



SOIL

Lesson 4 ♦ Erosion

Grades 6th-8th

Key Words

Weathering, erosion, bedrock, topsoil, sediment, chemical weathering, mechanical weathering, deposition, canopy layer

Key Concepts

Understand what erosion is, and its causes and effects on the natural surroundings.

Identify plants' roles in minimizing erosion and incorporate this knowledge to help protect the 'āina.

Comprehend the different layers of the forest and how each plays a part in maintaining a natural balance of precipitation to erosion.

Understand the importance of topsoil and its necessity to life on the planet.

Lesson Outline

Introduce soil erosion lesson. Explain that the Earth is always changing. Planet Earth is big and it's been around for a long time. But has it always looked the same? Or has it changed over time? The earth is constantly changing and shifting in many ways. Have you ever felt an earthquake? Or learned about glaciers carving out huge valleys? Or about volcanoes, like the ones we live on, that pour out lava that creates new land? Or watched the waves wash away the sand and rocks on the beach? All of these are ways that the earth and the land are shifting and changing.

Humans can also change the landscape and have been for thousands of years. Here in Hawaii we see evidence of this going back to the building of lo'i. An area was cleared for the lo'i near the kahawai, or stream, and water was diverted through an auwai (trench) to flow through the lo'i and then back to the kahawai. This system actually benefited the ecosystem as the lo'i helped filter and add nutrients to the water before it went back to the kahawai.

In many ways, humans also change the landscape in negative ways. We're constantly covering more and more land with concrete and asphalt which means we're sealing our soil underneath. In our gardens, we know that soil holds nutrients and water that plants need to grow, as well as an entire ecosystem of living organisms. When soil is sealed away under

concrete and asphalt, it can no longer perform its ecosystem role of storing water and nutrients, providing habitat for organisms, or growing plants.

Demonstrate the amount of soil/land available on Earth by facilitating Apple Activity. At the end of the activity you will be left with a thin layer of apple that represents the very top layer of land that we depend on for growing all of our food. This layer is called topsoil and it is very important for growing food because, just like our garden soil, it is full of nutrients and water and living things. The layer of topsoil on Earth is less than 5 feet deep. That may seem like a lot, but it takes 100 years for 1 inch of topsoil to form, so it's important for us to help protect it. One way we can do this is by preventing erosion.

Erosion happens when natural forces such as wind and water break away at soil and rocks. Erosion isn't a bad thing if it happens over a long, long time. This is how valleys and canyons form as the wind and water from rivers and ice from glaciers slowly break away at the rock and soil. And it's how we get minerals in our soil too like we talked about in our very first lesson.

But when erosion happens really quickly, we can start to lose our topsoil which we do not want. When there is a flood or a big storm that brings large waves or strong winds to the beaches, unprotected soil can be washed or blown away.

On Maui, we can see the effects of erosion after storms that carry a lot of precipitation and deliver large waves. When it rains heavily, we can see the cloudy, muddy runoff at the mouths of our streams. When large waves crash on the shoreline, rocks and sediment are released into the ocean. If we are able to reduce erosion, we protect not only our land, but also the ocean and the life inside of it.

That being said, when we talk about combating erosion, we must acknowledge the important role that plants play in preventing soil loss. When it rains in our native forests the tallest trees, known as the canopy layer, help to slow the heavy rain and prevent erosion of the soil. The mid canopy helps to absorb and trap in moisture from the air and the ground cover helps prevent evaporation from the soil, keeping it from drying out. The water that does not get absorbed into the soil washes downstream. The roots of the plants hold the land in place while filtering the water. This prevents erosion on the land as well as runoff to our rivers and oceans.

Thus, if we want to do our part in protecting the land where severe erosion is occurring, we can do our part by planting plants. There are many organizations on Maui that are giving back by planting trees; one of these groups is ReTree Hawai'i. For more information, please visit the link listed in the Resource section below.

Video Lesson

[Soil Lesson 4 Video - Erosion](#)

Activities

- **ACTIVITY: The World as an Apple** : Instructions for adults (or students who can safely cut apples) to demonstrate as Amber has done in our GSG video, using fractions of an apple, how much of the Earth is viable topsoil for growing everyone's food.
- **HANDOUT: Student Worksheet Erosion_6-8** : Student worksheet to accompany the video lesson.

Additional Resources

- **VIDEO: Erosion and Soil**: This 7-minute Youtube video on the Channel funsciencedemos does a great job of thoroughly explaining the set up of their erosion demonstration and precisely why less soil is lost in areas with established root systems and how those systems retain water as well.
Courtesy of FunScienceDemos YouTube Channel <https://bit.ly/16zEpWc>
- **VIDEO: What Is the Greenhouse Effect?** : This short, 3-minute video explains the Greenhouse effect, the gases that cause it and the human activities that increase the Greenhouse effect and contribute to global warming. The site also has supporting visuals. *Courtesy of NASA's Climate Kids site:* <https://climatekids.nasa.gov/>
- **WEBSITE: What Can Trees Tell Us About Climate Change?** : This page explains (with visuals) how tree rings teach us about the history of our climate. *Courtesy of NASA's Climate Kids site:* <https://climatekids.nasa.gov/>
- **VIDEO: Reforestation: Impact on Climate** : This short 3-minute video by the Nature Conservancy provides an overview of how trees help capture carbon dioxide and reduce erosion. *Courtesy of The Nature Conservancy YouTube Channel*
- **WEBSITE: ReTree Hawaii** : Website for the Statewide Tree Planting Day, which provides a list of reasons why planting trees in Hawai'i is so crucial, an overview video and upon clicking "Enter the site," there are links to credible native and non-native plant advice. On this page you can find out about planting events and/or register your home as a planting site. *Courtesy of ReTree Hawaii*

NGSS - Next Generation Science Standards

- **6-8-ESS2-2** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- **6-8-ESS2-4** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- **6-8-ESS3-2** Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

KAP - Kū 'Āina Pā Curriculum Map - Courtesy of the [Kohala Center](#)

- KAP_2:LS_6-8_1.2 Describe characteristics and components of living soil
- KAP_2:LS_6-8_1.4 Explain how soils are created and erode
- KAP_2:LS_6-8_5.1 Understand and describe how weather shapes the earth and affects soil and plants