

The Farmer Cares for the Land

Background

See Reading Page

Language Arts

1. Hand out the reading page for students to read and discuss.
 - Students will brainstorm actions early settlers took that were harmful to the land.
 - Ask students if they have ever done things that were harmful without knowing it.
 - Students will cut up the reading page to make a timeline of the development of agriculture.
2. Discuss problem/solution and cause/effect relationships.
 - Divide students into groups, and hand out copies of one of the situation pages to each group.
 - Students read the situations independently and highlight the main idea in one color and the details in another.
 - Students work in groups to discuss the cause and effect of each situation.
 - Students cut up the situation sheets to make timelines showing the sequence of events for each situation (problem, solution, new problem, alternative, effect, etc.)
3. Students work in pairs and choose an issue related to agriculture and the environment to research online.
 - Each student takes one side of the issue and writes a letter to the other defending his or her position, with special emphasis on facts.
 - Students work together to find common ground and report the resolution to the class.
4. Students make posters of items cut from the newspaper that show good agricultural practice or develop Power Point presentations using information from the internet.
5. Students search newspapers, magazines and TV for examples of facts and opinions about agriculture and the environment (wetlands, endangered species, etc.) Discuss findings as a class.

Social Studies

1. 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-

P.A.S.S.

GRADE 4

Science Process—4.1,4

Life Science—3.1

Earth Science—4.1

Reading—1.1;

3.1b,2b,3b,4d

Writing—2.3

Oral Language—2

Social Studies—1.2,3

GRADE 5

Science Process—4.1,4

Life Science—2.1

Earth Science—3.1

Reading—1.1; 3.1bd

Social Studies—1.1,2; 7.2

Writing—2.4

Oral Language—2.1,3

GRADE 6

Science Process—4.1,2,5

Life Science—4.1,4

Reading—1.1; 3.2.1b,3ab

Writing—1.2

Oral Language—1.4; 2.1,3

Vocabulary

bacteria— A widely-distributed group of typically one-celled microorganisms, many of which produce diseases. Many are active in processes of fermentation, the conversion of dead organic matter into soluble food for plants and the fixing of atmospheric nitrogen.

chemical fertilizer— 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— Following the contour lines of uneven terrain to limit erosion of topsoil.

decompose— To decay.

drought— A long period of abnormally low rainfall, especially one that adversely affects growing or living conditions.

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

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

erode— To wear away by wind, water or other forms of abrasion.

inorganic— Involving neither organic nor the products of organic life.

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— Substances necessary for life and growth.

organism— A living individual, plant or animal.

overgrazed— To graze land so heavily that the soil will no longer produce plants.

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

polluting— Contaminating water, soil or air to the extent that it is no longer useful or is offensive to the senses.

resources— Available assets.

riparian— Land which borders a stream or body of water.

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.

topsoil— The surface layer of soil.

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

wetland— Areas covered by surface or groundwater which support vegetation and aquatic life requiring saturated soil conditions or growth and reproduction; includes swamps, marshes, bogs and similar areas.

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.

hand smoke. Students may search the internet for any new laws on smoking in public places.

—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.

—Students should 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.

Science

1. Draw a Venn diagram on the chalkboard.
 - Students will describe what farmers do.
 - Students will define the word “environmentalist.”
 - Students will list what farmers and environmentalists have in common. (Both care about the land. Both need food to eat.)
 - Students will list issues on which farmers and environmentalists might disagree. (Environmentalists may think no fertilizers should be used. Farmers think there are ways to use them safely. Environmentalists may be more concerned about land in general while farmers may be more concerned about the land they own and work.)

Additional Reading

George, Jean Craighead, *Who Really Killed Cock Robin: An Ecological Mystery*, Harper Collins, 1991.

Pollock, Steve, *Ecology*, Eyewitness Science, Dorling Kindersley, 1993.

The Farmer Cares for the Land

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. This can 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.

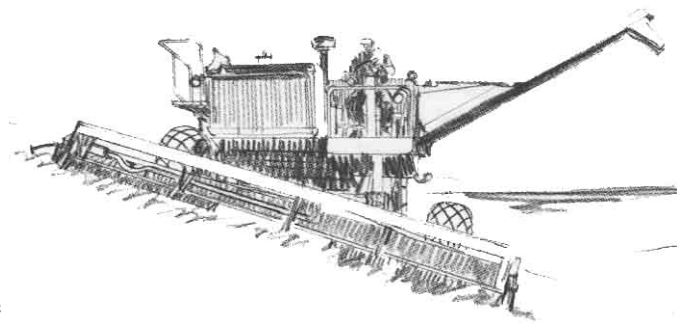
Early farmers learned from their mistakes and developed better farming methods. They learned to farm on the contour and build terraces—ridges of soil built across the slope to slow the runoff of water. They learned to rotate their crops—move them from one field to another to let the land rest. They learned 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 acres and acres of rich soil which had never been used for 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.



Wetlands

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

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.

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.

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.

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? _____

Soil Erosion

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

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? _____

Chemical Pesticides and Fertilizers

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

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 150 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 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. These methods help farmers use fewer chemicals. One method is Integrated Pest Management. Using this method, farmers 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 computer is connected to a satellite positioning system which uses soil test results to tell the fertilizer spreader on the tractor where fertilizer is needed and how much.

Problem

Solution

Cause

Effect(s)

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

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.