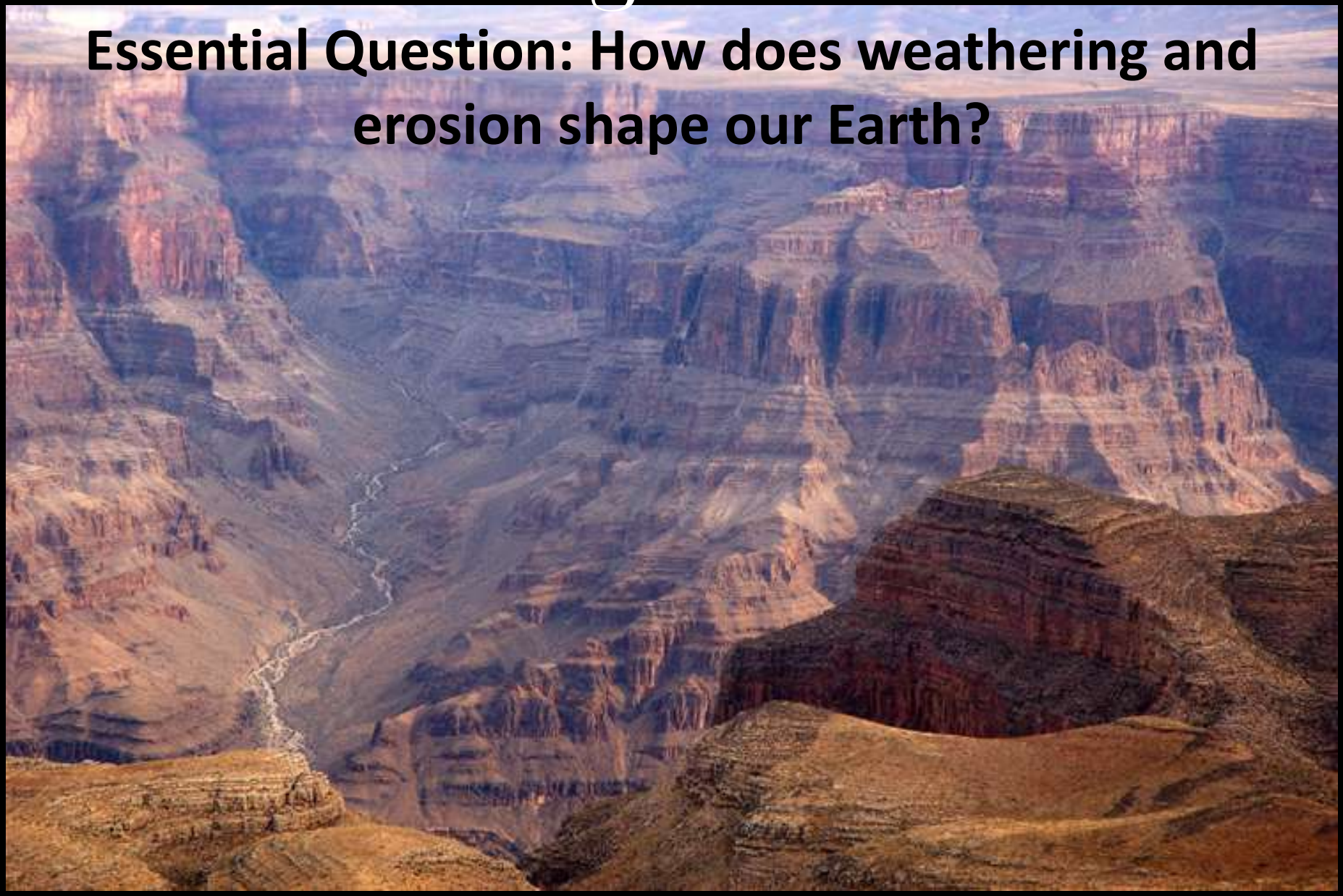
Weathering and Erosion

Essential Question: How does weathering and erosion shape our Earth?



What is Weathering?

Weathering is the process of breaking down rocks

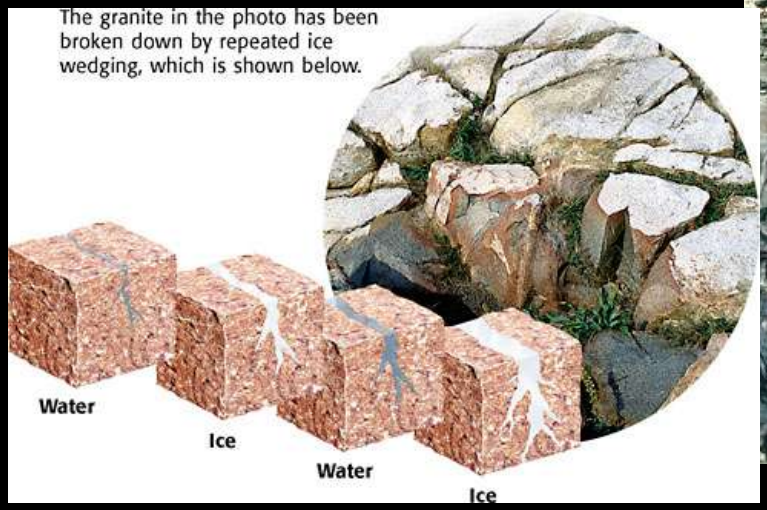
Two forms of weathering:

Mechanical/Physical

Chemical

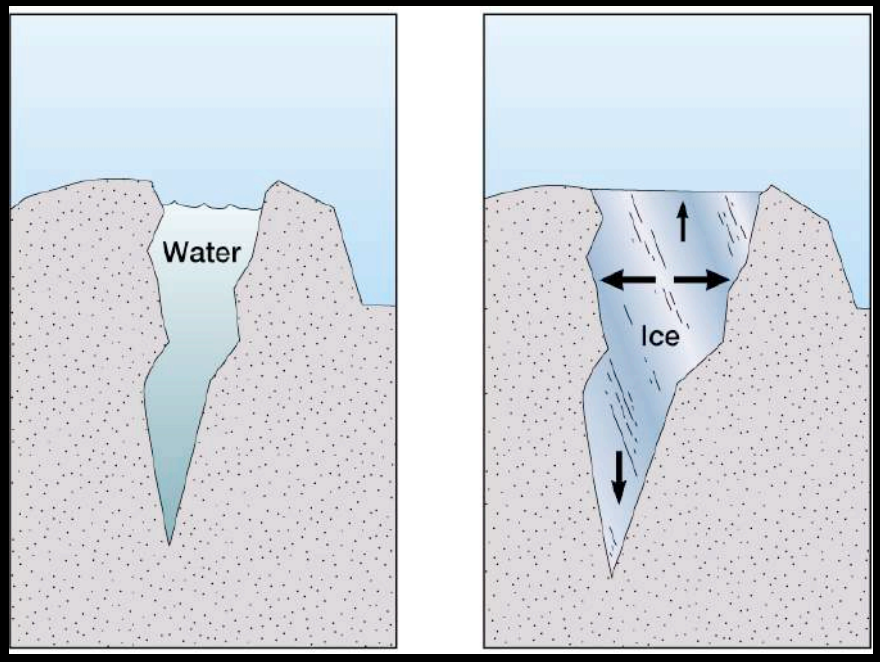
What is Mechanical Weathering?

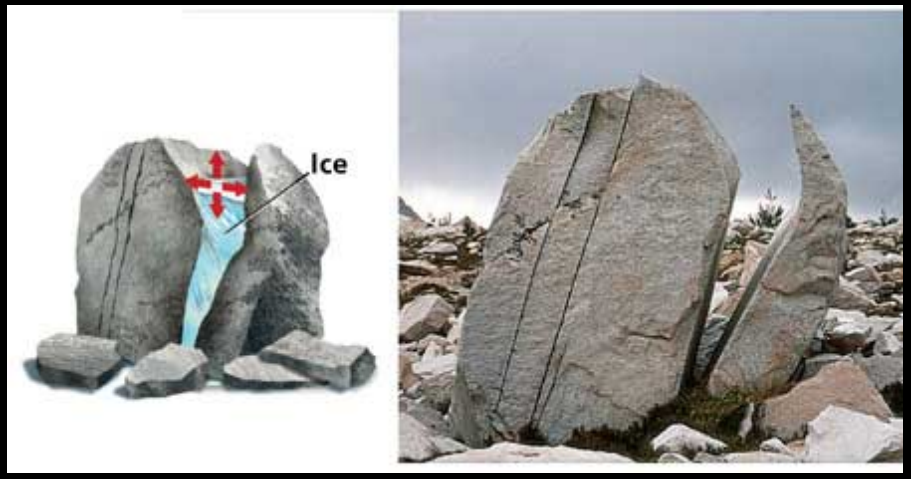
Mechanical weathering is breaking down by natural or physical processes



The 3 Types of Mechanical Weathering

1. ICE WEDGING





When water goes into fractures in rock and freezes, the force of expansion is great enough to break the rock into smaller pieces.

Mount Rushmore – South Dakota

Bryce Canyon – Utah

2 . Abrasion

- Abrasion
  - Collision of rocks
  - Makes rocks more spherical

What causes abrasion?

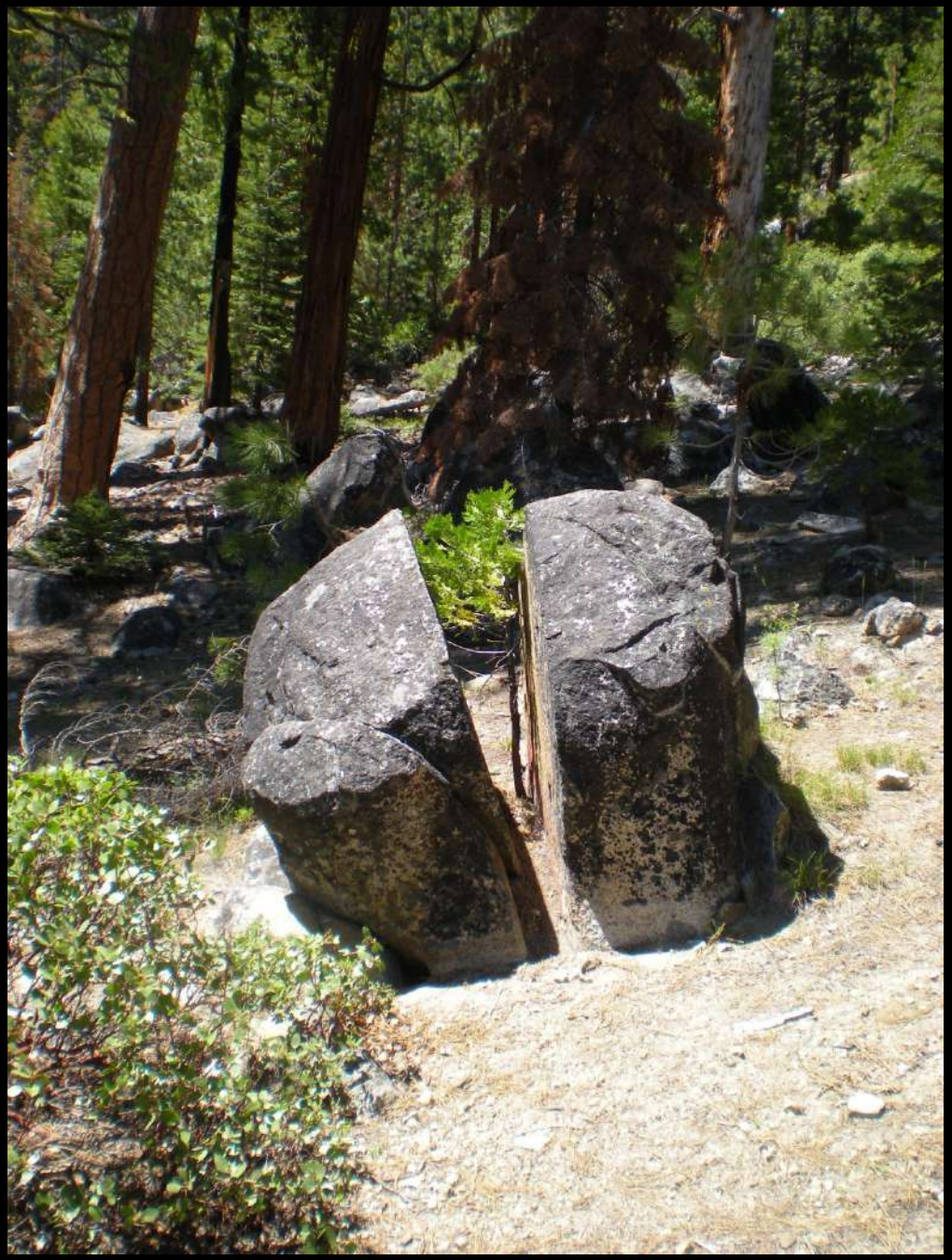
1. Water
2. Wind
3. Ice
4 . Gravity

Not Just Limited to Rocks…..

