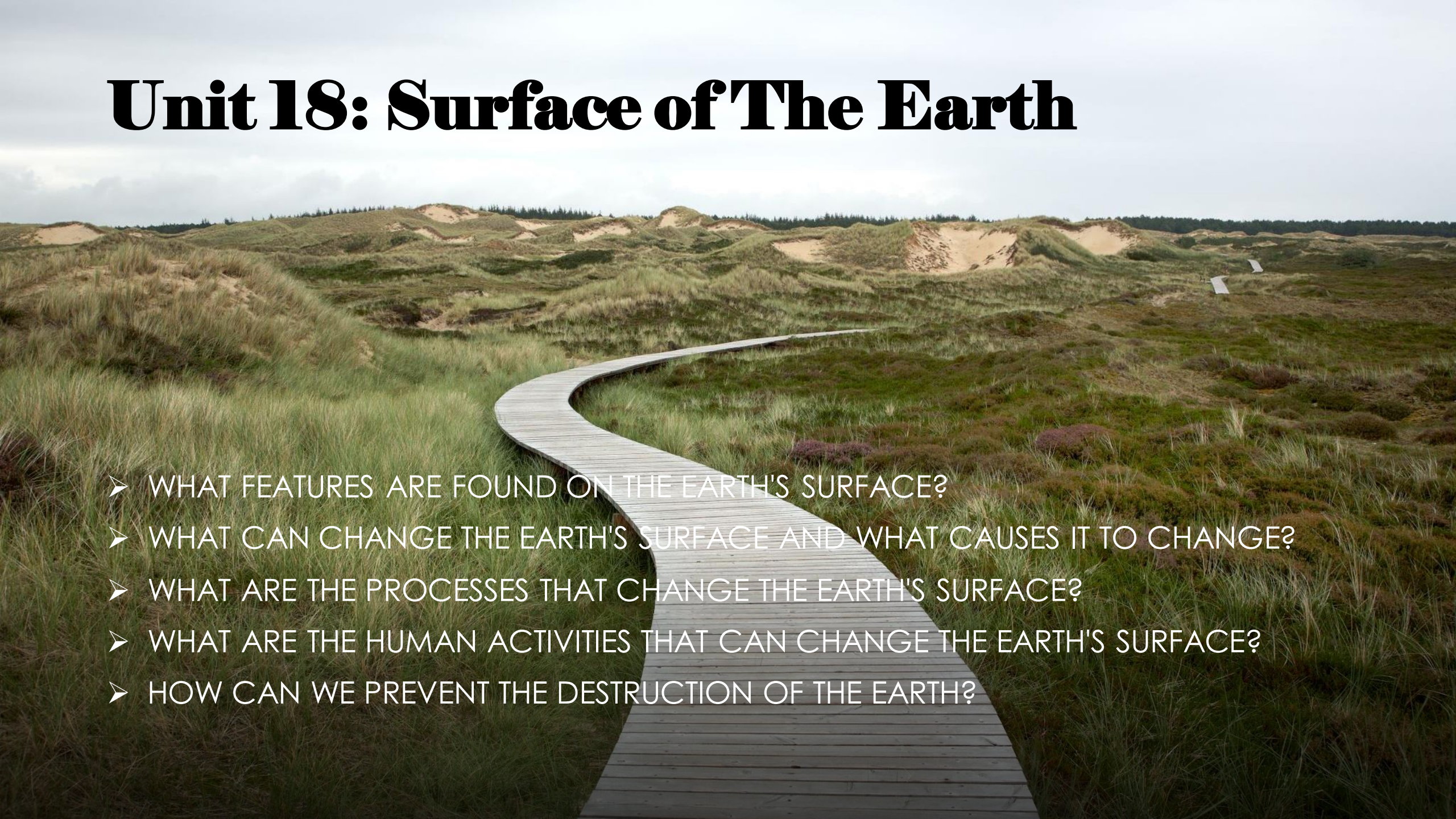
Unit 18: Surface of The Earth



- WHAT FEATURES ARE FOUND ON THE EARTH'S SURFACE?
- WHAT CAN CHANGE THE EARTH'S SURFACE AND WHAT CAUSES IT TO CHANGE?
- WHAT ARE THE PROCESSES THAT CHANGE THE EARTH'S SURFACE?
- WHAT ARE THE HUMAN ACTIVITIES THAT CAN CHANGE THE EARTH'S SURFACE?
- HOW CAN WE PREVENT THE DESTRUCTION OF THE EARTH?

18.1 Features of The Earth's Surface

VIDEO

What are some features that can be found on the Earth's surface?

Continents and Islands

- There are seven large masses known as **continents** and thousands of small land masses known as **islands**.

- The seven continents are known as Africa, Antarctica, Asia, Australia, Europe, North America and South America.

VIDEO

Oceans, Seas, Lakes and Rivers

- Surrounding the continents and islands are oceans and seas. The oceans are Pacific Ocean, Atlantic Ocean, Indian Ocean and Arctic Ocean.

- The Pacific Ocean is the largest and deepest ocean. There are also rivers that run across the land and lakes enclosed within the land masses.

