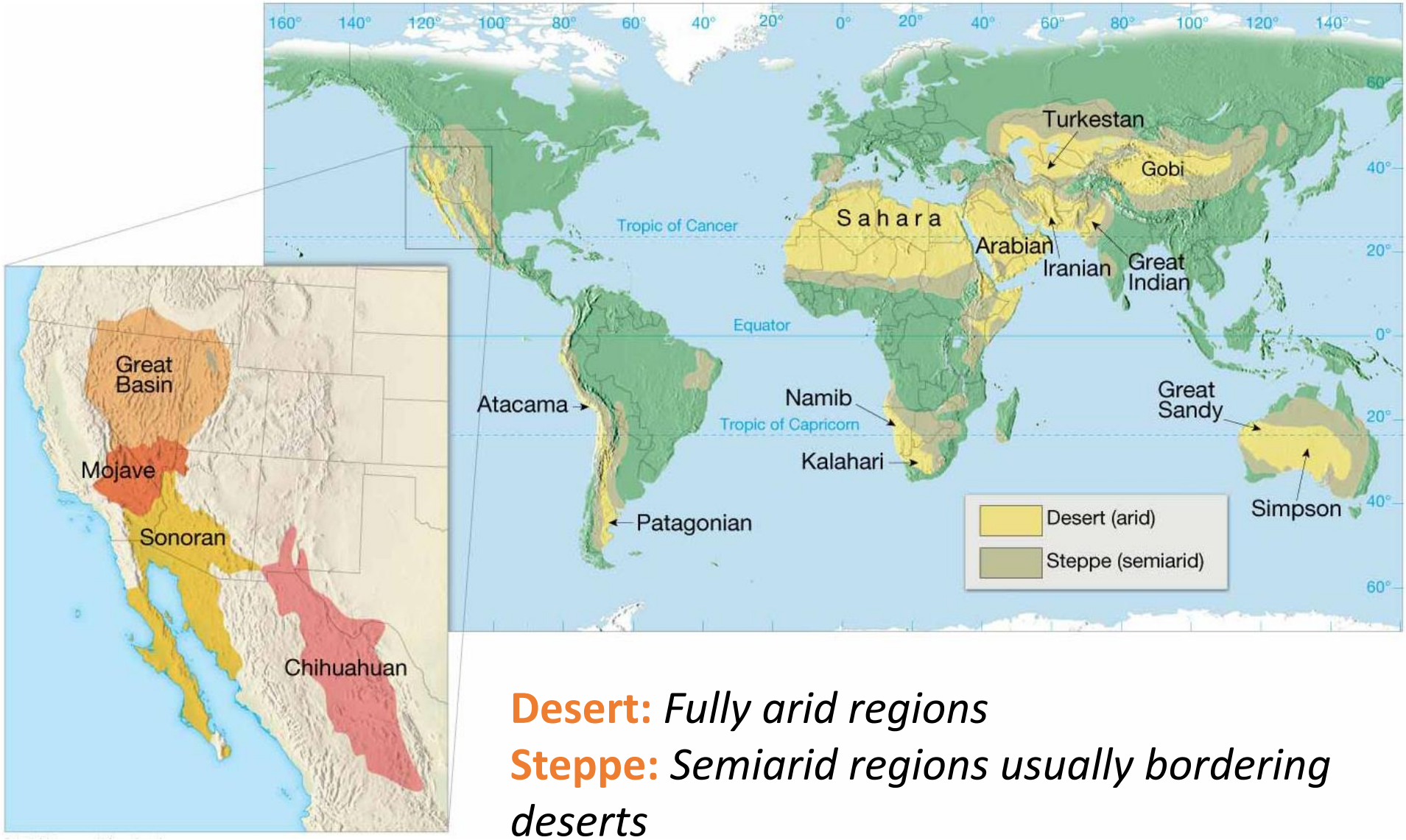
Deserts & Winds

Deserts are areas of **extreme dryness**, *usually >25cm of precipitation per year*

