

Earth Science

Chapter 18 - EROSION BY WIND AND WAVES

Section 1- Wind Erosion

STANDARDS:

SES3. Students will explore the actions of water, wind, ice, and gravity that create landforms and systems of landforms (landscapes).

d. Relate the past and present actions of ice, wind, and water to landform distribution and landscape evolution.

Objectives

- **Describe two ways that wind erodes land.**
- **Compare the two types of wind deposits.**

How Wind Moves Sand and Dust

saltation - the movement of sand or other sediments by short jumps and bounces that is caused by wind or water

- **Saltation occurs when wind speed is high enough to roll sand along the ground. When rolling sand grains collide, some sand grains bounce up.**
- **Because dust particles are very small and light, even gentle wind currents can keep dust particles suspended in the air.**



Effects of Wind Erosion

- **While wind erosion happens everywhere there is wind, the landscapes that are most dramatically shaped by wind erosion are deserts and coastlines. In these areas, fewer plant roots anchor soil and sand in place to reduce the amount of wind erosion.**



Arctic Coastline Erosion



Rodanthe, N.C

- **Also in the desert, where there is little moisture, soil layers are thin and are likely to be swept away by the wind. Moisture makes soil heavy and causes some soil and rock particles to stick together, which makes them difficult to move.**



White Desert Classic

Cairo - Baharia Oasis - White Desert - Farafra - Cairo.

A classical desert safari through the White Desert with its breathtaking chalk outcrops that are shaped by wind erosion. Sleep among those white statues that reflect the light on you as the moon sweeps the skies.



Libya Desert

READING CHECK:

Why does wind erosion happen faster in dry climates than in moist climates?

Moisture makes soil heavier, so the soil sticks and is more difficult to move. Therefore, erosion happens faster in dry climates.

Desert Pavement

deflation - a form of wind erosion in which fine, dry soil particles are blown away

- The remaining rock particles often form a surface of closely packed small rocks called *desert pavement*, or *stone pavement*.
- Desert pavement protects the underlying land from erosion by forming a protective barrier over underlying soil.





Black Rock, Nevada

Deflation Hollows

- **Deflation is a serious problem for farmers because it blows away the best soil for growing crops.**
- **Deflation may form shallow depressions in areas where the natural plant cover has been removed. As the wind strips off the topsoil, a shallow depression called a deflation hollow forms.**
- **A deflation hollow may expand to a width of several kilometers and to a depth of 5 to 20 m.**



Deflation Hollow on South Methong, St George, Queensland, Australia

Ventifacts

ventifact - any rock that is pitted, grooved, or polished by wind abrasion

- The word *ventifact* comes from the Latin word *ventus*, which means "wind." The direction of the prevailing wind in an area can be determined by the appearance of ventifacts.
- Erosion of large masses of rocks by wind-blown sand happens very slowly and happens only close to the ground, where saltation occurs.



