



THE FARMER CARES FOR THE LAND

GRADE LEVEL: 6-8

SUBJECT: Language Arts

NATIONAL STANDARD(S):

(6-8) LA: 5.1, 5.2, 5.4-8, 6.1-3, 6.7, 7.5-8

THEME: Environment

FOOD AND FIBER TOPIC: III-B,C,D

LEARNER OBJECTIVES:

Students will identify cause and effect relationships in issues relating to Agriculture and the environment.

VOCABULARY

bacteria—Single-celled microorganisms which may be beneficial or harmful.

chemical fertilizers—Any of a large number of synthetic materials, including nitrogen, phosphorus and potassium compounds, spread on or worked into soil to increase its fertility.

contaminate—To make impure by contact or mixture with harmful bacteria, fungi, or dangerous chemicals.

contour—Field operations, such as plowing, planting, cultivating, and harvesting at right angles to the natural slope, used to reduce soil erosion, protect soil fertility, and conserve water.

decompose—To break down into component parts; rot.

drought—Lack of sufficient rainfall for normal plant growth.

Dust Bowl—Part of the Great Plains region of the US which is subject to severe droughts.

ecosystem—An ecological community together with its environment, functioning as a unit.

environment—The total of all external conditions which act upon an organism or community of organisms to influence development or existence.

erosion—The wearing or carrying away of the surface from the earth, usually by means of wind or water.

Integrated Pest Management (IPM)—Ecological approach to pest management, incorporating all available techniques in a plan to manage the pest in such a manner that economic damage is reduced and adverse side effects are minimized.

legume—A family of plants which, with the aid of symbiotic bacteria, convert nitrogen from the air to build up nitrogen in the soil. Legumes include many valuable food and forage species, including peas, beans, peanuts, clover, and alfalfa.

livelihood—The way a person makes his or her living.

nitrogen—Gas that occurs naturally in the air and soil, where it is converted into usable forms for plant use by bacteria and other natural processes.

nutrients—Elements or compounds in the soil which are essential for the growth of a plant.

organisms—Any living individual, whether plant or animal.

overgrazing—Grazing land so heavily that the soil will no longer produce plants.

pesticides—A substance used to control insect, plant, or animal pests.

resources—The available means for producing food and fiber, including land, labor and capital.

rotate—To plant or grow (crops) in a fixed order of succession.

terraces—Ridges of soil built across the slope to slow the runoff of water in a field or pasture.

topsoil—Fertile upper layer of soil which is rich in organic matter.

underground water supply—Fresh water from aquifers running underground which can provide water to wells.

vegetation—The plants of an area or a region; plant life.

winter wheat—Wheat that is planted in the fall, survives the winter as a young seedling, and matures in the early summer of the following year.

BACKGROUND

Farmers care about the environment. The land is their livelihood. Most people, farmers included, try to avoid practices which might harm or destroy their way of life. Despite this fact, agriculture is blamed for many environmental problems.

People began polluting long before they knew that was what they were doing. Early settlers in this country dumped their trash into rivers and streams without considering the harm it might do. Before gasoline-powered tractors began releasing exhaust fumes into the rural countryside, work horses were creating pollution problems of their own. The average farm horse produced 35 pounds of manure or solid waste and two 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 which may filter through the soil into the underground water supply.

Thousands of years ago people began to farm because they found they could produce more food that way than they could by hunting and gathering. Over the years people discovered that some farming practices hurt the land. Cutting down trees, clearing away vegetation and letting animals overgraze left topsoil unprotected so winds and water could erode it away. Planting the same crop on the same field year after year used up all its nutrients. As a result, 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 the runoff of water. They learned to rotate their crops—not plant the same fields to the same crops each year to let the land rest. They learned 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 which had never been used for European-style crop farming. Many farmers abandoned the methods their ancestors had learned for protecting 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, they began farming sloping lands that could easily wash away and sandy soils that could easily blow away. In the early 20th Century, farmers began plowing up the native grasses of the Southern Plains to plant wheat. Since that land had never been

farmed before, farmers had no way of knowing that their hard work would be the first step toward creating what came 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 plowing up the Plains would cause the soil to blow away. Once they saw what had happened, they did what farmers have been doing for thousands of years. They began thinking of different farming 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 the chemicals were getting into the water supply and making birds, fish, animals and people sick. Today farmers and agricultural researchers are working on ways to solve that problem and many more.

