

Loss of Soil

Say Thanks to the Authors

Click <http://www.ck12.org/saythanks>

(No sign in required)



To access a customizable version of this book, as well as other interactive content, visit www.ck12.org

CK-12 Foundation is a non-profit organization with a mission to reduce the cost of textbook materials for the K-12 market both in the U.S. and worldwide. Using an open-content, web-based collaborative model termed the **FlexBook®**, CK-12 intends to pioneer the generation and distribution of high-quality educational content that will serve both as core text as well as provide an adaptive environment for learning, powered through the **FlexBook Platform®**.

Copyright © 2013 CK-12 Foundation, www.ck12.org

The names “CK-12” and “CK12” and associated logos and the terms “**FlexBook®**” and “**FlexBook Platform®**” (collectively “CK-12 Marks”) are trademarks and service marks of CK-12 Foundation and are protected by federal, state, and international laws.

Any form of reproduction of this book in any format or medium, in whole or in sections must include the referral attribution link <http://www.ck12.org/saythanks> (placed in a visible location) in addition to the following terms.

Except as otherwise noted, all CK-12 Content (including CK-12 Curriculum Material) is made available to Users in accordance with the Creative Commons Attribution-Non-Commercial 3.0 Unported (CC BY-NC 3.0) License (<http://creativecommons.org/licenses/by-nc/3.0/>), as amended and updated by Creative Commons from time to time (the “CC License”), which is incorporated herein by this reference.

Complete terms can be found at <http://www.ck12.org/terms>.

Printed: September 26, 2013

flexbook
next generation textbooks



CONCEPT 1

Loss of Soil

Lesson Objectives

- Identify human actions that increase soil erosion.
- List ways to reduce soil loss.

Vocabulary

contour cropping cover crop no-till planting strip cropping terracing windbreak

Introduction

It may “just” be dirt, but soil is one of our most important resources. We would starve without it. In fact, human beings — and most other land organisms — would never have evolved if it weren’t for soil. That’s because humans and other consumers rely on plants for food, and plants need soil. Soil anchors plant roots and provides them with water and nutrients.

People have always depended on soil. But for many generations, they took soil for granted. They didn’t realize that their actions would cause so much soil erosion. The Dust Bowl dramatically showed people what being careless with soil could do.

Human Actions and Soil Erosion

Runoff carved deep channels in the soil in **Figure 1.1**. Running water causes most soil erosion, but wind can carry soil away too. What humans do to soil makes it more or less likely to be eroded by wind or water. Human actions that can increase soil erosion are described below.

Growing Crops

The photos in **Figure 1.2** show how farming practices can increase soil erosion. Plant roots penetrate the soil and keep it from eroding. Plowing turns over bare soil and cuts through plant roots. Bare soil is exposed to wind and water. In the past, farmers always plowed fields before planting. Some farmers now use no-till farming, which does not disturb the soil as much.

The problem doesn’t stop with plowing. Crops are usually planted in rows, with bare soil in between the rows. In places where crops grow only during part of the year, the land may be bare for a few months.



FIGURE 1.1

Runoff carried away the bare soil in this field. Why do you think the soil bare to begin with?

How Crops Endanger Soil



Plant roots hold soil in place



A plow cuts through roots and disturbs the soil.



Plowed soil is exposed to wind and rain.



Rows of crops are separated by bare soil.

FIGURE 1.2

Farming leaves some soil exposed to erosion.

Grazing Animals

As you can see in **Figure 1.3**, some grazing animals, especially sheep and goats, eat grass right down to the roots. They may even pull the grass entirely out of the ground. Grazing animals can kill the grass or thin it out so much that it offers little protection to the soil. If animals are kept in the same place too long, the soil may become completely bare. The bare soil is easily eroded by wind and water.

**FIGURE 1.3**

Sheep and goats can damage plants and leave the soil bare.

Logging, Mining, and Construction

Other human actions that put soil at risk include logging, mining, and construction. You can see examples of each in **Figure 1.4**.

- When forests are cut down, the soil is suddenly exposed to wind and rain. Without trees, there is no leaf litter to cover the ground and protect the soil. When leaf litter decays, it adds humus and nutrients to the soil.
- Mining and construction strip soil off the ground and leave the land bare.
- Paved roads and parking lots prevent rainwater from soaking into the ground. This increases runoff and the potential for soil erosion.

