!
Did you know that
Kansas has a State Soil?

It is Harney Silt Loam



All soils must have the following ingredients in order to be soil:
SAND ~ SILT ~ CLAY

Soil Texture

- Some soils have more sand, some soils have more clay and some soils have more silt.
- Sand helps keep soil from being too compact or solid.
- Clay helps keep moisture in the soil.
- Soils that have equal amounts of sand, silt and clay generally are ideal for growing crops.

If you were to slice through soil, you would see layers:

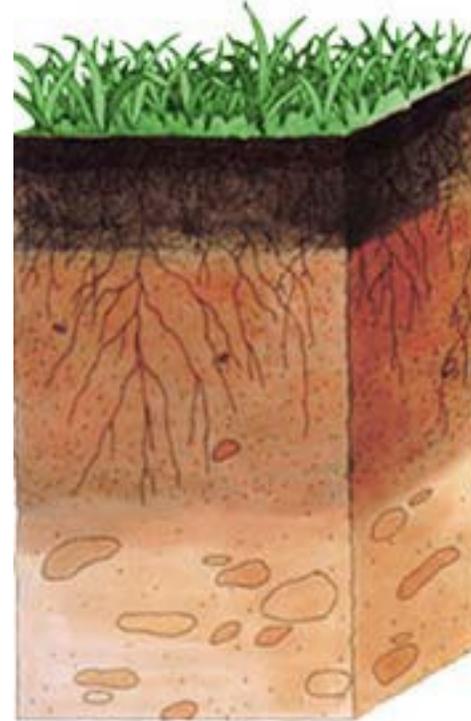


If you were to slice through soil, you would see it has 3 layers:

First Layer
Bedrock

This is the parent material from which soil is formed.

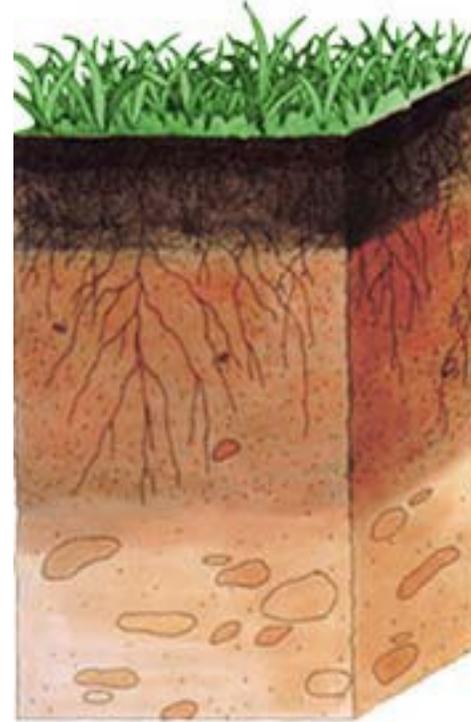
In Kansas, bedrock is below ground. In some parts of the world, bedrock layers are exposed. Mountains and other rocky areas are an example of exposed bedrock.



Roots cannot grow in bedrock. Air and water do get into the bedrock and help break it down after years of weathering.

Second Layer Subsoil

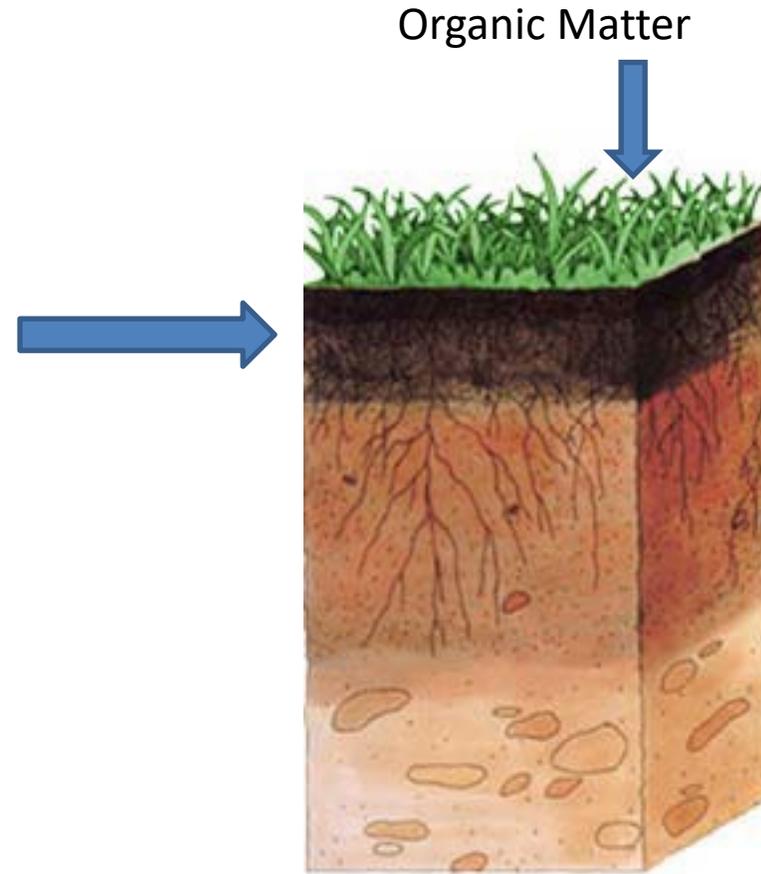
Located above the bedrock. Not a lot of organic matter in subsoil, but some plants such as soybeans and sunflowers can grow into the subsoil to find moisture and nutrients.



Third Layer Topsoil

The topsoil is the layer that farmers use to plant their crops.

This layer contains organic matter and nutrients and supports many forms of life from bacteria to worms.



Can you guess how many years it takes to form 1 inch of topsoil??

What is Soil Health?

We have to have healthy soil for plants to grow in! If soil is not healthy, plants don't grow as well.



What makes Healthy Soil?

The “stuff” in soil! Soils are Habitats!



Soil provides a habitat for animals. Lots of bugs, worms and other critters live in the soil. Some are so small you need a hand lens to see them. Earthworms living in your yard, garden or farm field are a real good sign that you have healthy soil. They make holes that help water and air get deep into the soil that makes it easier for roots and plants to grow.

How does healthy soil help us have a healthy life?



The food we eat comes from plants and trees that grow in soil. Farmers and ranchers take good care of the soil on their land. Then, healthy soil grows the healthy food we need to have a healthy life.

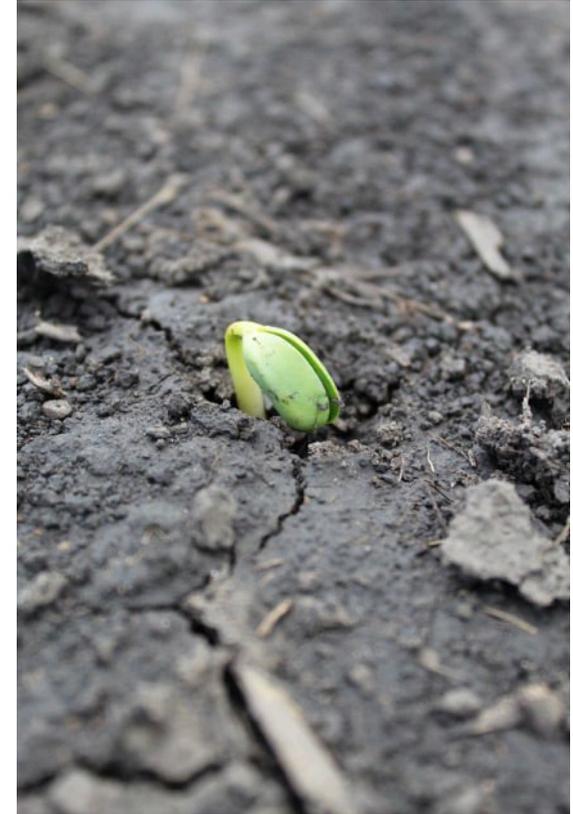
How Do Farmers Help Soils?

- Planting cover crops. Cover crops are plants that can protect and put nutrients back into the soil, they aren't grown for food.
- Rotating crops. This is when farmers plant different crops on the same patch of land at different times of the year. This keeps soil healthy by ensuring that soils stay nutrient rich, since not all the same nutrients are being used with each crop.
- Keeping soil intact. Tilling is a process that breaks up the soil to make it easier for crops to grow. But, breaking up soils means that they may be washed away by rain or blown away by the wind. Keeping soil intact by having no-till fields keeps soils in place and keeps moisture in the soil.
- Using buffer zones. A buffer zone is an area of vegetation between fields that are used to grow crops. Sometimes they are also near streams and lakes. These green spaces can keep soils in place and out of bodies of water.



Take Care of Your Soil!

Only about 10% of Earth's land surface has suitable soil for producing our food supply, housing, cities, schools, hospitals, air to breath and more! Our healthy life above ground depends upon healthy soil below our feet! It is vital that we practice good soil conservation.



Help is Here!



*“Out of the long list of nature’s gifts to man, none is perhaps so utterly essential to human life as soil.”
– Hugh Hammond Bennett*



Butler County Conservation District is eager to help you care for your soil.
Contact them at 316-320-3549 for information or visit their website,
www.butlercountyconservationdistrictks.com.

National Association of Conservation Districts (NACD) <http://www.nacdnet.org>

Poster Contest Details

Posters are due Monday, October 3, 2022 at the Conservation District office,
2503 Enterprise, Suite B, El Dorado, Kansas 67042

Winning local entries are selected by Butler County Conservation District volunteers and sent to the state level for judging. CASH awards are given to first, second and third place winners at every school at the local level.

One poster is selected from all of the Butler County schools participating in each contest category to be entered into the Kansas Association of Conservation Districts' State Contest.

Butler County Conservation District will contact participating teachers to let them know which students received first, second or third place.

State winner entries will be sent to the national level.



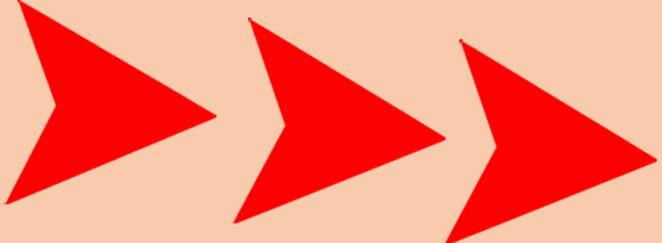
Poster Contest Rules

- Poster must be turned in on time for judging.
- Attach the poster **entry form** to the back of the poster.
- Entry must be contestant's original creation.
- Any media may be used to create a flat poster (examples include crayons, colored pencils, water-color paint, etc.)

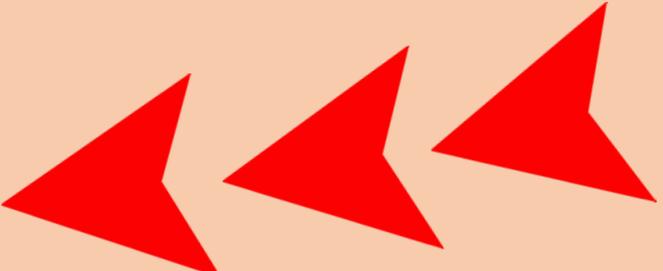


Poster Contest Rules Cont.

The Theme is – Healthy Soil – Healthy Life



We want to see the theme,
Healthy Soil – Healthy Life
on the poster.



Poster paper 12” x 18” – HORIZONTAL DISPLAY ONLY



Posters are judged:
Conservation message 50%
Visual Effectiveness 30%
Originality 10%
Universal Appeal 10%

CHECK YOUR SPELLING – SPELLING IS VERY IMPORTANT!!!!!!

WHAT MAKES A GOOD POSTER?

- A good poster attracts attention, is simple and clear, has a brief, catchy message, uses the theme, Healthy Soil – Healthy Life, is neat and words are spelled correctly.
- Uses colors and white space effectively
- Text is large enough to be easily read



When forming ideas for your poster...

