

Caring for the Land

Grade Level(s)

3 - 5

Estimated Time

1 hour

Purpose

Students will explain why people have different opinions regarding soil management and identify cause and effect relationships relating to agriculture and the environment.

Materials

- *Caring for the Land* activity sheets

Essential Files (maps, charts, pictures, or documents)

- [Caring for the Land Activity Sheets](#)
- [Caring for the Land Activity Sheets ANSWER KEY](#)

Vocabulary

chemical (inorganic) fertilizers: synthetic materials that are added to the soil to provide nutrients—including nitrogen, phosphorus, and potassium—necessary to sustain plant growth

contaminate: to make impure by contact or mixture with harmful bacteria, fungi, or dangerous chemicals

crop rotation: the practice of planting different crops in consecutive growing seasons to maintain soil health

decompose: to decay or break down into smaller pieces

environmental activist: a person who works to protect the natural world through direct, vigorous action that is often focused on controversial issues

environmentalist: a person who works to protect the natural world from pollution and other threats

farmer: a person who works with land, plants, and animals to produce raw materials for food, clothing, shelter, and other products that are used in industry and manufacturing

legume: a family of plants which, with the aid of symbiotic bacteria, convert nitrogen from the air into a form that plants can use; legumes include many valuable food and forage species, including peas, beans, peanuts, clover, and alfalfa

organism: any living thing, plant or animal

pesticide: word used to describe a variety of substances used to control insects (insecticide), plants (herbicide), or animals (rodenticide for mice, etc.)

Background Agricultural Connections

The land is the livelihood of **farmers**. Most people, farmers included, try to avoid practices that harm their way of life. When raising crops and livestock, farmers actively manage soil, water, plants, and animals. Farming is one of the closest working relationships that people

have with the environment, and sometimes farming practices lead to environmental problems. Often, it takes years for the environmental impacts of human activity to become evident, and it can be complicated to identify and change environmentally damaging actions. Farmers work both to produce food and to care for the land that is their livelihood. There are many different strategies for accomplishing these goals.

Considering the history of environmental issues can put modern-day controversies into context. People began polluting long ago. Early settlers in the United States dumped their trash into rivers and streams without considering the harm it might do. Before gasoline-powered tractors began releasing exhaust fumes, work horses created pollution problems of their own. The average farm horse produces 35 pounds of solid waste and 2 gallons of liquid waste each day. Although horse manure can be an excellent **fertilizer** when spread across a field, large amounts in small areas can create high concentrations of nitrogen and bacteria that can **contaminate** the water supply.

Thousands of years ago, people began to farm because they found they could produce more food in a more reliable manner by growing crops than by hunting and gathering. Over the years, people discovered that some farming practices harmed the land. Cutting down trees, clearing vegetation, and allowing animals to overgraze left the topsoil unprotected and vulnerable to erosion by wind and water. Planting the same crop on the same field year after year used up all the soil's nutrients, and the fields lost their ability to produce good crops.

Early farmers learned from their mistakes and developed better farming methods. They learned to farm on the contour and build terraces—ridges of soil built across the slope to slow water runoff. They learned to rotate their crops (**crop rotation**), moving them from one field to another to let the soil rest. They learned how to spread animal manure on their fields to restore organic matter and nutrients.

When European settlers came to the New World, they were dazzled by what seemed like endless resources—acres and acres of rich soil. Many farmers abandoned the methods their ancestors used to protect the land. When one field began to produce poor crops, the farmer would simply abandon it and move farther into the wilderness.

As more people moved in, more land was needed for farms. In the early twentieth century, farmers began plowing up the native grasses of the Southern Plains to plant wheat. They had no way of knowing that their hard work would be the first step leading to what would come to be known as the Dust Bowl. A severe drought dried up the exposed soil. With no grass roots to hold the sandy soil in place, it simply blew away with the strong summer winds.

Recognizing a problem is the first step toward solving it. Farmers didn't know that plowing up large, flat tracts of land would cause the soil to blow away in the event of a drought. Once they saw what had happened, they did what farmers have been doing for thousands of years. They began thinking of different methods they could use that would protect the soil.