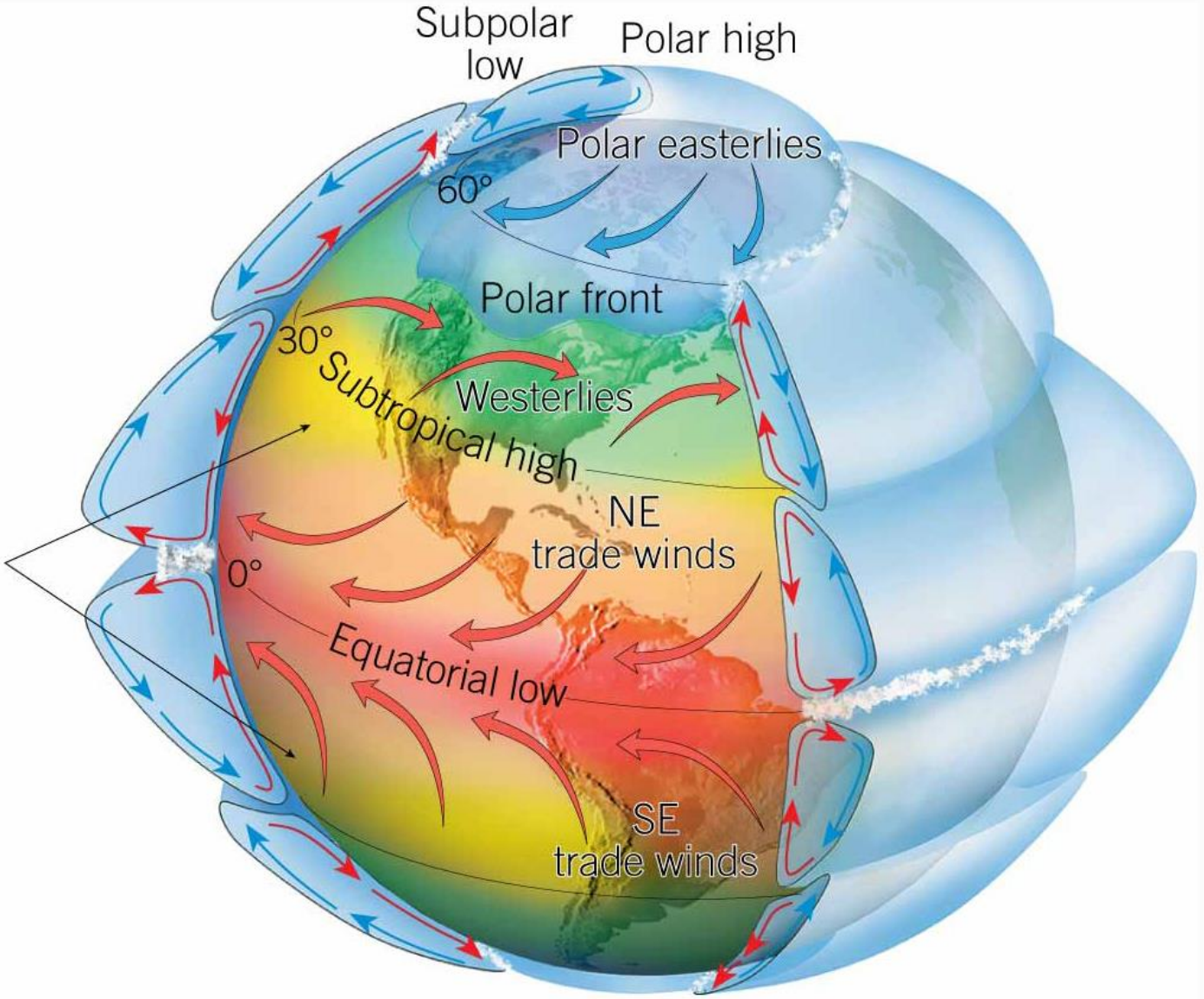


Desert: *Fully arid regions*

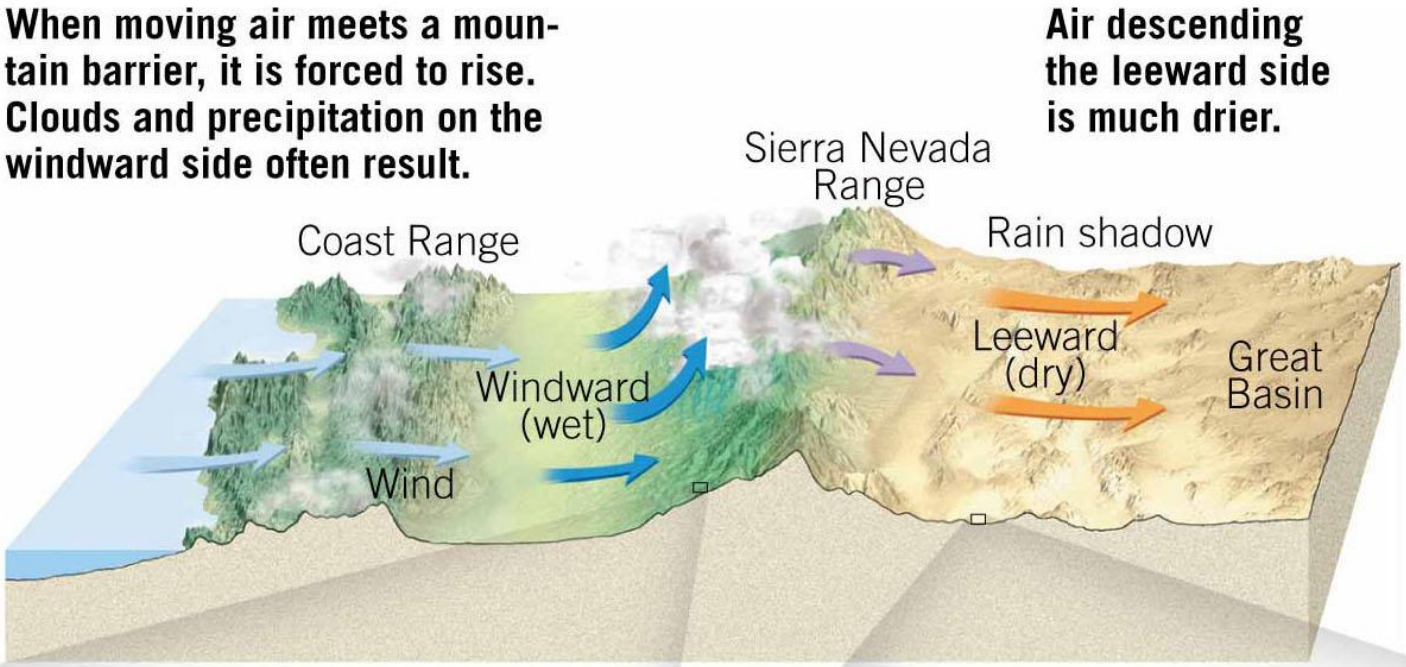
Steppe: *Semiarid regions usually bordering deserts*

Distribution of Deserts & Steppes

A. Subtropical deserts and steppes are centered between 20° and 30° north and south latitude in association with the subtropical high-pressure belts. Dry subsiding air inhibits cloud formation and precipitation.

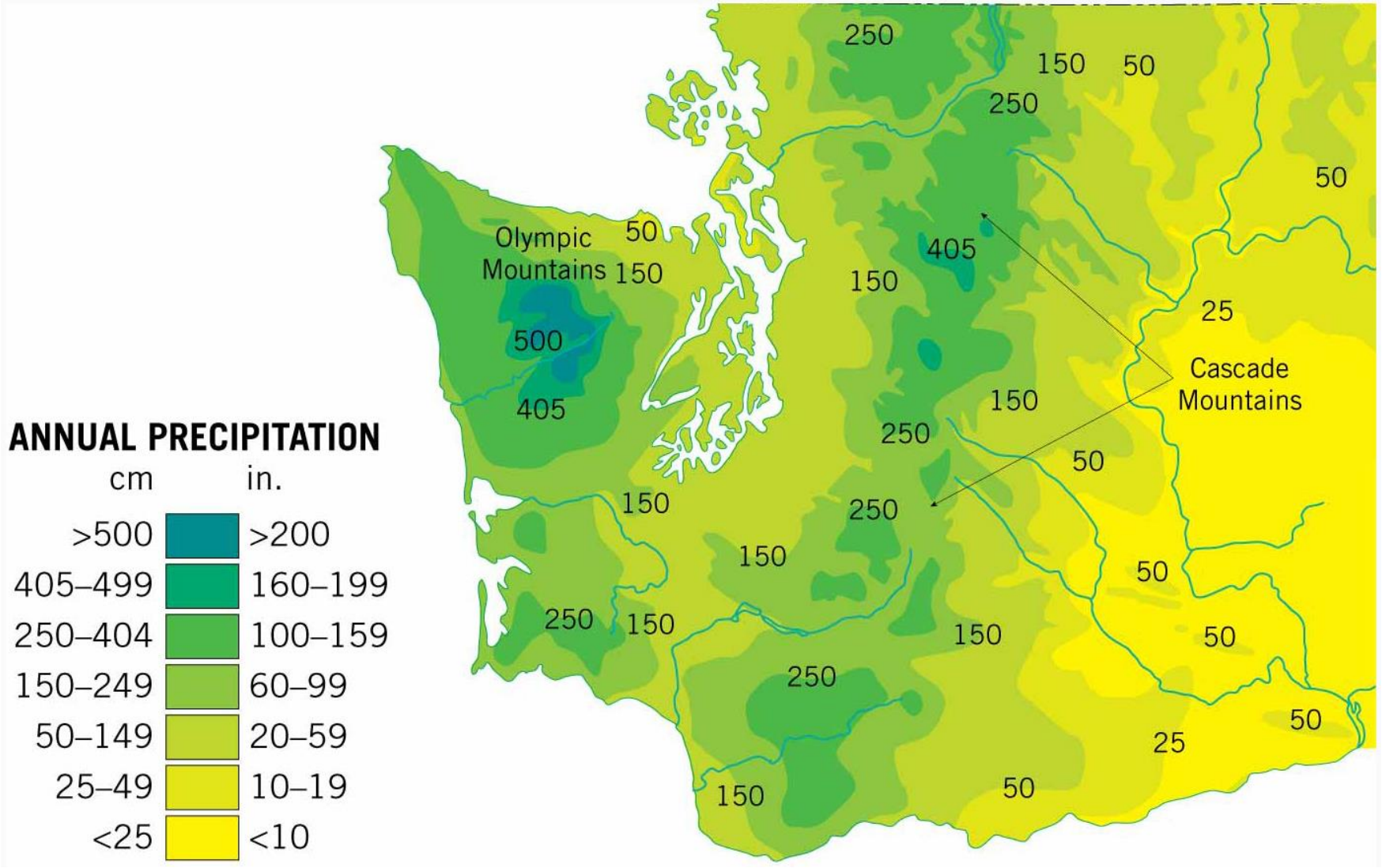


Distribution of Deserts & Steppes



Distribution of Deserts & Steppes

*Mountains can form major **rain shields** that block precipitation*



Geologic Processes in Arid Climates

Ephemeral Streams

Most of the time desert stream channels are dry.

An ephemeral stream shortly after a heavy shower. Although such floods are short-lived, they cause large amounts of erosion.

