

Losing Ground

Overview

This lesson presents the story of the Dust Bowl and two activities, which simply demonstrate how the effects of farming practices in the early 20th Century contributed to severe soil erosion of a large portion of the North American grasslands.

Suggested Grade Level

2 - 5

Estimated Time

45 minutes

Objectives

Students will be able to:

1. demonstrate that crop cover or mulch greatly reduces soil erosion by water and/or wind.
2. identify agricultural practices that are beneficial to soil conservation.

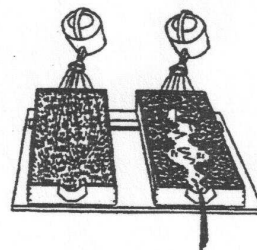
Materials: Activities A & B

1. A copy of "The Dust Bowl" story for each student
2. Two plastic flower flats or any two boxes that measure approximately 16" long, 12" wide, and 2" deep
3. A piece of sod to fit into one flat; loose, dry soil to fill the second flat
4. 2 large watering cans with sprinkler heads with equivalent volume and pouring speeds.
5. 2 large wide-mouth jars
6. Mulch: grass clippings, straw, wood chips, or sawdust
7. Watch or stopwatch
8. Water
9. Cardboard box or carton
10. Enough loose, **dry** soil to make a small pile
11. White paper and pencils
12. Electric fan or hairdryer

Background

Although every inch of soil cannot be covered continuously with crops, grass, or mulch, there is no doubt of their value in conserving soil and water. These two

activities will illustrate how crop cover or mulch reduces soil erosion from excess water and wind, and paves the way for discussion of various conservation measures. But first, have the students read "The Dust Bowl" story.



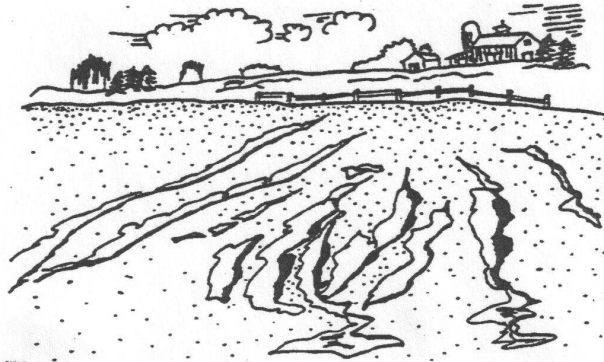
Activity A – Soil and Water

1. Cut a "V" notch at one end of each flat or box.
2. Cut a piece of sod from a lawn or field and trim vegetation to two inches for easier workability. A piece of sod with weeds will even suffice for this activity. However, the denser the plant cover, the more effective will be the activity.
3. Fill the second flat with soil to within one-half inch from the top of the flat. NOTE: For better results, the soil in each sample should be of similar dampness but not wet.
4. Set the flats with the "V" notches at the edge of a table or curb and tilt the unnotched end of each flat to create a sloped surface.
5. Set the jars below the "V" notches at the end of each flat. There must be room enough under the flats for the jars to stand upright.
6. Have the students pour at least one gallon of water from a height of 12" onto each flat simultaneously, if possible, with the watering cans. Pour steadily and at the same rate for each flat.
7. Time how quickly the water runs off each flat. Record the results.
8. Note which jar has the muddier water and which jar has the most water. Record the results.
9. Have students describe the appearance of the plain soil flat after the "heavy rain." Record the results.
10. Repeat the experiment, this time putting mulch over the bare soil. Notice what happens and record the results.

DISCUSSION

The water that ran off the soil surface carried soil with it. The water that ran off the sod should have been much cleaner. It also should take longer to run off and continue for a longer period of time.

This activity shows the importance of a ground cover or crop cover in protecting soils from erosion by water. If large fields are left uncovered, the topsoil (the most fertile layer) can wash away. Only the less fertile subsoil remains. Also, heavy rains can cut huge gullies in the fields making it impossible to plow. The results can be disastrous in regions where there are heavy rains.

