

Soil Erosion Article

(OPTIONAL) Link to the original website in case you want to see the whole article.

<https://www.nrdc.org/stories/soil-erosion-101#intro>

1. This article and worksheet will mainly focus on **soil erosion** on land and especially involving farm land. Other than farms, can you think of another place where people would be negatively affected by **erosion** removing soil from an area?



Erosion in an unprotected Tennessee cornfield following a brief storm *Credit: Tim McCabe/USDA NRCS*

Introduction

When we hike through the woods, drive by a cornfield, or mow our lawns, we tend to focus on the plants: the blooming flowers, the tassel-topped stalks, and the green grass borders. But what about the dirt? It seems soil is one of the planet's most underappreciated natural resources. Yet healthy soil is needed for agriculture; soil also plays a vital role in protecting the air we breathe, the water we drink, the food we eat—and even our climate.

Also, unhealthy soil can cause major trouble. Think of the 1930s, there was an event called the Dust Bowl. After many years of overplowing, poor land

management, and drought, millions of acres of formerly productive farmland in the Midwest and Southern Plains dried up. A single dust storm could transport 300 million tons of soil all the way to the East Coast. Below is a photo of a dust storm blowing large amounts of healthy soil away. This is an example of [soil erosion](#).



Loss of soil threatens to destabilize our food systems even today. Incredibly, one inch of topsoil can take several hundred years to form, and scientists estimate that the United States is losing soil at a rate 10 times faster than nature's ability to replenish it. Soil scientists believe that if soil continues to degrade at the same rate then, all of the world's topsoil could be gone within 60 years. Luckily, there are many time-tested techniques to help conserve our soil so that it may continue to serve the needs of generations to come.

2. Roughly how long does it take for 1 inch of topsoil to be produced naturally?



A farmer and his sons walk through a dust storm in Cimarron County, Oklahoma, in 1936. *Credit: Library of Congress*

During dust storms farm animals suffocated from the thick clouds of fine dust. Tragically, about 7,000 people perished from an illness called “dust pneumonia.” In April 1935, Congress declared [soil erosion](#) “a national menace” and established the Soil Conservation Service—known today as the Natural Resources Conservation Service (NRCS)—within the U.S. Department of Agriculture to instruct farmers on how to prevent [erosion](#).

3. What was a negative health impact from widespread soil erosion in the past?

What Is Erosion?

Erosion is a process in which earthen materials (i.e., soil, rocks, **sediments**) **are transported** over time by natural forces such as water or wind.

Sometimes erosion is sped up by poor land use or other human impacts on land. The natural process of **river erosion**, in fact, created the Grand Canyon, as the Colorado River cut deep and wide through the rock over millions of years, and **glacial erosion** carved Yosemite National Park's iconic landscape. The difference between **weathering** and **erosion** is that in the process of weathering, materials are **worn away but not transported**. And erosion is when natural forces **move materials from a location**.

Soil erosion refers to the erosion of the top layer of dirt known as **topsoil**, the fertile soil vital to life. The rate of soil erosion depends on many factors, including the soil's composition, vegetation, and the intensity of wind and rain. Because human activities can also influence the speed of soil erosion, we have the power (and the responsibility) to solve one of the planet's greatest environmental challenges.

4. What is soil erosion?

What Causes Erosion?



Logging clear cuts in a forest in Lincoln County, Oregon *Credit: Hal Bergman/iStock*

Soil erosion happens primarily when dirt is left exposed to strong winds, hard rains, and flowing water. In some cases, human activities, especially farming and removing plants, leave soil vulnerable to erosion. For example, when farmers till (plow) the soil before or after growing a season of crops, they may leave it exposed to weather for weeks or months. The grazing of plants by farm animals like cattle and sheep can also leave large areas of land empty of **ground-covering plants** that would otherwise hold the soil in place with their roots. Another practice that has devastating consequences for soil health is deforestation, particularly clearcutting, a widespread practice of the logging industry. This is when trees are cleared away, the land is left exposed to wind and rain without the security of roots to prevent the soil from being swept away.

5. Why do farming and clearcutting leave soil susceptible to erosion?

Climate is also a major driver of erosion. Changes in rainfall and water levels can wash away soil. Extreme changes in temperature can dry out soil and make topsoil more vulnerable to be removed by erosion. Additionally, long droughts can prevent plants from growing, leaving soil further exposed without protective plants.