Mountains and Hills

- There are tall mountain ranges and low hills that can be found on the continents. Some of these mountain ranges can also be found on the ocean floor.

- The highest point on Earth is Mount Everest (8848 m above sea level) in the Himalayas mountain ranges. The lowest point on the Earth is the Mariana Trench in the Pacific Ocean. It is about 11 033 m below sea level.

Other Features

- Deserts, **plains**, volcanoes and valleys are the other surface features of the Earth's surface.

- Deserts make up one-third of the Earth's land surface. Deserts are classified into two types: hot desert and temperate desert.

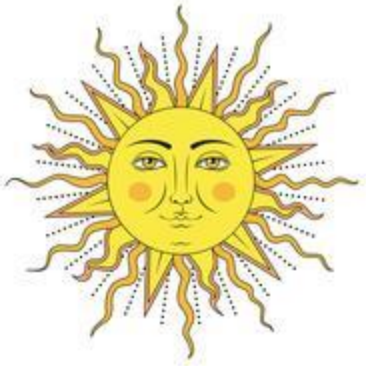
What are the differences between a hot desert and a temperate desert?

- A hot desert experiences high temperatures all year long. A temperate desert experiences hot summers and freezing cold winters.
- It rains in a hot desert while it snows in a temperate desert.

18.2 The Changing Surface of The Earth

What causes the surface of the Earth to change and how does it change?

The Earth's surface changes over time and are caused by agents of erosion and weathering. Rain, running water, wind, sunlight and tidal waves are agents of erosion and weathering.



Rain

Rain can slowly erode the soil and the rocks on the Earth's surface.

- Rain is slightly **acidic** and can react with some minerals in rocks chemically. This causes rocks to break down.

- Rain washes away soil that does not have any plants or trees growing on it, leaving the soil **exposed**. This can result in **barren** land.

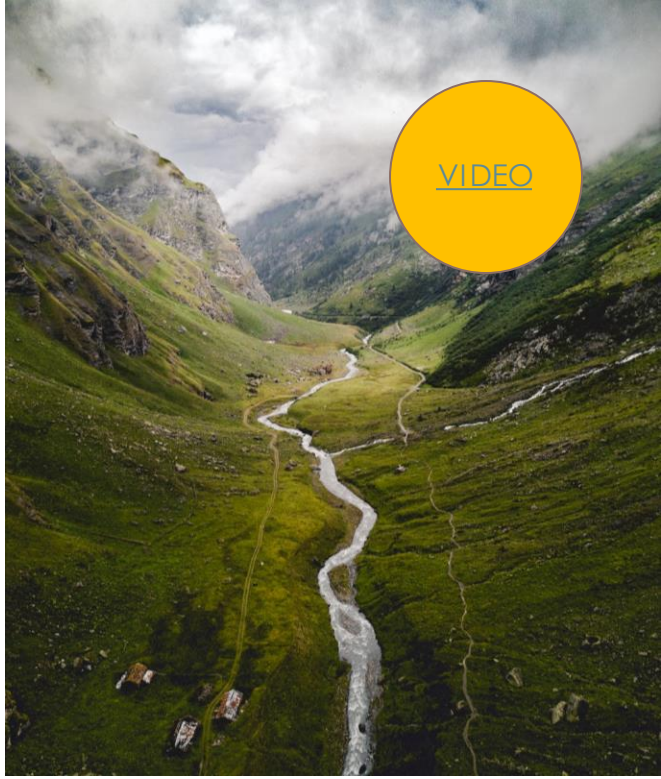
Running Water

Running water can slowly erode the Earth's surface and the rocks found on it.

Sediments in fast-flowing water hit against the rocks found on the river. The sediments also grind against the riverbed and the river banks.

