Kansas Apple Earth - Soil's Value

Suggested Grade Level: 3rd-5th grades

Time: 1 hour

Subject: Earth Science, Math, 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. Students will model the demonstration using a ball of playdough. Through listening, observing, calculating values, and writing, 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. Explain land use
3. Use math to calculate topsoil loss
4. Describe the value of topsoil

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 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. Why is there an uneven distribution of agricultural land devoted to foods for direct human consumption compared to the land devoted to feeding livestock? To explore this distribution topic, we must first understand that cattle, sheep, and goats are ruminants. They have unique digestive systems that allow them to digest and gain nutrients from grasses and other forages that humans (and most other animals) cannot. 86% of global livestock feed intake in dry matter consists of feed materials that are not edible for humans (Mottet et al.). Grazing animals can convert many otherwise unusable plants and by-products to quality protein. Grazing is especially vital in arid regions of the world where water is insufficient for the growth of other crops (Livestock). These marginal lands can be considered low value due to poor soil, steep terrain, low water availability, or other undesirable characteristics.

There are many factors to consider when determining how land can be used. Climate, topography, and available natural resources are a few. One natural resource critical to agricultural land use is **topsoil—**the upper, outermost layer of soil. 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. Farmers will work hard to protect their soil. However, erosion and other forms of soil loss can be complicated and expensive to address.

Soil comprises both living (biotic) and nonliving (abiotic) elements. Soil contains air, water, minerals, and plant and animal matter. The disintegrating of rock forms soil under the influence of climate. Events such as temperature fluctuations (freezing and thawing) contribute to rock weathering into the substance we recognize as soil. Organic matter such as leaves, dead plant material, and decaying organisms contribute to the biotic components of soil.

It can take 100 to 500 years to make one inch of topsoil. From the perspective of a human lifetime, soil is a nonrenewable resource. In the United States, cropland erosion decreased by more than 40% between 1982 and 2007. During this time, more and more farmers implemented conservation practices like strip cropping, contour planting, conservation tillage, and planting cover crops to help mitigate wind and water erosion. Erosion has slowed over the past 30 years, but we are still losing millions of tons of topsoil each year at a rate much faster than the natural replenishment rate.

Erosion reduces agricultural productivity and washes sediment into rivers, lakes, ocean gulfs, and bays, affecting fisheries and recreation opportunities in these water bodies. Soil loss affects our country's economy and our lives. Soils produce our food, keeping us alive. How do we put a value on soil or land? Many would say it is invaluable, but farmers must make economic decisions about the soil daily. They cannot spend more to protect the soil than they earn from selling their crops, or they will go out of business. Yet, if farmers don't protect the soil, many years of erosion could destroy the productivity of our valuable agricultural soils. The field of sustainable agriculture evaluates problems like this and looks for solutions. Agricultural scientists, policymakers, engineers, and many others are working to help farmers develop economically viable techniques, produce the food we need, and protect natural resources like soil and water over the long term.

Agriculture is an integral part of the economy of the United States. In 2020, 19.7 million full- and part-time jobs were related to the agricultural and food sectors—10.3 percent of the total U.S. employment (USDA). Agricultural exports translated into billions of dollars for United States trade. On poor soil, it costs farmers more to produce good crops; the higher cost is passed on to the consumer—you—in higher prices at the grocery store. Erosion reduces agricultural productivity and washes sediment into rivers, lakes, ocean gulfs, and bays, affecting fisheries and recreation opportunities in these water bodies. Soil loss affects our country's economy and our lives.

Kansas Connections:

Kansas Land

"The state is known for its vast plains, but it isn't all flatlands. Gentle hills with pastures and forests can be found in the northeast. This area is called the Dissected Till Plains. The land was cut (or dissected) into hills and valleys by moving glaciers and wind over 400,000 years ago." The Southern Plains include the "Osage Plains, composed of eroded shale and limestone, and the Flint Hills, whose flint ridges stick up because flint doesn't erode (or break down) as other rocks and soil do. Kansas' western half is covered by the Great Plains, which rise in elevation as you continue west toward the Rocky Mountains. Near the Colorado border is Mount Sunflower, the state's highest point" (Kiffel-Alcheh).