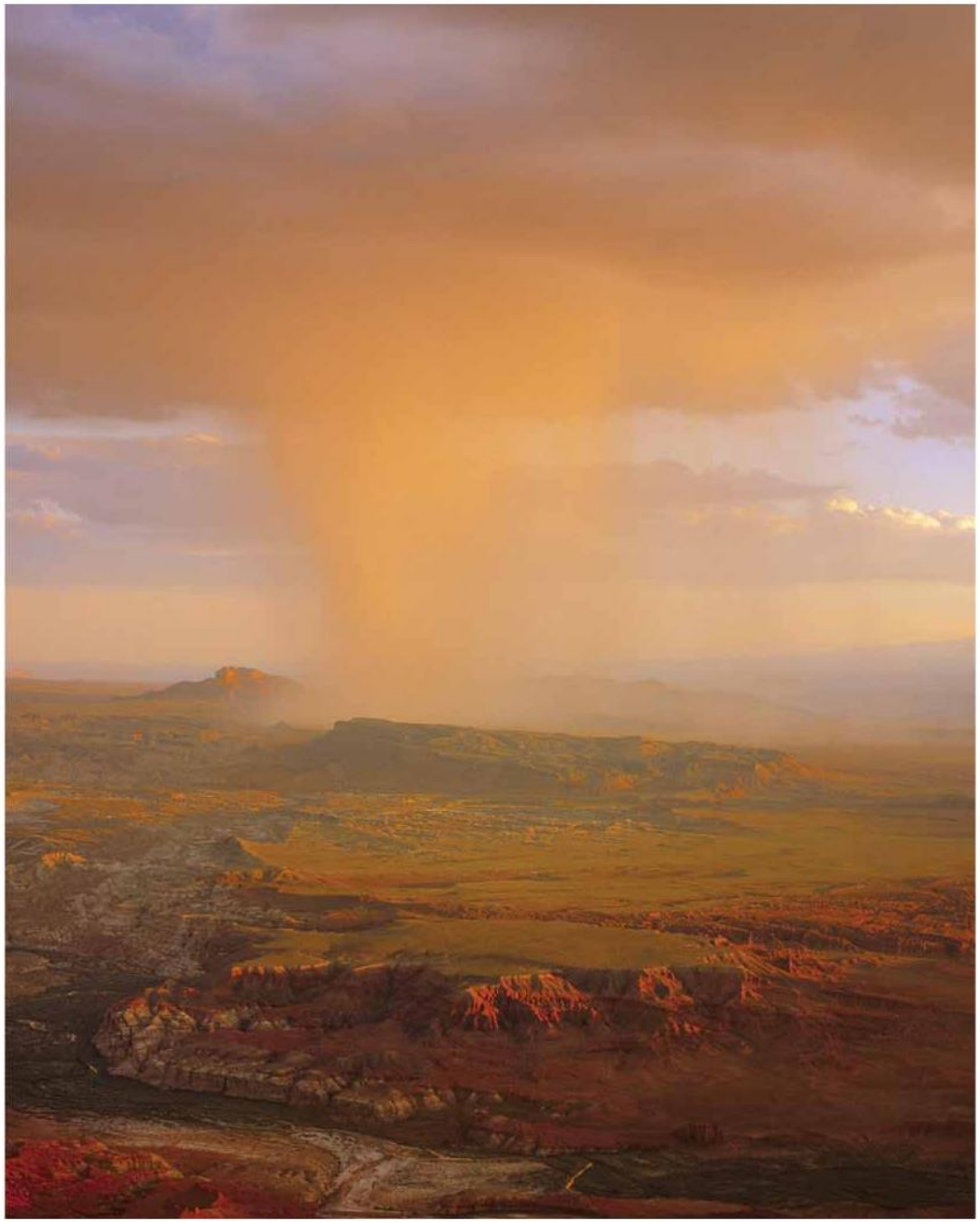
A familiar sign in desert areas. Roads dip into washes which can rapidly fill with water following a heavy rain.

Geologic Processes in Arid Climates

Ephemeral Streams

Canyons in which ephemeral streams form are common throughout the arid regions of the world:

- *Wash - US*
- *Arroyo – Southwest US*
- *Wadi – Arabic/North Africa*
- *Donga – South America*
- *Nullah – India*