One method involved using chemicals on weeds instead of turning the soil with a plow. For many years, this method seemed like an excellent way to keep the soil in place while producing the food people needed. Then, scientists discovered that some chemicals were getting into the water supply and making birds, fish, animals, and people sick. Other chemicals have begun to lose their effectiveness as weeds develop resistance to them. Today, farmers and agricultural researchers are working on ways to solve food production problems

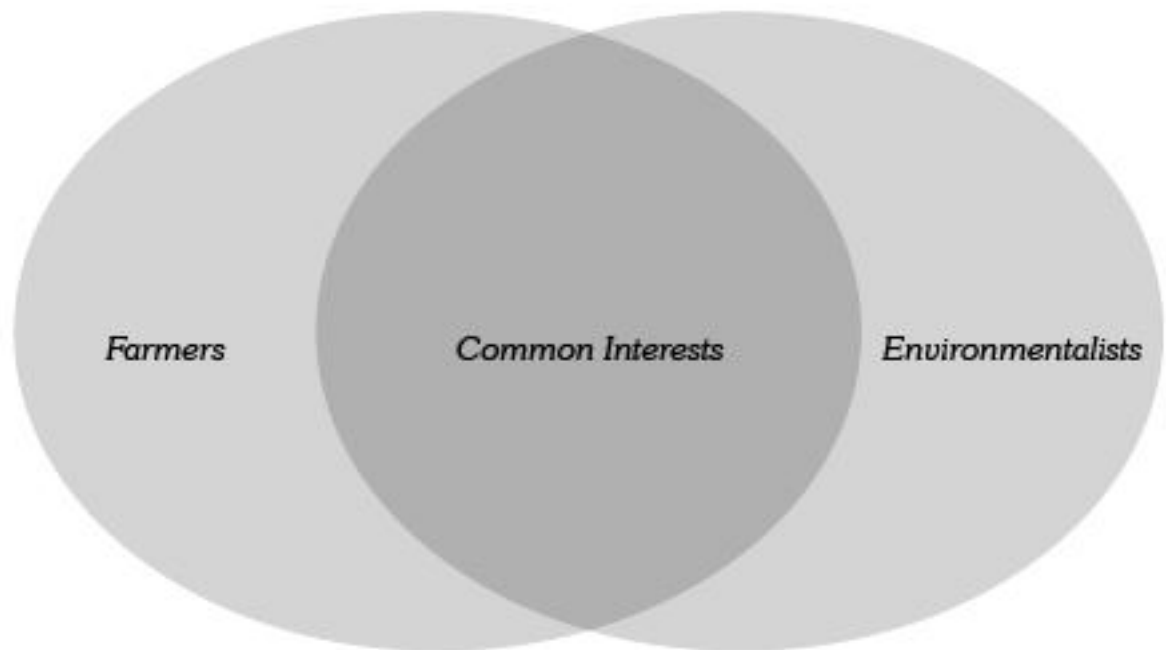
while taking into consideration the growing world population, the state of food prices and economics, and the condition of environmental resources such as soil and water.

Interest Approach – Engagement

1. Ask students to think about people they know who are farmers or environmentalists. Can farmers be environmentalists?
2. Continue discussion on the topic to create interest and gauge students' prior knowledge using the following questions:
 - Why would farmers be motivated to protect natural resources like soil and water?
 - What motivates environmentalists to protect natural resources?
 - What are some methods farmers use to protect soil and water quality?

Procedures

1. Begin the lesson by asking students to describe and define in their own terms the words: *farmer*, *environmentalist*, and *environmental activist*.
2. Ask students if they have heard any news reports about conflicts between farmers and environmental activists (endangered species preservation, invasive species management, public land use, wetland preservation, etc.).
3. Draw a Venn diagram on the whiteboard (see the example below), and ask students to list things about which farmers and environmental activists disagree and the things they have in common. For example, both care about the land, both need food to eat. Note: You may have to make very large circles.



4. Share the background material and discuss problem/solution and cause/effect relationships.
5. Divide your class into three groups, and hand out copies of one of the *Caring for the Land* activity sheets to each group.
6. Ask students to read the situation described in the text carefully to identify the cause and effect, the problem and solution, and any alternatives and their effects. Ask each group to share what they discussed with the class.

7. Discuss the following questions:

- Why do we need farmers? (food, clothes, shelter, other manufactured goods)
- Who should decide how to use the land?
- How should we decide how to use the land?

Concept Elaboration and Evaluation

After conducting these activities, review and summarize the following key concepts:

- The land is the livelihood of farmers, and most farmers try to avoid practices that harm their way of life.
- People have differing opinions about environmental issues.
- Farms provide food, shelter, clothing, and other manufactured goods.

Read Issue 3 of Ag Today titled *Our Invaluable Natural Resources*. This reader can be printed or accessed digitally. It helps 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.