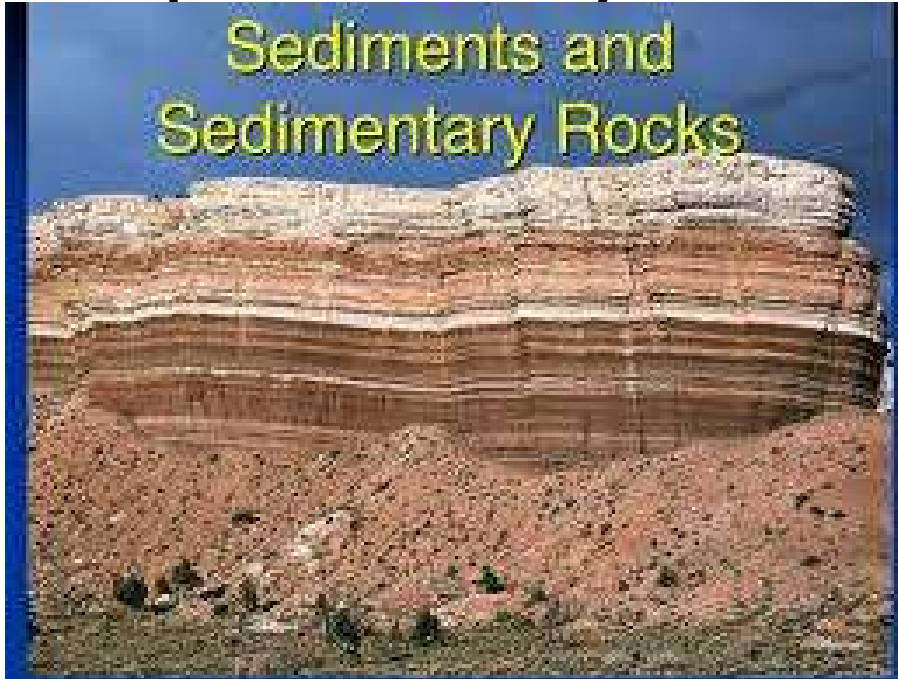
Palm Springs, CA



McMurdo Sound at Marble Point, Antarctica

Wind Deposition

- The wind drops particles when it slows down and can no longer carry them.
- These deposited particles are continually covered by additional deposits.
- Eventually, cementation and pressure from overlying layers bind the fragments together.
- This process is one way that sedimentary rocks form.



Dunes

dune - a mound of wind-deposited sand that moves as a result of the action of wind

- Dunes form where the soil is dry and unprotected and where the wind is strong, such as in deserts and along the shores of oceans and large lakes.
- A dune begins to form when a barrier slows the speed of the wind. As more sand is deposited, the dune itself acts as a barrier, grows, and buries the original barrier.



Sand Dunes in Ga.

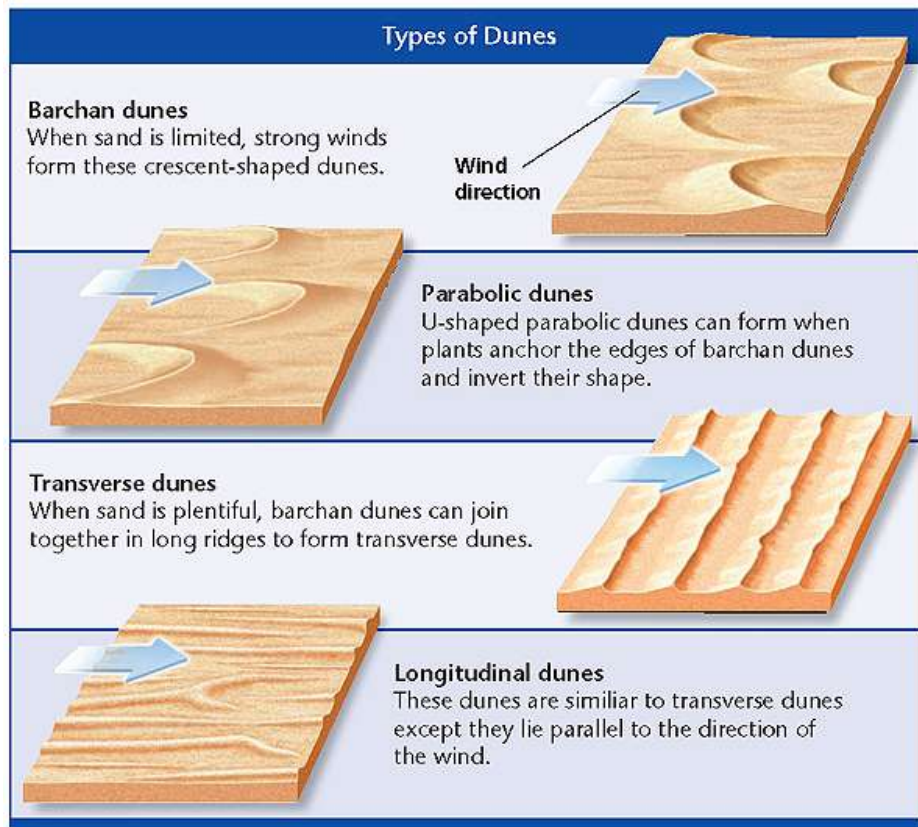


Albany, Ga.

Types of Dunes

- **The force and direction of the wind shapes sand dunes.**
- **Commonly, the gentlest slope of a dune is the side that faces the wind.**

The table below shows the different types of dunes.