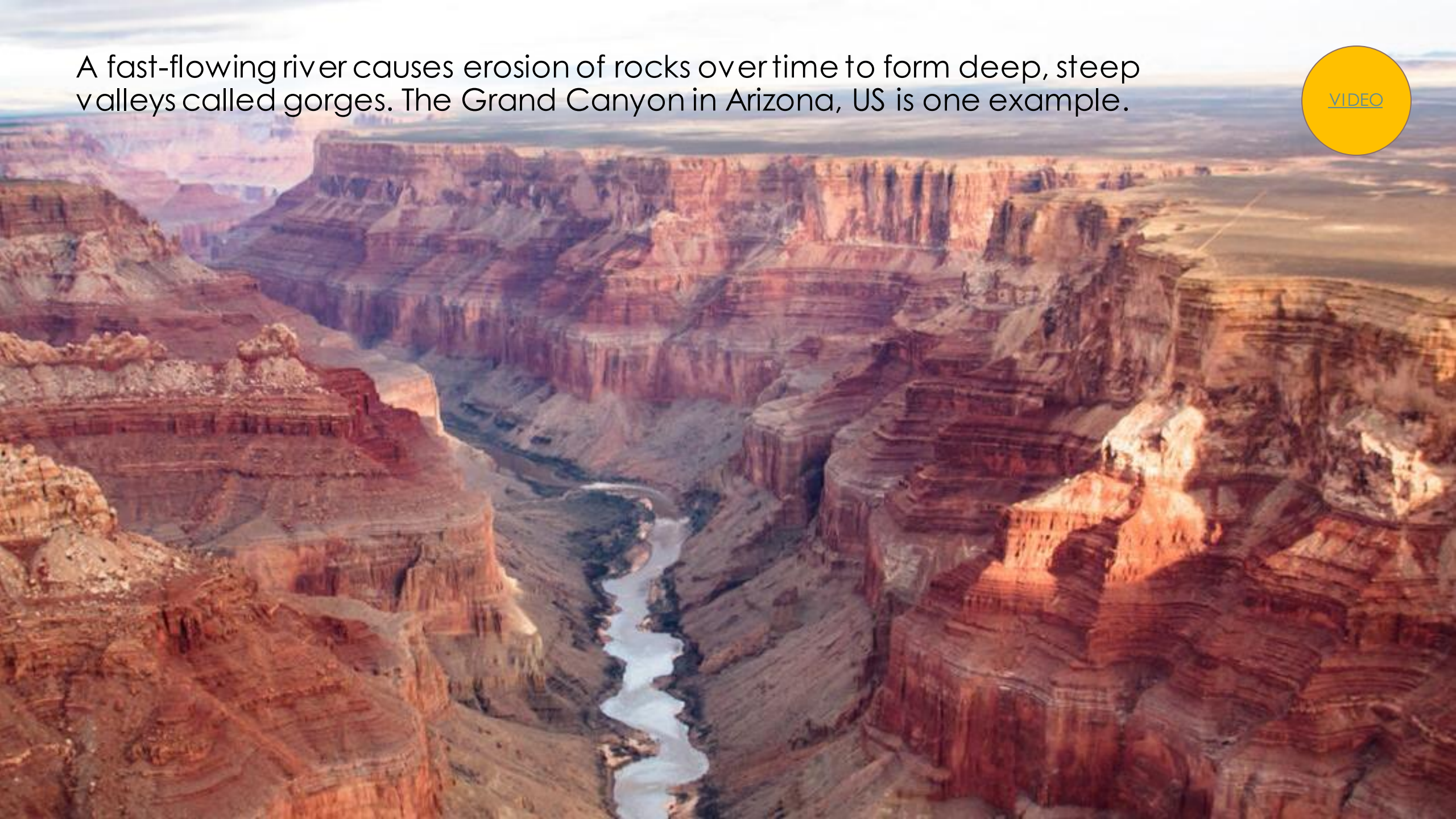
This causes the rocks that lie on the riverbed and river banks to loosen, smoothen or break into smaller pieces. This process of breaking down rocks into smaller pieces by