- Research the topic of the theme
- Brainstorm ideas and make a list
- Use the theme as your title:

“Healthy Soil, Healthy Life”

- Use some of the important issues from this presentation
- Look around your community for ideas
- Talk to professionals in the industry
- Research soil health and use the information you find



Poster TIPS

Do...

- limit text and balance a combination of illustrations and words.
- be as neat as you can and be sure to erase any penciled sketches or guidelines.
- blend colors when using crayons or colored pencils.
- research the theme topic as a way to brainstorm poster ideas.



Poster TIPS Cont.

Don't...

- use staples, tacks, or tape.
- use fluorescent-colored posters.
- create a poster that is all words or all illustrations.
- have your parent or others draw your poster for you to color in.
- try to include too many ideas. A single message – clearly illustrated – is most effective.



For Additional Information...



Ag in the Classroom: <https://www.agclassroom.org/>

Junior Master Gardener Program: <https://jmgkids.us/>

Nutrients for Life Foundation: <https://nutrientsforlife.org/>

NACD: <https://www.nacdnet.org/>

My American Farm: <http://www.myamericanfarm.org/>

Soil Science Society of America: <https://www.soils.org/>

Soil Stories: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054316

National Agriculture Statistics Service: <https://www.nass.usda.gov/>

National Agricultural Library: <https://www.nal.usda.gov/main/>

4-H Virtual Farm: <https://4-h.org/about/4-h-at-home/design-your-own-farm/>

USDA Know Your Farmer, Know Your Food: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/?cid=nrcs142p2_037679



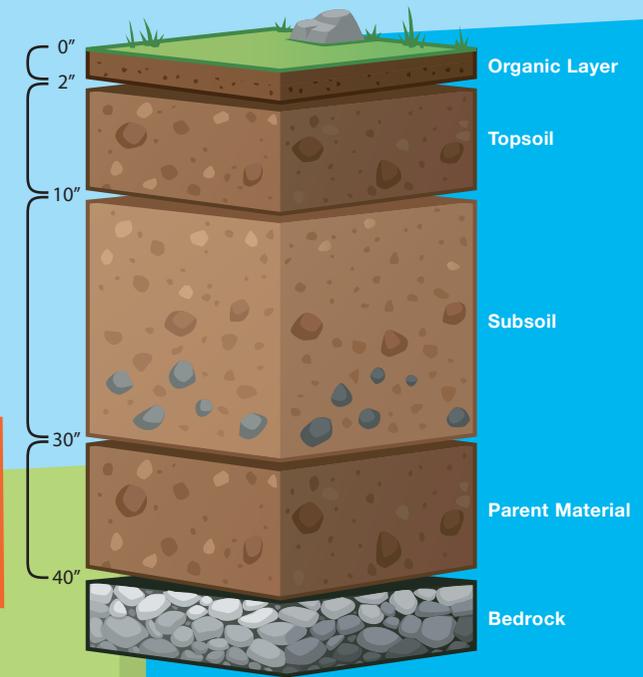
We rely on soils for food.

In fact, 95% of food production relies on soil!



Soils may seem sterile but they are actually teeming with life!

A teaspoon of soil can actually contain more microorganisms than there are people on Earth.



Healthy soils are like a filter!

They can help to clean the water that we depend on to survive.

A quarter of the Earth's species are found in soils!

This includes critters like small mammals, worms, fungi, and bacteria. Scientists are still learning about and discovering organisms that live in soil!

Over 1,000,000 earthworms can be found in one acre of cropland!



There is more than one type of soil!

Soil is made of layers, and soil scientists call these layers horizons. These include organic material, like decaying leaves, the topsoil, the eluviated horizon, the subsoil, parent material, and bedrock.

Healthy soils can help the environment!

Soil that's in good shape can prevent floods and mitigate drought because they store water.



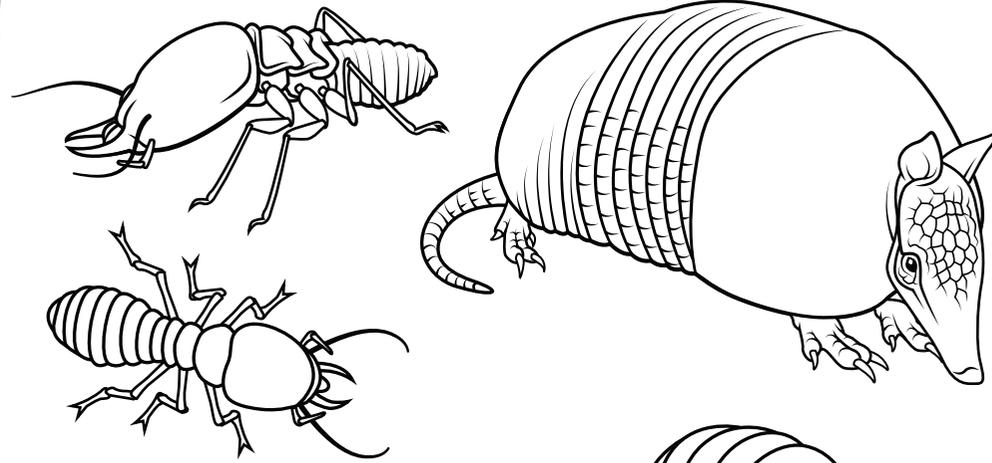
We use natural resources from the soil.

Actions like recycling can help us reuse these resources so we can protect soils.



Many organisms are found in the soil - it's a habitat!

In the soil you can find the roots of trees, animals like worms, mice, ants and moles, fungi and microscopic organisms that are too small to see with your eye!



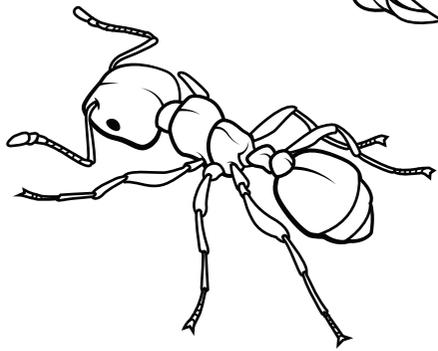
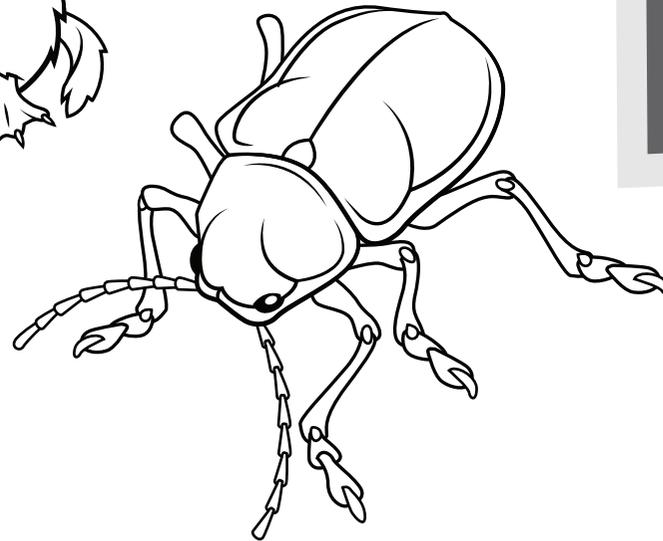
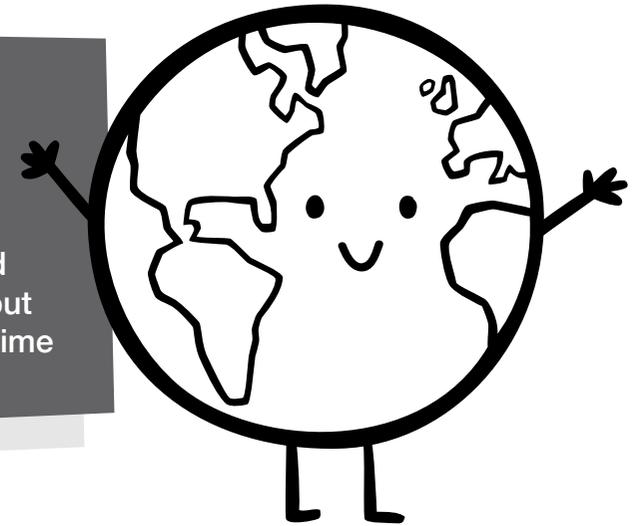
Did you know that they can also have a state soil?

This can include a soil that is unique or significant to each state.



It can take up to 1,000 years for a half-inch of topsoil to form.

Fertile soil is important to food production and life on Earth, but this resource can take a long time to form.



Soil has three main particles:

Silt, Sand and Clay. These particles can combine in different ways to form different types of soils.





DID YOU KNOW?

One teaspoon of soil can hold between 100 million and 1 billion bacteria and other organisms!

FUN

FACT

You are walking on living organisms every time you walk to the school bus or through the yard to get to the mailbox!



What do you call a worm with no teeth?

A gummy worm!!!



HEALTHY
SOIL
HEALTHY
LIFE



Soil is an amazing substance.

A complex mix of minerals, air, and water, soil also teems with countless micro-organisms, and the decaying remains of once-living things. Soil is made of life and soil makes life. To the farmer, soil is where crops grow. To the engineer, soil is a foundation upon which to build. To the ecologist soil supports communities of living things. To the archaeologist, soil holds clues to past cultures. To the city dweller, soil nurtures grass and gardens. To the soil scientist, soil is all of these things. Soil has been called “the skin of the earth” because it is the thin outermost layer of the Earth’s crust. Like our own skin, we can’t live without soil.



National Association of
Conservation Districts

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EDUCATORS GUIDE



National Association of Conservation Districts

NACD Headquarters
509 Capitol Court, NE
Washington, DC 20002-4937

Phone: (202) 547-6223
Fax: (202) 547-6450
Email: stewardship@nacdnet.org

NACD

The National Association of Conservation Districts is the non-profit organization that represents the nation's 3,000 conservation districts, their state associations and the 17,000 men and women who serve on their governing boards. For almost 70 years, local conservation districts have worked with cooperating landowners and managers of private working lands to help them plan and apply effective conservation practices.

Conservation districts are local units of government established under state law to carry out natural resource management programs at the local level.

NACD's mission is to serve conservation districts by providing national leadership and a unified voice for natural resource conservation. The association was founded on the philosophy that conservation decisions should be made at the local level with technical and funding assistance from federal, state and local governments and the private sector. As the national voice for all conservation districts, NACD supports voluntary, incentive-driven natural resource conservation programs that benefit all citizens.

NACD maintains relationships with organizations and government agencies; publishes information about districts; works with leaders in agriculture, conservation, environment, education, industry, religion and other fields; and provides services to its districts. NACD is financed primarily through the voluntary contributions of its member districts and state associations.

The association's philosophy is that conservation decisions should be made by local people with technical and funding assistance from federal, state and local governments and the private sector. The association's programs and activities aim to advance the resource conservation cause of local districts and the millions of cooperating landowners and land managers they serve.

Visit www.nacdnet.org for additional information.

To find your local district contact information, go to: www.nacdnet.org/about/districts/directory/index.shtml

Stewardship Week Information

NACD has sponsored Stewardship Week since 1955.

Education is a critical element of the conservation effort at the local, state and national levels. Educating youth ensures that the next generation will be wise stewards of America's natural resources. Helping today's adults understand the need for effective conservation practices builds on the conservation legacy. Through NACD's Stewardship and Education efforts, we help districts and communities extend the reach of their education programs.

Stewardship Week, celebrated annually between the last Sunday in April and the first Sunday in May, reminds us of our individual responsibilities to care for the natural resources upon which we all depend.



Healthy Soil, Healthy Life Level 1, Grades K-1

Booklet & Lesson Objectives

Students will:

- Describe patterns of what plants and animals (including humans) need to survive
- Recognize that soils are a habitat for plants and animals
- Animals and plants can change soils and the environment they live in
- Describe patterns of adaptations that animals have to live in the soil
- Use their understanding of these patterns to design a solution to a human problem

NGSS Connections

For full information on the standards, review Appendix A

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none">• Analyzing & Interpreting Data• Scientific Knowledge is Based on Empirical Evidence• Constructing Explanations and Designing Solutions	<ul style="list-style-type: none">• Organization for Matter and Energy Flow in Ecosystems• Structure and Function• Information Processing	<ul style="list-style-type: none">• Patterns• Structure and Function

Vocabulary Words

Adaptation - a physical trait or behavior that helps an organism survive in their environment

Agriculture - growing crops, raising livestock and cultivating soil. Includes the field of study and occupations like farming.