"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

Play Dough Exercise (the demonstration can be done without students using play dough)

- Small containers of play dough, one for each student
- Plastic knives to cut the playdough - one for each student

Activity

“The Value of Soil” worksheet found at the end of this lesson, one per student

Optional Activity

Ag Today titled *Our Invaluable Natural Resources, digital copy available on the National Ag in the Classroom website.*

Assessment

“Slicing up the Earth’s Land Resources” Activity Sheet found at the end of this lesson- one for each student

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:

1. Ask the students to think about an item that is valuable to them. Ask them to answer the following questions to themselves:
    - Was your item expensive to buy?
    - Can it be easily replaced?
    - Does it perform a function that has value?
    - Could another item perform the same function?
2. Next, ask students if they believe that soil is valuable. Discuss why or why not.
3. Watch this YouTube video:
   Save Soil | Why Soil Is Important | The Planet Voice
   https://www.youtube.com/watch?v=XfqaJqm5nCk
4. Follow up with a guided class discussion to help students begin to understand that soil is a valuable natural resource.
5. Inform students that they will be exploring why soil is valuable.

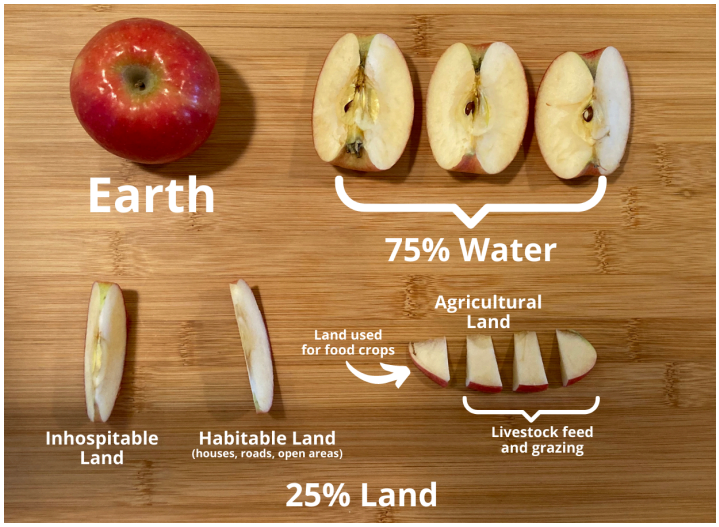
Introduce the demonstration activity by letting students know that they will learn about the earth's surface and the importance of soil as a natural resource to grow our food.

Procedures:

Demonstration

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. Ask each student to roll their play dough into the shape of an apple.



2. Remove and hold up piece #1 of the apple model, that is, ¾ 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. Ask students to use a plastic knife to cut their play dough into four pieces and set three of the pieces aside.
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 and ask students to compare the one piece of play dough to the three pieces they set aside.
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 land. Ask students to cut one piece of their play dough into three sections and set one of the pieces aside to represent inhospitable land.
5. Remove and hold up piece #3 of the apple model. "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 and their two pieces of play dough 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, this piece of apple, and your small piece of play dough represent arable land.” Cut the remaining small piece of apple into four pieces. Explain that three pieces represent land used for livestock to graze or produce forages for livestock feed. Set aside the three pieces, ask students to cut their one piece of play dough into four pieces, and set three aside representing the agricultural land used for livestock.
7. The remaining piece of apple or play dough is 1/48th of the Earth used to produce human food. Peel the remaining piece of apple and explain to students that the small piece of apple peel represents the topsoil used to grow all human food.
8. Ask students to roll up all of the pieces of play dough they have cut away and compare the size of the play dough they set aside, which represents land not used for food production, to the small amount that represents the amount of the earth used to produce food.

Discussion:

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

Slicing Up Earth's Land Resources

Lead a class discussion using the slides.

- Slide 2. What land can be used to grow my food?

- Slide 3. How much of Earth's surface is covered with water?
- Slide 4. How much of Earth's surface is land?
- Slide 5. Can All land on Earth be used to produce my food?
- Slide 6. Some land is inhospitable. What does that mean? What are some examples of inhospitable land?
- Slide 7. Some land is habitable. What does that mean?
- Slide 8. What are some examples of habitable land used outside of food production?
- Slide 9. How much of the Earth is used for agricultural land? What impacts the potential of agricultural land? What is agricultural land used for?
- Slide 10. How is land used for livestock?
- Slides 11 & 12. Why do we use land for livestock?
- Slide 13. What are some examples of food that is grown on agricultural land?
- Slide 14. How much of the earth is used to grow food for people?