Suggested Companion Resources

- Children of the Dust Bowl: The True Story of the School at Weedpatch Camp (Book)
- Dirt: The Scoop on Soil (Book)
- Rocks and Soil (Book)
- Soil! Get the Inside Scoop (Book)
- Survival in the Storm (Book)
- The Journal of C.J. Jackson, a Dust Bowl Migrant (Book)
- This Land Is Your Land (Book)
- You Wouldn't Want to Live Without Dirt! (Book)
- Planet Zorcon (Kit)
- America's Heartland: A Sea of Grass (Multimedia)
- Apple as Planet Earth video (Multimedia)
- Black Blizzard (Multimedia)
- Dirt: Secrets in the Soil (DVD) (Multimedia)
- Dust Bowl: CBS 1955 Documentary (Multimedia)
- FDR's Fireside Chat: Dust Bowl (Multimedia)
- Hugh Hammond Bennett: The Story of America's Private Lands Conservation video(Multimedia)
- Soil Science Videos (Multimedia)
- Third-Grader Explains Nature's Role in Providing Clean Water (Multimedia)
- Ag Today (Booklets & Readers)
- Caretakers All (Teacher Reference)
- Rocks and Soils (UEN Sci-ber Text for 4th Grade) (Website)
- Soil Center (Website)

Sources/Credits

Lesson adapted from materials provided by Oklahoma Agriculture in the Classroom.

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Caring for the Land

English Language Arts:

- **3rd Grade, 4th, & 5th Grades:**
 - **Reading Informational Text (RI):**
 - **Standard 4:** Read with sufficient accuracy and fluency to support comprehension.
 - **Meaning and Context (MC):**
 - **Standard 5:** Determine meaning and develop logical interpretations by making predictions, inferring, drawing conclusions, analyzing, synthesizing, providing evidence and investigating multiple interpretations.
 - **Language Craft and Structure (LCS):**
 - **Standard 11:** Analyze and critique how the author uses structures in print and multimedia texts to craft informational and argument writing.

Health:

- **3rd- 5th Grades:**
 - **Standard 8:** “Students will demonstrate the ability to advocate for personal, family, and community health” (NHES, 2007).

Caring for the Land

Identify the problem and the solution, as well as the main cause and effect relationship in the information that follows.

Soil Erosion

Erosion occurs when soil is washed or blown away. Plants, like trees and grass, help hold the soil in place. In Utah, annual rainfall is low; the state average is 14 inches a year. Erosion in Utah is primarily caused by wind. During the 1930s, livestock in Tooele County were allowed to overgraze the range. Between 1933 and 1935, the area had even less rainfall than usual. The severe drought killed crops and worsened overgrazing. Large swaths of land had no plant root system to anchor it, and much of the soil blew away. Dust and sand storms buried roads and houses. The Great Plains also experienced a drought during this time. Farmers seeded crops, but nothing would grow without rain, and repeated tilling left the soil loose, bare, and vulnerable. Clouds of dust from this area reached as far east as Washington, DC. We now know this as the Dust Bowl.

In response to the disaster, the federal government created the Soil Erosion Service and the Civilian Conservation Corps. Workers replanted grass, planted trees, and helped farmers develop and implement agricultural methods that would better protect the soil. Over time, the Soil Erosion Service has evolved and changed

names; its modern-day equivalent is the Natural Resources Conservation Service. At the state level, citizens of a local area that concern themselves with the conservation of soils belong to a governing board called the Soil Conservation District. Today, these organizations help Utah farmers and ranchers develop and implement better land management strategies.

One method developed to prevent overgrazing is to move livestock regularly, giving the pasture plants a period of rest. In order to implement this practice—known as rotational grazing—someone must move the livestock regularly, and fences are often needed to keep livestock off of the pasture section that is resting. Rotational grazing requires more labor and infrastructure than allowing livestock to graze freely.

Another method to prevent erosion is no-till farming of annual crops, in which the farmer seeds directly into a field that still has last year's plant stems, stalks, and leaves on or in the ground. This ensures that the soil is never left bare and vulnerable to erosion. However, no-till farming is most effective when herbicides are used to control weeds, and some people worry that the herbicides used might pollute the water, harming people and ecosystems downstream.

Problem

Cause

Effect(s)

Solution

Does the solution create another problem? If so, what is it?

Caring for the Land

Identify the problem and the solution, as well as the main cause and effect relationship in the information that follows.

Chemical Pesticides and Fertilizers

In natural ecosystems, plants take nutrients from the soil and return them when leaves and other plant parts die and decompose. In agricultural systems, people harvest plant matter (e.g. vegetables, grains, hay), and by doing this, remove nutrients. Over time, if the nutrients aren't replaced, the soil will no longer support healthy plant growth. In early years, farmers replaced nutrients by adding animal manure, growing a legume crop, resting fields, or rotating crops from year to year so that soils could restore some of their nutrients through natural processes.

