Human Impact on the Lithosphere (Erosion)

1930's Dust Bowl

Essential Standard 2.2

Understand how human influences impact the lithosphere.

Learning Objective 2.2.2

Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present.

I Can Statements

At the end of this lesson, you should be able to say, with confidence:

- I can describe various ways human activities have increased erosion of soil on the effects the erosion of soil has had on the environment.
- I can describe various ways human activities have increased coastal erosion and the impact it has had on our beaches.

Man Made Erosion

The most widespread devastating impact human activities have on the lithosphere is man made erosion.

Essential Natural Resource

As you have already learned, soil is an essential, natural resource vital for plant growth.

Soil also provides food and homes for animals, beneficial bacteria, and beneficial fungi.

Devastating Consequences

The loss of soil due to erosion can have devastating consequences on ecosystems.

Erosion of soil not only affects the land, but it is also the number one cause of water pollution.

Plant Protection

The best way to protect the soil from erosion is by keeping the soil covered with grass and other plants.

Plants help anchor the soil, prevent it from drying out, and keep it nourished with organic matter.

Plant Protection

Anything humans do that reduces plant cover will result in increased erosion of soil which can then lead to increased desertification, water pollution, air pollution, and loss of habitat.

Deforestation

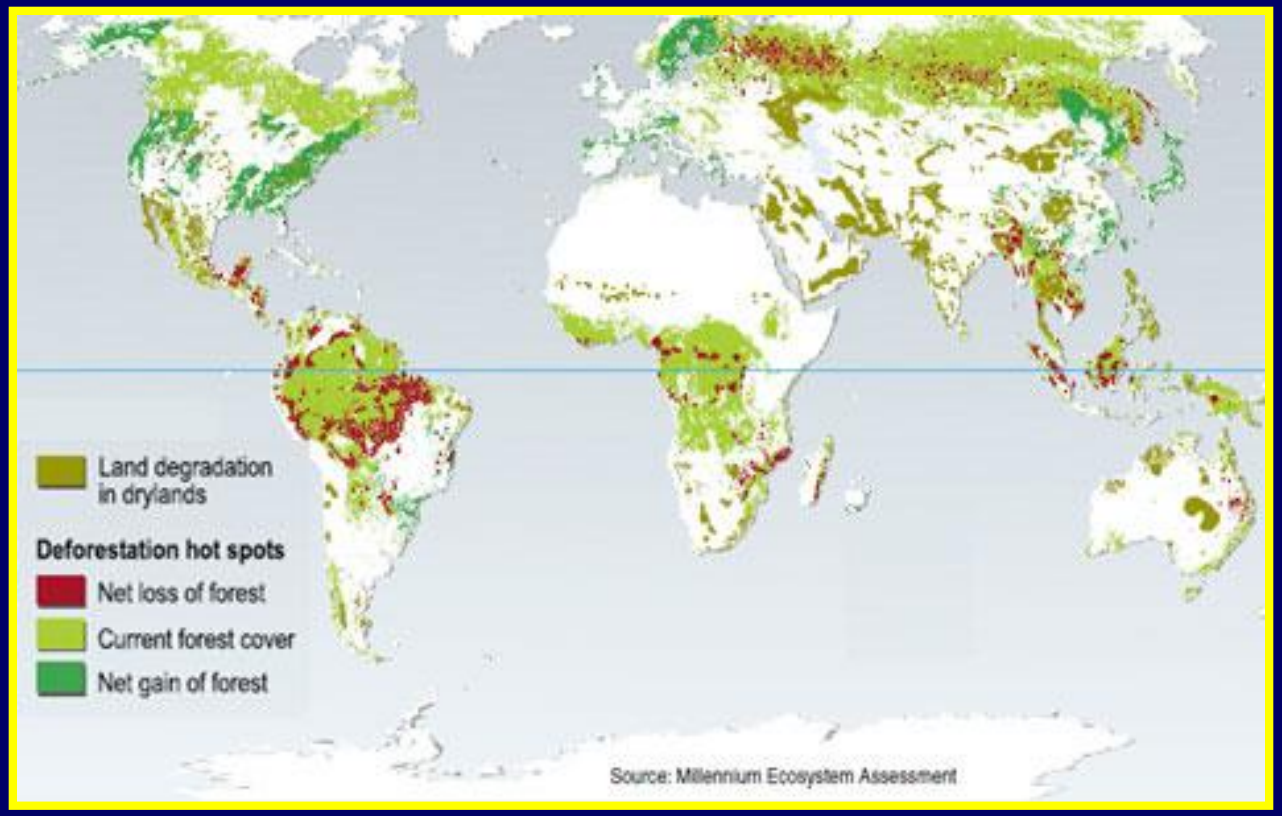
Deforestation is the removal of forests for lumber, to create farmland, or for other development.