3. Root Action

Slow process

When roots spread to break rock



Close to Home

What is Chemical Weathering?

Chemical weathering occurs when minerals are chemically changed causing them to dissolve or change to another mineral

Oxidation

Acid

Plants

Oxidation

1. Oxidation - chemical reaction with oxygen and iron rich rocks. Causes rocks to “rust”

- iron-rich rock have reddish stains from "rusting" due to iron and oxygen reacting

Close to Home

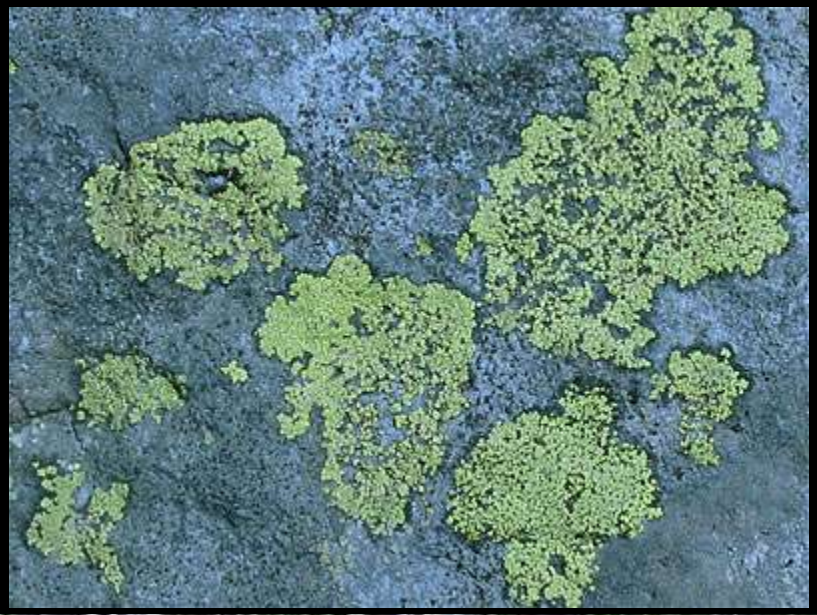
Plant Acids

- Some roots and decaying plants give off acids that also dissolve minerals in rock. When these minerals dissolve, the rock is weakened.

- Eventually, the rock will break into smaller pieces.

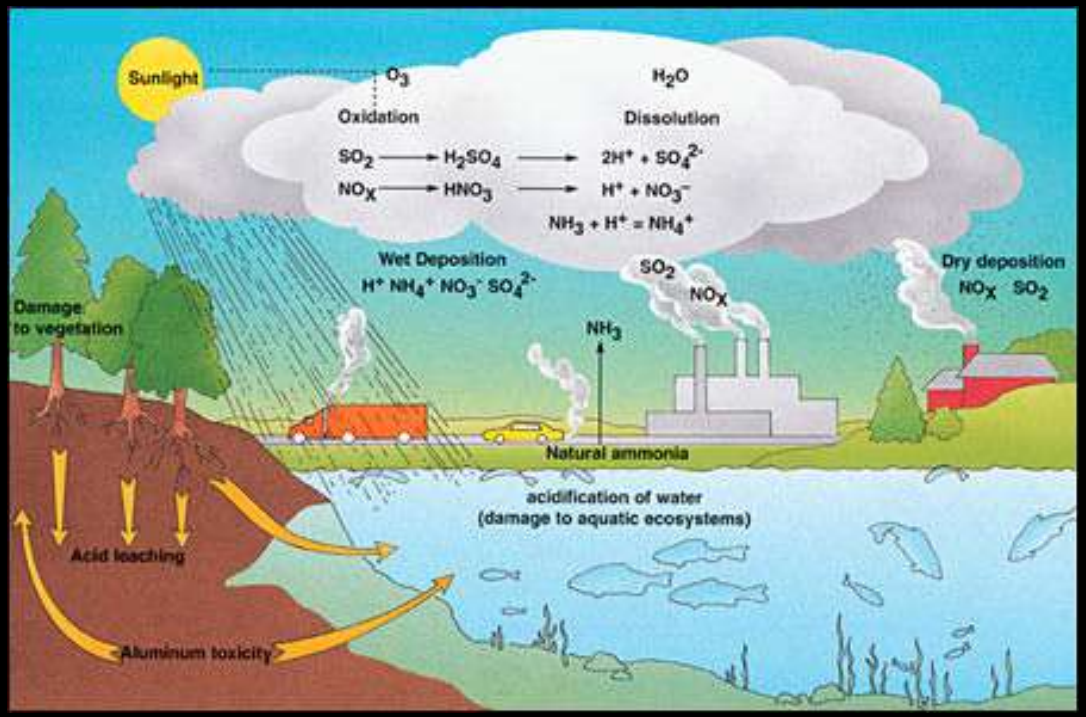
Plants

Plants – called lichens
produce rock
dissolving acids that
can break down rock.



Acid precipitation (Acid Rain)

Sulfur & CO2 from cars and coal/oil mix with water to produce acidic precipitation.



1. Rain
2. Snow
3. Sleet
4. Hail

How does the Environment affect Weathering?