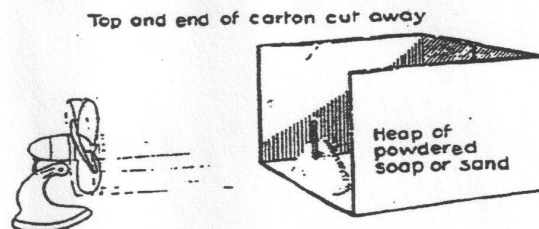


Extensions

1. Keeping the mulch in place, have students tilt the unnotched end of the flats to a higher (steeper) angle and repeat step number 6 above. Observe the differences in the speed of the water runoff. Have them describe where they might see a similar scene in real life and how this might effect the environment.
2. Repeat the activity at steeper and steeper angles; eventually tilting the flat high enough to cause the mulch run off with the water. What can the students conclude?

Activity B – Soil and Wind

1. Cut away one side of the large carton, place the white paper on the bottom of the carton, and pour a pile of very dry soil or soap flakes onto the paper.
2. Turn the fan or hairdryer towards the pile and notice how the particles move.
3. Put various obstacles (pencils or rulers) in the soil. Notice what happens.



DISCUSSION

When you checked the white paper, did you notice that it was covered with a fine layer of tiny soil particles? Even though you may not see them at first, wind can lift tiny soil particles into the air if soil is left uncovered. As the wind increases, so does the number and size of soil particles lifted into the air. As you learned by reading in *The Dust Bowl*, wind erosion can lead to disastrous dust storms and the loss of valuable topsoil.

When pencils were put into the soil, you should have noticed that the soil blew less and tended to pile in the path of heavy winds. In areas where there are heavy winds, it is very important to protect the soil with tree fences, crop covers, crop residue, strip cropping, or by other special plowing methods.

Extensions – wind and soil

1. Have students use higher and lower speeds of the fan or hairdryer on the pile of soil in the box. What can they conclude from their observations?
2. Add moisture to the pile of soil. Repeat the step above. What differences did they observe if any?
3. Have students divide into small groups of 2-3 and find out more about the Soil Conservation Service and what it does today to teach our citizens about soil and water conservation practices.

Cornell Educational Resources Program (CERP), Department of Education, Cornell University, Ithaca, NY 14853.

Losing Ground: The Dust Bowl

During the 1930's, the United States went through an economic crisis known as the Great Depression. Many banks closed and jobs, money, and food were scarce. At the same time, the Great Plains area of the southwestern United States was devastated by a severe and prolonged drought. Rainfall was well below normal for about seven years. In addition to the drought, high winds blew across the dry plowed fields every day. The loose soil was blown into the air and created dust storms larger than anyone had ever seen. Day after day, week after week, and for years, one storm after another blew the soil off the fields.

Reportedly, one storm in 1934 started in the Great Plains and pushed eastward at 60 to 100 miles per hour. Airplane service was grounded and people had to drive their cars with their lights on at midday. Some people who were caught in the storm were lost for days in the darkness. The storm reached the eastern seaboard, shutting out the sun in New York, Baltimore, and Washington, DC. Dust even sifted into the White House and settled on President Roosevelt's desk. A day later, ships at sea reported that dust was covering their decks. There were many people who thought the world was coming to an end.

The southwestern region of the Great Plains where most of the dust storms occurred became known as the Dust Bowl. The whole area, covering parts of the states of Texas, Oklahoma, Kansas, Colorado, and New Mexico, looked like a misplaced beach. Crops turned brown, withered and died from the lack of rain and the blowing dust. People and animals alike suffered from breathing the dust into their lungs, and many died as a result. Since no crops could grow, people and animals alike suffered from the lack of food. Milk cows went dry and hogs were so thin that they couldn't be sold at any price. Many farmers were on some kind of government "relief" or welfare. In all, over 50 million acres of land were affected. It was indeed a time of bleakness and despair.

The Problem

People can do very little to influence the wind and the rain. But their treatment of the land can make the effects of wind and the lack of rain far worse than need be. There were three main factors that contributed to the Dust Bowl: poor farming practices, the drought, and the Great Depression.