Removing all the forest trees and undergrowth, exposes large areas of soil to surface runoff.

Even when crops are grown on the land, it's less coverage than what a forest provides.

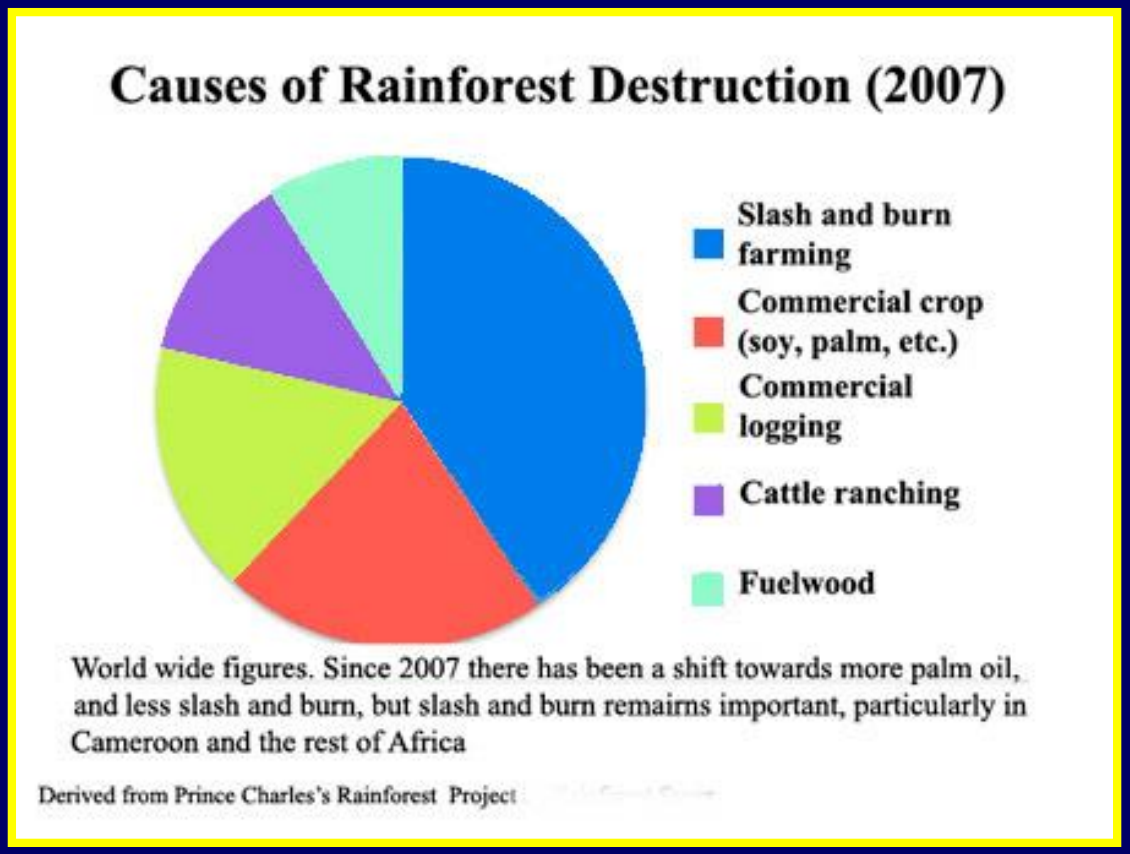
Rainforest Destruction

Deforestation for logging or agriculture has lead to the loss of over 17% of the Amazon rainforest in the past 50 years.