6. How is climate change thought to be making soil erosion worse?

Impacts of Erosion

Soil erosion reduces the quantity and the quality of soil and farmable land that can be used to grow crops. Scientists estimate that over the past 50 years half of all topsoil loss has occurred due to human caused erosion. According to the federal agencies, cropland across Iowa has lost an average of 6.8 inches of topsoil since 1850. And soil erosion in the United States costs the country about \$37.6 billion in productivity losses each year. Severe soil erosion can result in:

- the loss of food crops
- negatively impact community resiliency and livelihoods
- alter ecosystems by reducing diversity.

7. How does soil erosion impact farming?



A dead catfish lies on the shoreline of an algae-filled Lake Erie in Toledo, Ohio. *Credit: Andy Morrison/The Blade via AP*

Where does the soil go after [erosion](#)? About 60 percent of soil that is washed away ends up in rivers, streams and lakes. The soil brings with it whatever has been applied to that soil, including chemicals and other pollutants that can contribute to harmful [algal blooms](#) and polluted waterways. Dirt that enters the water can also clog their natural flow and increase flooding. Soil that doesn't make it all the way from farm fields to waterways can end up being [deposited](#) in neighboring areas.

The impacts of excess fertilizer can be disastrous for aquatic ecosystems as well as public health. Each summer, high levels of manure and fertilizer are responsible for harmful [algal blooms](#) that not only kill aquatic life by depleting oxygen in the water but also leave fresh water undrinkable and unsafe for recreation. In 2014, the 500,000 citizens of Toledo, Ohio's water system were

told to avoid their tap water after officials discovered unsafe levels of toxins, caused by Lake Erie algal blooms, at a city water treatment plant.

8. How does soil erosion negatively impact aquatic ecosystems?

Erosion Control



Spring no-till planting at Hundley-Whaley Research Center in Albany, Missouri Credit: Kyle Spradley/Curators of the University of Missouri

Soil erosion is essentially **a battle between two forces: flowing water or wind versus the gravity that holds soil in place.** The ability of soil to stay put relies on how well we work to eliminate or minimize the erosion forces and maximize soil stability.

Methods to control Erosion

Below are some common strategies for reducing erosion. It's worth noting that finding appropriate erosion-control relies on understanding which specific erosion processes are occurring in a location.

9. What are some things the article recommends keeping in mind to prevent soil erosion? (They are listed below. I would do this question last)

- **Grow Plants:** Trees, shrubs, and ground plants can block [wind erosion](#). Adding [ground cover](#), such as through planting cover crops, also helps bind soil to roots so it cannot erode away.
- **Use erosion control matting:** Also known as an erosion control blanket, this [ground covering](#) is often made of weaved, biodegradable materials that shield the soil and provide support for growing vegetation on bare ground. This erosion control method is often effective for solar farms and construction sites where large areas are left without plants for a period of time and vulnerable to wind and water erosion.

10. The “Grow Plants” and “Control Matting” both fall into the “Ground Cover” control technique. What are both of those sections encouraging people to do to prevent erosion?

- **Practice no-plow/minimal plowing:** Farmers have been [plowing](#) farm fields for centuries, but in recent decades agriculture scientists have helped prove that a no-plow approach may offer more benefits. By not disturbing soil, farmers have been able to reduce [erosion](#) and runoff, which benefits crop productivity and water quality. No-plow practices can also help reduce nitrogen loss and other vital soil nutrients so farmers need to use less fertilizer.

- **Use grazing practices that reduce erosion:** [Rotational grazing](#) is a method that moves farm animals from one pasture area to the next. Each area gets a rest period and plants are allowed to regrow undisturbed, which reduces soil compaction and erosion. The plants are able to regrow and protect the soil from erosion before the farm animals return to eat more.

11. How does “Rotational Grazing” help reduce erosion?

- **Build soil [organic matter](#):** To be healthy, soil needs just the right mixture of water, air, minerals, and organic matter. Soil [organic matter](#) is made up of decomposing plant and animal material. It is the glue that helps bind soil together and keeps it anchored in place. Research suggests that increasing [organic matter](#) from 1 to 3 percent can reduce erosion by 20 to 33 percent because it increases the water-holding capacity of soil. This makes the soil less likely to blow or wash away.

12. Why is “Soil Organic Matter” important?