In the 1920s, farmers began using tractors instead of horses and mules. They began using inorganic nitrogen fertilizers to replace the organic nitrogen the fields had been getting from animal manure. Nitrogen is one of the major nutrients plants need to grow. In the 1940s, farmers learned to use chemicals to kill insects and weeds. These pesticides and fertilizers help American farmers provide enough food and fabric for many hundreds of non-farmers.

Although they've greatly increased productivity, chemicals have also caused some problems. Chemical pesticides can kill organisms other than the ones for which they are intended. Some of the organisms

they harm are useful ones that help crops grow. Chemical fertilizers cause reactions in the soil that, over time, can make the soil less desirable for plant growth. Chemicals used in agriculture can also contaminate the water we drink, moving through the soil into the underground water supply, or washing into lakes, rivers, and streams with rainwater.

Farmers are concerned about these problems. They are trying new methods that will help them use fewer chemicals on their fields while still growing enough food to meet our needs. One method is Integrated Pest Management (IPM). Farmers using this method begin by monitoring to find out what kind and how many pests they have. They don't use pesticides unless there are enough pests to cause economic damage. They often choose environmentally friendly pesticides or beneficial insects to control the pests.

Another method, called "precision farming," makes use of a computer installed in the farmer's tractor to more efficiently use fertilizer. The farmer takes soil samples from his or her fields and has them tested for nutrient deficiencies at a laboratory. The computer receives mapping information from a satellite in space and then uses the results of the soil tests to tell the fertilizer spreader where to place the fertilizer and how much to use.

Problem

Cause

Effect(s)

Solution

Does the solution create another problem? If so, what is it?

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Wetlands

Wetlands are land areas saturated with water. There are many types of wetlands, including the shallows of small lakes, reservoirs, ponds, and streams; marshes and wet meadows; mud and salt flats; and playas that are only temporarily filled with water. Even wetlands that are small or seasonal can provide critical habitat for aquatic species and migrating birds, especially in arid areas. Although Utah is mostly arid, one of the largest and most important wetlands in the Intermountain West is found here. In 1991, the Great Salt Lake, along with its associated wetlands, was designated a Hemispheric Reserve in the Western Hemisphere Shorebird Reserve Network due to its importance to migratory waterfowl and shorebirds.

Wetlands are critical ecosystems. They support biodiversity, reduce flooding, and filter toxins out of water. People can enjoy spectacular wildlife viewing in wetlands, which act as important rest and food stops for migrating birds and provide homes for diverse populations of amphibians, reptiles, and fish. Many endangered plants and animals depend on wetlands.

Wetlands act like sponges, soaking up water from heavy rains that could otherwise

cause floods and destroy homes, businesses, and farms. Wetlands store water, releasing it slowly into aquifers and underground streams—an important source of drinking water for many people. Wetlands also help purify water, filtering out harmful chemicals and waste. Dirty water gets a good cleaning when it flows slowly through a wetland area that is thick with the roots of many plants.

At the time of European settlement, there were about 221 million acres of wetlands in the lower 48 states. Since then, over half of these wetlands have been lost. Most were converted to agricultural uses. For many years, people thought of wetlands as obstacles to farming and breeding grounds for mosquitoes. The government even encouraged landowners to drain wetlands and turn them into dry lands for farming or building homes.

Now we know more about wetlands and recognize their importance. Federal laws have been passed to protect and preserve them. Some people don't like the wetland laws. People who have wetlands on their property think they should be able to use their property as they want. Draining a wetland and planting crops may mean earning money to support a family.

Problem

Cause

Effect(s)

Solution

Does the solution create another problem? If so, what is it?

Answers to “Caring for the Land” Activity Sheets

Soil Erosion

- Problem: soil erosion
- Cause: overgrazing, removing vegetation cover from soil
- Effect(s): soil washes or blows away
- Solution: rotational grazing, no-till farming
- New problem: increased labor and infrastructure needs with rotational grazing, overuse of pesticides may cause water pollution

Chemical Fertilizers and Pesticides

- Problem: chemical pollution
- Cause: using chemical fertilizers and pesticides
- Effect(s): increase production, pollute water, harm non-target organisms
- Solution: integrated pest management (IPM)
- New problem: none identified in text, but students may recognize that IPM and precision farming could require new, specialized equipment or increase labor requirements

Wetlands

- Problem: loss of wetlands
- Cause: draining or filling in wetlands
- Effect(s): flooding, loss of habitat for wildlife, loss of natural water purification
- Solution: passing laws to protect wetlands
- New problem: people are unable to use their property as they wish