Farm - an area of land or water where particular animals, birds, fish, or crops are raised for commercial purposes

Habitat - the place where an organism or community of organisms is found. Includes the other living and nonliving things that are found there.

Mimic - imitating the mannerisms, movements or coloration of another animal

Organism - living things capable of growth and reproduction. Examples include plants, animals, fungi and bacteria

Ranch - a large farm devoted to keeping a particular type of animal or growing a particular type of crop

Soil - the top layer of most of the Earth's land surface, consisting of the unconsolidated products of rock erosion and organic decay, along with bacteria and fungi

Survival - continuing to live and thrive in an environment

Topsoil - the layer of soil found on the surface of the ground, includes minerals and organic material. Many living organisms are found in this layer of the soil.

Surviving in the Soil Activity

Time

Engage: 10-15 minutes

Explore: 15-20 minutes

Explain: 20-30 minutes

Elaborate: 20-45 minutes

Evaluate: 10-15 minutes

Total Time: 1 hour - 2hours, 15 minutes

Materials

- Animal Cards: earthworm, ant, mole, termite, groundhog, armadillo, millipede, beetle, sowbug, shrew
- Soil is a Habitat Student Pages

Background

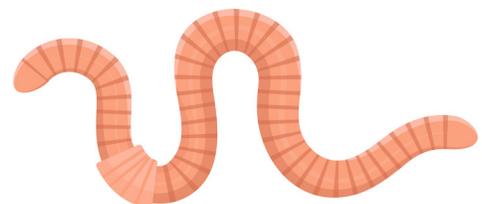
There is great diversity among the animals that are found living in soils. Some of these organisms are too small for the human eye to see and some are large and recognizable. Soil organisms can be classified into microfauna (protozoa), mesofauna (mites and nematodes), and macrofauna (earthworms, beetles, termites, etc.) The most common animals found in soils are the micro- and meso-fauna. This activity will focus on animals that can be seen without a microscope with easily distinguishable features.

Soils form a unique environment. Living underground may require animals to create burrows or tunnels, in addition to developing unique adaptations to survive in their surroundings. The animals that live in the soil may also help to contribute to soil health. For example, when earthworms tunnel in the soil, they create spaces for air and water. This allows water to flow into soils rather than running off and causing erosion.

Engage

Begin by asking students what they think it's like to live in the soil. What do they think it would be like? How do they think it would feel - would it be dry or wet, would they have a lot of room to move around or would it be cramped? What do they think animals in the soil need to survive? Would they see lots of other creatures in the soil or would it feel empty? Do they think other creatures in the soil would be large or small? What other questions do they have? Write down student responses on a large sheet of paper or whiteboard.

Ask students if they learned anything new. Was there anything interesting they noticed? Tell students they are going to spend some more time identifying animals that live in the soil and that they are going to focus on animals that can be seen without a microscope.



Surviving in the Soil Activity Cont.

Explore

After you have gathered responses, tell students that they are going to spend some time exploring and learning about the animals that make the soil their home. There are a few short clips that you can watch to begin to investigate life beneath the soil. Before watching these videos, ask students to pay special attention to the features of the animals that are mentioned. What are their similarities or differences? How do they differ from animals that they are familiar with that may be found on Earth's surface?

[Soils Are Living](#) (Soil Science Society of America)

[What's It Like to Live Underground](#) (SciShow Kids)

[Soil is Alive!](#) (SciShow Kids)

Ask students if they learned anything new. Was there anything interesting they noticed? Tell students they are going to spend some more time identifying animals that live in the soil and that they are going to focus on animals that can be seen without a microscope.

Explain

Have students examine the animal cards. On the student page, have them record their observations. What do they notice about each animal's features? Practice with one card together and then have students work in smaller groups.

Kindergarten students should focus on the question of how they think the features of these animals help them to survive and work on constructing an explanation based on what they know about life in the soil. Do any of these animals have common adaptations?

First graders should think about the adaptations they notice. Would any of these adaptations be helpful to humans?

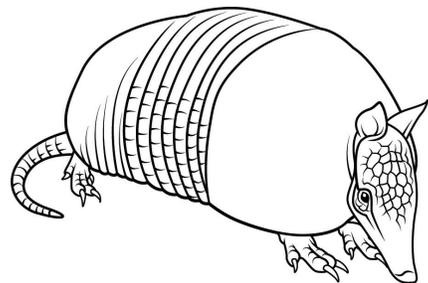
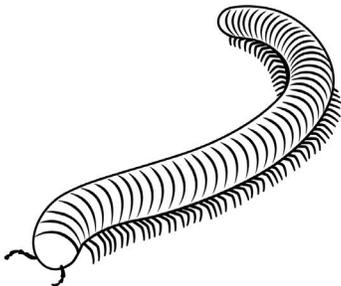
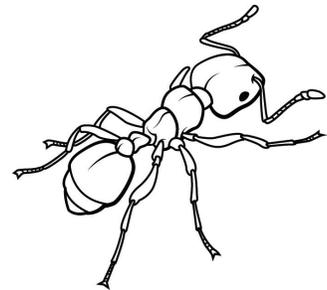
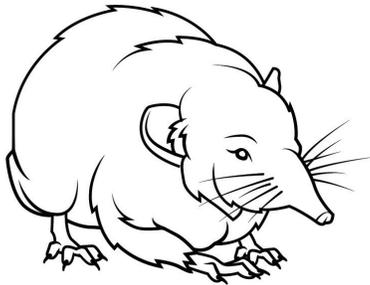
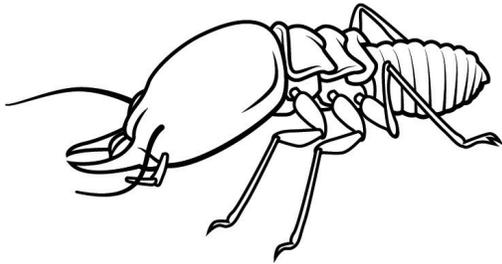
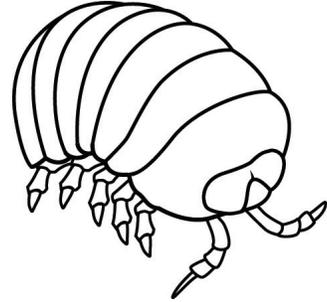
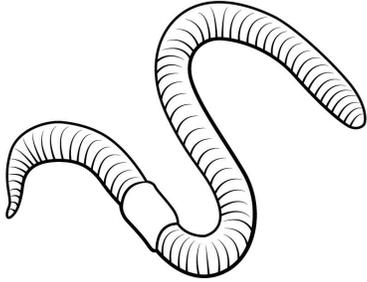
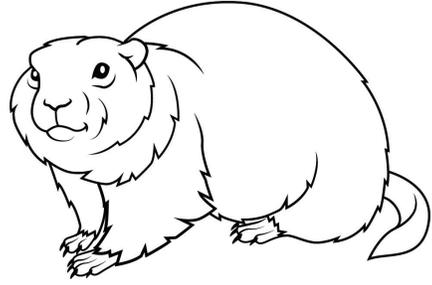
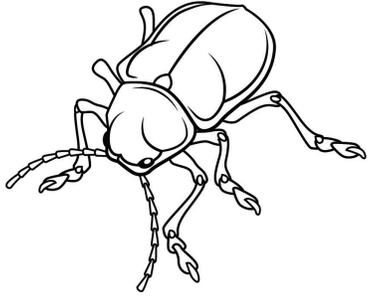
Elaborate

Kindergarten students can create a poster featuring their favorite animal that lives in the soil. They should indicate the adaptations that help them to survive in their environment

First grade students can create a poster highlighting their favorite adaptation and explain how this adaptation may help humans solve a problem.

Evaluate

Have students explain their reasoning for highlighting particular adaptations. Return to the questions from the beginning of the lesson. Would students change their answers? Were their original questions answered? Is there anything else they would like to know?



GROUND HOG

BEETLE

SOW BUG

**EARTH
WORM**

MOLE

TERMITE

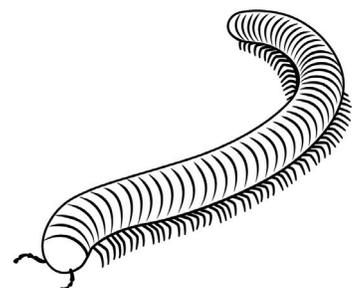
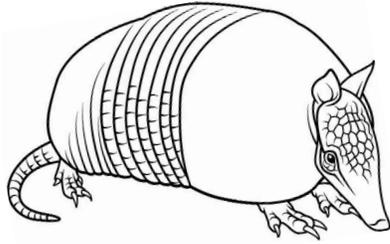
ANT

SHREW

ARMADILLO

MILLIPEDE

Animals That Live in Soil: My Observations



Healthy Soil, Healthy Life Level 2, Grades 2-3

Booklet & Lesson Objectives

Students will:

- Describe characteristics of soil
- Use their senses to explore soil samples
- Discover the materials in soils
- Understand how soils support life

NGSS Connections

For full information on the standards, review Appendix A

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none">• Planning and Carrying Out Investigations• Constructing Explanations and Designing Solutions	<ul style="list-style-type: none">• Biodiversity and Humans• Variation of Traits	<ul style="list-style-type: none">• Patterns• Cause and Effect

Vocabulary Words

Ecosystem - living and nonliving organisms and their many interactions. Can vary in size and are found on land and in water. Examples can include school gardens and entire forests.

Habitat - the place where an organism or community of organisms is found. Includes the other living and nonliving things that are found there.

Inorganic Material - materials from non-living sources, including rocks and minerals

Organic Material - materials from living sources found in natural environments

Soil - the top layer of most of the Earth's land surface formed from the weathering of rocks. Made up mainly of minerals, organic materials, air, water, and living organisms, all of which interact.

Texture - the feel or appearance of a surface or substance, for example, rough or smooth

Surprising Soils

Time

Engage: 10-15 minutes

Explore: 10-15 minutes

Explain: 25-30 minutes

Elaborate: 20-30 minutes

Evaluate: 10-15 minutes

Total Time: 75 minutes - 1 hour 45 minutes

Materials

- Three soil samples from different areas.
- Sealed baggies containing soil samples from each area
- Cups with each sample (for educator)
- Pictures of each site where the soil
- Hand lenses or microscope (optional)
- Surprising Soils Student Page

Background

Soil is composed of minerals, organic materials, air, water and living organisms. The particles in soil are different shapes and sizes, giving soils different textures depending on what they are composed of and where they are found. These can also be described as inorganic material in the soil. Also found in soil is organic material. This includes materials from living sources and can include the decayed remains of once-living plants and animals.

Soils form a habitat for living organisms, including plants, microorganisms and larger organisms like bugs and small mammals. Depending on the types of particles present, soils may be dry and sandy, or wet and sticky. The composition of soil will impact the types of plants that can grow and the organisms that are found in it. While soil can be a habitat, they are also an important part of ecosystems and important to all life on earth.

Engage

Begin by asking students if they know what soil is. Where are soils found? Do they know what soils are made of? Are all soils the same? Do they think that people need soil? Ask students if there is anything they want to know about soils. Write answers on a large sheet of paper or in a place where they can be seen by all students.



Surprising Soils Cont.

Explore

After you have gathered responses, review them and go over the vocabulary.

Tell students that they are going to examine three different soil samples that have been collected from nearby. They will use these senses to explore these samples and describe how they are similar and different. Students will try to identify where the samples were collected and try to identify the type of environment the soils are from.

Show students the images where the samples were collected, but don't tell them which sample is from which location.

Review how to examine a sample in a bag using their senses. They can look, touch and even hear what kind of sound the sample makes. To smell each sample, they should visit the teacher who will let them smell the sample in a cup. Samples should not be tasted.