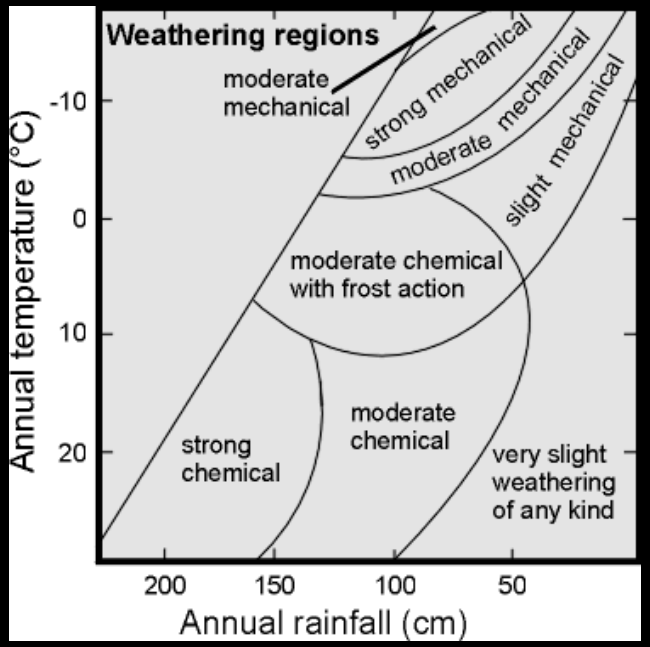
Temperature

Different temps give different type of weathering

Moisture

High moisture, chemical Weathering

Low moisture, mechanical



Effects of Climate

- Chemical weathering is more rapid in warm, wet climates.

- Lack of moisture in deserts and low temperatures in polar regions slow down chemical weathering.

- In cold climates, where freezing and thawing are frequent, mechanical weathering rapidly breaks down rock through the process of ice wedging.

1

1-Abrasion
Mechanical

2

2-Onion Skin Weathering Mechanical

3

3-Chemical
Water is wearing away the rock

4

4-Freezing and Thawing Mechanical

5

5-Mechanical

6

6-Mechanical & Chemical….how?