Recreation

Even things that people do for fun can expose soil to erosion. For example, overuse of hiking trails can leave bare patches of soil. Off-road vehicles cause even more damage. You can see examples of this in **Figure 1.5**.

Preventing Soil Erosion

Soil is a renewable resource, but it can take thousands of years to form. That's why people need to do what they can to prevent soil erosion.

Farming Methods that Reduce Soil Erosion

The Dust Bowl taught people that soil could be lost by plowing and growing crops. This led to the development of new ways of farming that help protect the soil. Some of the methods are described in **Figure 1.6**.

Other Ways to Reduce Soil Erosion

There are several other ways to help prevent soil loss. Some of them are shown in **Figure 1.7**.

Logging, Mining, and Construction



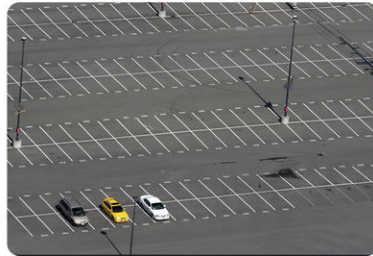
Logging has removed all the trees from these slopes. This leaves the soil bare. Runoff can rush downhill and wash away the soil.



Monster trucks are dwarfed by this huge open-pit iron mine. Soil was stripped from the ground, layer by layer, to remove the iron ore.



Earth-moving equipment prepares a site for construction. The soil is pushed aside and the land is left bare. Some of the soil blows away even as the machine moves it.



Parking lots and other paved surfaces don't allow rain to soak into the ground. This creates greater runoff and erosion.

FIGURE 1.4

Logging, mining, construction, and paving surfaces are some of the ways that soil erosion increases.

Off-Road Vehicles and the Soil



FIGURE 1.5

What's fun for people may be bad for soil. Off-road vehicles can destroy plants and leave the ground bare. This sets up the soil for erosion.

- Prevent overgrazing. Frequently move animals from field to field. This gives the grass a chance to recover.
- Avoid logging steep hillsides. Cut only a few trees in any given place. Plant new trees to replace those that are cut down.
- Reclaim mine lands. Save the stripped topsoil and return it to the land. Once the soil is in place, plant trees and other plants to protect the bare soil.
- Use barriers to prevent runoff and soil erosion at construction sites. Plant grass to hold the soil in place.
- Develop paving materials that absorb water and reduce runoff.
- Restrict the use of off-road vehicles, especially in hilly areas.

Farming Methods that Reduce Soil Loss



Strip Cropping

Groundcover plants such as grasses are planted in strips between fields of crops. The strips of groundcover soak up rain and slow runoff.



Terracing

Step-like terraces are built on slopes. They prevent runoff from rushing downhill and carrying away the soil.



No Till Planting

Seeds are planted in the ground without first tilling (plowing) the soil. Dead plants from the previous crop remain on the ground. Their roots hold the soil in place.



Windbreaks

Rows of trees are planted between fields. The trees slow down the wind and reduce wind erosion.



Contour Cropping

Crops are planted in curving rows to follow the contour of hills. This slows runoff and reduces erosion.



Cover Crops

Fields are planted year-round, even in seasons when crops don't grow. The plants cover the soil and hold it in place.

FIGURE 1.6

There are many farming methods that help prevent soil erosion.

Lesson Summary

- Many human actions make it easier for wind and water to carry away soil. They include plowing, logging, construction, and even some types of recreation.
- Farming methods such as strip cropping and terracing help prevent soil erosion. Other ways to protect soil include replanting forests and reclaiming mine land.

Protecting the Soil



Replant forests.



Reclaim mine land.



Hold soil in place at construction sites.



FIGURE 1.7

Taking steps to control erosion can help save soil.

Lesson Review Questions

Recall

1. How do plants help prevent soil loss?
2. How does logging endanger soil?
3. Describe the effects of construction on soil.
4. How do paved parking lots contribute to soil loss?
5. What is terracing? How does it reduce soil erosion?
6. What are cover crops, and why are they grown?

Apply Concepts

7. Off-road vehicles are popular in Pleasant Valley. Many people like to ride on a nearby grassy hillside. Write a letter to the editor of the Pleasant Valley Newspaper urging residents to protect the soil on the hillside. Your letter should explain why soil is important and why the soil on the hillside is at risk. Describe a better place to ride that is less likely to put soil at risk.
8. Look at **Figure 1.8**. Identify two farming methods that have been used to reduce soil loss. How do they help prevent erosion?