Explain

Give each student a copy of the Student Page to record their observations. Working in three groups, each group should examine each soil sample using their sense of sight, touch, smell and hearing. Students will rotate to each station to examine the soil types and will make a prediction about where it was collected.

Elaborate

Let students examine soil samples with hand lenses or a microscope.

Have students explain their reasoning about where each soil sample was collected. Look at the pictures from each place together and have students share what they see in each photo.

Go over the correct answer for each sample with reasoning.

Evaluate

Return to the questions from the beginning of the lesson. Would students change their answers? Were their original questions answered? Is there anything else they would like to know?

Surprising Soils

SAMPLE 1

SAMPLE 2

SAMPLE 3

Healthy Soil, Healthy Life Level 3, Grades 4-5

Booklet & Lesson Objectives

Students will:

- Recognize that soils are a habitat for plants and animals
- Describe that soils are made up of different particles that can be identified
- Articulate that soils vary based on their locations and conditions
- Describe that soils help to support the cycling of matter through ecosystems
- Understand and describe how humans interact with soils

NGSS Connections

For full information on the standards, review Appendix A

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none">• Constructing Explanations and Designing Solutions	<ul style="list-style-type: none">• Earth Materials and Systems• Cycles of Matter and Energy Transfer in Ecosystems	<ul style="list-style-type: none">• Systems and System Models• Cause and Effect

Vocabulary Words

Clay - very fine particles with little organic material, often damp, sticky and hard

Ecosystem - living and nonliving organisms and their many interactions. Can vary in size and are found on land and in water. Examples can include school gardens and entire forests.

Habitat - the place where an organism or community of organisms is found. Includes the other living and nonliving things that are found there.

Horizons - the different layers of soils, including organic material, topsoil, eluviated horizon, subsoil, parent material and bedrock. Soils may include some or all of these layers.

Microorganism - small organisms that can only be seen with a microscope. Includes bacteria, algae, protozoa and fungi.

Organic Material - materials from living sources found in natural environments

Organism - living things capable of growth and reproduction. Examples include plants, animals, fungi and bacteria

Sand - granular (tiny) material from the disintegration or erosion of rocks, coarser than silt

Silt - rock particles that are 1/20 millimeter or less in diameter

Soil - the top layer of most of the Earth's land surface, consisting of the unconsolidated products of rock erosion and organic decay, along with bacteria and fungi

Survival - continuing to live and thrive in an environment

Topsoil - the layer of soil found on the surface of the ground, includes minerals and organic material. Many living organisms are found in this layer of the soil.

Soil Layers Activity

Time

Engage: 5-15 minutes

Explore: 5-15 minutes

Explain: 30-45 minutes, up to 48 hours for full experiment observation

Elaborate: 10-15 minutes

Evaluate: 10-15 minutes

Total Time: 60 - 105 minutes for lesson, plus up to 48 hours for full experiment observation

Materials

- Quart jars with lids - you'll need one jar for each sample collected
- Dish soap
- Rulers
- Materials to label jars (masking tape and markers or permanent markers)
- Soil samples. You'll need at least two. Soil samples should be dry. They can come from locations like a garden, flowerbed, field, roadside, etc. If you are only gathering two samples, they should be from different locations (garden vs. roadside, for example.)
- Plastic baggies for soil samples
- Water
- Measuring spoons (tablespoon and teaspoon)
- Soil Layers Student Pages

Background

Soils are made up of a variety of particles. Sand, silt and clay are present in soils in varying amounts. These give the soil its texture and characteristics.

Sand: The largest type of soil particle. You can feel individual grains of sand with your fingers and see them with your eyes, but they are still pretty small! An individual sand particle can range from 0.05 to 2.0 mm.

Silt: Time to grab a magnifying glass! You'll need it to identify a silt particle since they are 0.002 and 0.05 mm wide. Silt is fine and feels powdery.

Clay: The smallest particle of them all! Clay particles are less than 0.002 mm in diameter.

For this activity, students will be examining the topsoil. This layer is the outermost layer of soil. It has the highest concentration of organic matter and microorganisms.

One tool that can be used to determine soil composition is the soil triangle. When you know what types of particles are present in the soil, you can use them to determine what type of soil is present and its characteristics.

Engage

Begin by asking students what they know about soils. Do they think soil is all one uniform layer or does it have multiple layers? Is soil the same all around the world? What about in their communities? What questions do they have about soil? Record responses in a place where everyone can see them.

Soil Layers Activity Cont.

Explore

Tell students that soil does have multiple layers and today they will be exploring the topsoil. Have students refer to the page in their student booklet that reviews the horizons found in soils and the particles that make up soil. Ask students if they have any questions about this section.

Ask students if they think they could identify the different particles in soil. How would they do it? Would they need a microscope or could they use tools from around the house or classroom?

Tell students that they are going to work with topsoil samples collected in different locations to identify the particles that are found in each sample.

Explain

Have students work in small groups. Give each group a soil sample, jar, dish soap and materials to label jars.

Give each group a soil sample in a plastic baggie. Have them record their observations about their sample on their student page. What does it feel like? Does it have a smell? Is the soil sample damp or dry? What color is the sample? Where do they think it was collected?

Have students crush any dried soil clumps and remove any rocks, roots and litter from the samples.

Students should add their soil sample to their jars, filling the jar no more than $\frac{1}{4}$ full. Then, students should slowly add water to the jar using the tablespoon until it is filled half-way. Finally, add 1 teaspoon of dish soap to each jar.

After the students add the mixture of topsoil, water and dish soap to the jar, have them record their observations. Tell them that they will secure the lid on the jar and shake it for a few minutes. What do they think will happen?

After shaking the jars, set them on a table and observe them. Students should begin to notice particles settling to the bottom of the jar. Allow students to look at other samples during this time. Students should measure the layers and record the data on their sheet.

Observe the jars at 30 minutes, 24 hours and 48 hours. After two days, sand should have settled at the bottom, followed by silt, with clay on the top. Any additional organic matter may be floating at the top.

Have students record data for their sample, and allow them to observe other samples. Which particles of soil settled where and why? What difference do they notice between the samples? Where do they think they were collected?

Elaborate

Tell students where the samples were collected. Is this the same as their hypothesis? What did they notice about the soil that led them to this explanation?

If students were planning on growing a garden, which soil sample would they use and why?

Evaluate

Return to the questions from the beginning of the lesson. Would students change their answers? Were their original questions answered? Is there anything else they would like to know?

Soil Layers Observations

Record your observations about your soil samples here. You can write or draw pictures.

Healthy Soil, Healthy Life Level 4, Grades 6-8

Booklet & Lesson Objectives

Students will:

- Identify soil science as an area of study and potential career path
- Understand soil types and be able to identify them based off of the types of soil particles present in a sample
- Explain that soil is a natural resource and a habitat
- Describe how humans interact with the soil, with the ability to cause both positive and detrimental outcomes, and explain how these negative outcomes can be avoided.
- Identify soils where they live and explain their characteristics

NGSS Connections

For full information on the standards, review Appendix A

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<ul style="list-style-type: none">• Analyzing and Interpreting Data• Engaging in Argument from Evidence	<ul style="list-style-type: none">• Interdependent Relationships in Ecosystems• Human Impacts on Earth's Systems	<ul style="list-style-type: none">• Cause and Effect

Vocabulary Words

Agriculture - growing crops, raising livestock and cultivating soil. Includes the field of study and occupations like farming.

Habitat - the place where an organism or community of organisms is found. Includes the other living and nonliving things that are found there.

Horizons - the different layers of soils, including organic material, topsoil, eluviated horizon, subsoil, parent material and bedrock. Soils may include some or all of these layers.

Natural Resource - something found in nature that can be used by humans that are considered valuable in their natural form. These include light, air, water, soil, minerals, and fossil fuels.

Organism - living things capable of growth and reproduction. Examples include plants, animals, fungi and bacteria

Soil - the top layer of most of the Earth's land surface formed from the weathering of rocks. Made up mainly of minerals, organic materials, air, water, and living organisms, all of which interact.

Soil Science - the branch of science that studies the formation, nature, ecology, and classification of soil.

Survival - continuing to live and thrive in an environment

Topsoil - the layer of soil found on the surface of the ground, includes minerals and organic material. Many living organisms are found in this layer of the soil.

Sustaining Soils & People Activity

Time

Engage: 10-15 minutes

Explore: 10-20 minutes

Explain: 20-30 minutes

Elaborate: 10-20 minutes

Evaluate: 10-15 minutes

Total Time: 60 - 100 minutes

Materials

- Sustaining Soils & People Cards
- Sustaining Soils & People Student page

Background

Humans have the ability to modify environments to meet their needs. This may include developing land for agricultural purposes, building homes and retail spaces and more. However, humans share the land with many other organisms that provide important ecosystem services. Occasionally, this causes conflict when it comes to development. However, we can work together to find solutions that balance the needs of people with the natural world.

Engage

Begin by asking students what they know about land use. Who gets to make decisions about how land is utilized? What are some of the uses of land? Can they think of some of the impacts of turning unused land into farmland, or land used for agriculture? (These can be both positive and negative outcomes) What do they think are some of the things we can do to mitigate negative impacts? What other questions do they have? Write down student responses in a place where everyone can see them.

Explore

Ask students if they think that all land can be used for agriculture. Why or why not? Have students conduct research online to find the answer.

Ask students to record their findings and sources on the student page. Is agricultural land distributed evenly around the globe? What about where they live? Tell students that for land to be suitable for agriculture it needs to have fertile soils, adequate precipitation and temperatures suitable for growing food.

Sustaining Soils & People Activity Cont.

Ask students to record their findings and sources on the student page. Is agricultural land distributed evenly around the globe? What about where they live? Tell students that for land to be suitable for agriculture it needs to have fertile soils, adequate precipitation and temperatures suitable for growing food.

Explain

Tell students that individuals working in agriculture need to make decisions about what crops they plant and how they work the land. It's not always as easy as just growing food. Farmers need to make sure that the land is cared for, so they can support food production and keep the land intact, avoiding scenarios like the Dust Bowl.

Have students work in small groups to read the scenarios on the Sustaining Soils & People Cards. How would they solve each of the problems presented?

Elaborate

If time allows, have students research their questions and to see if their solutions are viable. Is there anything they would change or modify?

Evaluate

Have students explain their reasoning for the solutions they presented. Return to the questions from the beginning of the lesson. Would students change their answers? Were their original questions answered? Is there anything else they would like to know?

Scenario Cards

You are responsible for overseeing a farm that is located on a waterway that is prone to erosion. How would you maintain the farmland and keep the waterway clear?

Your farm is located in an area that typically receives a lot of rain. This year is very dry and you are concerned about future years. What actions would you take?

Your farm is located in an area that typically receives very little rain. This year is very wet and you are concerned about future years. What actions would you take?

You are a farmer and you are interested in creating more habitat for native wildlife on your farm. What management strategies would you use?

You have noticed a decrease in pollinators on your farmland. What actions would you take to help pollinator populations, like bees and other insects, thrive?

You are concerned about how runoff from your farm is impacting nearby waterways. What actions would you take?

Appendix A - NGSS Connections

K-1 NGSS Correlations:

K-LS1-1 Use Observations to describe patterns of what plants and animals (including humans) need to survive [Clarification statement: Examples of patterns could include that animals need to take in food but plants to not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water]

1-LS1-1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow and meet their needs. [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills, and detecting intruders by mimicking eyes and ears.]

2-3 NGSS Correlations

2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats. [Clarification statement: Emphasis is on the diversity of living things in each of a variety of different habitats.][Assessment boundary: Assessment does not include specific animal and plant names in specific habitats.]

3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment. [Clarification statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]

4-5 NGSS Correlations

5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification statement: Emphasis is on the idea that matter is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.][Assessment boundary: Assessment does not include molecular explanations.]