physically grinding against their surfaces is also known as **abrasion**.

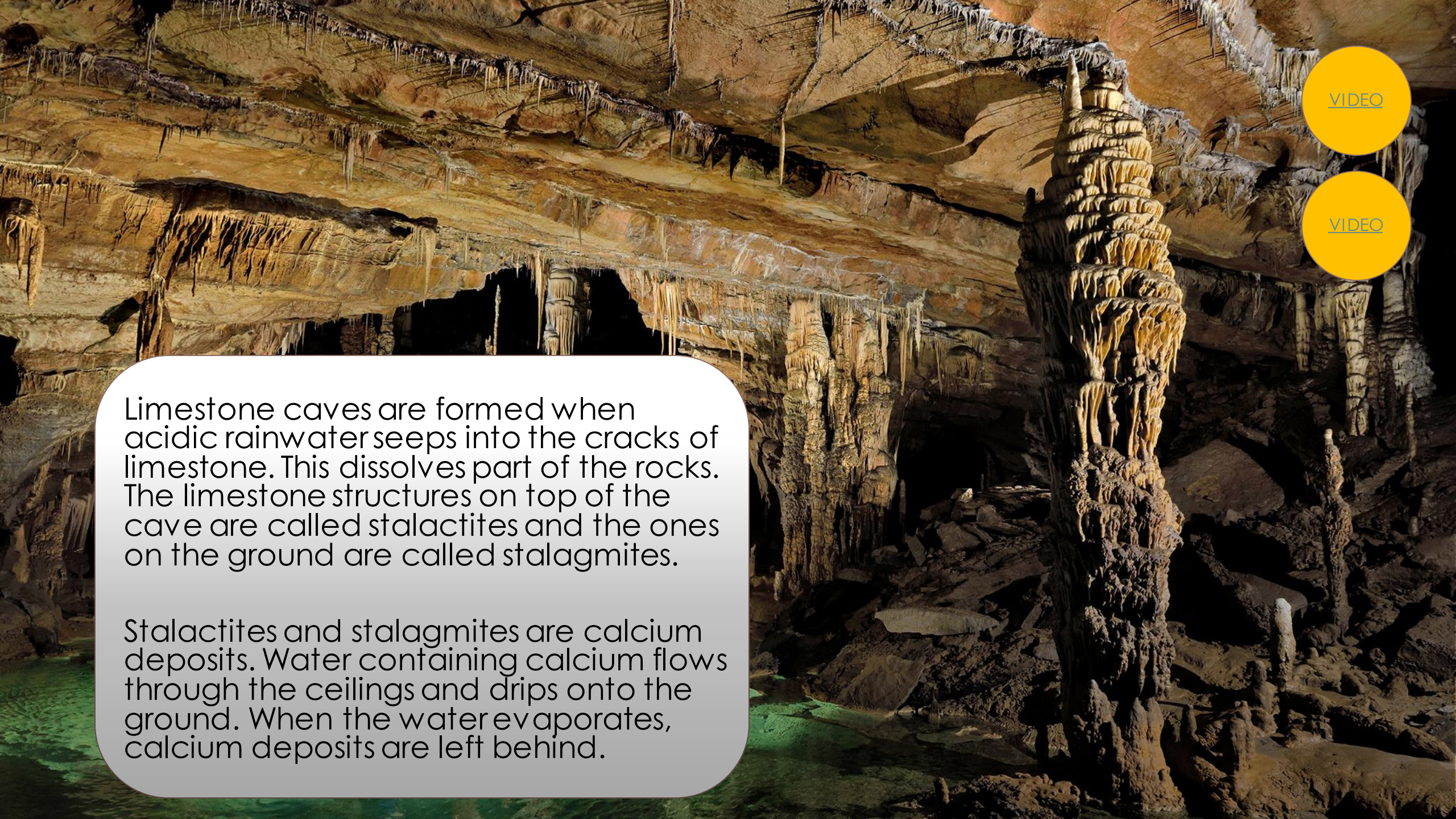
The flow of water then carries the loosened materials away. Over time, caves and valleys are formed.