7

7-Mechanical Animal Actions

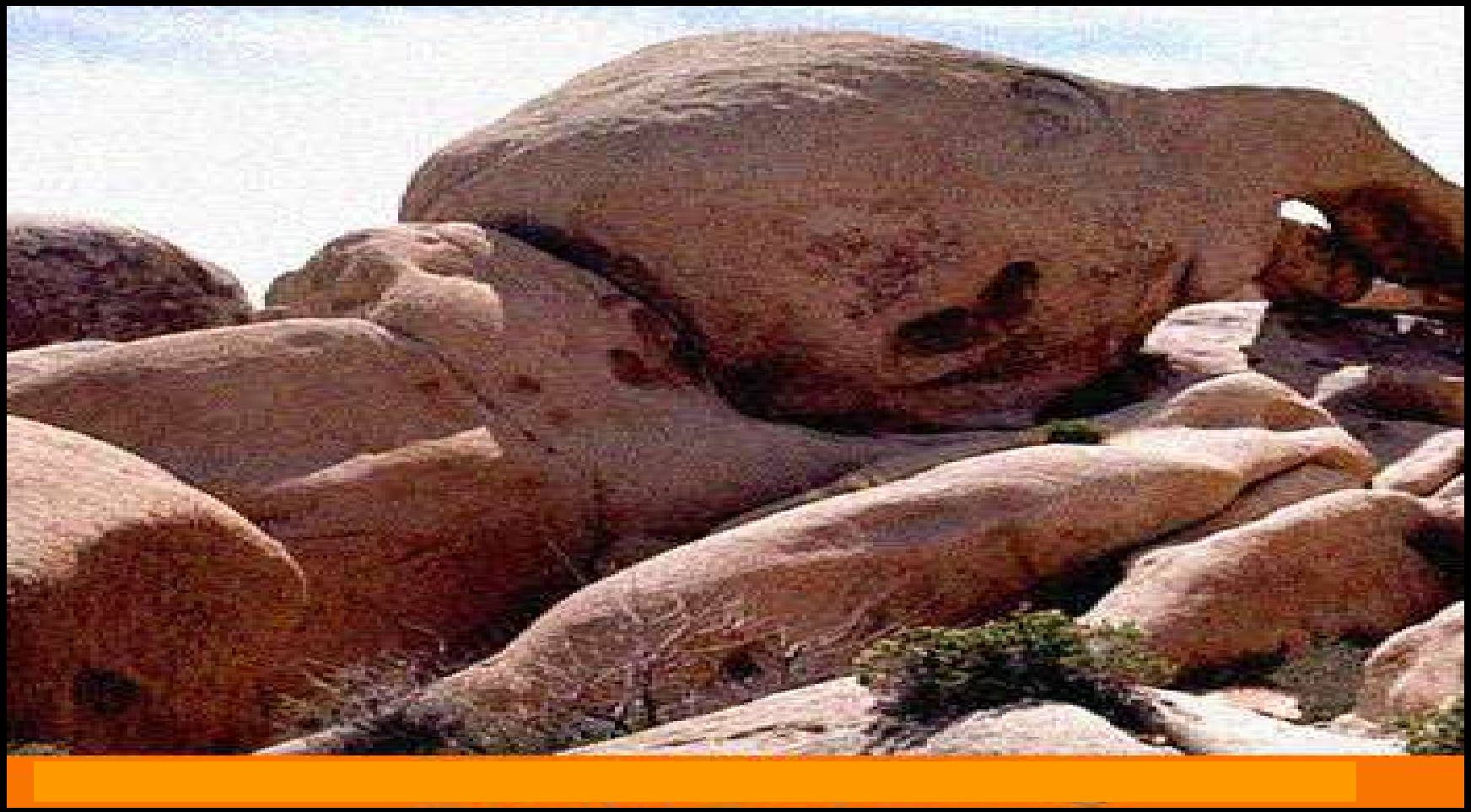
8

8-Mechanical with a little Chemical

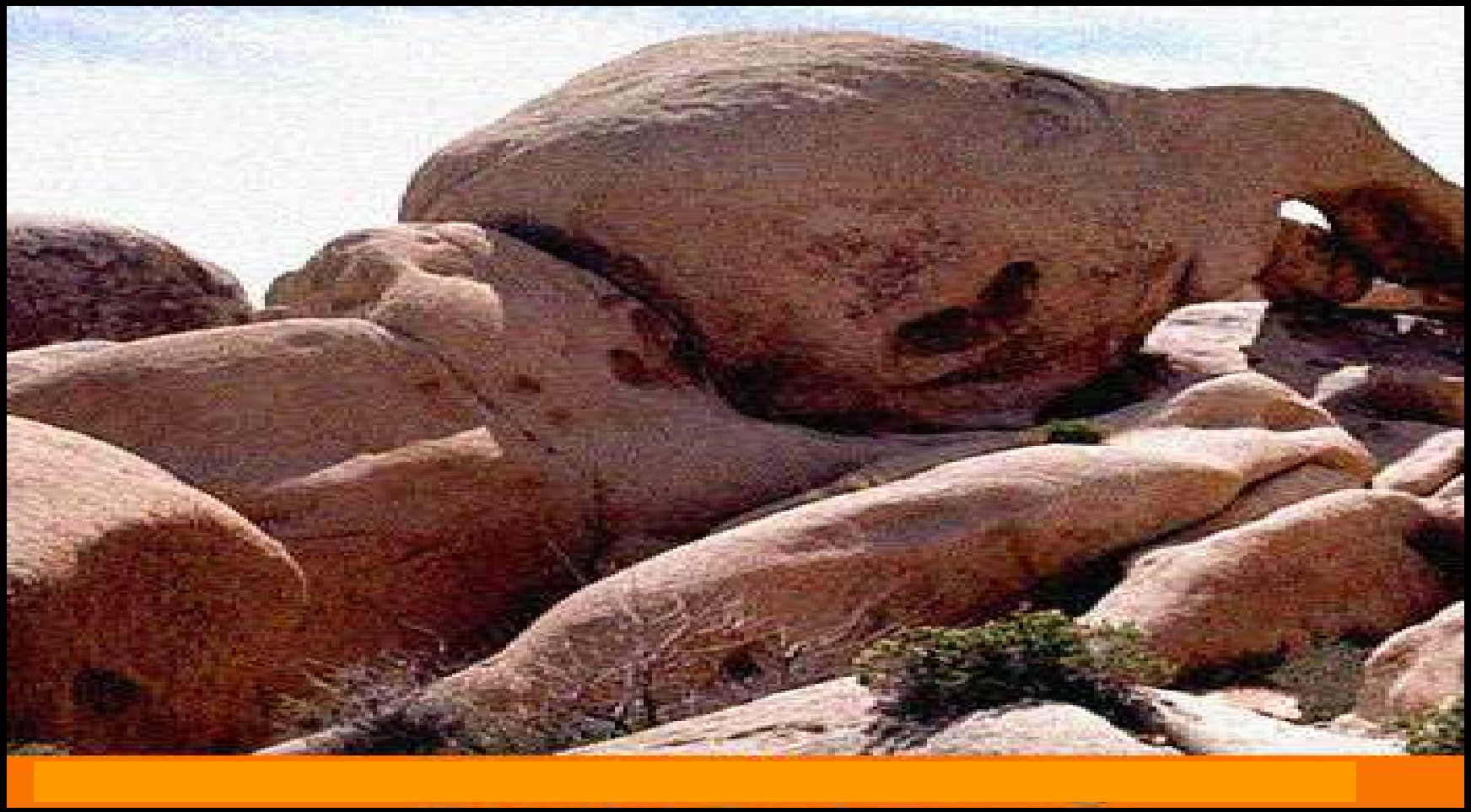
9

9-Chemical

10



10- Mechanical but could possibly be chemical



11

11-Another rusted bike!