Arabian Peninsula barchan dunes.

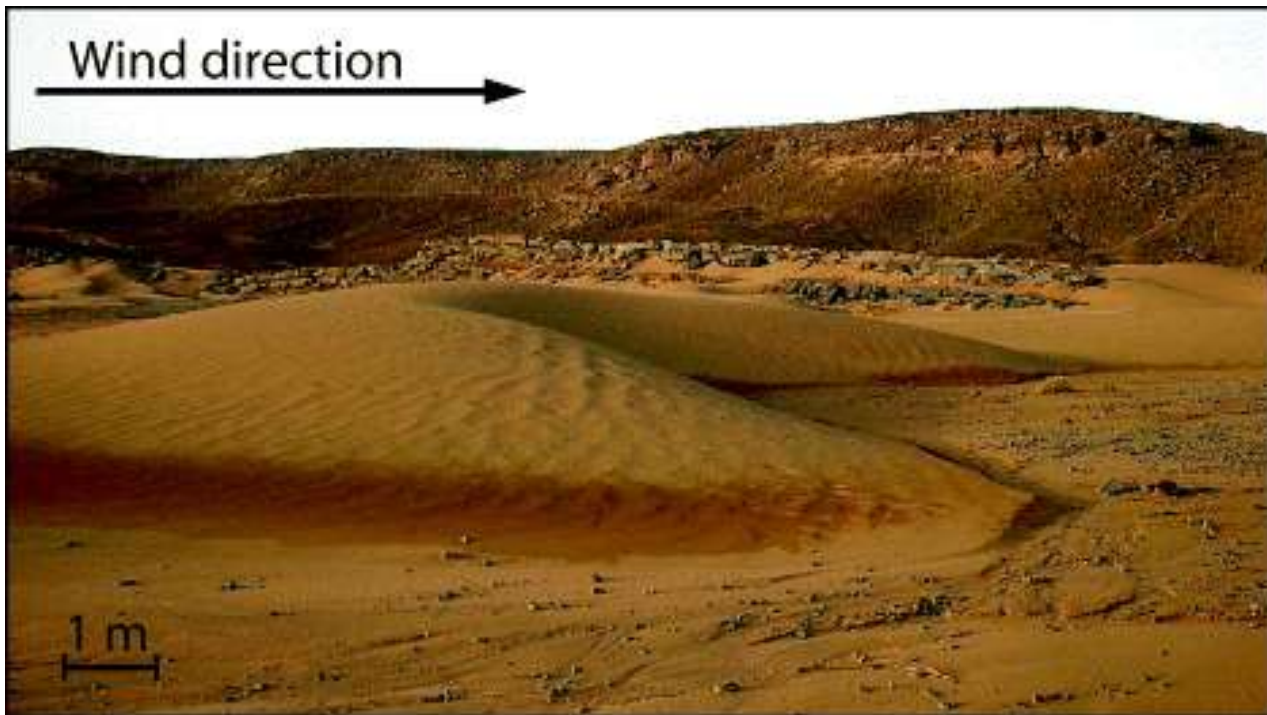


Photo of a barchan dune (Erfoud, Morocco)



Parabolic Dune.



Transverse Dune



Longitudinal Dune

READING CHECK

How do barchan dunes differ from transverse dunes?

Barchan dunes are crescent shaped; transverse dunes form linear ridges.

Dune Migration

- The movement of dunes is called ***dune migration***.
- If the wind usually blows from the same direction, dunes will move downwind.
- Dune migration occurs as sand is blown over the crest from the windward side and builds up on the slipface.
- In mostly level areas, dunes migrate until they reach a barrier.



Loess

loess fine-grained sediments of quartz, feldspar, hornblende, mica, and clay deposited by the wind

- **Thick deposits of yellowish, fine-grained sediment, called loess, can form by the accumulation of windblown dust.**
- **Although loess is soft and easily eroded, it sometimes forms steep bluffs.**
- **Loess deposits are extremely fertile and provide excellent soil for grain-growing.**



A typical loess exposure in southern Illinois.



Loess canyon on Crowley's Ridge, near Vicksburg, Mississippi.