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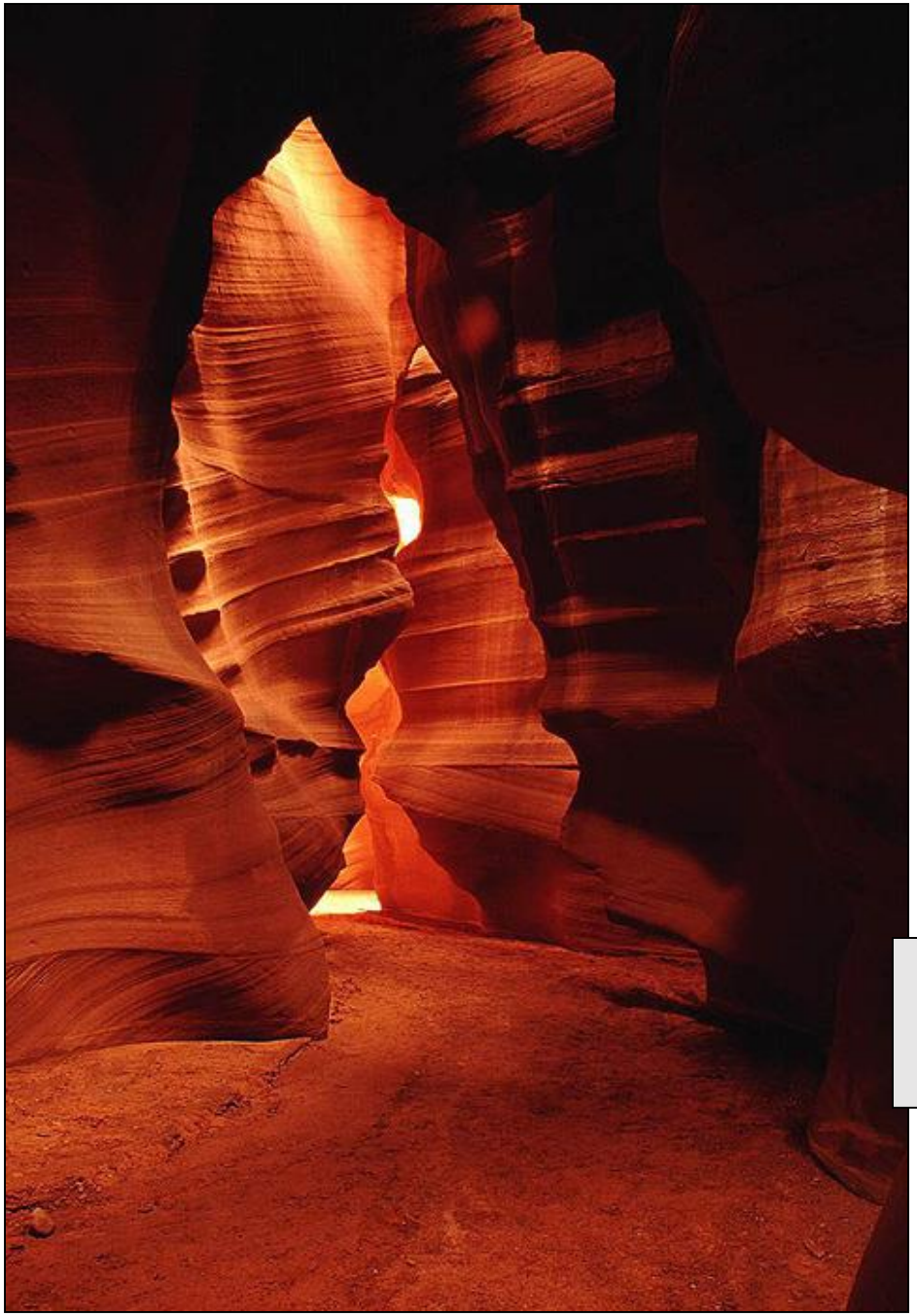
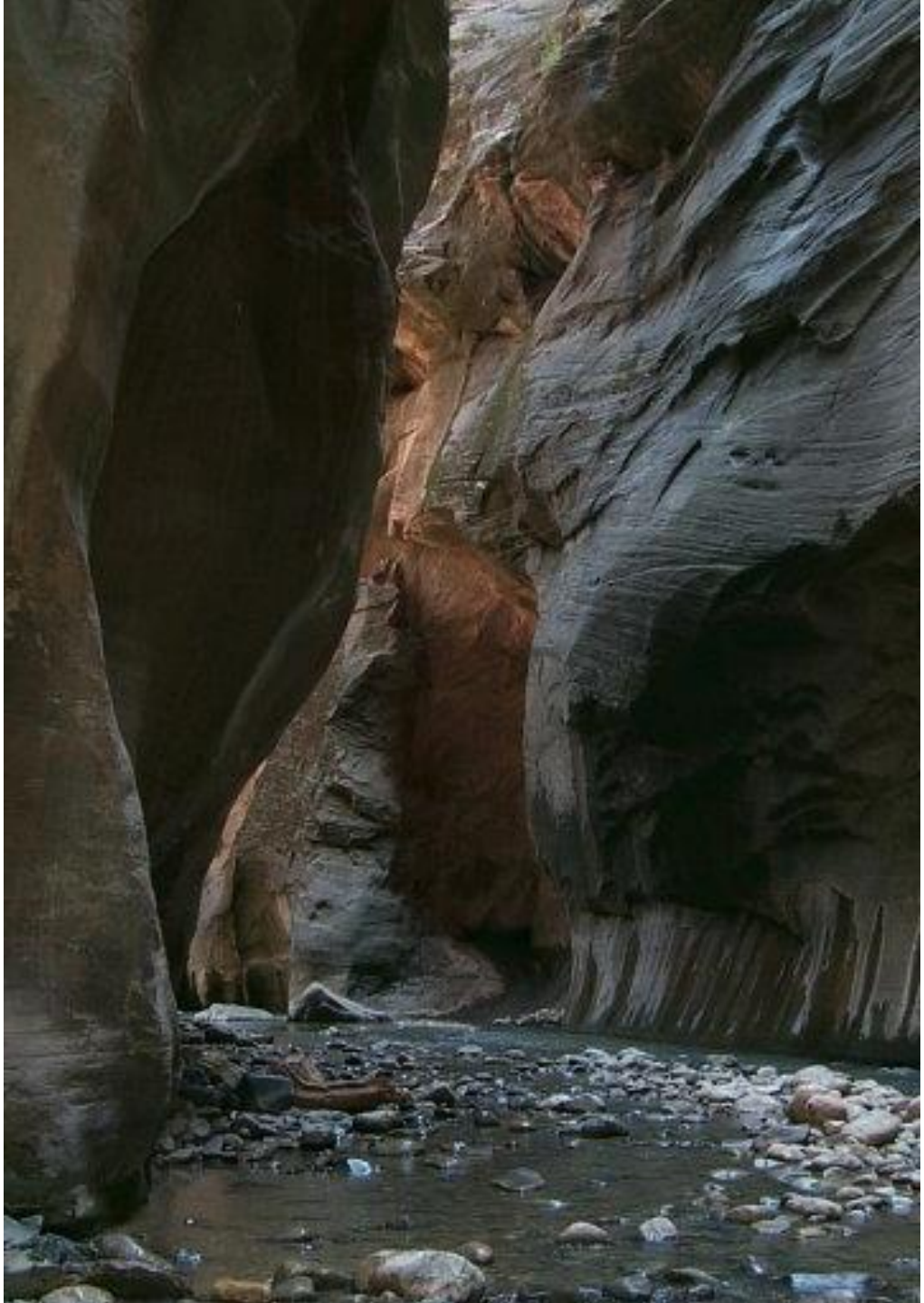
Joshua Tree N.P.

