Kansas Apple Earth - Soil Under Your Feet

Suggested Grade Level: K-2

Time: 45 minutes

Subject: Science, English Language Arts

Overview: Students will watch an "Apple Land Use Model" demonstration and the division of an apple into the parts of the earth's surface to learn about the limited natural resource of topsoil available for growing all the food, fiber, and lumber for our ever-growing earth population. Through listening, observing, writing, and speaking, students will study the surface of the earth and the available land for agricultural use.

Objectives:
1. List the parts of the Earth's surface
2. Describe topsoil
3. Identify types of land
4. Tell a story about land use

Background Information :

Earth, the blue planet as observed from space, is almost three-quarters (¾ - 75%) water and one-quarter (¼ - 25%) land. The land area includes mountains, deserts, snow- and ice-covered polar regions, wetlands, forests, grasslands, and farmlands. These water and land areas are essential to the plants, animals, and microorganisms making up the global ecosystems. Not all land is created equal. Polar regions, deserts, salt flats, and exposed rock comprise one-third of the global land area. These areas are considered inhospitable and unsuitable for people to live or produce food. Two-thirds of our land is habitable. This land is located in climates where people can live and where they produce food. Half of the world's habitable land is covered in houses, cities, roads, and other developments. The remaining half of all habitable land is used for agriculture (Ritchie & Roser). So, only a tiny fraction of the total land area has the quality of topsoil, topography, available water, and length of growing season to permit cultivation.

Cultivated land areas provide the bulk of the world's food and fiber for humans. Whether the land is producing food crops, grazing livestock, or producing crops for livestock feed, it must have fertile topsoil. Agriculture depends on good soil. Fertile topsoil produces the highest yields of food per acre. While the world population is growing, the size of our Earth and the natural resources that provide for our needs are not. Farmers work hard to protect their soil. However, erosion and other forms of soil loss can be complicated and expensive to address.

To further examine agricultural land use, 25% of agricultural land is used to produce food crops for direct human consumption. This land use includes the production of fruits, vegetables, beans, rice, grains, etc. The remaining 75% of agricultural land is used to feed livestock such as cattle, pigs, poultry, sheep, and goats. Livestock are raised throughout the world for meat, milk, and eggs. Livestock land use includes range and pasturelands used for grazing and croplands used to grow grain commodities fed to livestock (rather than people). Grain-based feeds are fed to beef cattle in the feedlot, dairy cattle during milk production, and poultry and pigs that convert their feed into other protein-based foods for humans.

Kansas Connections:

Kansas Land

"Kansas is the 15th largest state in the U.S., measuring 82,278 square miles, 213,099 square kilometers" (Amend). "The total Kansas land area in 2016 was 52,659,200 acres" (Farmland). "There are 45,759,319 acres of farmland in Kansas, which accounts for 87.5 percent of all Kansas land" (Kansas).

Kansas Economy

"Agriculture is the largest economic driver in Kansas, with a total contribution of $81 billion to the Kansas economy. The agriculture sector in Kansas supports more than 253,000 jobs through direct, indirect, and induced effect careers or about 13% percent of the entire workforce in the state" (Kansas).

Kansas Agriculture Production

The top five agricultural products grown or raised in Kansas include:

- Cattle and Calves
- Wheat
- Corn
- Sorghum
- Soybeans

Kansas Specialty Crop - Apples

- Kansas is not a leading producer of apples. The state does not produce enough to be recognized individually for apple production; however, apples are one of the most reliable fruit trees that can be grown in Kansas, and production is increasing (USDA).
- There are several (at least 7) apple orchards in the state, including 86th St. Orchard in Topeka; Cider Hill Family Orchard in Kansas City; Pome On the Range Orchards & Winery in Williamsburg; Sunflower Orchards in Paola; The Orchard in Emporia, KS; Wagon Wheel Orchard in Gardner, KS; and South Baldwin Farms in Douglas County. According to Kansas State University, the Delicious Golden, Granny Smith, Jonagold, Delicious, Jonathan, Empire, and Gala are the apple varieties that grow well in Kansas. Some of these orchards

are called "U pick orchards" and allow people to come to pick fresh fruit directly from the trees.