A fast-flowing river causes erosion of rocks over time to form deep, steep valleys called gorges. The Grand Canyon in Arizona, US is one example.

VIDEO



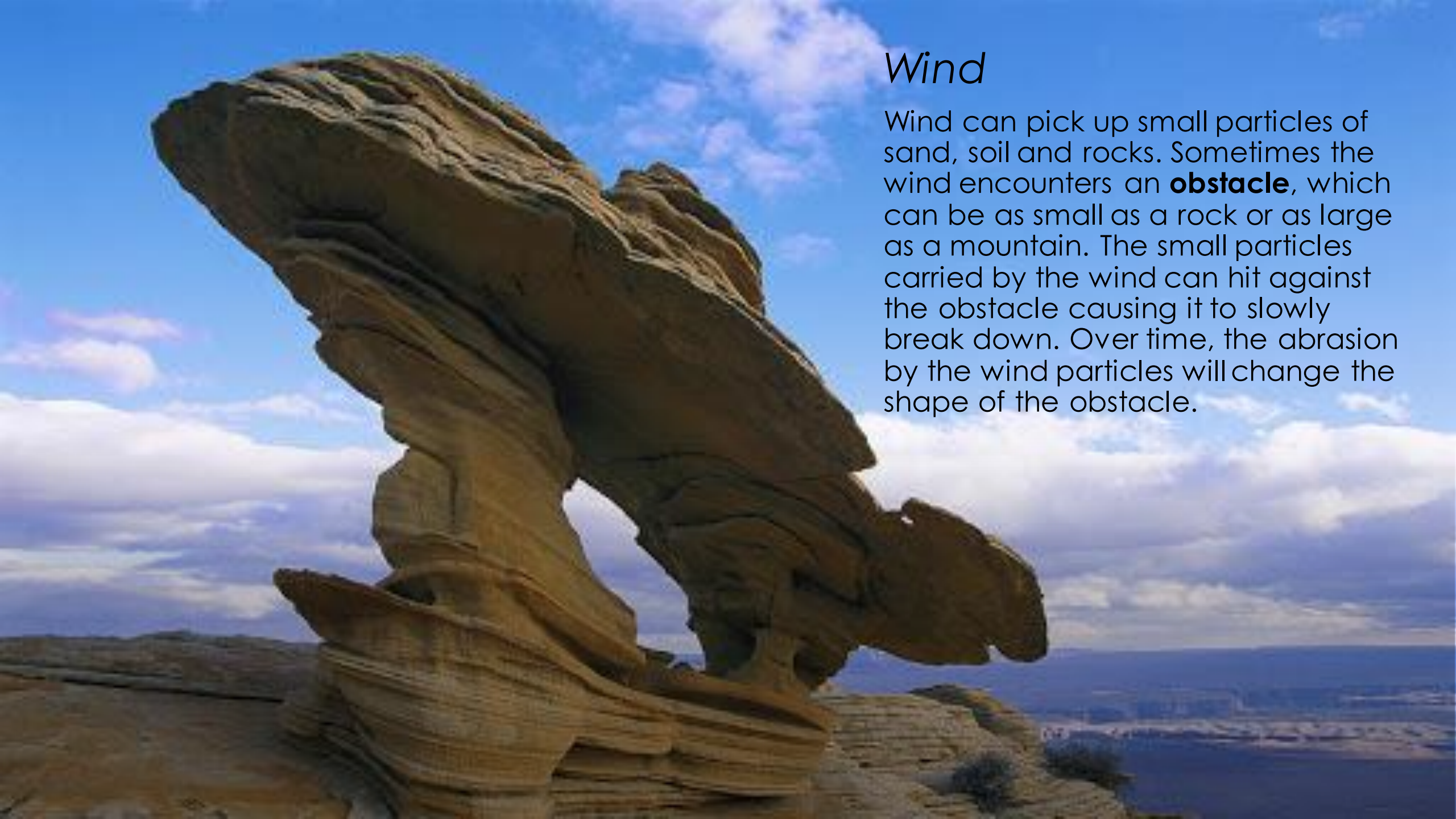


VIDEO

VIDEO

Limestone caves are formed when acidic rainwater seeps into the cracks of limestone. This dissolves part of the rocks. The limestone structures on top of the cave are called stalactites and the ones on the ground are called stalagmites.

Stalactites and stalagmites are calcium deposits. Water containing calcium flows through the ceilings and drips onto the ground. When the water evaporates, calcium deposits are left behind.



Wind

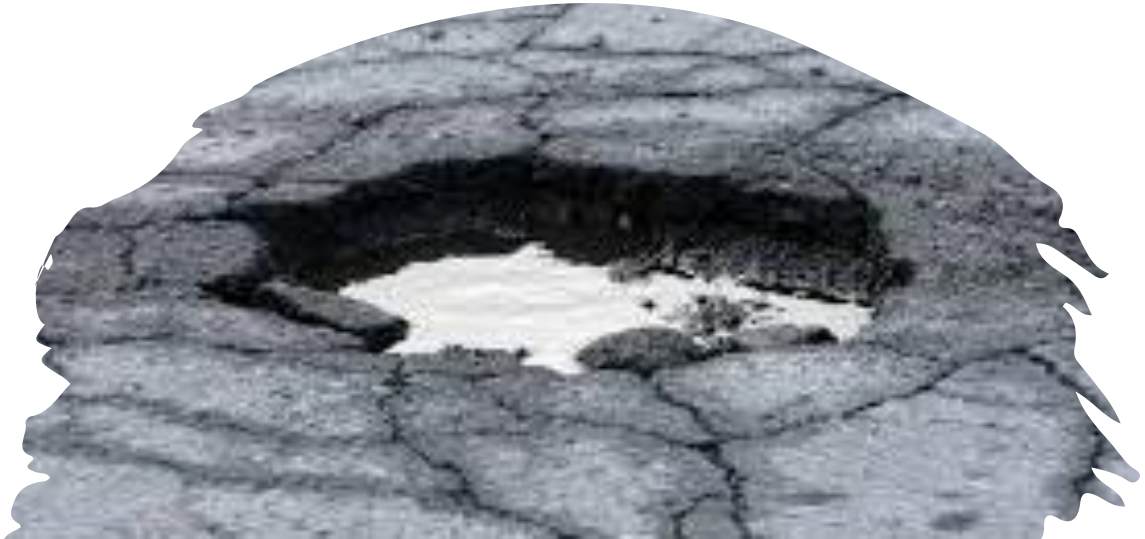
Wind can pick up small particles of sand, soil and rocks. Sometimes the wind encounters an **obstacle**, which can be as small as a rock or as large as a mountain. The small particles carried by the wind can hit against the obstacle causing it to slowly break down. Over time, the abrasion by the wind particles will change the shape of the obstacle.

Sunlight

Sunlight can change the Earth's surface in many ways. **Thermal** expansion and frost action are two examples.

Thermal Expansion

Daily thermal expansion in the day and contraction at night can loosen the outer layers of rocks and other land structures. This process of weathering is more common in areas where there is a large temperature change, such as the desert.