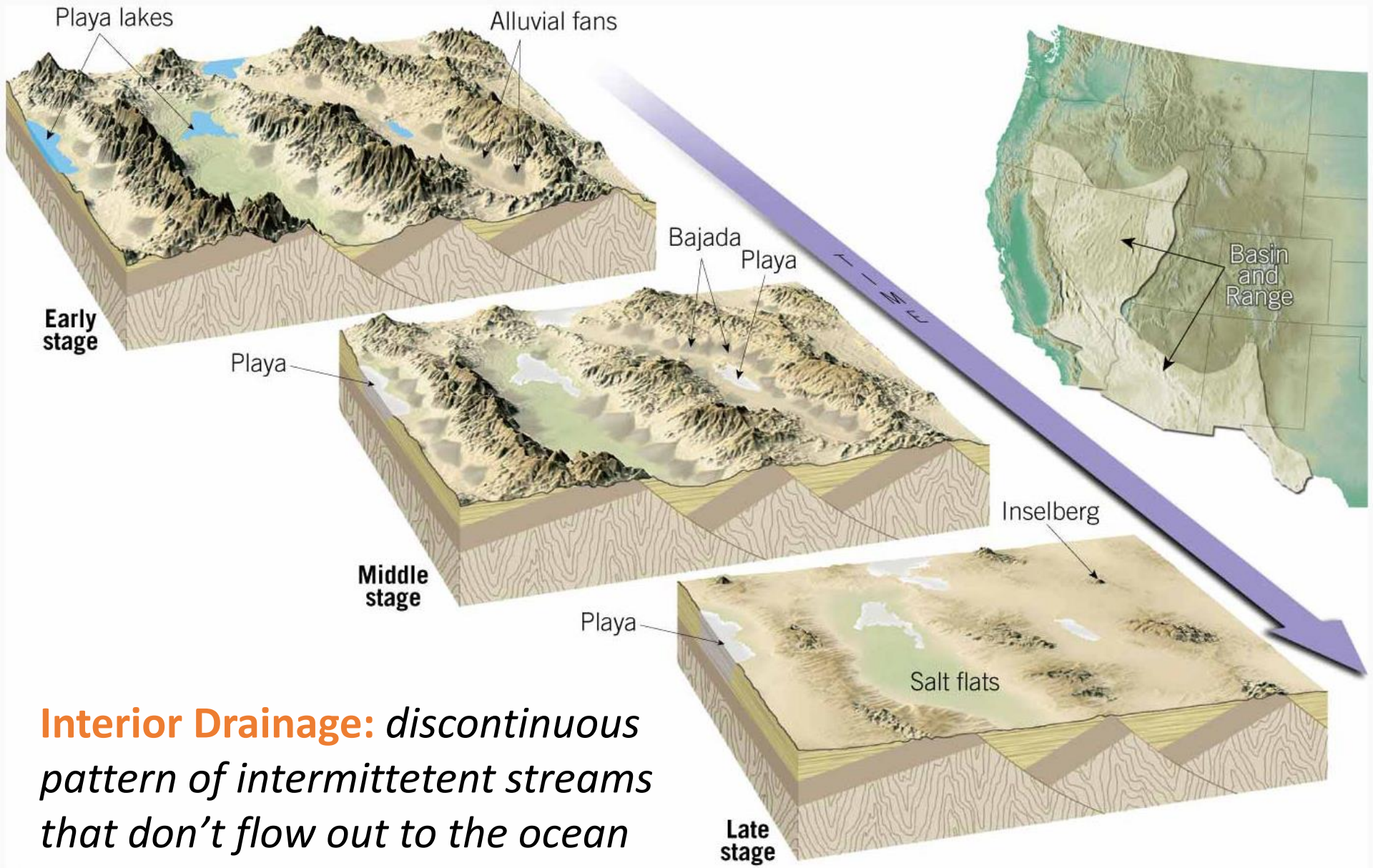


Slot Canyon



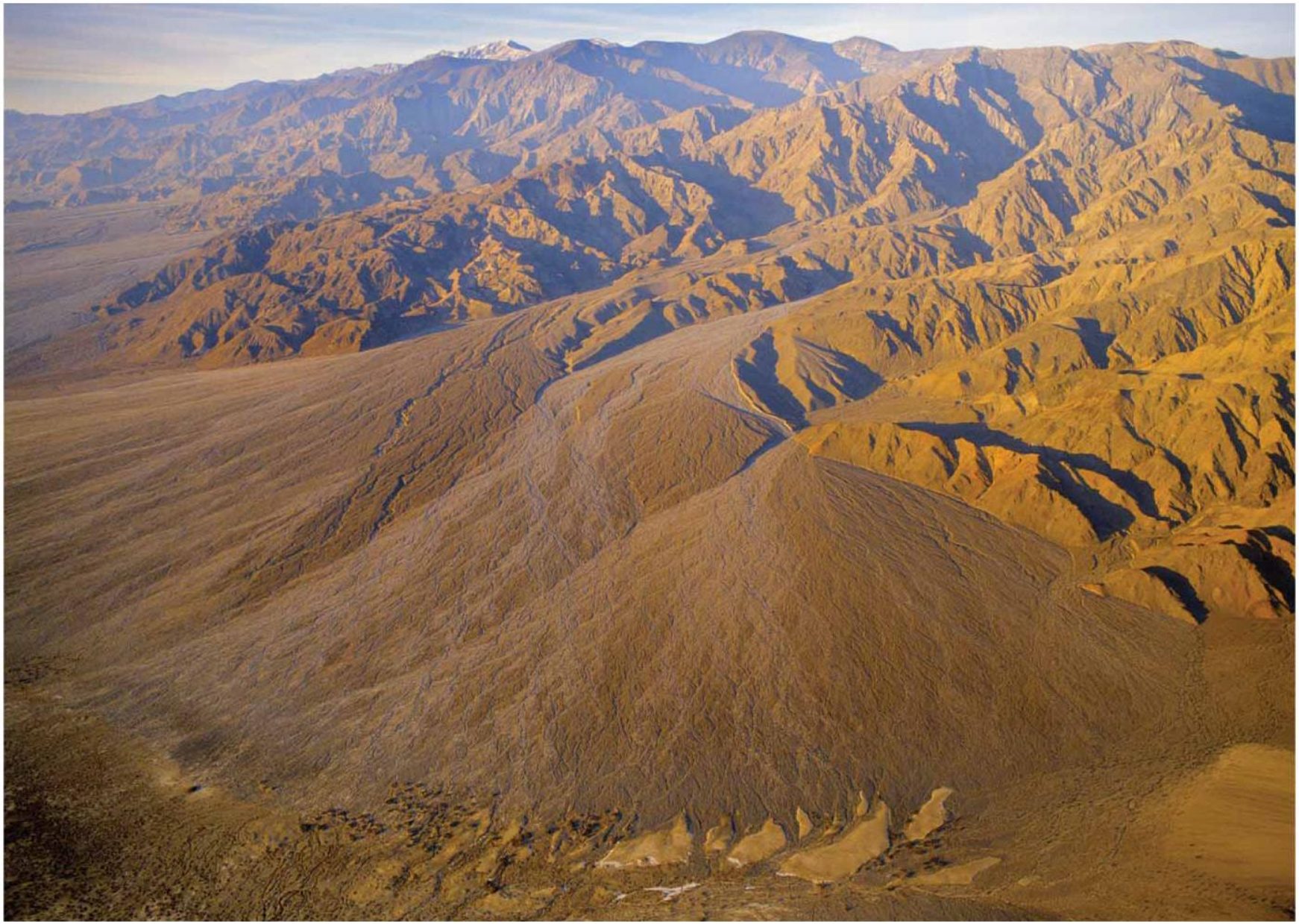
The Narrows, Zion N.P., Utah

The Basin & Range: Evolution of a Desert Landscape

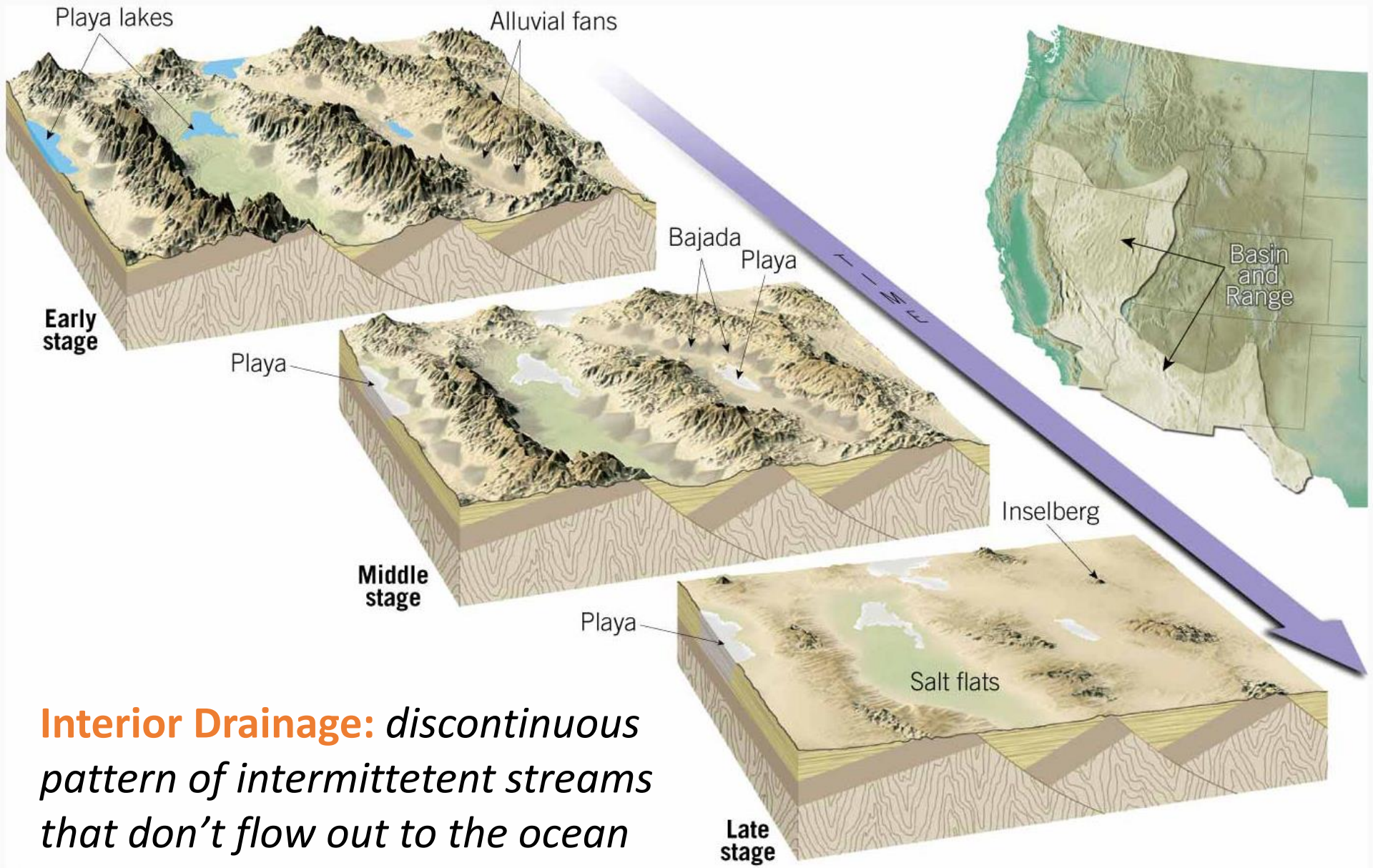


Interior Drainage: *discontinuous pattern of intermittetent streams that don't flow out to the ocean*