Slash and Burn

Slash and Burn refers to the practice of slashing down trees and burning the rest, in order to clear the land for farming.



Commercial Crops

The current leading cause for rainforest destruction is to clear land for palm oil plantations.

Clear Cutting

Clear cutting is when forests are cleared of all trees for logging and the land is just left exposed to weathering and erosion.

Overgrazing

Over-grazing occurs when livestock eats the grass faster than it can grow back.

Overgrazing

As the land is left bare, erosion and loss of soil increases, making it difficult for grass to ever re-establish itself.

Desertification

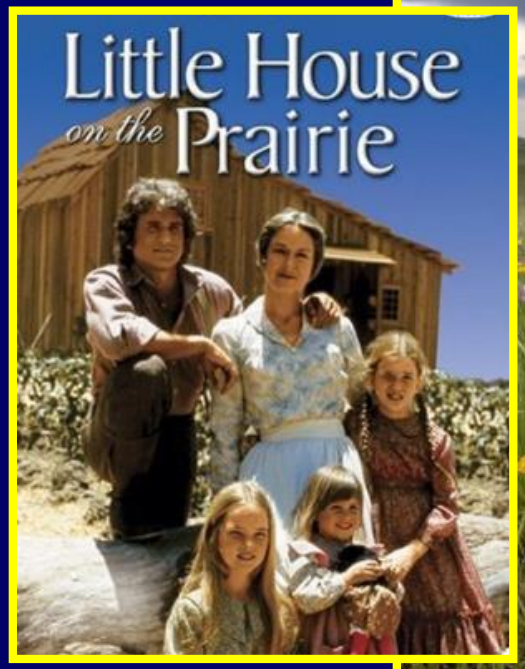
With the loss of soil and plant cover, the land is unable to hold onto water, changing the land into desert, a process called desertification.

Over Farming

Excessive farming on land without replacing the nutrients or protecting the soil can also lead to major soil loss.

Prairies

Thousands of years of prairie grass growth, death, and decomposition led to thick, dark, organically rich layers of soil in the prairies.



Periodic Droughts

However, the prairies are subjected to natural periodic droughts and so were considered unsuitable for farming.

But as the population of the United States continued to increase, people began to migrate to the prairies to try farming the prairies anyway.

Homestead Act

With the federal Homestead Act of 1862 and the completion of the transcontinental railroad, the government encouraged settlers to begin farming in the Great Plains.

Mechanical Plow

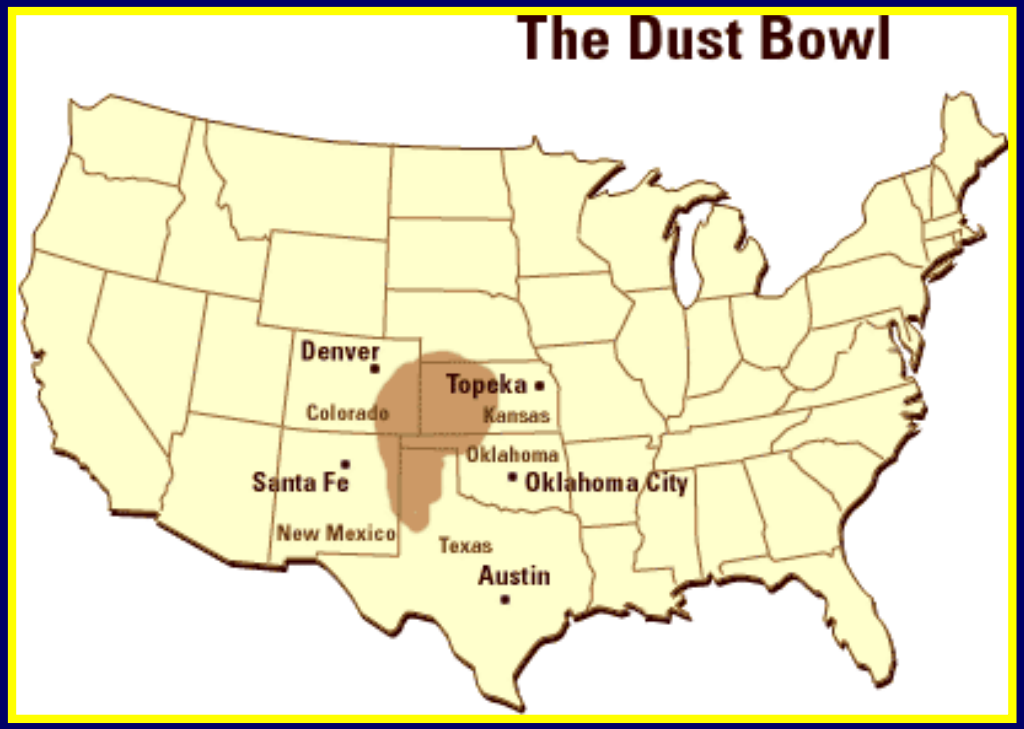
The invention of the mechanical plow, an unusually long wet period, and an increased need for wheat production led to profitable farming in the Great Plains during the 1920's.