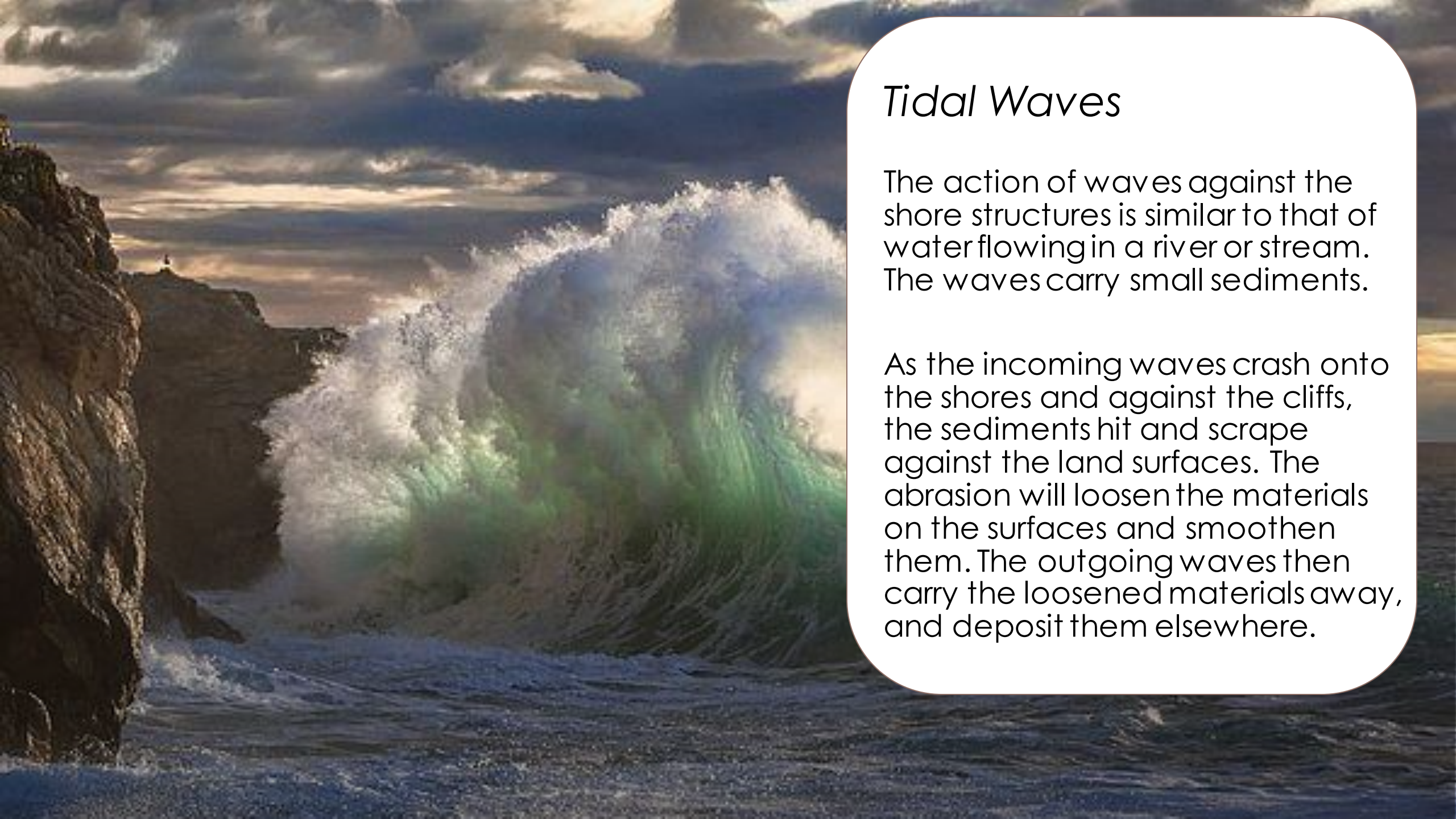
Sunlight

VIDEO

Frost Action

In winter, there is less sunlight and some areas may experience very low temperatures. Water trapped in the cracks of rocks and other land structures may freeze to become ice and expand. This causes cracks to enlarge.

Over repeated freezing of water and melting of ice in the cracks, the rocks eventually break apart into smaller pieces. This weathering process is also known as freezing or frost action.



Tidal Waves

The action of waves against the shore structures is similar to that of water flowing in a river or stream. The waves carry small sediments.

As the incoming waves crash onto the shores and against the cliffs, the sediments hit and scrape against the land surfaces. The abrasion will loosen the materials on the surfaces and smoothen them. The outgoing waves then carry the loosened materials away, and deposit them elsewhere.

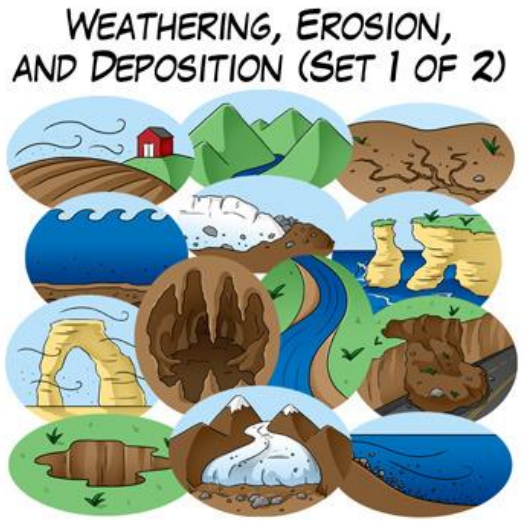
18.3 Processes that Change The Earth's Surface

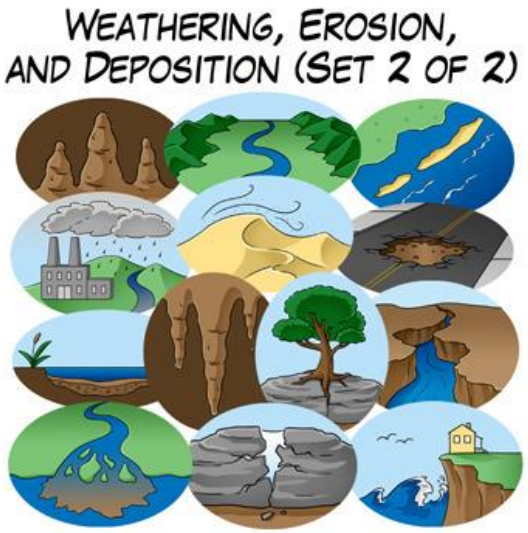
What are the processes that cause the Earth's surface to change?