Bajada: *continuous apron of sediment at the base of a range*

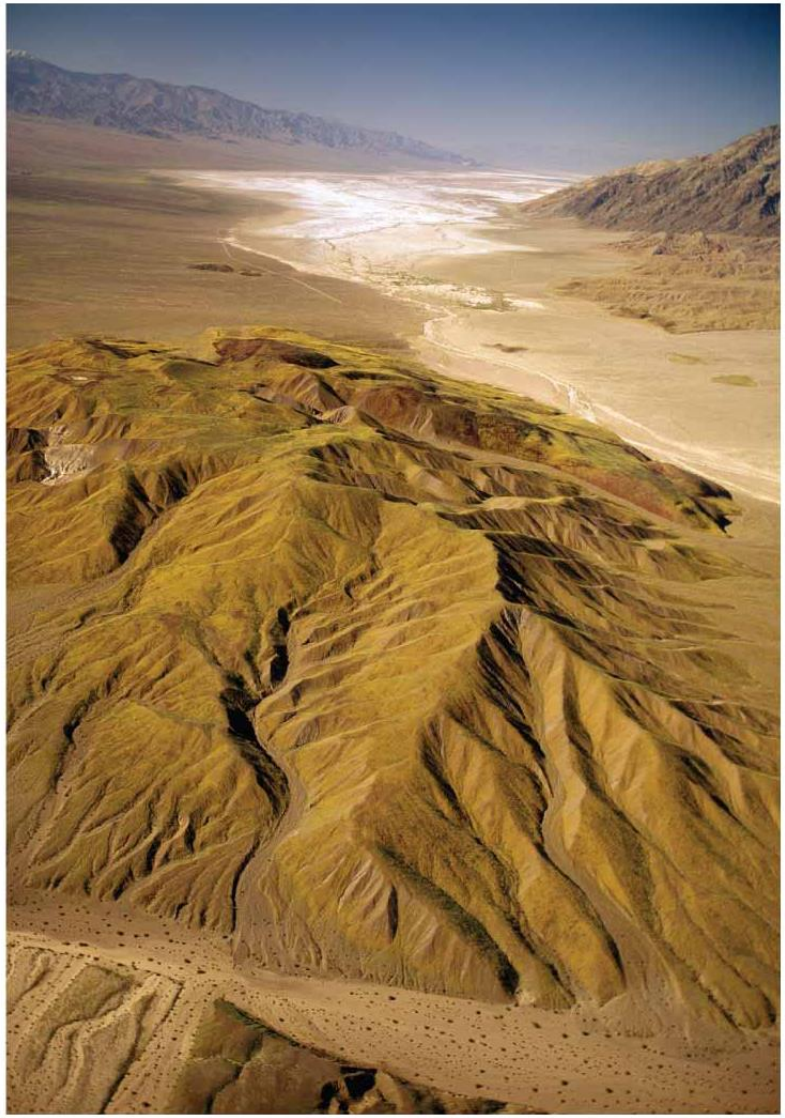


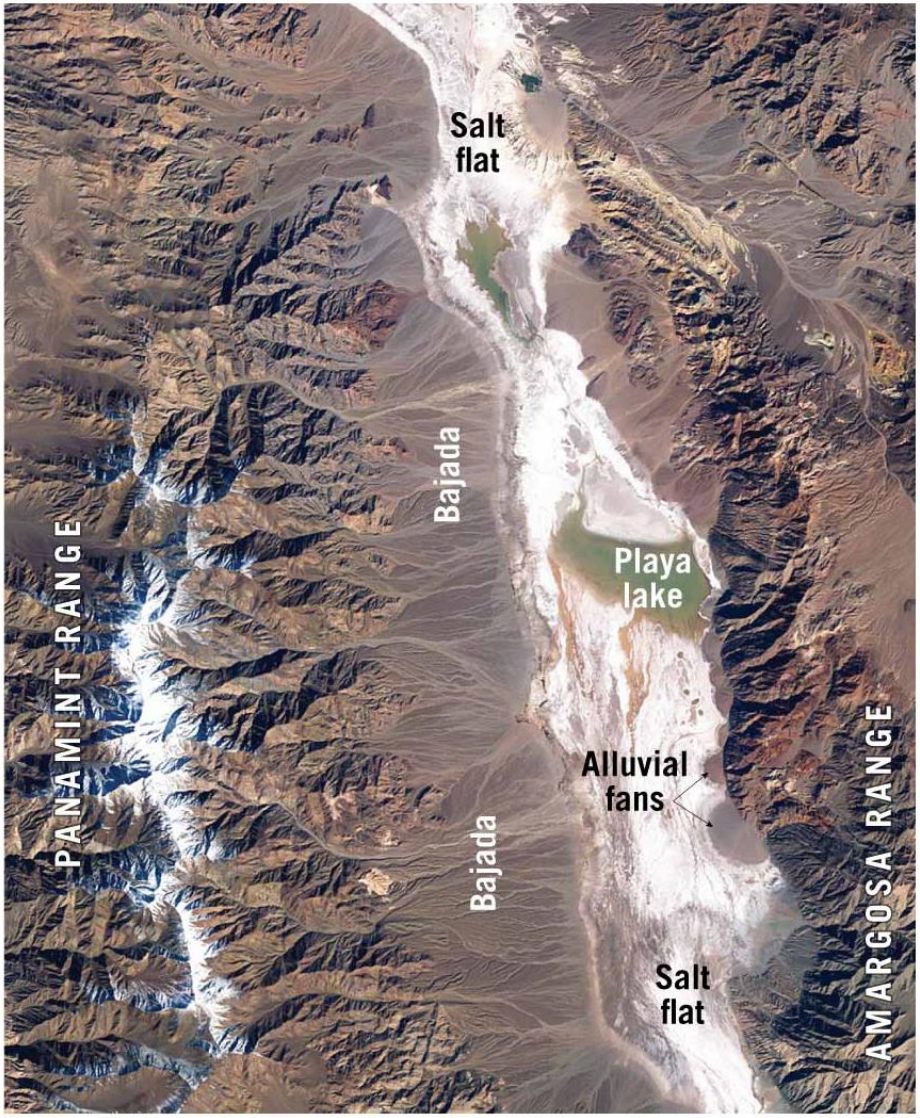
The Basin & Range: Evolution of a Desert Landscape