5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or the atmosphere interact. [Clarification statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.][Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]

6-8 NGSS Correlations

MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

Appendix B - Literature Connections

Book Name	Age	ISBN	Author
From Garbage to Compost	4 - 7	978-1512412994	Lisa Owings
Dirt Don't Hurt	4 - 7	978-1480817166	Vikki Franklin
From Soil to Garden	4 - 7	978-1512413021	Mari Schuh
The Simple Science of Dirt	4 - 8	978-1515770923	Emily James
Dig In!: Learn about Dirt	4 +	978-1602535077	Pamela Hall
Celebrating Soil	5 +	978-0998629438	Aaron William Perry
How Do Animals Make Soil?	5 - 8	978-1627248358	Ellen Lawrence
Little Lily and Eddie the Earthworm	5 - 8	978-1517297770	Chad Currin
Up in the Garden and Down in the Dirt	5 - 8	978-1452161365	Kate Messner
Is Soil All the Same? (Down & Dirty)	5 - 8	978-1627248365	Ellen Lawrence
Exploring Soils: A Hidden World Underground	6 +	978-1486305001	Samantha Grover
Curious About Worms (Smithsonian)	6 - 8	978-0451533692	Kate Waters
Seed Soil Sun	6 - 8	978-8179936443	Sandhya Rao
In the Soil (Garden Squad!)	7 - 10	978-1499409758	Dave Mack
Explore Soil!: With 25 Great Projects	7 - 10	978-1619302952	Kathleen M. Reilly
What's in the Soil?	7 +	978-1474706087	Martha E H Rustad
Rocks and Soil	8 - 11	978-1499431537	Peter Riley
Worms Eat My Garbage	8 +	978-1612129471	Mary Appelhof
Under the Microscope : Earth's Tiniest Inhabitants	8 +	978-1541940208	Baby Professor
Dirt or Soil: What's the Difference?	8 - 12	978-1627248334	Ellen Lawrence
You Wouldn't Want to Live Without Dirt!	8 - 12	978-0531224380	Ian Graham
Soils (Do-It-Yourself Experiments)	8 - 12	978-1489652904	Gina Hagler
Soil, Sun, and Seeds	9 - 12	978-1541903548	Baby Professor
Wonder Waste: A Book on Composting	9 - 12	978-8179936528	Tirna Ray

Appendix C - Vocabulary

Adaptation - a physical trait or behavior that helps an organism survive in their environment

Agriculture - growing crops, raising livestock and cultivating soil. Includes the field of study and occupations like farming.

Clay - very fine particles with little organic material, often damp, sticky and hard

Ecosystem- living and nonliving organisms and their many interactions. Can vary in size and are found on land and in water. Examples can include school gardens and entire forests.

Farm - an area of land or water where particular animals, birds, fish, or crops are raised for commercial purposes

Habitat - the place where an organism or community of organisms is found. Includes the other living and nonliving things that are found there.

Horizons - the different layers of soils, including organic material, topsoil, eluviated horizon, subsoil, parent material and bedrock. Soils may include some or all of these layers.

Inorganic Material - materials from non-living sources, including rocks and minerals

Microorganism - small organisms that can only be seen with a microscope. Includes bacteria, algae, protozoa and fungi.

Mimic - imitating the mannerisms, movements or coloration of another animal

Natural Resource - something found in nature that can be used by humans that are considered valuable in their natural form. These include light, air, water, soil, minerals, and fossil fuels.

Organic Material - materials from living sources found in natural environments

Organism - living things capable of growth and reproduction. Examples include plants, animals, fungi and bacteria

Ranch - a large farm devoted to keeping a particular type of animal or growing a particular type of crop

Sand - granular (tiny) material from the disintegration or erosion of rocks, coarser than silt

Silt - rock particles that are 1/20 millimeter or less in diameter

Soil - the top layer of most of the Earth's land surface formed from the weathering of rocks. Made up mainly of minerals, organic materials, air, water, and living organisms, all of which interact.

Soil Science - the branch of science that studies the formation, nature, ecology, and classification of soil.

Survival - continuing to live and thrive in an environment

Texture - the feel or appearance of a surface or substance, for example, rough or smooth

Topsoil - the layer of soil found on the surface of the ground, includes minerals and organic material. Many living organisms are found in this layer of the soil.

Appendix D- Resources

The following resources provide additional information and ideas for expanding lessons in the classroom. To learn more about what is happening in your Conservation District, visit: <https://www.nacdnet.org/general-resources/conservation-district-directory/>

Ag in the Classroom: <https://www.agclassroom.org/>

Junior Master Gardener Program: <https://jmgkids.us/>

Nutrients for Life Foundation: <https://nutrientsforlife.org/>

NACD: <https://www.nacdnet.org/>

My American Farm: <http://www.myamericanfarm.org/>

Soil Science Society of America: <https://www.soils.org/>

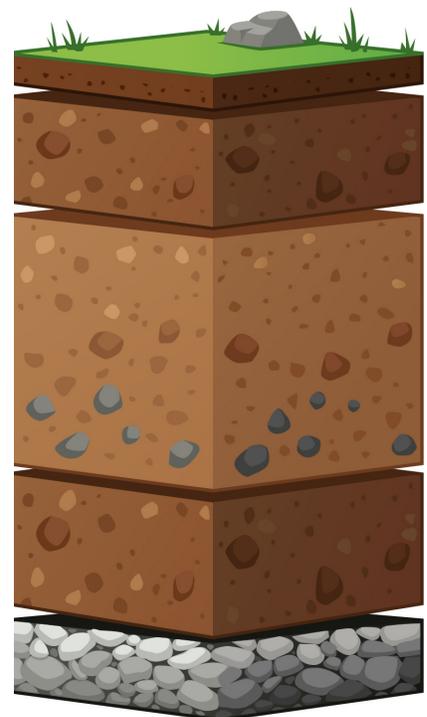
Soil Stories: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054316

National Agriculture Statistics Service: <https://www.nass.usda.gov/>

National Agricultural Library: <https://www.nal.usda.gov/main/>

4-H Virtual Farm: <https://4-h.org/about/4-h-at-home/design-your-own-farm/>

USDA Know Your Farmer, Know Your Food: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/?cid=nrcs142p2_037679





National Association of
Conservation Districts



Level 1
Grades K - 1st

Intro Story

Hi! My name is Whitney the Worm and I can't wait to show you around my home. But I don't live in a house or apartment. My home is the soil!

Soil is where plants grow and where animals like me live. Farmers grow the plants we eat in soil. You might even have a garden at home! Soil might not seem like it's doing much but its an important part of the Earth. I can't wait to take you on a tour of this exciting place!



Did You Know?

The soil is home to many living things. You may be able to easily spot worms and bugs, but many of the creatures that live in the soil are too small to see with your eyes! A handful of soil may be home to millions of tiny organisms.

You can help protect soils! If you have a garden at home, it's a good idea to cover your soil with materials like straw. This will keep soil from blowing away in the wind or washing away in the rain.

Animals like earthworms are good for the soil. You can help animals that live in the soil by keeping it healthy and using chemicals like weed killer only when necessary.

We use natural resources from the soil. Actions like recycling can help us reuse these resources so we can protect soils.



What Do You Think?

Draw a picture of what you think it looks like in the soil. What animals might live there? What might you see growing?



Food Grows in the Soil

The food we eat comes from plants and trees that grow in soil. How does healthy soil help us have a healthy life? Let's take a look at cereal - you might have had some for breakfast!

1. Whole wheat cereal is made from wheat that grows in the soil.
2. Fruit, like berries, are grown in soil.
3. Milk comes from cows. Cows eat grasses that are grown in soil.

Read each sentence. Write the number of the sentence by the picture of the food it matches. Draw a line from the food to the plant or animal it comes from and to the soil where our food gets its start.

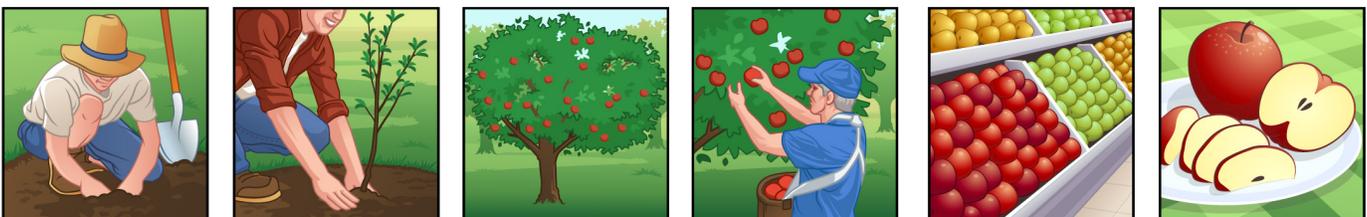


We Get Our Food From Plants & Animals

Plants and animals need food, water and a good place to grow just like you. Plants need healthy soil to live in, water, and light from the sun to make food. Plants use the soil to help them grow. Animals need plants for food.

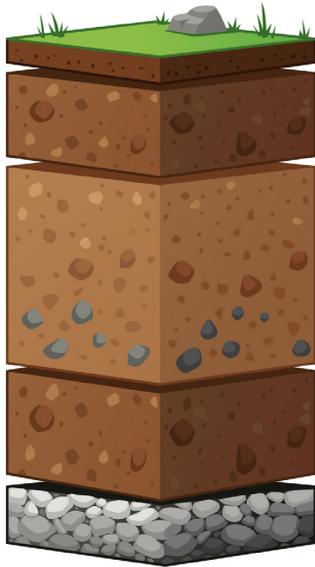
Most of the food we eat is grown on farms or raised on ranches. Farmers and ranchers take good care of the soil and water on their land. Healthy soils grow the healthy foods we need to have a healthy life. Soil that is taken care of can also help make sure that the water we drink stays clean.

Write the numbers 1 through 6 on the box below each picture to show how an apple gets from the soil to you for a yummy snack!



Soils are Habitats!

Whitney the Worm here! Healthy soils can grow the foods we need for a healthy life. Soil also provides a habitat for animals like me! Animals and other living things may change the environment they live in to survive. Earthworms can tunnel through the soil. Our tunnels provide spaces for air and water to get into the soil. We also help by making it easier for roots and plants to grow. Help me navigate this worm tunnel maze so I can meet up with the rest of my worm buddies!

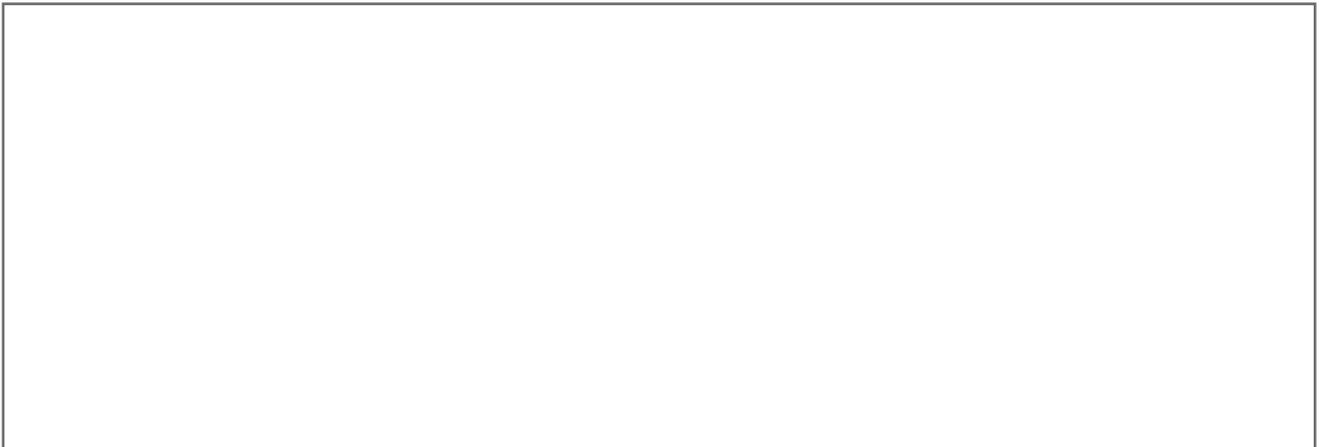


Layers of the Soil

Did you know that the soil is more than just one layer? It actually has multiple layers, just like a cake! Scientists who study the soil are interested in learning more about the characteristics of each of these layers. Check them out!