The Earth's surface changes due to processes that can be slow or rapid.

Slow Processes

Slow processes occur over time. These slow processes include **weathering** and **erosion**.





Weathering - *slow process*

Weathering is the physical and chemical break down of rocks and other land structures. Agents of weathering include:

- rain, water, sunlight, tidal waves and wind

VIDEO

VIDEO

Erosion - *slow process*

Erosion is the removal of earth materials, such as soil and rocks, from their natural environment. Agents of erosion include:

- running water, tidal waves, rain and wind

Rapid Processes

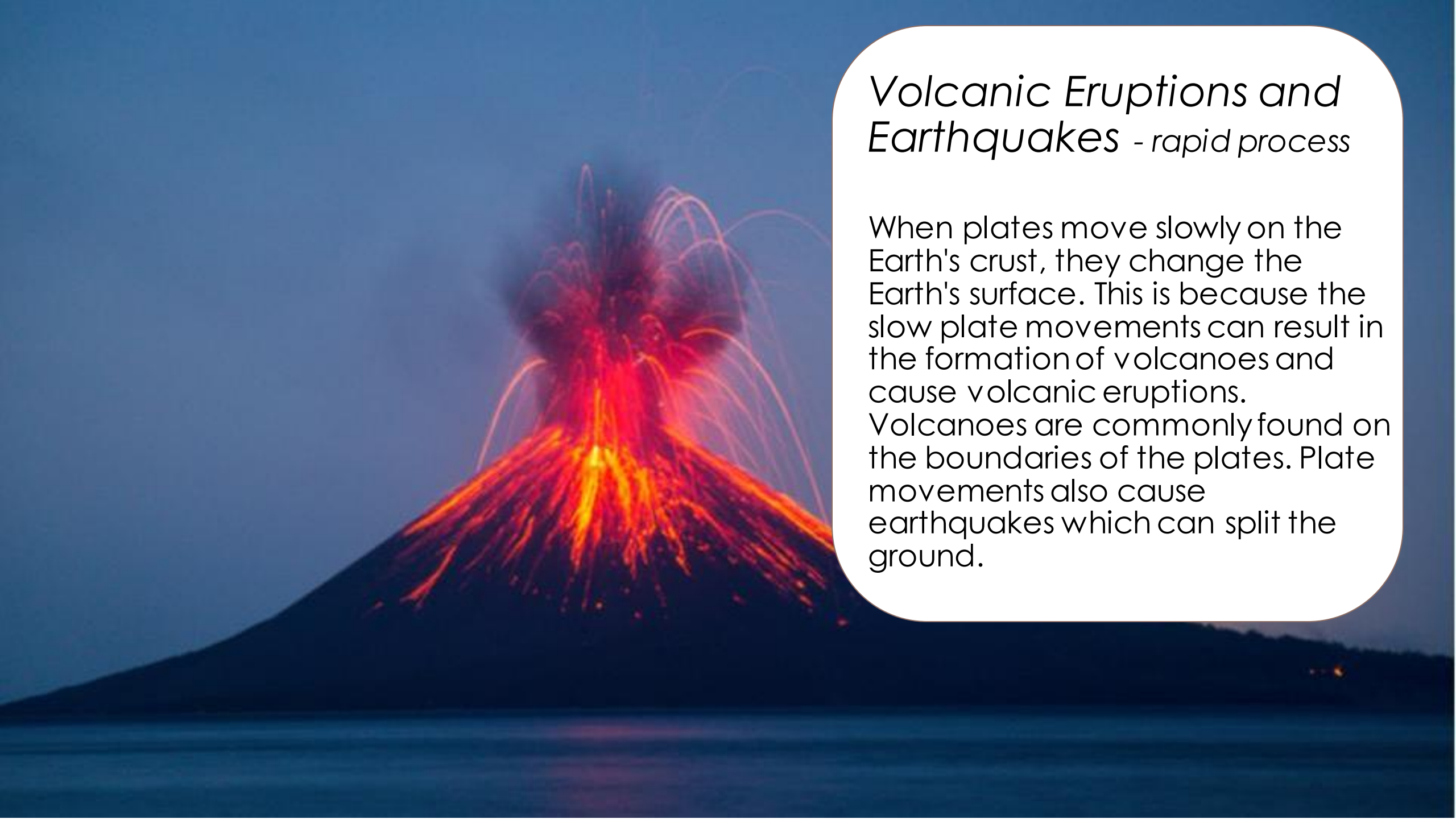
Rapid processes only require a very short time for the changes to be observable. These rapid processes include **landslides**, **volcanoes** and **earthquakes**.

VIDEO

Landslides - *rapid process*

Landslides can change the shape of a hill or mountain. A landslide is the movement of rocks, soil or other earth materials down a slope. Sometimes, running water from heavy rains can cause a landslide.

Landslides can cause great damage to property and roads. People trapped in houses and buried under landslides can die from **suffocation** due to lack of oxygen.