Materials:
Demonstration
- Apple Land Use Model provided in Lesson Kit

Additional Materials for Live Apple Demonstration
- One Large Apple
- Pairing knife to cut the apple
- Cutting board or plate for a surface to cut the apple
- Paper towels or wet wipes

Activity (per student)
- "Slicing up the Earth's Resources" worksheet found at the end of this lesson for each student
- "Soil Under Your Feet" worksheet found at the end of the lesson or each student
- writing utensil
- Scissors
- Glue to secure pictures to a paper in story order

Instructional Format:
1. Review background information.
2. Conduct engagement exercises.
3. Follow the procedures to conduct the demonstration for students.
4. Lead a class discussion.
5. Complete the activity.
6. Conduct assessment exercise.

Engagement:
Introduction: Ask students, "Do you know what soil is? Do you know what soil is made of?" Let's explore…

Watch the video,

▶ Where Does Soil Come From? https://www.youtube.com/watch?v=5b9o7yM7YGE

Discussion Questions:
1. Ask students, "What is a natural resource?" Allow students time to answer the question. Build upon their answers to teach or clarify that natural resources are substances that occur in nature. Give examples of natural resources such as minerals in the ground, forests, water, and fertile land and soil.
2. Ask students, "Where does our food come from?" If needed, give specific examples of food such as an apple, lettuce, corn, etc. Point out that each of these foods grows from plants in the soil.
3. Ask students, "Is soil a natural resource?" *(Yes)*

Introduce the demonstration activity by letting students know that they will learn about the earth's surface and the importance of soil as a natural resource to grow our food.

Procedures:
Demonstration
"Comparing Apples and the Earth": Instructional Video on YouTube
▶ Comparing Apples and...Earth?

1. Hold up the Apple Land Use Model. "This Apple Model represents the planet Earth." Hold up an apple to the class. This apple can also represent the earth.

2. Remove and hold up piece #1 of the Apple Model, that is ¾ piece of the top layer of the model. "Nearly three-quarters of the Earth is covered in water." Slice the apple into fourths. Set aside three of the quarters, as they represent water on the Earth's surface.

3. Point to the remaining ¼ of the apple. "The remaining quarter represents the land area or the area of the earth that is land." Show students the slice of the quartered apple for comparison.

4. Remove and hold up piece #2 of the Apple Model. "This section represents inhospitable land including deserts, mountains, and polar regions that are unsuitable for people to live or grow crops." Cut the quarter apple slice into three sections. Set aside one of the sections to represent the inhospitable or uninhabited land.

5. Remove and hold up piece #3. "This section represents habitable land. People live on this land, but crops are not grown here as this land includes nature preserves, public lands, and developed areas like roads, schools, houses, etc. Explain to students that the two pieces of apple represent habitable land. Set aside another section to represent habitable land where people live but crops are not grown.

6. Remove and hold up piece #4. "A tiny portion of the Earth's surface has the potential to grow crops. This section of the model represents arable land." Cut the remaining small piece of apple into four pieces. Set aside three pieces and explain that they represent land used for livestock to graze or produce forages for livestock feed.

7. The remaining piece of apple is 1/48th of the Earth used to produce human food. Carefully peel this section. Hold up the peel and explain that it represents the thin layer of topsoil available for producing all of the world's food crops upon which humans depend.
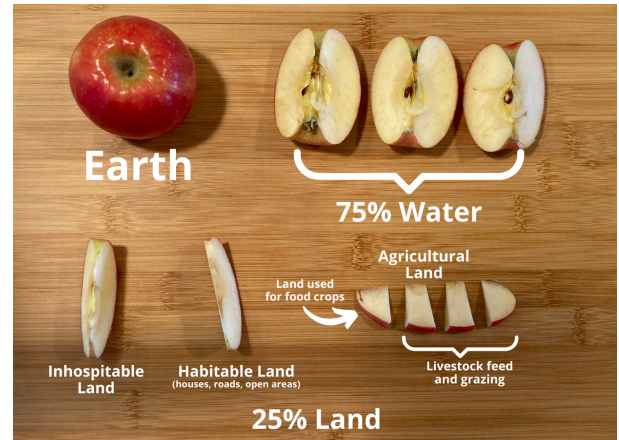
Discussion:

Project the Slicing up Earth's Land Resources slide deck/power point.