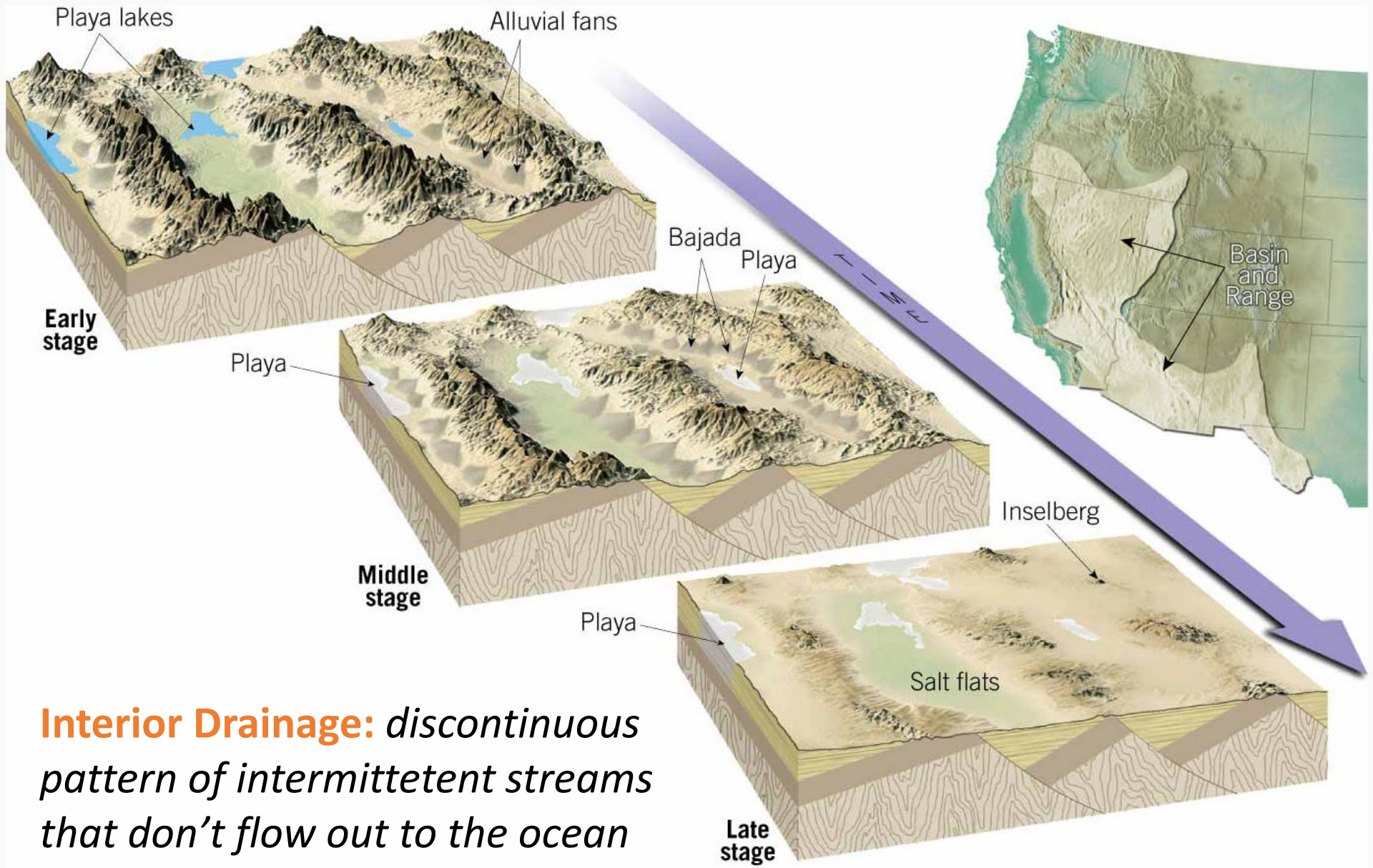
Interior Drainage: *discontinuous pattern of intermittetent streams that don't flow out to the ocean*

Playas and Playa Lakes: *flat sediment planes at the between desert ranges (become salt flats)*





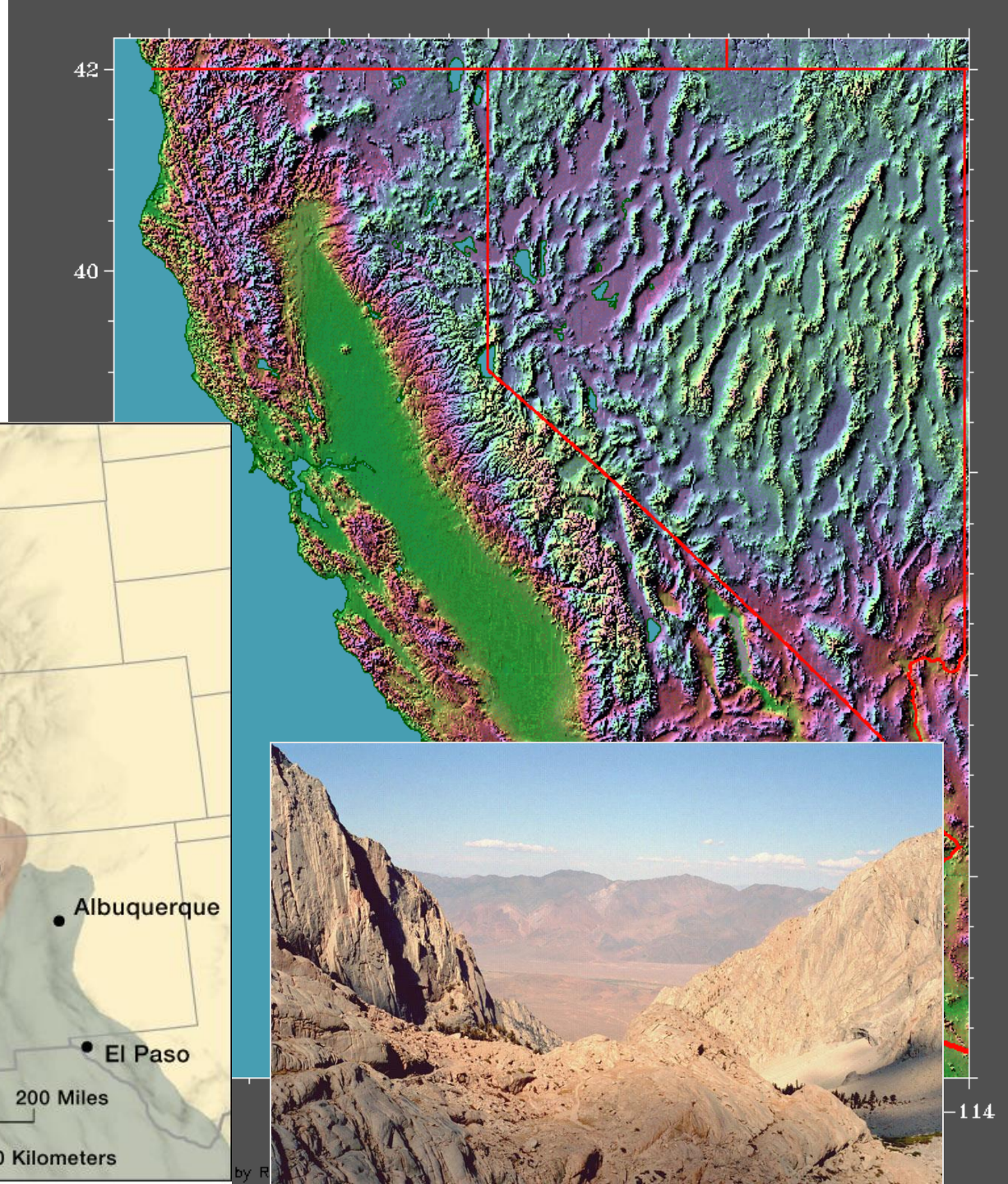
The Basin & Range: Evolution of a Desert Landscape