How Does Your Garden Grow?

One way for you to connect with soil is by growing a garden. Gardens can include plants like flowers, or even fruits and vegetables. What would you grow in your garden? Draw your garden here!





Level 2
Grades 2 - 3

Intro Story

Hi! Whitney the Worm here. I'm so glad you are here to learn about soils! Soil is the top layer of Earth's land surface, it's everywhere but we don't usually think about it. Soil is important to animals, plants and people.

If we didn't have soil we wouldn't be able to grow the crops that people depend on to eat and trees wouldn't have a place to grow! Soil is an important habitat and it's my favorite place! I can't wait to show you around this hidden world that's all around us.



Did You Know?

Do you know the difference between soil and dirt? Soil contains minerals, water, air and many organisms. It's a habitat! Dirt is the stuff that might get on our hands or under our nails when we are playing outside. It doesn't have the same characteristics of soil and can't support life the way soil does.

Healthy soils are like a filter! They can help to clean the water that we depend on to survive.

There is more than one type of soil! Soil is made of layers, and soil scientists call these layers horizons. These include organic material, like decaying leaves, the topsoil, the eluviated horizon, the subsoil, parent material, and bedrock.

Many organisms are found in the soil - it's a habitat! In the soil you can find the roots of trees, animals like worms, mice, ants and moles, fungi and microscopic organisms that are too small to see with your eye!

Over 1,000,000 earthworms can be found in one acre of cropland!



What Do You Think?

What do you think soil looks like under a microscope? Draw a picture of what you think you might find!



Meet a Soil Health Champion!

Meet Jay, Mary, Marshall and Mead Hardwick. They live in Newellton, Louisiana and they grow cotton, corn, soybeans and wheat on their family farm. Part of their farmland is also used for timber (wood) and has features like wetlands and lakes. The Hardwicks have been recognized for their efforts to steward their land and soils.

On their land, the Hardwicks use cover crops and rotate crops to keep the soil in good condition. They also work to restore and enhance the quality of their water, air, soil and wildlife habitat. On their farmland, the Hardwicks often see local wildlife like deer, turkeys, migratory birds, turtles, alligators and even black bears!



Healthy Soil Gives Us a Healthy Life

Where does your food come from?

Are your favorite foods grown on a farm? Raised on a ranch? Picked from a tree? No matter where your food comes from, it all has one thing in common, soil! Most of the food you eat comes from plants that grow in the soil or the animals that eat plants that grow in the soil. Plants also need sunlight and air to grow.

What are three of your favorite foods? Write them on the lines below:

- 1.
- 2.
- 3.

Write down where you think your favorite foods come from:

- 1.
- 2.
- 3.



It's me, Whitney the worm! Where do you think plants get the nutrients they need to survive? Here's another fun fact - plants get nutrients from the soil and the water they need to grow. But, plants also need air, sunlight and water to grow!

Healthy Meals and Healthy Lives

Have you ever wondered where your food comes from? Getting food from the soil to our homes so we can have healthy meals takes a lot of hard work by many people. The food you eat has to be grown by a farmer or raised by a rancher. Food also has to be moved from fields to processing and packaging plants and finally to stores or restaurants where it can be sold.

How do you think a spaghetti dinner (with breadsticks and a salad - yum!) makes it to your table? Fill in the blanks to complete the story of a spaghetti dinner using the word bank.

CROPS
SOIL
BUTTER
CHEESE
GROCERY STORE

MEAL
MILK
FLOUR
SAUCE
FARM

VEGETABLES
BREAD
PASTA



Tomatoes and other vegetables are grown on a farm.

Wheat grows in the _____.



Cows eat hay. Farmers will _____ cows and milk is made into _____.

Farmers will harvest _____.



_____ are moved from farms to be processed and packaged.

Tomatoes can be made into _____. Wheat is made into _____. These items are packaged and sold at _____.



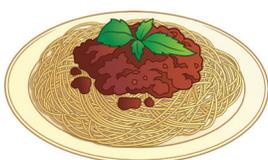
Wheat can also be turned into _____. You might use this to make _____ at home or buy it at the store.



In addition to cheese, milk can be churned to make _____.



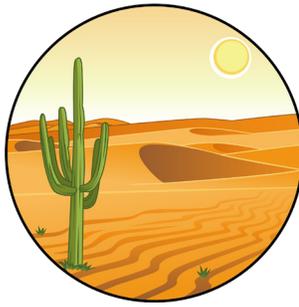
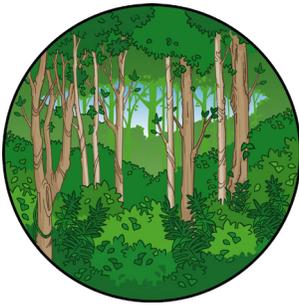
At the grocery store you can find items that were grown on a _____.



You can take all these ingredients home and turn them into a _____.

Soil is a Habitat!

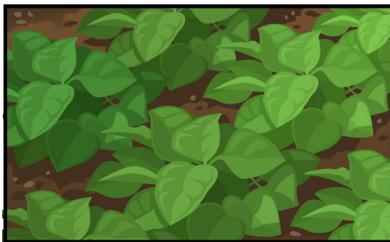
Have you ever thought about habitats? These are places where we can find living and nonliving things interacting. In the United States we have deserts, forests, mountains, prairies and wetlands. Each of these habitats includes unique plants and animals, landforms and, of course, soil! Below are a few different images of habitats and places where humans interact with the environment. What do you think the soil is like in each of these places?



How Do Farmers Help Soils?

Farms and ranches are places where humans interact with the environment. We also depend on farms and ranches for food. Here are some of the ways that farmers work to protect and manage soils to keep them healthy:

1. Planting cover crops. Sounds cozy, right? Cover crops are plants that can protect and put nutrients back into the soil, they aren't grown for food. They can also help slow erosion!



2. Rotating crops. No, it's not a ride at an amusement park! This is when farmers plant different crops on the same patch of land at different times of the year. This keeps soil healthy by ensuring that soils stay nutrient rich, since not all the same nutrients are being used with each crop.

3. Keeping soil intact. Tilling is a process that breaks up the soil to make it easier for crops to grow. But, breaking up soils means that they may be washed away by rain or blown away by the wind. Keeping soil intact by having no till fields keeps soils in place and keeps moisture in the soil.



4. Using buffer zones. A buffer zone is an area of vegetation between fields that are used to grow crops. Sometimes they are also near streams and lakes. These green spaces can keep soils in place and out of bodies of water.

How Would You Be a Soil Health Champion?

The National Association of Conservation Districts recognizes farmers and ranchers from across the nation who work to make sure the soils on their lands are healthy. It's no small task to be a Soil Health Champion! In addition to growing the crops and raising the animals we depend on for food, they also try to maintain a healthy habitat. Meet a few more of these amazing stewards!



Meet the Eriksens!

Located in Eastern Washington State, the Eriksens' farmland is located in an area of the country that receives up to 19 inches of rainfall in fall and winter but is hot and dry in the spring. In their farming practices, they work to decrease the amount of disturbance to the soil so that it can hold more water. The Eriksens also plant a variety of crops and rotate them to maintain soil health. They also work to share what they have learned with other farmers and ranchers to help others learn how they can keep soils healthy.



Meet the Snells!

Earl and Charisee Snell grow watermelons, peanuts, peas, squash, greens, tomatoes, and other vegetables on their small farm in Alabama. They grow their crops in a hoop house, which is similar to a greenhouse. This protects their crops from weather and insects. To ensure that their crops are healthy, the Snells work to make sure their soil is also in good shape. They do this by using compost and rotating different species of plants.



Meet the Bednarskis!

Located in Kentucky, Jon and Sylvia Bednarski have a 2,000 acre farm where they raise grass-fed cattle. Since their farm is located near a tributary of the Ohio river, they work to protect soils from erosion. The Bednarskis planted over 400 trees near the tributary to protect the creek banks and the cattle are fenced out of the creek, pond and wooded areas, to protect the environment. They also use compost on their pastures.

What Ideas Do You Have?

How would you design a farm to keep soils and the environment healthy?

My name is: _____

I live in: _____

On my farm I would grow or raise: _____

My farm is located near (river, urban area, etc.): _____

Draw Your Farm!

Soil Word Search

Find each word in the puzzle and circle it. Words can be found up, down, or in any direction.

T O S S O W T L H T T I W R V
A S K O D J A E W R O C N P C
T T B N I B A P E I P C N I R
I I V N S L A C E D S N S Z O
B U R B T K M T V E O N M Z P
A R T H G I L N U S I L G S S
H F Y C E I D R M R L F N F U
B K V E G E T A B L E S O N Q
F O O D N H T F W V B P C E C
X B L P M G Z K A H V D U F W
L C N D X R N U T R I E N T S
C O W A T O O E E A L F S F X
Y U S S S W T A R D S Q C Z D
S N O Z I R O H M R A F K P J
U C I K H V U T A R V Y Y I W

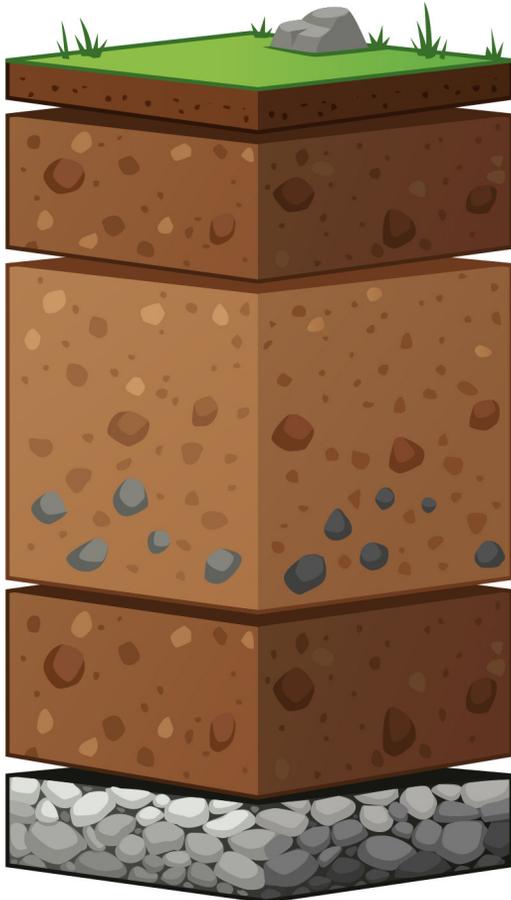
CROPS
DIRT
FARM
FOOD
FRUITS
GROW
HABITAT
HEALTHY
HORIZONS
NUTRIENTS
SOIL
SUNLIGHT
TOPSOIL
VEGETABLES
WATER



Level 3
Grades 4-5

Intro Story

There's a habitat all around us that we don't often think about. It's not above us but right under our feet. It's the soil! Healthy soils are part of a healthy life for humans, plants and animals. Soil plays an important role in energy cycling (think: food chains) and is habitat for many organisms. Humans interact with the soil, especially farmers and ranchers. People often have to design solutions to keep soil healthy and intact. Read on to dig in to soil science and some fun soil facts.



Did You Know?

A quarter of the Earth's species are found in soils! This includes critters like small mammals, worms, fungi, and bacteria. Scientists are still learning about and discovering organisms that live in soil!

We rely on soils for food. In fact, 95% of food production relies on soil!

Soil has multiple layers, or horizons. These include organic material, like decaying leaves, the topsoil, the eluviated horizon, the subsoil, parent material, and bedrock. Food is produced in the topsoil.

Healthy soils can help the environment! Soil that's in good shape can prevent floods and mitigate drought because they store water.

Soil has three main particles: silt, sand and clay. These particles can combine in different ways to form different types of soils.

Many states have a state bird, flower, fossil or rock. But did you know that they can also have a state soil? This can include a soil that is unique or significant to each state.

My State Soil

Using a computer or smart phone, find out what your state soil is!

I live in _____.

My state soil is _____.