Volcanic Eruptions and Earthquakes - *rapid process*

When plates move slowly on the Earth's crust, they change the Earth's surface. This is because the slow plate movements can result in the formation of volcanoes and cause volcanic eruptions. Volcanoes are commonly found on the boundaries of the plates. Plate movements also cause earthquakes which can split the ground.

18.4 How Human Activities Change The Surface of The Earth

How do human activities change the Earth's surface?

Human activities can also cause significant changes to the surface of the Earth. These activities include **industrialization**, farming and **land reclamation**.

Industrialization

An **industrialized** country or **society** has a lot of highly developed **industries** with buildings and factories. In industrialized places, we can expect to see many factories that produce goods, power plants that generate electricity and a large human population to support the industry.

Factories, Power Plants and Houses

To build factories, power plants and houses, a lot of land is required. To make available land for development, hills are flattened, swamps are filled, and forests are cleared.

VIDEO

Dams

The building of dams to generate hydroelectric power can also change the Earth's surface. This is because the dams cause lakes to form behind them, thus reducing the flow of water downstream.

Roads and Bridges

The construction of roads, bridges, tunnels and other transportation routes provides easy access to places by motor vehicles. This can change the surface of the Earth too.

In Mountainous and hilly regions, roads are cut into them or tunnels are bored through them. Some bridges are built across rivers and this causes the rivers to stop flowing.

Mining

Mining is an activity that can greatly change the surface of the Earth. Hills, mountains and other parts of the Earth's surface are drilled to obtain metals and fuels.

Logging

With industrialization, there is a greater demand for building materials and fuels for power generation. Logging takes place in areas that have many trees and ores that can provide wood and metals.

Farming

Farming requires large areas of land to be cleared for the growing of crops. As the human population increases, there is greater demand for food. So, more land for better yielding crops are required for farming.

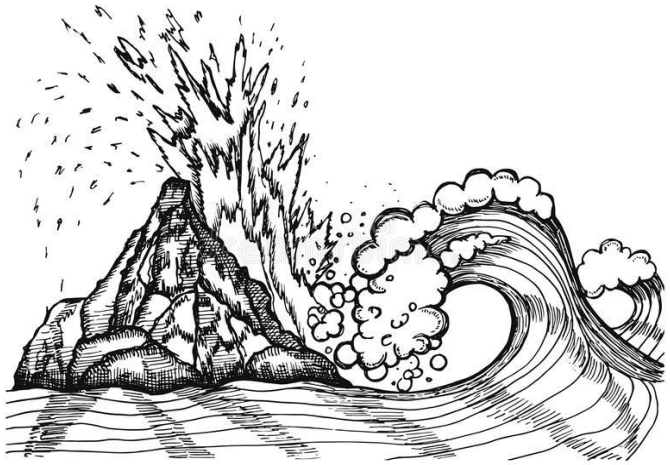
Land Reclamation

Rocks and other earth materials are excavated from hills to reclaim land from the sea. This usually occurs for countries with limited land for development. For example, Hong Kong has to reclaim land near its coastal areas to build housing for its expanding population.

18.5 Ways To Prevent The Destruction of The Earth's Surface

How can we prevent the Earth's surface from being destroyed?

The Earth is the only home we have. We must find ways to prevent **destruction** of the surfaces of the Earth by erosion, landslides, abrasion and floods.



Erosion

Here are some ways to prevent erosion of the surface of the Earth:

- Do not cut down trees unnecessarily as this exposes the soil to weathering agents. Grow trees and plants on exposed soil.

- Keep the soil damp during hot weather by watering it regularly. Wet soil is harder to be blown away by the wind. In order to allow plants and trees to grow on exposed soil, cover it up with a natural material like **jute**.

Landslides

Here are some ways to prevent landslides:

- Regrow plants and trees on slopes that have been left barren.
- Do not cut down trees unnecessarily as this exposes the soil to weathering agents. Grow trees and plants on exposed soil.
- Place a wire mesh over rocks and exposed soil.

Abrasion

The breaking down of rocks and the Earth's surface by abrasion can be reduced by having a protective layer between the wind, waves, running water and the structures of the Earth.

For example, **breakwaters** as well as rocks and concrete prevent the destruction of the Earth's surface by abrasion.

Floods

Floods are destructive as they can wash away rocks and soil. Sometimes, an area becomes unsuitable for farming or other human activities after a flood. This is because a flood brings materials onto the land or away from it.

For example, a strong thick wall called a **dike** can be built to prevent the river from flooding the surrounding land surface.

Recap – At A Glance

- THE SURFACE OF THE EARTH INCLUDES CONTINENTS, ISLANDS, OCEANS, SEAS, LAKES AND RIVERS. ALL THESE LIE ON PLATES.
- THE SURFACE OF THE EARTH ALSO INCLUDES MOUNTAINS AND HILLS.
- SLOW PROCESSES SUCH AS WEATHERING AND EROSION CHANGE THE SURFACE OF THE EARTH.
- RAPID PROCESSES SUCH AS LANDSLIDES, VOLCANIC ERUPTIONS AND EARTHQUAKES CHANGE THE SURFACE OF THE EARTH.
- HUMAN ACTIVITIES CHANGE THE SURFACE OF THE EARTH.