Slicing Up Earth's Land Resources

Lead a classroom discussion using the slides and the following questions to help students prepare to write one sentence that they learned about the earth's surface and land use:

- Slide 2. What kind of land can be used to grow my food? Does the land for food need topsoil?
- Slide 3. How much of Earth's surface is covered with water? Does this surface have topsoil?
- Slide 4. How much of Earth's surface is land? Does all of this land have topsoil that can be used for cultivation or agriculture?
- Slide 5. Can All land on Earth be used to produce my food?
- Slide 6. Some land is inhospitable. Can it be cultivated?
- Slide 7. Some land is habitable. Is it all used for agriculture?
- Slide 8. What are some ways we use habitable land? What kind of land does the world population live on?
- Slide 9. What is agricultural land?
- Slide 10. How do we use land for livestock? Is this agricultural land?
- Slides 11 & 12. What food do we use from livestock?
- Slide 13. What are some examples of food that is grown on agricultural land?
- Slide 14. How much of the earth is topsoil?
  What is topsoil?
  Why do we protect natural resources?

Activity:

1. Post or project the vocabulary words.
2. Read through the vocabulary words.
3. Allow students time to discuss their learning from the demonstration with a partner using their "Soil Under Your Feet" worksheets and vocabulary words

Vocabulary:
- **earth**: Our home planet is a round rocky body that spins in space and travels around the sun. It is the only planet in the solar system with water on its surface, oxygen in its air, and moderate temperatures that allow life.
- **nonrenewable resource:** A limited natural resource that cannot be replaced or reproduced within a generation and cannot be managed for renewal; examples include oil, soil, and mineral resources (lead, iron, cobalt, zinc, etc.)

- **Cultivation:** The act of preparing the land and growing crops on it.
- **agriculture:** The practice of farming or cultivating the soil for growing crops and raising animals to provide food and non-food products such as wool and fuel.
- **Topsoil:** The upper, outermost layer of soil.
- **world Population:** the total number of humans currently living on earth.
- **value:** usefulness or importance of something; also, the amount of money that something is worth

Assessment:

1. On the "Soil Under Your Feet" worksheet, have students color the pictures, label them, and cut them out. Provide the label words: Road, Field, Water, Mountains, Houses, Animals.
2. Have students arrange the pictures into a story about land use and glue them to another sheet of paper, creating a storyboard.
3. Ask students to tell their stories to a partner, a group, or the class.

Kansas Curricular Standards:
Next Generation Science Standards
Kindergarten
K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive.
K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.] K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
Science and Engineering Practices
Developing and Using Models Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. Use a model to represent relationships in the natural world. (K-ESS3-1)
ESS3.A: Natural Resources Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)
Analyzing and Interpreting Data
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations. Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1)

Engaging in Argument from Evidence
Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s). Construct an argument with evidence to support a claim. (K-ESS2-2)
Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information. Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. (K-ESS3-3)

Disciplinary Core Ideas
ESS3.A: Natural Resources Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)
ESS3.C: Human Impacts on Earth Systems Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (secondary to K-ESS2-2),(K-ESS3-3) ETS1.B: Developing Possible Solutions Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary to K-ESS3-3)
Cross Cutting Concepts
Cause and Effect Events have causes that generate observable patterns. (K-ESS3-3)
Systems and System Models Systems in the natural and designed world have parts that work together. (K-ESS2-2),(K-ESS3-1)

1st Grade
Science and Engineering Practices Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
● Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (1-LS3-1)
● Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1)
Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K– 2 builds on prior experiences and uses observations and texts to communicate new information.
● Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)
Crosscutting Concepts Patterns Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-LS1-2),(1-LS3- 1)