Follow-up questions:

Is soil important? Why?

What is the value of soil?

Why do we protect natural resources?

Activity

Remind the students that almost all of our food is produced on a small portion of Earth. Ask, "What non-renewable natural resource covers the surface of agricultural land?" (topsoil) Show students the apple peel that represents the topsoil.

Facts to remember:

- Topsoil makes agricultural land valuable and capable of growing crops or supporting livestock for our food.
- Crops grow best in fertile topsoil.
- Soil is a nonrenewable resource because it can take 100 to 500 years to make one inch of new topsoil.
- It is important to protect topsoil. Farmers use conservation practices to protect topsoil from erosion.

Use the worksheet "The Value of Topsoil" to complete story problems related to the value of topsoil.

Optional Additional Activity:

Read Issue 3 of Ag Today titled *Our Invaluable Natural Resources.* This reading will help students understand how plants and animals raised on farms depend on natural resources to live, such as the sun, soil, water, and air, to grow. Learn

methods farmers use to protect and preserve these natural resources while still providing the food, fiber, and fuel we need to live.

Vocabulary:

- **global:** relating to the whole earth; worldwide.
- **ecosystems:** an interconnected system such as a biological community of interacting organisms and their physical environment
- **inhospitable:** an environment that is harsh and difficult to live in
- **habitable:** an environment good enough to live in
- **climate:** the long-term weather pattern in a region
- **agriculture:** the science or practice of farming, including cultivation of the soil to grow crops and the rearing of animals to provide food, fiber, and fuel.
- **erosion:** the gradual destruction of soil by wind, water, or other natural agents
- **poor soil:** soil that contains low nutrients and has low fertility
- **conservation:** prevention of the waterful use of a resource
- **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.)
- **sustainable agriculture:** an approach to agriculture that focuses on producing food while improving the economic viability of farms, protecting natural resources, and enhancing quality of life for farmers and society as a whole

Assessment:

Have students complete the “Slicing up the Earth’s Land Resources” worksheet.

Additional assessment:

Post or project the vocabulary words. Have students complete a journal entry by writing a short answer to the following questions using as many vocabulary words as possible.

- Since soil provides our food, how can we really place a value on it?
- What conservation practices help preserve the land and topsoil?

Kansas Curricular Standards:

Next Generation Science Standards

3rd grade

3-LS4-3. Construct an argument with evidence that in a particular habitat, some organisms can survive well, some survive less well, and some cannot survive at all. 3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.* 3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Disciplinary Core Ideas

LS2.C: Ecosystem Dynamics, Functioning, and Resilience When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (secondary to 3-LS4-4)

Crosscurring Concepts

Cause and Effect Cause and effect relationships are routinely identified and used to explain change. (3-LS2- 1),(3-LS4-3)

4th grade
4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.
4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. Disciplinary Core Ideas
ESS1.C: The History of Planet Earth Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)
ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)
ESS2.B: Plate Tectonics and Large-Scale System Interactions The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2)
ESS2.E: Biogeology Living things affect the physical characteristics of their regions. (4- ESS2-1)

5th grade
5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.
Disciplinary Core Ideas
LS2.A: Interdependent Relationships in Ecosystems The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
Science and Engineering Practices
Using Mathematics and Computational Thinking Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)
Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in 3– 5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1)
Disiplinary Core Ideas
ESS3.C: Human Impacts on Earth Systems Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

Math

3rd Grade

Represent and solve problems involving multiplication and division. (Counting and Cardinality and Operations and Algebraic Thinking Progression K-5 Pg. 22)
3.OA.1. Interpret products of whole numbers,
3.OA.2. Interpret whole-number quotients of whole numbers,
3.OA.3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities,
3.OA.4. Determine the unknown whole number in a multiplication or division equation by using related equations.