A fun fact about this soil is _____.

Meet a Soil Health Champion!

Meet the Sims Family! The Sims have been living on the land for five generations and they currently own and operate the Sims Cattle Company. Their ranch is 26,000 acres and supports 1,000 cows! In addition to cattle, the Sims harvest forage.

When thinking about their ranch, they make sure to keep soils in mind. The Sims work hard to preserve their soil and consider the whole ecosystem, including the water cycle, the mineral cycle, energy flow and community when they make decisions.

Because of their management techniques, they have increased the diversity of plants on their ranch, which has improved soil health and the health of their cattle. Through their dedication, the Sims have improved both their operation and the environment around them.



Energy Moves Through Ecosystems

Every living organism is either a producer or consumer.

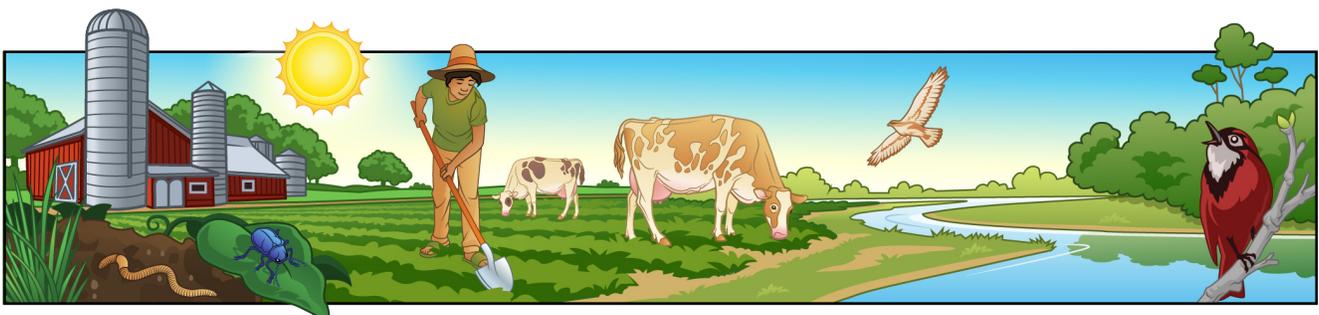
Producers make their own food. They do this by using light energy from the sun, carbon dioxide from the air and water from the soil to produce food.

Can you think of a producer? Draw one below!

Consumers cannot make their own food, so they eat plants and/or animals. There are three types of consumers. Herbivores eat only plants. Carnivores eat only animals. Omnivores eat plants and animals.

Draw a consumer below!

How are producers and consumers connected to each other? Check out this picture below and draw arrows to show how producers and consumers interact with each other and how they transfer energy. Where do you think this energy comes from?



Soils - A Hidden World Beneath Our Feet

Soil forms a complex environment. The component parts of soil are:

Sand: The largest type of soil particle. You can feel individual grains of sand with your fingers and see them with your eyes, but they are still pretty small! An individual sand particle can range from 0.05 to 2.0 mm.

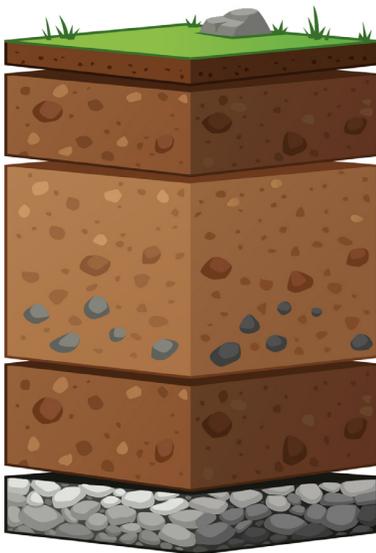
Silt: Time to grab a magnifying glass! You'll need it to identify a silt particle since they are 0.002 and 0.05 mm wide. Silt is fine and feels powdery.

Clay: The smallest particle of them all! Clay particles are less than 0.002 mm in diameter.

Which of these do you think will hold water or nutrients best? Why?

Different soils contain different amounts of sand, silt, and clay. When you hold a handful of soil you can feel its texture. It may be coarse or fine, dry or wet, lumpy or smooth, due to the amount of these particles.

Soil scientists may study the composition of soils or the soil horizons (layers.) See if you can identify each soil horizon.



O (organic) - matter including things like decomposing leaves. Not present in every type of soil.

A (topsoil) - includes minerals and organic matter. Where many plants and organisms are found.

E (eluviated) - mostly sand and silt particles. Found mostly in older soils and forest soils.

B (subsoil) - full of minerals that have moved down from other horizons. Roots from plants can be found into this horizon.

C (parent material) - the deposit at the Earth's surface where the soil developed.

R (bedrock) - mass of rock that forms the parent material of some soils.

Soil is truly a foundation of life on Earth. It's where crops and other plants grow and provides them with nutrients. Soil filters water and air. And, it's home to many organisms. Soils also support roads and buildings. If we take care of the soil it will help take care of us!

How Much Soil Can We Use?

95% of food production depends on the Earth's soils! Soil is an important natural resource and we depend on it, along with other organisms. But, how much soil do we have?

Go ahead and take a guess! What percentage of the Earth can be used for agriculture (growing crops)? :

Let's figure it out!



Here's a delicious pie. It represents the Earth.

$\frac{3}{4}$ of this pie is oceans! These slices have got to go. This leaves $\frac{1}{4}$ a slice of Earth!



$\frac{1}{2}$ of this slice represents deserts, swamps, and regions that are too cold or mountainous to grow crops. We're left with $\frac{1}{8}$ th of the pie.

This slice has to be cut up even more! This slice represents habitable land, where people can live and grow crops. We can cut this into 4 very small slices. One slice represents land developed by people for our homes and infrastructure. One slice is land that is habitable, but may be too wet for food production, it could flood during some seasons. One slice represents places that are too hot to grow crops. Another represents land that is too rocky for food production. So, where can we grow our food?



If you cut off a small piece of crust, about 3% of the total pie, you'll have a representation of the part of Earth where we can produce food. Soil is an important natural resource, just like air and water. How do you think we can protect our soils?

Design Your Farm!

Farmers and ranchers have a limited amount of land to work with, since soils are an important natural resource. If you were a farmer, how would you design your patch of land? Here are a few things to consider:

1. Planting cover crops. Cover crops are plants that can protect and put nutrients back into the soil, they aren't grown for food. They can also help slow erosion!
2. Rotating crops. This is when farmers plant different crops on the same patch of land at different times of the year. This keeps soil healthy by ensuring that soils stay nutrient rich, since not all the same nutrients are being used with each crop.
3. Keeping soil intact. Tilling is a process that breaks up the soil to make it easier for crops to grow. But, breaking up soils means that they may be washed away by rain or blown away by the wind. Keeping soil intact by having no till fields keeps soils in place and keeps moisture in the soil.
4. Using buffer zones. A buffer zone is an area of vegetation between fields that are used to grow crops. Sometimes they are also near streams and lakes. These green spaces can keep soils in place and out of bodies of water.
5. Will your farm have other animals? These might include cows, goats, chickens, ducks or even bees!
6. What's the climate of your region? Do you experience all four seasons or is it more temperate?
7. What kind of structures are on your farm?

Draw your farm and write about why you chose to design it this way!

Word Search, Fill In The Blank & Word Bank

Fill in the blanks in the sentences with words from the Word Bank. Next, find the words in the puzzle and circle them.

Word Bank

SAND	RESOURCES	NUTRIENTS
FARMER	WATER	CROPS
TOPSOIL	COVER	CARNIVORE
FOOD	HERBIVORE	SOIL
RANCHER	CLAY	EROSION
SILT	HORIZONS	OMNIVORE
PRODUCTION	CONSERVATION	ROOTS

D B A N W H D Z D N Q Z O Q H
L M A O P O P L I O S A M D B
F Y S I I R G O P I I R N R R
A G P T T I C R L T P E I P A
R M O C Q Z L T W A C S V L N
M Z R U S O A H E V O O O I C
E C C D T N Y R S R V U R O H
R V W O N S O T M E E R E S E
I Y J R E V O L H S R C D P R
V T V P I O R Y B N T E O O B
T N I B R E K Q R O W S O T X
C L R G T S E U I C L D F C Q
R E I A U P T G H X G N N U S
H U W S N G E R O V I N R A C
R G T N O I S O R E R E R D S

The three parts of soil are _____, _____, and _____.

Plants absorb _____ and other _____ from the _____ through their _____.

_____s and _____s grow crops and raise livestock to provide us with food to eat.

It is important to practice _____ habits to protect our natural _____.

The layers of soils are called _____.

A _____ eats only plants, a _____ eats only animals, and an _____ eats both plants and animals.

_____ includes organic matter and minerals, it's where most plants are found.

95% of _____ depends on Earth's soils.

Farmers may plant _____ to keep soils healthy and prevent _____.

Mad Libs

A Day on the Farm

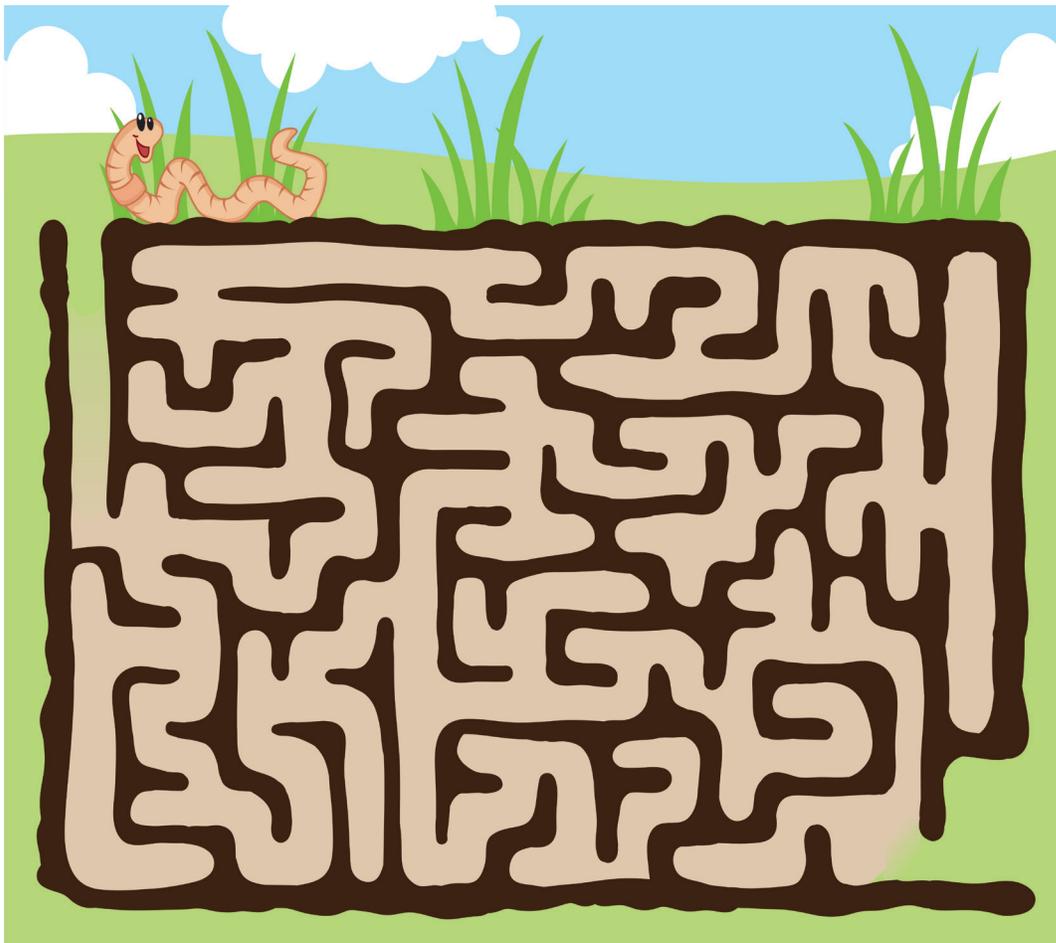
_____ (Name) arrived on the farm for the first day of _____ (plural noun). The day had just begun and they wanted to get as much _____ (verb) done before the _____ (noun) got too _____ (adjective) for _____ (verb, -ing).