12

12-Release of Pressure Mechanical

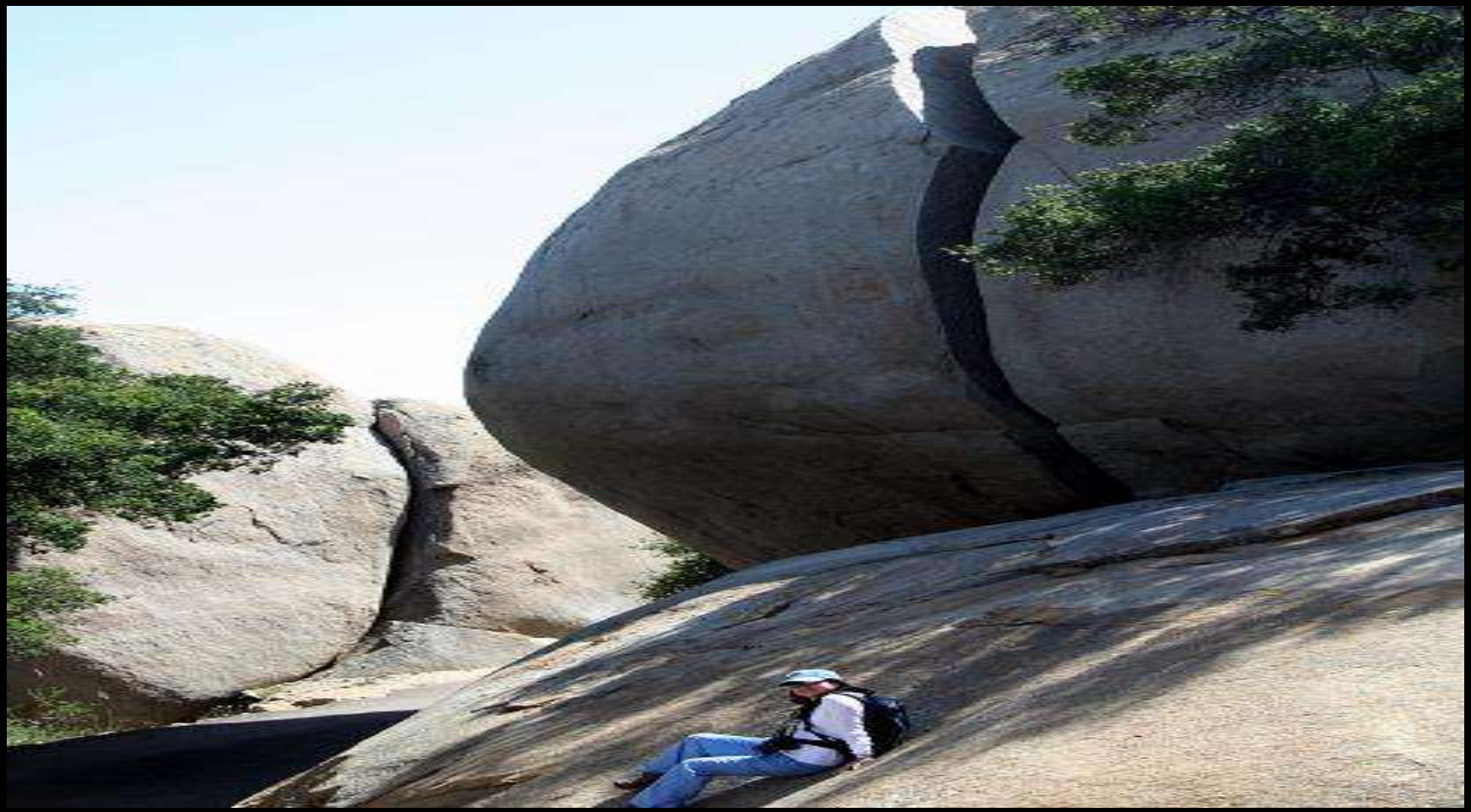
13

13-Chemical – Lichen grow, they release chemicals when they grow

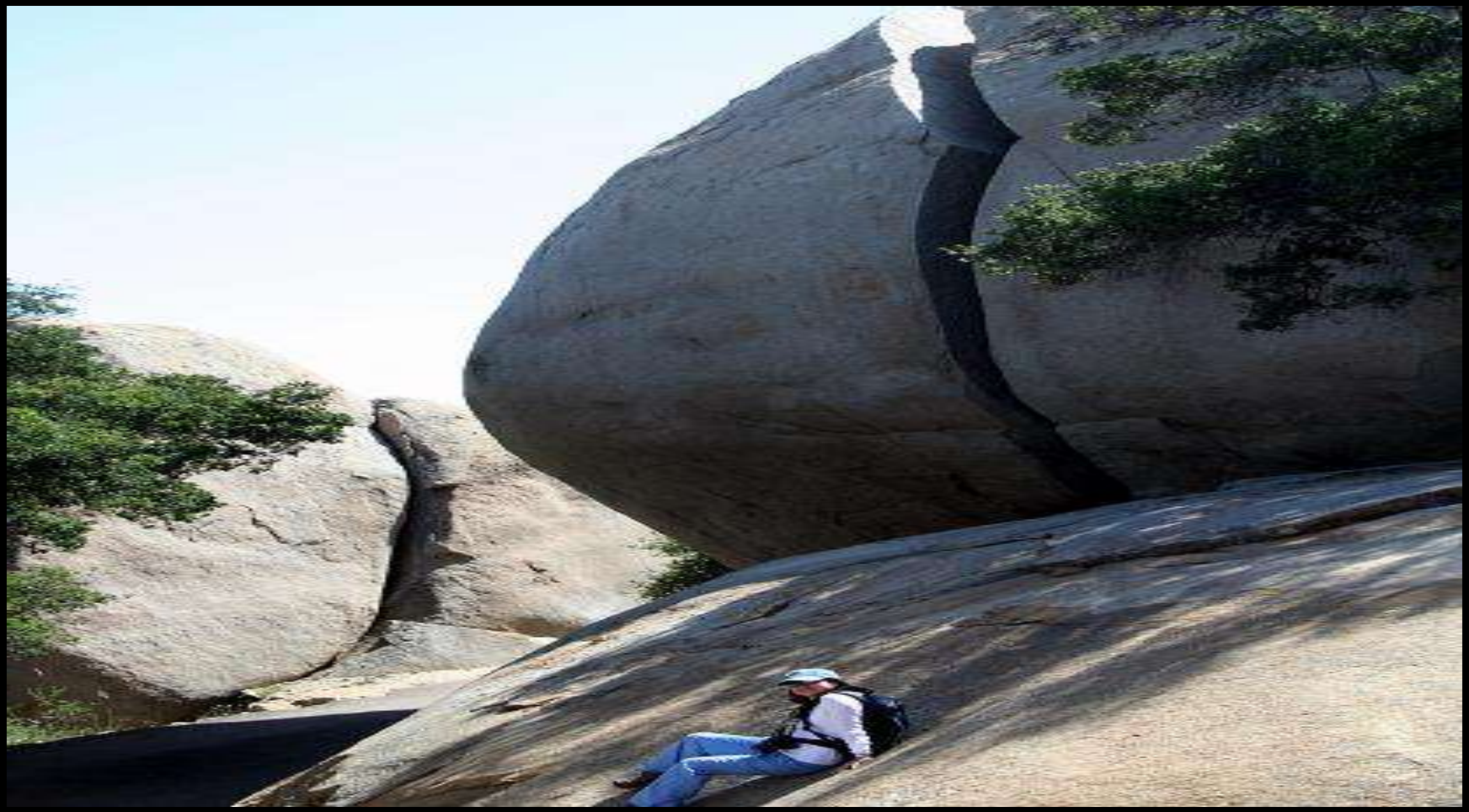
14

14-They call this Potato Chip Rock Could mechanical or chemical….

15



15-Freezing and Thawing Mechanical



16

16-Chemical-Water

17

17-See the different colors in the rock Chemical from oxidation

18

18-Mechanical
What role do humans play in weathering of Earth's surface?

What is Erosion?

Erosion is the removal and transport of material from one place to another

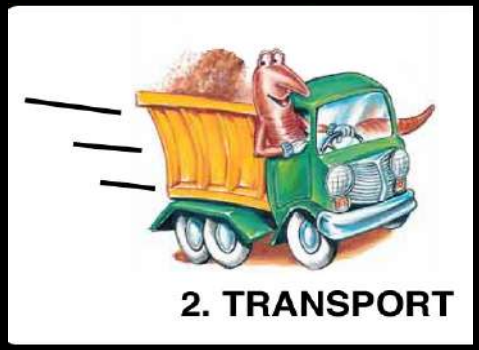
What are the agents of Erosion?

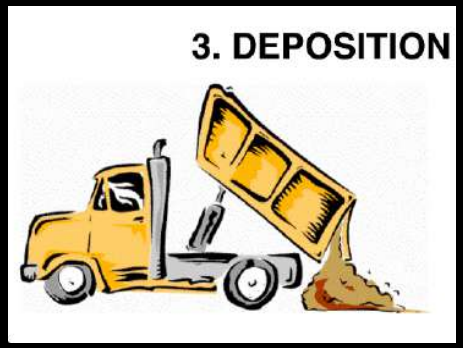
- There are 4 main agents of erosion:
  - Gravity
  - Water
  - Glaciers
  - Wind

What happens to the sediments?