4th Grade

4.OA.1. Interpret a multiplication equation as a comparison,
4.OA.2. Multiply or divide to solve word problems involving multiplicative comparison,

5th grade

5.NF.6. Solve real world problems involving multiplication of fractions and mixed numbers,

English and Language Arts

3rd Grade

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.
RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.
RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text.
RI.3.8 Describe the logical connection between particular sentences and paragraphs in a text.
RI.3.10 Use knowledge of language and its conventions when reading.
RI.3.11 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 3 reading and content, choosing flexibly from a range of strategies.
RI.3.13 Read and comprehend high quality informational text of appropriate quantitative and qualitative complexity for Grade 3.
W.3.10 Demonstrate knowledge of language and command of the conventions of standard English grammar and usage when writing.

4th Grade

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
RI.4.2 Determine the main idea of a text and explain how it is supported by key details; summarize the text.
RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
RI.4.13 Read and comprehend high quality informational text of appropriate quantitative and qualitative complexity for Grade 4.
W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
W.4.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
W.4.10 Demonstrate command of and use knowledge of the conventions of standard English grammar and usage when writing.
W. 4. 11 Demonstrate command and the conventions of standard English Capitalization punctuation, and spelling when writing.
SL.4.3 Identify the reasons and evidence a speaker provides to support particular points.
RF.4.3 Know and apply grade-level phonics and word analysis skills in decoding words. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read unfamiliar multisyllabic words accurately in context and out of context.
RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
RI.4.5 Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.
RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, timelines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

5th Grade
W.5.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
W.5.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.
W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work; and provide a list of sources.
W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research
W.5.10 Demonstrate command of the conventions of standard English grammar and usage when writing.
W.5.11 Demonstrate command of standard English capitalization, punctuation, and spelling conventions when writing.
RF.5.3 Know and apply grade-level phonics and word analysis skills in decoding words. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read unfamiliar multisyllabic words accurately in and out of context.
RF.5.4 Read with sufficient accuracy and fluency to support comprehension.
RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
RI.5.2 Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.
RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
RI.5.10 Use knowledge of language and its conventions when reading. RI.5.11 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 5 reading and content, choosing flexibly from various strategies.
RI.5.13 Read and comprehend high-quality informational text of appropriate quantitative and qualitative complexity for Grade 5.

National Ag Literacy Outcomes:
Agriculture and the Environment

- Recognize the natural resources used in agricultural practices to produce food, feed, clothing, landscaping plants, and fuel (e.g., soil, water, air, plants, animals, and minerals) (T1.3-5.e)

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

All About soil YouTube, https://www.youtube.com/watch?v=I3A7OnTLSM8

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

Book: *Under Your Feet Soil, Sand, and Everything Underground*, illustrated by Wnjia Tang

KFAC Topsoil in Our Food System poster

Author: Adapted by Nancy Zenger-Beneda from the NAITCO lesson plan "What's our Soil Worth? by Debra Spielmaker. https://agclassroom.org/matrix/lesson/148/

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Livestock & the Environment - Meeting the Challenge. https://www.fao.org/3/x5304e/x5304e03.htm#livestock%20on%20grazing%20lands

Mottet, A., De Haan, C., Falcucci, A., Tempio, G., Opio, C., & Gerber, P. (2017). Livestock: On our plates or eating at our table? A new analysis of the feed/food debate. *Global Food Security*, *14*, 1-8. https://doi.org/10.1016/j.gfs.2017.01.001

Ritchie, Hannah., Roser, Max. (2019). "Half of the world's habitable land is used for agriculture." Published online at OurWorldInData.org. Retrieved from: https://ourworldindata.org/global-land-for-agriculture. [Online Resource].