They started the difficult task of _____ (verb, -ing) but then heard the _____ (noun) calling _____ (adjective) from the barn. It turns out that _____ (Name) needed a _____ (verb) to help them with planting because the soil was too _____ (adjective.)

Working together, they _____ (verb) and _____ (verb) until the sun went down and the _____ (noun) went up. They were so _____ (adjective) after a long day of work that they _____ (adverb) went home to eat.

The next day, to their _____ (adjective) the _____ (noun) had already started to grow! The soil must have had so much _____ (noun)! They knew exactly what they had to do!

They harvested their _____ (adjective) crop and headed to market to sell them for _____ (number amount). The people at the market _____ (adverb) bought their whole harvest! The farmers went back to their _____ (plural noun) hoping they could do it all again the next day.

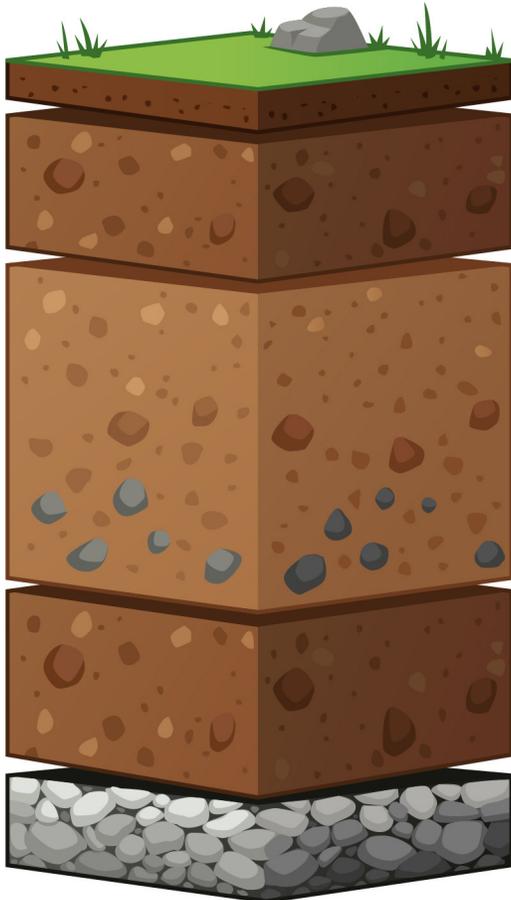




Level 4
Grades 6-8

Intro Story

Do you know what a natural resource is? Some things may come to mind like water, trees, fossil fuels and air. But there's another natural resource that we don't often think about - it's soil! Soil is the upper layer of the Earth, where plants grow and where billions of organisms are found. Farmers and ranchers depend on healthy soil to grow crops and raise livestock so we can lead healthy lives. Soil scientists study the soil to understand more about its characteristics, how soil stores nutrients, and more. Read on to learn more about how we are all connected to the soil.



Did You Know?

Soils may seem sterile but they are actually teeming with life! A teaspoon of soil can actually contain more microorganisms than there are people on Earth.

Fertile soil is important to food production and life on Earth, but this resource can take a long time to form. It can take up to 1,000 years for a half-inch of topsoil to form.

Soil has three main particles: silt, sand and clay. Each has its own unique characteristics and these particles can combine in different ways to form different types of soils. A gram of coarse sand can contain about 1,000 particles, but a gram of clay contains about 90 billion particles!

Soil that contains equal parts of sand, silt and clay is called loam.

Soils have structure! A handful of healthy soil will remain intact, even when placed in water. This is called a slake test and farmers or soil scientists may use this technique to learn more about the health of soil.

Every place has a unique type of soil. In your state there may be multiple soil types!

Keep on Discovering!

What is something that you'd like to learn about soils? Jot down your question here.

Meet a Soil Health Champion!

Meet Kirsten Holland Robertson! On the Pecan Dale Farmstead in Pelzer, South Carolina, Kristen and her husband Jonn farm sheep for meat, goats for milk and chickens for eggs. Their farmstead includes a pecan orchard and 300 native fruit and nut trees.

Since incorporating soil health practices into their operation, Robertson says the biggest change she has experienced is that farming has now become a joy. She had become so frustrated with the endless mud, deworming activities, filthy animals and barnyard smells that she was about ready to sell the farm. Now, the Robertsons use practices like planting cover crops, adding perennials to increase soil fungi, and pollinator plots under their pecan trees.

“Moving the animals is the best part of the day for me now,” Robertson said. The mud is completely gone, they no longer have to deworm, and the wildlife on the farm has expanded unbelievably because of their new soil health management system. Through this journey, Robertson has made hundreds of new friends and has found the journey to healthy soil to be, what she considers, the most fulfilling challenge she’s ever accepted.



Soil Science - Dig in to this STEM Career!

Do you like science? What about being outside and exploring the environment? Becoming a soil scientist might be the career for you! Soil science is the study of soils as a natural resource. This includes understanding soil formation, classification, and mapping; learning about the unique properties of soil including their physical, chemical and biological properties and how fertile they are; and understanding how soil can be managed based on these characteristics.

There are a variety of careers in soil science and many of them intersect with agriculture. Soil scientists may work for a university, state and federal agencies, or in the private sector. People who become soil scientists usually have at least a bachelor degree in Soil Science or Environmental Soil Science.

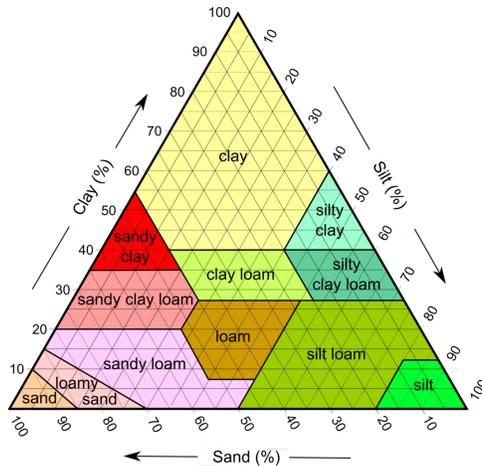
You might be interested in becoming a soil scientist if you:

- Have a passion for science and STEM
- Like to communicate what you know to help people make sound decisions about the environment
- Enjoy solving problems and designing solutions related to agriculture and the environment
- Like spending time in and working outdoors
- Have curiosity about ecosystems and how humans interact with the land

Soil Sleuths

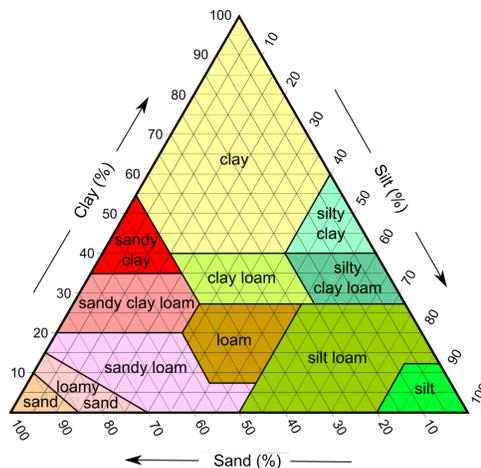
Soils are a natural resource and form a unique ecosystem. Soil consists of sand, silt and clay and the different amounts of these soil particles form different soil types. But how can we figure out the type of soil that's around us?

We can determine the type of soil by measuring the different amount of each particle present. Soil scientists and farmers may use a tool called a soil texture triangle to identify a soil type. The soil texture triangle looks like this:



There are 12 different soil categories, including clay, sandy clay, silty clay, sandy clay loam, clay loam, silty clay loam, sand, loamy sand, sandy loam, medium loam, silt and silty loam. Which one do you think can support the most life, or grow the most crops?

To determine the soil type, you can measure the percentage of each particle and use the soil texture triangle to figure out how it's classified. Let's say you have a sample with 60% sand, 30% clay and 10% silt. Starting with sand, find the 70 on the bottom of the triangle. You can draw a line here:



Then, find the percentage of clay. Draw another line at 20, for the 20% clay found in this sample.

Where the lines intersect, this will indicate the percent silt. In this case, it's 10%. This intersection also indicates the soil type. Here, the soil sample is sandy clay loam.

You can practice being a soil sleuth! Below is information for a few different samples and a table of soil texture properties. Use the numbers to determine the type of soil texture and figure out what makes it unique. Do you think you can grow crops in this type of soil?

Sample	% Sand	% Silt	% Clay	Texture Name	Properties	Could I grow crops or plants in this soil? Why?
A	75	10	25			
B	10	80	10			
C	40	30	30			
D	20	60	20			
E	45	45	10			

Soil Texture	Can Hold Nutrients	Water Can Filter Through	Water Retention	Soil Contains Air	Soil is Easy to Work
Clay	Good	Poor	Good	Poor	Poor
Silt	Medium	Medium	Medium	Medium	Medium
Sand	Poor	Good	Poor	Good	Good
Loam	Medium	Medium	Medium	Medium	Medium

Soil is a Natural Resource

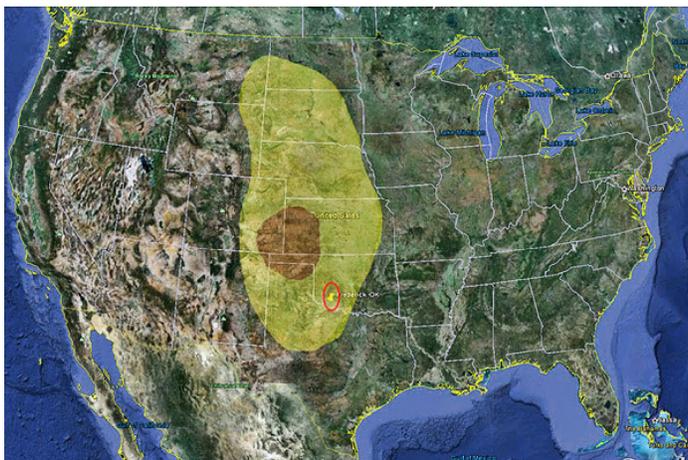
Farmers depend on healthy soils.

Our food supply depends upon our ecosystems, and every ecosystem has a carrying capacity. Some of the components of an ecosystem that affect the organisms living within it are the amount of living space, the supply of nutrients, the absence or presence of predators and the number of competing organisms. Farmers can modify an ecosystem with fertilizers and pesticides to increase the carrying capacity for crops (like corn or oranges) and decrease the carrying capacity for competing organisms (like weeds or beetles.) What does this mean for us? More food is available because of an increase in crop yields!

How can we keep soils healthy?

There are a number of things that farmers, and even people like you, can do to keep soils healthy. See if you can unscramble these words and match them to their definition.

RUNEITTNS	Managing nitrogen and phosphorous is important for soil health. This can be done by adding fertilizer or organic material.
TARTEO	Moving crops around can improve crop health and reduce excess nutrients.
BIAHATT	Providing places for beneficial organisms to live can reduce pests and create a healthier ecosystem.
STIPCDIEES	Mitigating this can keep soils in place so they don't erode.
OVREC	Reducing this can keep soils aerated, providing more space for water filtration and drainage.
GRAINCO TAMRET	Using these sparingly or only when necessary can help beneficial insects thrive.
PCAMCTOINO	Planting these types of crops can help prevent erosion.
SRBCAENUTIDS	Adding this material can be important to crop health. Crops can produce this, or it can be added.



In the 1930's, sections of the Great Plains, including Colorado, Kansas, Texas, Oklahoma and New Mexico became what was called the Dust Bowl. These areas were used to raise livestock but were then plowed to grow wheat. After years of over cultivation and poor management, followed by a drought, the soils became unhealthy and dry. This soil, unprotected by cover crops, was blown by spring winds, creating dust storms. Some of these storms blew across the country! In addition to creating poor conditions and impacting crop production, many families were displaced. We can look back at this time in history to understand why managing our soils and farmlands is so important to creating a healthy life for all people and organisms.