STEP-BY-STEP INSTRUCTIONS

1. Ask students to describe what farmers do. Then ask students to define the word “environmentalist.” Ask students if they have heard any news reports about conflicts between farmers and environmentalists (endangered species, grazing on public lands, wetlands). Draw a Venn diagram on the chalkboard, and ask students to list things on which farmers and environmentalists disagree and things they have in common. (Both care about the land. Both need food to eat.)
2. Share background material and discuss problem/solution and cause/effect relationships.
3. Divide your class into three groups, and hand out copies of one of the worksheets to each group. Have students read the situations on the student worksheets and identify the cause and effect and the problem and solution in each one. Students should also identify the alternatives and their effects.

RELATED ACTIVITIES

1. Have students search current newspapers and magazines for issues having to do with conflicts between agriculture and environmentalists (wetlands, endangered species, etc.)
2. Lead a discussion on the conflicts between individual rights and the common good, e.g., the individual rights of people who want to smoke in public places conflict with the need to protect the public from second-hand smoke. Lead the discussion toward the individual right of the farmer to use his or her land to make a living in conflict with the public need to protect the environment. Make sure students also recognize the common good that comes from having a safe, inexpensive and abundant food supply and that individual rights sometimes work toward the common good, e.g., the public benefits if the farmer is able to earn a living by producing food.

RESOURCES

Student Books

Andryszewski, T. (1993). The Dust Bowl: Disaster in the Plains. Millbrook.

- George, J. C. (1991). Who Really Killed Cock Robin: An Ecological Mystery. Harper Collins.
- Pollock, S. (1993). Ecology. Eyewitness Science, Dorling Kindersley.
- Scott, M. (1996) Young Oxford Book of Ecology. Oxford University Press.
- Stanley, J. (1992). Children of the Dust Bowl: The True Story of the School at Weedpatch Camp. Crown.
- Yount, L. (1995) Pesticides. Lucent

Teacher Resources

- My Father's Garden, Bullfrog Films, PO Box 149, Oley, PA 19547. Phone 1-800-543-3764 (video contrasting the effects of conventional farming using chemicals with those of non-chemical organic farming through the stories of two farm families, one from North Dakota and one from Florida, \$250, available free for 10-day review).
- "Things We Can Learn From a Cow and a Worm," National Cattlemen's Beef Association, Education Dept., 444 N. Michigan Ave., Chicago, IL 60611, 1-800-368-3138 (22- by 34-inch educational poster with activities demonstrating the positive role ruminants, especially cattle, play in our environment. Earthworms are featured as an example of natural recycling, code # 17-517, \$1.50).
- Van Cleve, J. (1996) Janice Van Cleave's Ecology for Every Kid, Wiley

Related Internet Websites

- "Kids! Renew America": http://solstice.crest.org:80/sustainable/renew_america/mainkids.html

EVALUATION

Were students able to identify cause/effect and problem/solution relationships? Were students able to understand the complexity of the farmer's challenge?

ACKNOWLEDGMENT

This lesson was adapted from Oklahoma Ag in the Classroom, Department of Agricultural Education, Communications and 4-H Youth Development, Oklahoma State University, Stillwater, OK 74078.

Name _____

The Farmer Cares For the Land A

Identify the problem and the solution and the main cause and effect relationship in the information below.

Wetlands

Wetlands are low areas that are saturated with water. Marshes and swamps are wetlands. Most of the wetlands in Oklahoma are the areas along creeks and rivers, between the water and the land. These are called **riparian areas**. Oklahoma has some marsh and swamp areas, too, mostly in southeastern Oklahoma.

Wetlands are an important part of the earth's ecosystem. They act like sponges to store water during the wet times of the year and release it into the aquifers and underground streams where we get most of our drinking water. When there are no wetlands to soak up the water, rains are more likely to turn into floods which destroy homes, businesses and farms. Plants that grow in wetlands hold the soil and help keep it from being washed away.

Wetlands also help purify water. They filter out harmful chemicals and wastes. Dirty water gets a good cleaning when it flows through a wetland.

Wetlands provide homes for many birds and animals that need wet places to grow and reproduce. They are important rest and food stops for many migrating birds. Many endangered plants and over 1/3 of our endangered animals live in or use wetlands.

At the time of European settlement, there were about 215 million acres of wetlands in the lower 48 states. In the last 200 years over 54 percent 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 turn wetlands into dry lands.

Now we know more about wetlands. We realize how much they help the environment, wildlife and humans. 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 to earn money to support their families.