Contour planting on terraces in Montgomery County, Iowa. USDA Photo by Tim McCabe.

FIGURE 1.8

Think Critically

9. Explain why plowing before planting can lead to soil loss. What is the alternative? Why does it reduce soil loss?

Points to Consider

Increasing soil erosion isn't the only way that human actions can affect the land. Many human actions also pollute the land.

- What is pollution?
- What human actions might pollute the land?

References

1. Neil Bradfield. [Soilerosion](#). Image Copyright Neil Bradfield 2010, Used under license from Shutterstock.com
2. From left to right, top row: Mazzzur, Radu Razvan; bottom row: Fred Leonero, Natali Glado. <http://www.shutterstock.com/pic.mhtml?id=47605948>; http://www.shutterstock.com/results.mhtml#lang=en&search_source=search_form&similar_photo_id=&searchterm=43440784; http://www.shutterstock.com/results.mhtml#lang=en&search_source=search_form&similar_photo_id=&searchterm=62652919; http://www.shutterstock.com/results.mhtml#lang=en&search_source=search_form&similar_photo_id=&searchterm=64016470. Image Copyright Mazzzur, Radu Razvan, Fred Leonero, Natali Glado 2010, Used under license from Shutterstock.com
3. Mircea BEZERGHEANU. [Sheep and goats on fieldin spring](#). Image Copyright Mircea BEZERGHEANU 2010, Used under license from Shutterstock.com
4. Left to right, top row: TFoxFoto, Christopher Halloran; bottom row: tarasov, J. Helgason. http://www.shutterstock.com/results.mhtml#lang=en&search_source=search_form&similar_photo_id=&searchterm=58674553; <http://www.shutterstock.com/results.mhtml#searchterm=34950370>; <http://www.shutterstock.com/results.mhtml#searchterm=60692746>; <http://www.shutterstock.com/results.mhtml#searchterm=271867>; Image Copyright TFoxFoto, Christopher Halloran, tarasov, J. Helgason 2010, Used under license from Shutterstock.com

5. Left to right, Hywit Dimyadi, Shani Rubin-Pinhas. http://www.shutterstock.com/results.mhtml#lang=en&search_source=search_form&similar_photo_id=&searchterm=10127581; <http://www.shutterstock.com/results.mhtml#searchterm=40651540>; Image Copyright Hywit Dimyadi, Shani Rubin-Pinhas 2010, Used under license from Shutterstock.com
6. Strip cropping: Image Copyright Studio 37, 2011; terracing: Image Copyright beboy, 2011; no-till planting: Tennessee Dept. of Agriculture, Agricultural Resources Conservation Fund; windbreaks (top): Image Copyright Cloudia Newland, 2011; windbreaks (bottom): Image Copyright Loskutnikov, 2011; contour cropping: Image Copyright Earl D. Walker, 2011; cover crops: USDA Natural Resources Conservation Service. **Strip cropping:** <http://www.shutterstock.com>; **terracing:** <http://www.shutterstock.com>; **no-till planting:** <http://www.tn.gov/agriculture/water/arcf.html>; **windbreaks(top):** <http://www.shutterstock.com>; **windbreaks (bottom):** <http://www.shutterstock.com>; **contour cropping:** <http://www.shutterstock.com>; **cover crops:** http://www.vt.nrcs.usda.gov/technical/Conservation_Planning/Questionnaire/Questionnaire_Index.html. Strip cropping: Used under license from Shutterstock.com; terracing: Used under license from Shutterstock.com; no-till planting: Public domain; windbreaks (top): Used under license from Shutterstock.com; windbreaks (bottom): Used under license from Shutterstock.com; contour cropping: Used under license from Shutterstock.com; cover crops: Public domain
7. From left to right, top to bottom: 4780322454; A.S. Zain; Gary Whitton; Mark Winfrey. **From left to right, top to bottom: Pine-treeplant; Reclamation at coal mining site; Soil erosion mitigation; Erosion control on a construction site.** From left to right, top to bottom: Image Copyright 4780322454, 2011 Used under license from Shutterstock.com; Image Copyright A.S. Zain, 2011 Used under license from Shutterstock.com; Image Copyright Gary Whitton, 2011 Used under license from Shutterstock.com; Image Copyright Mark Winfrey, 2011 Used under license from Shutterstock.com
8. Tim McCabe for the USDA. http://www.livinghistoryfarm.org/farminginthe30s/crops_11.html. Public domain