2nd Grade
2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.
Science and Engineering Practices
Developing and Using Models Modeling in K–2 builds on prior experiences and progresses to include using and developing models.
Develop a model to represent patterns in the natural world. (2-ESS2-2)
Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.
Disciplinary Core Ideas
ESS1.C: The History of Planet Earth
● Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)
ESS2.A: Earth Materials and Systems Wind and water can change the shape of the land. (2- ESS2-1)
ESS2.B: Plate Tectonics and Large-Scale System Interactions Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2- 2)
ESS2.C: The Roles of Water in Earth's Surface Processes Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)

Crosscutting Concepts
Patterns
  ● Patterns in the natural world can be observed. (2-ESS2-2),(2-ESS2-3)
Stability and Change
  ● Things may change slowly or rapidly. (2- ESS1-1),(2-ESS2-1)

Language Arts
Kindergarten:
W.K.7 Participate in shared research and writing projects
W.K.10 Demonstrate command of the conventions of standards English grammar and usage when writing.
SL.K.1 Participate in collaborative conversations with diverse partners about Kindergarten topics and texts with peers and adults in small and larger groups.
Presentation of Knowledge and Ideas
SL.K.4 Use details to describe familiar people, places, things, or events with prompting and support.
SL.K.5 Add drawings or other visual displays to descriptions as desired to provide additional detail.
SL.K.6 Speak with appropriate volume, enunciation, and rate, or order to express thoughts, feelings, and ideas clearly.
SL.K.7.e Produce and expand complete sentences in shared language activities.
First Grade:
W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
W.1.5 With guidance and support from adults, focus on a topic, respond to questions and suggestions from peers, and add details to strengthen writing as needed.
Language in Writing
W.1.10 Demonstrate command of the conventions of standard English grammar and usage when writing.
W.1.11 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
Comprehension and Collaboration
SL.1.1 Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and large groups.
SL.1.2 Ask and answer questions about key details in a text read aloud or information presented orally or through other media.
SL.1.3 Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.
Language in Speaking and Listening
SL.1.7 Demonstrate command of the conventions of standard English grammar and usage when speaking.

2nd Grade:
W.2.2 Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.
Production and Distribution of Writing
W.2.5 With guidance and support from adults and peers, focus on a topic and strengthen writing as needed by revising and editing.
Research to Build and Present Knowledge
W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).
Language in Writing
W.2.10 Demonstrate command of the conventions of standard English grammar and usage when writing
W.2.11 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
Comprehension and Collaboration

SL.2.1 Participate in collaborative conversations with diverse partners about grade 2 and texts with peers and adults in small and larger groups.
SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.
SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.
Presentation of Knowledge and Ideas
SL.2.6 Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification while demonstrating proper usage of English grammar.
Language in Speaking and Listening
SL.2.7 Demonstrate command of the conventions of standard English grammar and usage when speaking.
SL.2.8 Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using adjectives and adverbs to describe.

National Ag Literacy Outcomes:
Agriculture and the Environment
- Describe the importance of soil and water in raising crops and livestock (T1.K-2.b)
- Identify natural resources (T1.K-2.c)

Plants and Animals for Food, Fiber & Energy

- Identify the importance of natural resources (e.g., sun, soil, water, minerals) in farming (T2.K-2.e)

Companion Resources: (supplemental documents)
Apple Earth, YouTube https://www.youtube.com/watch?v=v9WXCAwk4_c

▶ Soil Is Alive! | SciShow Kids YouTube,
https://www.youtube.com/watch?v=Q-J2FErZHuA&t=270s

Work Sheet "What's Soil Made Of?"
https://cdn.agclassroom.org/media/uploads/2015/09/03/Whats_Soil_Made_Of.pdf

Lesson plan https://populationeducation.org/video-transcript/earth-the-apple-of-our-eye/

Activity Reader available for free by request for the Nutrients for Life Foundation
https://app.etapestry.com/cart/NutrientsforLifeFoundation/default/item.php?ref=1020.0.1584135
5

Slicing Up Earth's Land Resources Slide Deck/Powerpoint

KFAC Topsoil in Our Food System poster

Author:
Adapted by Nancy Zenger-Beneda from the NAITCO lesson plan "The Soil We Grow In." by Debra Spielmaker and Andrea Gardner. https://agclassroom.org/matrix/lesson/301/

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Name:_____

Soil Under Your Feet

Label each image and color each picture!

KFAC