Acres and acres of prairie grass was converted into wheat and other crops.

Mechanical Plow

Dust Bowl

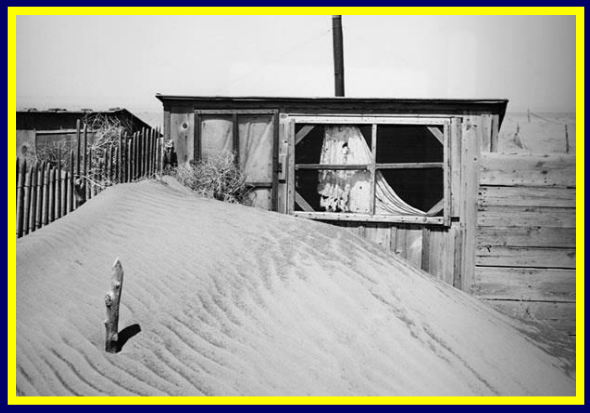
During the 1930's, several states in the Great Plains, experienced a severe drought and frequent dust storms.



The time and area came to be known as The Dust Bowl.

Dust Bowl

As crops died, the exposed soil was subjected to wind erosion which turned into massive dust storms due to the attraction forces of static electricity.



Dust Bowl

With farming being impossible and being in the midst of the Great Depression, most of the population of the Great Plains lost their farms and had to migrate to other areas, where they were not welcome..

Grapes of Wrath by John Steinbeck

Loss of Soil

The average depth of top soil in Iowa, alone, decreased from between 14 - 18 inches at the beginning of the 20th century to 6 – 8 inches by the end of the century.

The pillars show the change in the depth of topsoil in Iowa over the past 150 years.

The top portion is the actual depth of the soil.

Increased Surface Runoff

Increased surface runoff from rainwater can also lead to a loss of soil and can occur wherever plant cover has been reduced due to poor farming practices and development.

Tilling the Soil

When farmers till or plow the fields, loosening the topsoil, and leave the soil exposed in between crop growth, more soil is washed away every time it rains.

Animals in Streambeds

As farm animals enter and leave streams, they loosen the soil and increase erosion of the stream bed.

Construction

Erosion is also frequent during construction projects when plant cover is removed and the soil is left exposed.

Coastal Erosion

Human actions can also increase erosion on the coast.

Nags Head Beach

Natural Erosion

Along the coast, erosion and deposition of sand is a natural process due to waves and currents.

Bear Island, NC

When the beach is allowed to remain undisturbed, as sand is eroded, more sand is deposited and the beach maintains its size..

Beach Development

When we build on the beach, the natural erosion and deposition flow becomes disrupted and the beach continues to decrease in size.

Beach Structures

Permanent structures meant to protect the beach like sea walls, groins, and breakwaters, may protect the sand for a short period of time but actually end up increasing erosion over a longer period of time.

Series of Groins at Bald Head Island

Groins are walls built perpendicular to the shoreline.

Groins induce deposition on one side, but rob the beach of sand on the other side.