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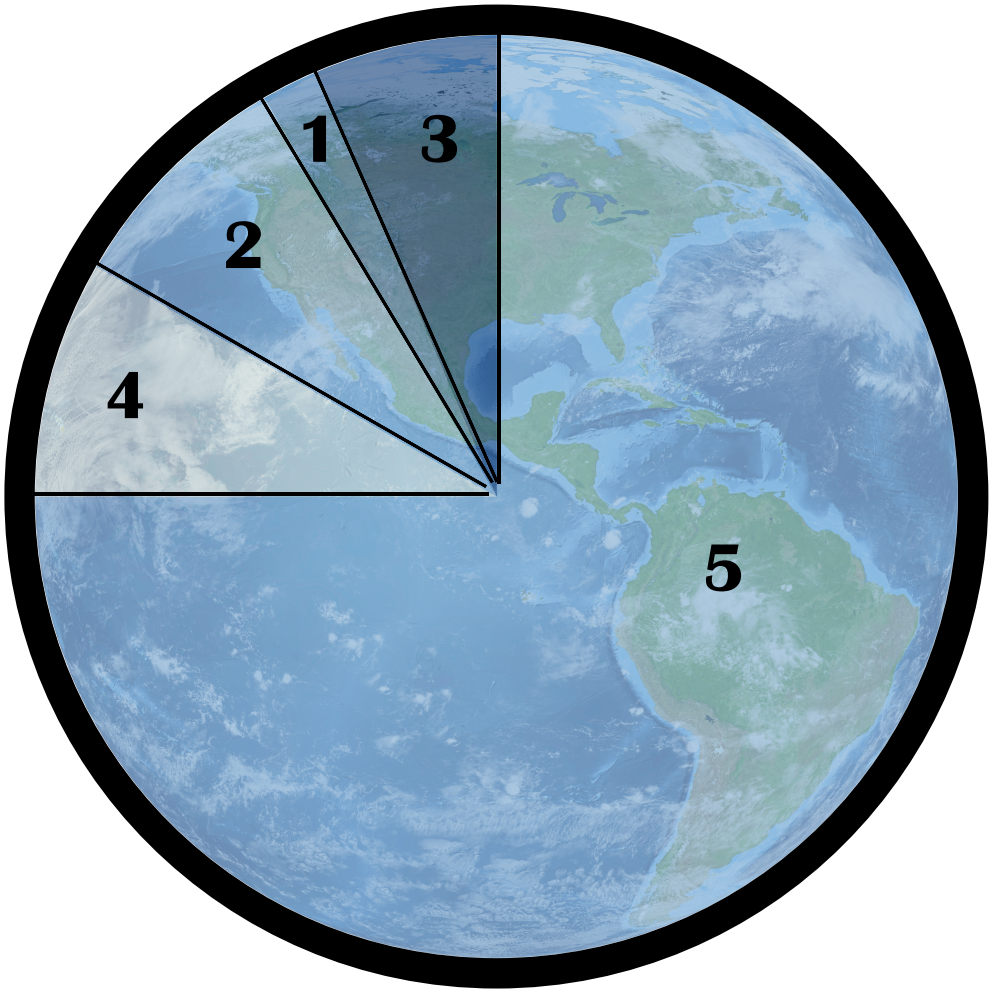
Name:_____

Slicing Up Earth's Resources

Write the number of the section on the globe next to the label that describes it.



_____ **Water**

_____ **Inhospitable Land**

_____ **Habitable Land**

_____ **Land for Livestock to Graze**

_____ **Land to Grow Food**

Name:_____

Value of Topsoil

Let's imagine we have 1 acre of land and 7 inches of topsoil. If every inch of topsoil is worth $10, how much is your total topsoil worth?

Suppose you lose ½ inch of topsoil each year to erosion.

½in x $10 =

How much value does your soil lose in a year?

What is your topsoil worth after one year?

How much topsoil would you lose in 3 years?

What would your topsoil be worth in 3 years?

What is your topsoil worth after five years?

At the current rate of erosion, how many years will it take to lose all seven inches of topsoil?

Bonus: Draw a picture of a soil profile and label the parts.

Vocabulary

- global: relating to the whole earth; worldwide.
- ecosystems: an interconnected system such as a biological community of interacting organisms and their physical environment
- inhospitable: an environment that is harsh and difficult to live in
- habitable: an environment good enough to live in
- climate: the long-term weather pattern in a region
- agriculture: the science or practice of farming, including cultivation of the soil to grow crops and the rearing of animals to provide food, fiber, and fuel.
- erosion: the gradual destruction of soil by wind, water, or other natural agents
- poor soil: soil that contains low nutrients and has low fertility
- conservation: prevention of the waterful use of a resource
- 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.)
- sustainable agriculture: an approach to agriculture that focuses on producing food while improving the economic viability of farms, protecting natural resources, and enhancing quality of life for farmers and society as a whole