When sediments are eroded (moved), they are not lost from Earth—they are just relocated

Deposition is when sediments are moved and deposited or "dropped off"





Weathering, erosion, and deposition act together in a cycle that wears down and builds up Earth's surface

How does Gravity cause Erosion?

A mass movement is any type of erosion that happens as gravity moves materials down slope

Landslides

Mudslides

Rock slides

What are the different types of mass movement?

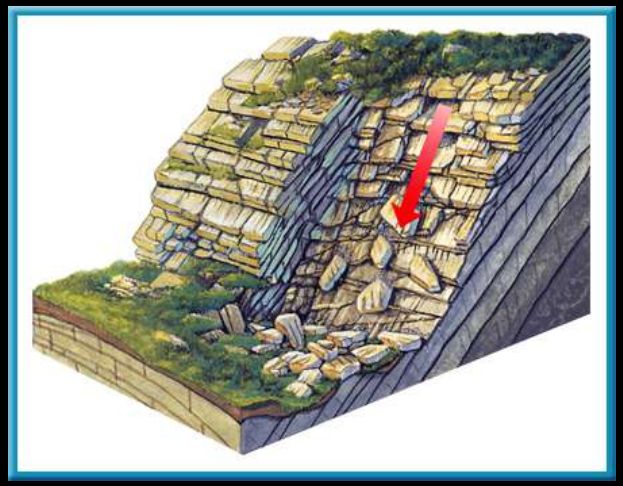
- Landslide is the most destructive kind of mass movement. It is when rock and soil slide quickly down a steep slope
- Mudflow is a rapid downhill movement of a mixture of water, rock, and soil. Usually occurs after heavy rains in normally dry areas.

What are the different types of mass movement?

- Slump is a mass of rock and soil suddenly slips down a slope. The difference is that the material in a slump moves in one large mass.
- Creep is very slow downhill movement of rock and soil. Often a result of freezing and thawing of water in cracked layers of rock beneath the soil. It is so slow, you can hardly notice it!

Self Check

1. What is erosion?
2. What type of mass movement is shown in this illustration?
3. What are the 4 agents of erosion?



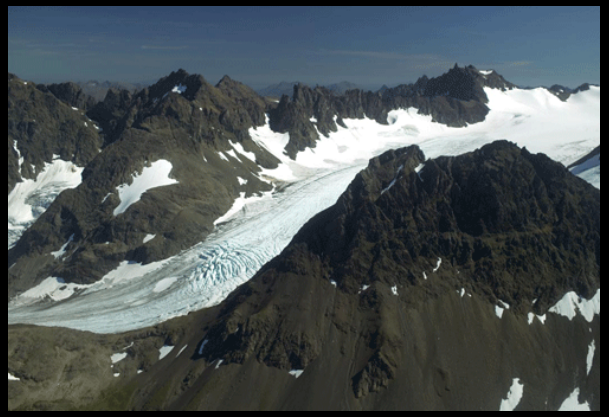
How do Glaciers cause Erosion?

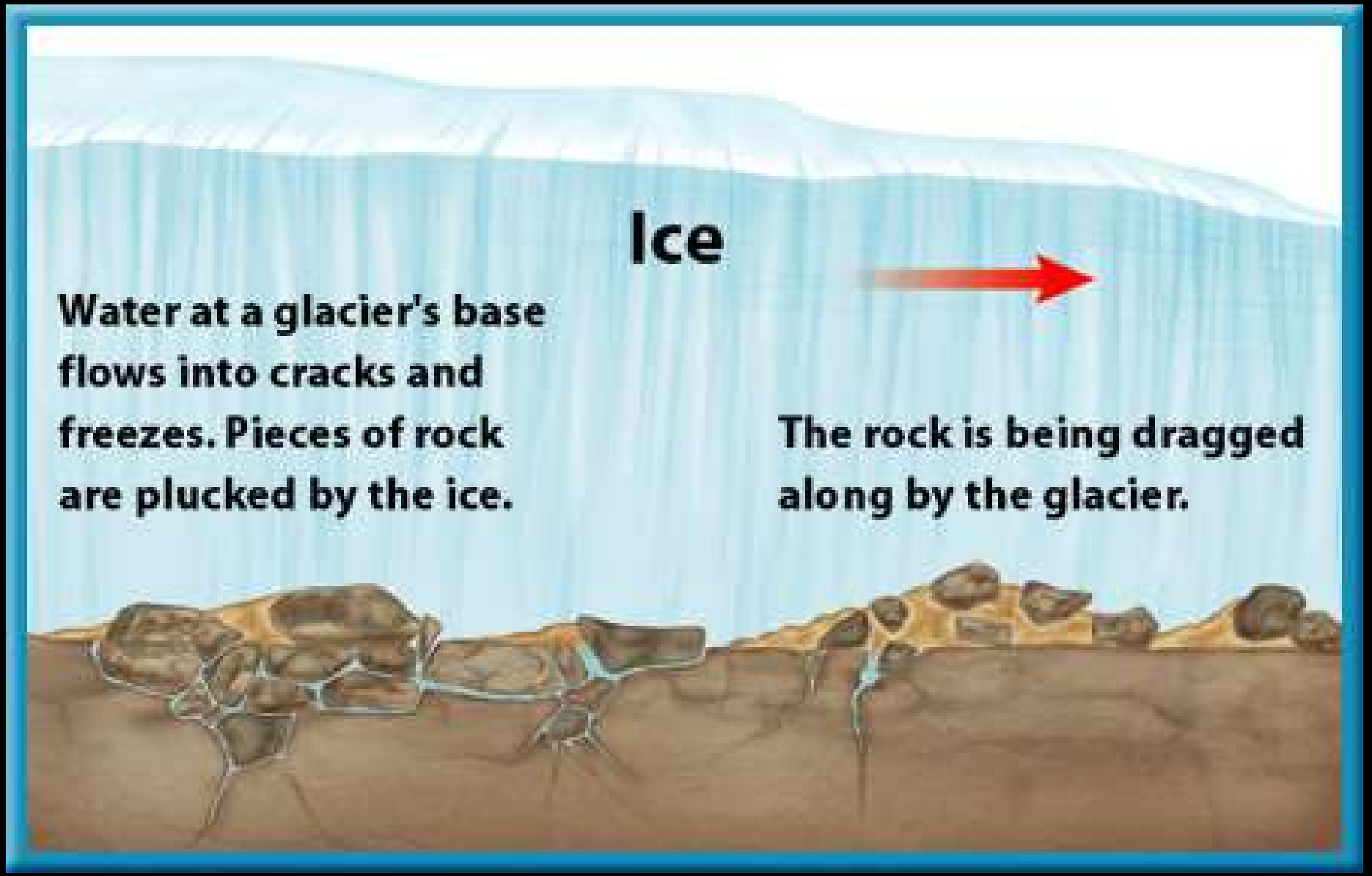
A glacier is a large mass of ice and snow moving on land under its own weight

