Landforms from Erosion and Deposition

Landforms from Stream Erosion and Deposition

Study Tip

A stalagmite comes from the ground and has a "g" in its name. A Stalactite comes from the ceiling and has a "c" in its name.

Streams erode at their banks, carrying sediments and soluble ions in their waters. Sediments can be carried as a:

- **Dissolved Load:** ions in solution
- **Suspended Load:** carried as a solid. Streams that carry larger particles are both faster and have a greater **competence.** A greater competence comes from a steeper **gradient** (slope).
- **Bed Load**: large particles pushed along the stream bed.
  - These particles do not move continuously. Their movement is described as **saltation**.
  - When a stream approaches **base level,** or a large body of standing water, it deposits more than it erodes. On flatter ground, streams deposit material on the inside of **meanders**, which are bends or curves along the stream channel.
  - The **floodplain** is very broad and shallow compared to the stream. When the stream widens, the sediment creates **natural levees,** or higher areas around the edges of the stream**.**
  - The stream deposits all of the sediment into a **delta (**a triangular shaped deposit**).**
  - An **alluvial fan** develops when a stream falls down a steep slope onto a flat valley.

Landforms from Groundwater Erosion and Deposition

Rainwater combines with carbon dioxide to form carbonic acid. This acid seeps into the ground through cracks and pores. This acid then becomes what is called **groundwater.** Groundwater is able to form underground caves by wearing away at soil. When the roof of a cave collapses, a **sinkhole** is formed. Groundwater carries minerals in solution and the minerals can be deposited as **stalagmites** and **stalactites.** The joining of a stalagmite and a stalactite is called a **column.** Caves form when groundwater travels along small cracks over an extended period of time. The groundwater slowly dissolves and carries away the solid rock which enlarges cracks and forms caves.

These are stalagmites, stalactites, and columns inside a cave

Landforms from Wave Erosion and Deposition

When a wave hits the ground, the inshore part hits first and is slowed down. This causes the curving of the waves known as **refraction.** Wave refraction can:

- Spread energy, depositing sand
- Concentrate energy on a single point called a **wave-cut cliff**

Waves can also create:

- **Wave-cut platforms**: level areas formed by wave erosion.
- **Archs:** formed when waves erode through a cliff
- **Sea stacks:** isolated towers of rock

A: Wave-cut platform *B: Arch* *C: Sea Stack*

Waves spread sediments along a coast in order to create a **beach.** Waves have higher energy during winter than in summer. Sand is pushed onto shore in the summer, and pulled offshore during winter. Sometimes **spits** are formed, which are areas of sand that extend land masses into water. Shores may also be lined with **barrier islands,** small pieces of land that act as a defense against storms. People try to protect shores by making:

- **Groins:** piles of rocks that run perpendicular to the shore and keep sand at the beach
- **Breakwaters:** Structure built in the water parallel to the shore to protect from strong incoming waves.
- **Seawalls:** structures built parallel to the shore on the beach to protect against strong waves

A: Groins *B: Breakwaters* *C: Seawalls*

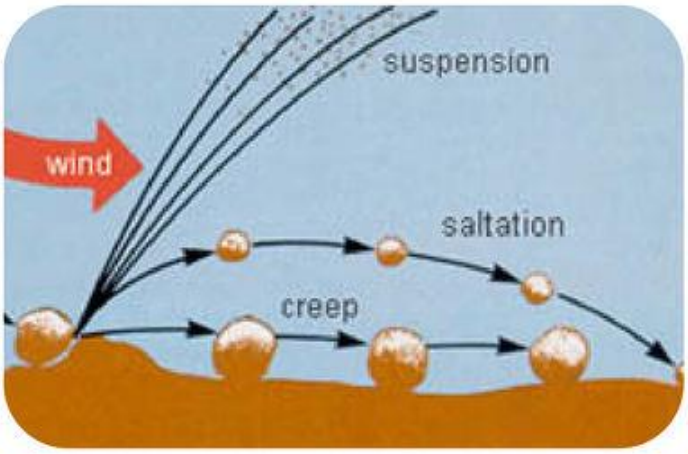
Landforms from Wind Erosion and Deposition

Wind is able to transport small particles over long distances. Wind transports both bed and suspended loads, with sand-sized particles traveling via bed loads. These bed loads are made of sand-sized particles which move by saltation.

When the wind blows away smaller, finer particles, the desert surface is rockier, causing the ground to subside (known as **deflation).** This leaves behind **desert pavement, or** rocky, pebbled surfaces. Grains are moved by the wind and hit other surfaces, eroding the surface in the form of abrasion. Surfaces that have been worn away at by grain are called **ventifacts.**

Rocks in deserts often gain a dark coating called **desert varnish.** This coating is made by manganese and iron oxides, which react with other substances that wind transports. Steady winds can form **sand dunes,** which are slopes of sand with a **slip face,** or flatter face on the opposite side. Silt and clay deposited layer over layer is called **loess.** Clay on the ocean floor is brought to the ocean by the wind.

Wind can also bring silts and clays to the ocean, forming fine-grained mud in the deep ocean. When these particles are deposited on the water's surface by wind, they eventually settle to the ocean floor in the form of green, brown or red clays.



Wind transport is by suspension, saltation, and creep (bed load).

In a sandstorm, sand is usually within a meter of the ground. A dust storm's smaller particles can travel higher.

Landforms from Glacier Erosion and Deposition

Glaciers have the power to erode at rock through abrasion and **plucking.** Plucking is when water seeps into the cracks between rocks and freezes pushing the rocks outward. As the glacier moves the rocks create long parallel grooves called **glacial striations.** When glaciers cut through a v-shaped valley they widen it making it a u-shaped valley. A **hanging valley** forms when a main glacier cuts off a tributary glacier and creates a cliff.

Glacial erratics are rocks that are carried by glaciers and are eventually dropped. A **glacial till** is a pile of the bits of rock that the glacier had been carrying. Linear rock deposits are called **moraines.**

- Lateral moraines: form at the edges of glaciers when the eroded particles of valley walls fall onto the glacier
- Medial moraines: form at the conjunction of two lateral moraines on tributary glaciers and the middle of a larger glacier.
- Ground moraines: form from sediments beneath glaciers that are left behind when the glaciers melt.
- Terminal moraines: form from the long ridges of till that are present at the furthest point a glacier reaches
- End moraines: deposited where a glacier stops for a period of time to create a rocky ridge.

Varves are former where lakes are covered by ice. Dark sand sinks to the bottom of the lake and then when the ice melts a layer of light sand is deposited.

Landforms from Erosion and Deposition by Gravity

Gravity causes erosion because of **mass weathering.** Weathered material falls from a cliff because there is nothing to hold it in place. Rocks falling to the base of a cliff make a **taulus slope.** Landslides occur when falling rocks hit other rocks causing them to fall as well. When there is high precipitation, a **mudflow** will be created. A lahar is a mudslide on a volcano. **Slump** moves materials along a curved surface. **Creep** is a gradual movement of soil downhill. Several factors increase the chance of a landslide. These are:

Multiple landslides created the mass weathering effects seen on this cliff.

- Water: increases weight of sediment, allowing flow
- Rock Type: weak rocks allow more landslides
- Undercutting: the slope may be unstable if people dig into the base of the slope
- Ground Shaking: earthquakes and volcanic eruptions can shake unstable ground and cause a slide

Concept Check

- Compare the effects of different types of erosion.
- Why does erosion occur and how does it affect humans?
- How are landforms formed by different types of erosion?