The Great Plains were originally grasslands with sandy soil. The plains are a vast expanse of flat land and are very dry, receiving variable amounts of rainfall from one year to the next. During a good year with plenty of rain, crops such as cotton, wheat, and corn could be grown successfully in large fields. The problem was that farmers were gambling on a "good year" every year at the expense of their land. Their farming practices simply did not include safeguarding their farmland against one or more bad years.

The short buffalo grass that grew naturally on the Great Plains held the soil in a tightly woven network of roots. When the farmers plowed under the sod, called sod busting, they planted crops that could bring in more income. Unfortunately, these cash crops didn't hold the soil well, especially when they were in the early stages of growth. Thus, the valuable topsoil was left largely unprotected from the harsh weather conditions of the plains. Compounding the problem of careless land-use was the lure of new technology in farming. During the late 1800's and early 1900's, the sod-busters had only mules, horses, and oxen to pull their plows. The areas they were able to cultivate were relatively small. However, as tractors and machinery improved, more and larger fields could be worked with less time and labor.

Since the prices for these cash crops were very good at the beginning of the 1930's, farmers planted as much land as they could. Out-of-town, "suitcase" farmers moved out the plains, bought up large quantities of land, and hired workers and tractors to plant every acre of land available. It seemed to be a perfect "easy profit" way to farm. But the fact was that most farmers didn't realize at the time that plowing up the Great Plains would cause the soil to blow away.

The good times ended quickly. A series of droughts and intense summer heat waves in 1931, '34, '36, and '37 pointed out what everyone had failed to notice. There was simply too much uncovered land with nothing to hold down the soil. Severe soil erosion was inevitable. The results were devastating. Farmers had borrowed money to plant large amounts of crops, but when the crops failed, they had nothing to sell. Unable to repay their loans, many lost their homes and farms to the banks. There was a huge population shift off the farms, especially in the five Dust Bowl states. People left to go "down the road," often on foot, in search of any kind of job that could help feed their families. Many of these people became known as "Okies" since so many came from Oklahoma. But people came from many other states as well. Some people traveled as far as the lush valleys of California to take jobs as migrant farm workers.

The Solution

The problem of the damaged and unproductive land still needed to be solved. Fortunately, the United States government took notice of this serious national problem, and President Roosevelt's "New Deal" set up many programs to help farmers reclaim the land.

One policy was to persuade farmers through incentive payments to improve their farming practices and land use. Instead of only producing soil-depleting crops like corn, the farmers were encouraged to alternate cash crops with crops that would hold the soil and improve it. The idea was to promote long-term conservation practices instead of short-term cash crop production.

In 1935, the U.S. Soil Conservation Service was established. The federal government realized that soil erosion had spread beyond the five-state region of the Dust Bowl to South Dakota, Wyoming and Nebraska, and steps were taken to repair the damage and to prevent it as well. Natural grasslands were reserved for controlled cattle grazing instead

Name _____

Activity Sheet

of farming. Other lands that were unsuitable for farming were purchased for parklands. Every farmer was encouraged to diversify and rotate crops from field to field each year. Instead of burning crop stubble in the fall, farmers left it to decompose in the field to add organic matter to the soil. Planting was done in zigzag contours against the prevailing winds. If the soil was too dry at planting time, an emergency crop that could withstand drought was planted. When wheat was planted, it was alternated with strips of native grasses so that there would be something to prevent soil erosion if the wheat failed. These measures worked well for preventing both wind and water erosion, and they are still used today.

Soil Conservation Today

The Soil Conservation Service continues to be dedicated to the protection of farmland as well as conservation of water resources. Most of the land in the United States is now within a Soil Conservation District that is governed locally. Each District has done soil surveys that include maps made by soil scientists to describe the location and types of soils within the area. With this information, each District can identify lands that are more prone to erosion than others. They can then recommend the types of agriculture or urban land uses that are best suited for each soil type.

Soil conservation is moving into the high tech age with remote sensing, aerial photography, and soil mapping with digital computer imaging. With an increasing population and decreasing green space, innovative soil and water conservation practices are more important today than ever before.