Problem	
Solution	
Cause	
Effect(s)	

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



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The Farmer Cares For the Land B

Identify the problem and the solution and the main cause and effect relationship in the information below.

Soil Erosion

Soil erosion is what happens when soil is washed or blown away. In most places, trees, grass and other plants hold soil in place. When that vegetation is removed, winds and rains can carry the soil away. Over the years, farmers have removed unwanted grass, weeds and other vegetation from soil before planting their crops. Cattle and other farm animals can also remove all the vegetation from an area if there are too many or if they are left in one place for too long. Once gone, soil is not likely to be replaced within our lifetime or within several generations.

On the Southern Plains, the soil is sandy; annual rainfall is low; there are large, open areas; and high winds are common. The first white settlers allowed their livestock to roam and graze the Plains until there was very little vegetation left to hold the soil in place. Early in the 20th century, farmers plowed up the natural grass cover on the Plains and planted *winter wheat*. Between 1934 and 1937, the area had even less rainfall than usual. With large areas of plowed land having no grass root system to anchor it, much of the soil blew away. The dust storms and sand storms buried roads and houses. Clouds of dust reached as far east as Washington, DC.

In response to the disaster, the federal government created the Soil Erosion Service and the Civilian Conservation Corps to find ways to recover the land. Workers replanted grass, planted trees and showed farmers scientific agricultural methods to help them protect the soil.

One method was to put large numbers of animals out to graze on one piece of land for a short period of time and then move them to a new pasture. This allowed the animals to get the nutrition they needed while cutting down on overgrazing and erosion.

Another method was no-till farming. A farmer using this method planted crops directly in the plant stems, stalks and leaves from the last harvest. For this method to work, the farmer must use herbicide to kill unwanted grass and weeds. This method helps stop soil erosion, but some people worry that the herbicides used might pollute the underground water supply.

Problem	
Solution	
Cause	
Effect(s)	

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



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The Farmer Cares For the Land C

Identify the problem and the solution and the main cause and effect relationship in the information below.

Chemical Pesticides and Fertilizers

In the natural plant cycle, plants take nutrients from the soil and return them when leaves and other plant parts die and *decompose*. When people take plant matter (grains and hay) from the soil, they are also removing *nutrients*. Over time, if the nutrients aren't replaced, the soil can no longer provide enough nutrients for plants to grow. In early years, farmers replaced these nutrients by adding animal manure, growing a *legume* crop, resting fields or *rotating crops* from year to year so fields 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 chemicals now help one American farmer provide food and fiber for 50 non-farmers.

Chemicals have caused some problems, too. Chemical *pesticides* can kill other *organisms* besides the ones for which they are intended. Some of the organisms they kill are useful ones that help crops grow naturally. *Chemical fertilizers* also 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. Sometimes they move through the soil and enter the *underground water supply*, and sometimes they are carried by rainwater into lakes, rivers and streams.

Farmers are concerned about these problems. They are trying new methods that will help them grow enough food for all the people to eat without damaging their land and water supplies. These methods help farmers use fewer chemicals on their fields. One method is *Integrated Pest Management*. Under this method, farmers first find out how many and what kinds of pests they have. They don't use chemical pesticides unless there are enough pests to cause economic crop damage. They often choose environmentally-friendly pesticides or beneficial insects to control the pests.

Another method makes use of a computer installed in the farmer's tractor. The farmer takes soil samples from his or her fields and has them chemically tested at a laboratory. The computer is connected to a satellite positioning system which uses the results of the soil tests to tell the fertilizer spreader where to place the fertilizer and how much to use.

Problem	
Solution	
Cause	
Effect(s)	

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



Name _____

The Farmer Cares For the Land (answers)

A. Wetlands

Problem	Loss of wetlands
Solution	Passing laws to protect wetlands
Cause	Draining or filling in wetlands
Effect(s)	Flooding, loss of habitat for wildlife, loss of natural water purification

New problem: People are unable to use their property as they wish.

B. Soil Erosion

Problem	Soil Erosion
Solution	Rotational grazing, no-till farming
Cause	Overgrazing, clearing vegetation from soil
Effect(s)	Soil washes or blows away

New Problem: Use of herbicides may cause water pollution.

C. Chemical Fertilizers and Pesticides

Problem	Overuse of chemicals
Solution	Integrated Pest Management, computers to monitor fertilizer use
Cause	Using chemical fertilizers and pesticides
Effect(s)	Increases production, pollutes water

New Problem: None identified in text.



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