Beach Structures

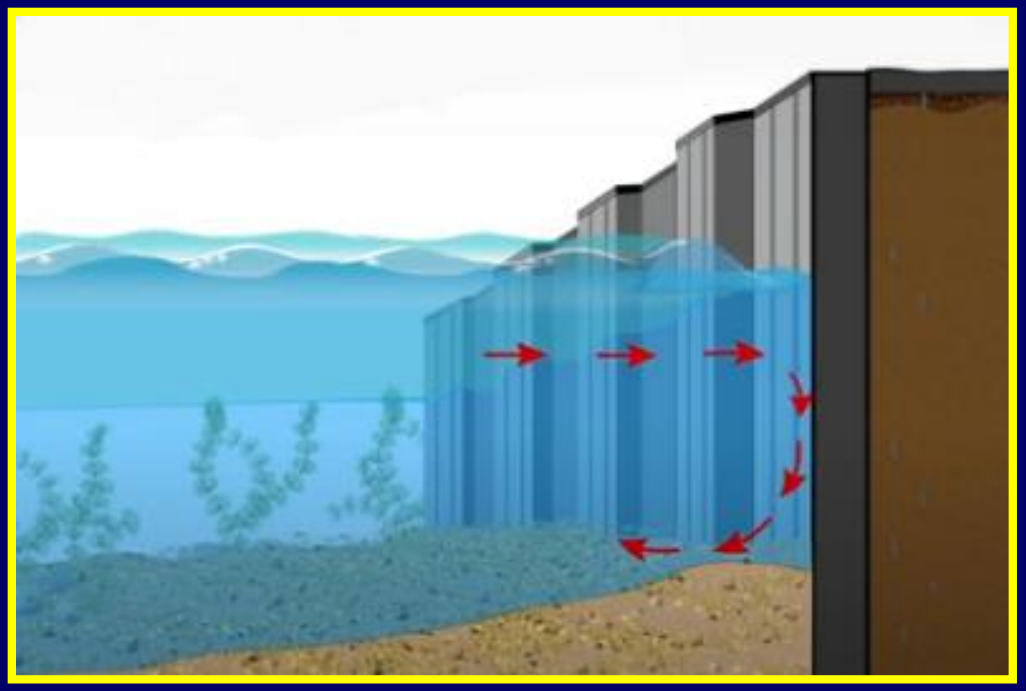
Seawalls and breakwaters are built parallel to the shoreline.

Seawall in Galveston, Texas.

Series of Breakwaters in Miami, Florida.

Beach Structures

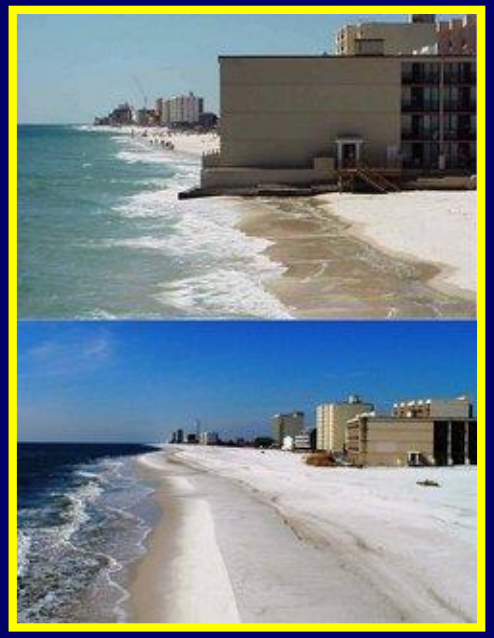
Both seawalls and breakwaters cause the waves and tides to be diverted downward where the water scours out the sediment.



As more and more sand is removed, the seawall or breakwater is no longer supporter and just end up collapsing.

Beach Structures

Beach re-nourishment projects involve dredging sand from offshore and placing it along beaches to widen the beaches.



However, re-nourishment is only temporary and are very expensive.

Beach Structures

To maintain shipping inlets, the Army Corps of Engineers conduct regular dredging projects that cost millions of dollars each time.

Again, this is only an expensive temporary solution.

The End