As glaciers pass over land, they erode it, changing features on the surface

Glaciers then carry eroded material along and deposit it somewhere else.

There are 2 types of glaciers: Continental (covers most of a continent) and Valley Glaciers (in the valley between 2 mountains)



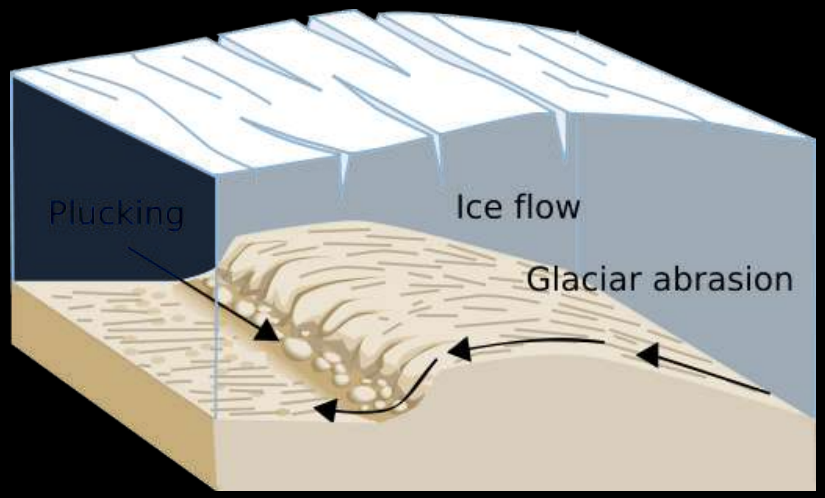

Ice
Water at a glacier's base flows into cracks and freezes. Pieces of rock are plucked by the ice.
The rock is being dragged along by the glacier.

How do Glaciers shape the land?

The movement of a glacier changes the land beneath it

Although glaciers work slowly, they are a major force of erosion

The two process by which glaciers erode the land are plucking and abrasion



How do Glaciers shape the land?

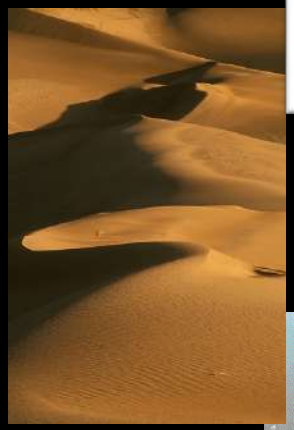
As a glacier flows over the land, it picks up rocks in a process called plucking

Due to the glaciers extreme weight, it can break rocks apart and then the rocks freeze to the bottom of the rock carrying it with it when it moves

As rocks remain on the bottom of the glacier and it drags them across the land, abrasion occurs as it scratches the bedrock

When a glacier melts, it deposits the sediment it eroded from the land creating various landforms

How does wind contribute to erosion?



Wind by itself is the weakest agent of erosion, however, it can be a powerful force in shaping the land areas where there are few plants to hold the soil in place

Sand dunes are mounds of sediment drifted by the wind

Dunes can be see along shore of oceans, but are common in desert regions

Self Check

1. What are two ways in which glaciers erode Earth's surface?
2. What is the difference between a continental and a valley glacier?

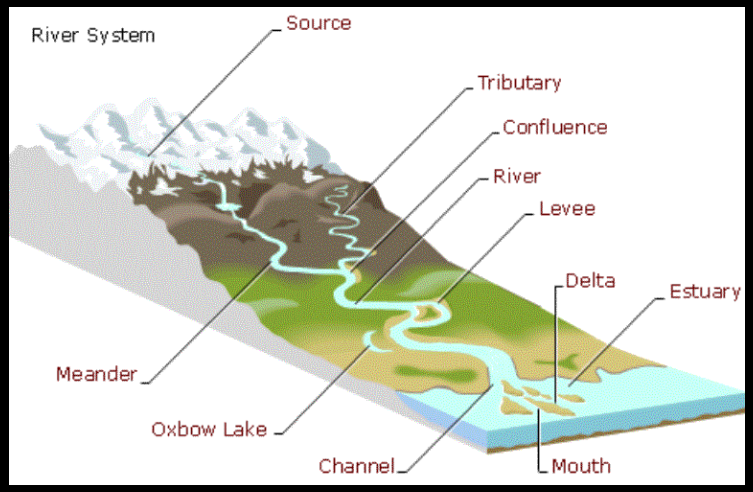
How is water an agent of Erosion?

Moving water is the major agent of erosion that has shaped Earth's land surface

Through erosion, a river creates valleys, water falls, flood plains, and other landforms

Deposition of sediments creates landforms such as deltas and also adds soil to a river's flood plain

A delta is sediment that are deposited where a river flows into an ocean or lake building up a landform



How is water an agent of Erosion?

Ground water is another agent of erosion through the process of chemical weathering

Ground water is water that fills the cracks and spaces in underground soil and rock layers

Ground water containing carbonic acid can break down limestone creating caves or caverns.

Stalactites and stalagmites are also formed from the deposit of calcite due to chemical weathering

How do waves contribute to Erosion?

The energy in waves comes from wind that blows across the water's surface

Waves shape the coast through erosion by breaking down rock and transporting sand and other sediment

Waves shape a coast when they deposit sediment, forming coastal features such as beaches, sand bars, and sea arches

Self Check

1. What is the source of the energy in ocean waves?
2. What process is the cause of ground water erosion (mechanical or chemical)?