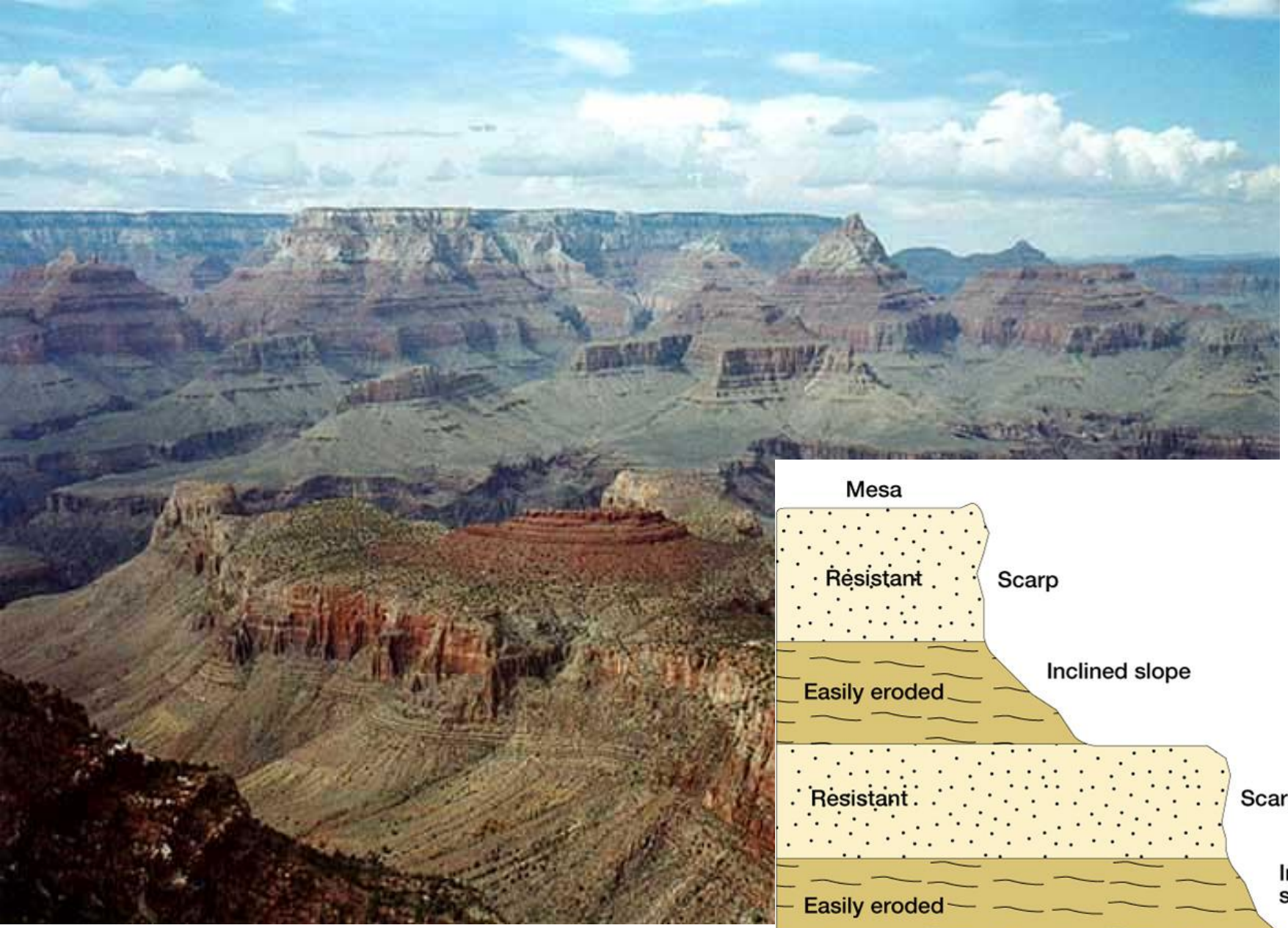


Interior Drainage: *discontinuous pattern of intermittetent streams that don't flow out to the ocean*

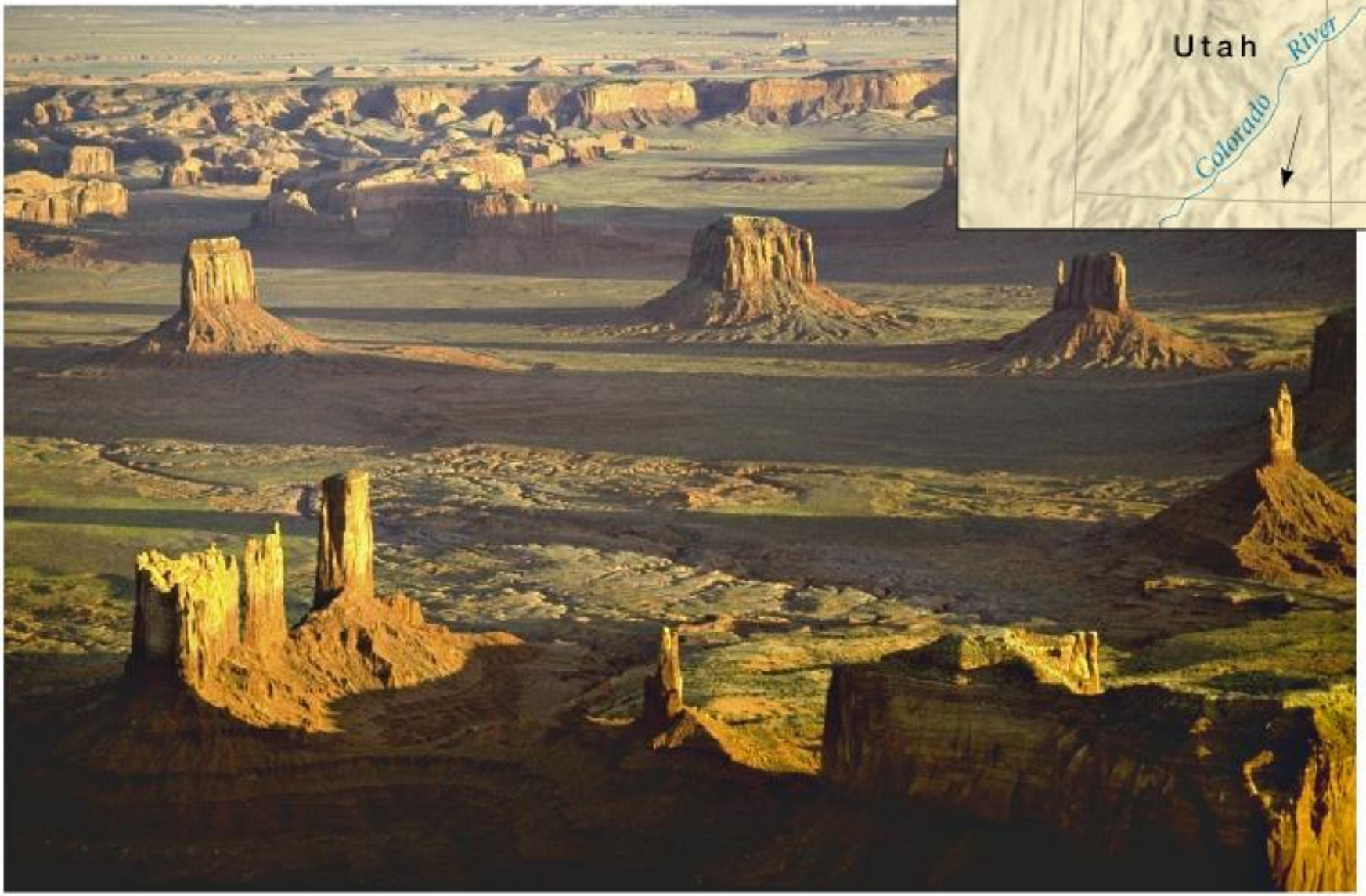
Salt Flats: *remains of playa lakes, super flat expanses between eroded mountain ranges*

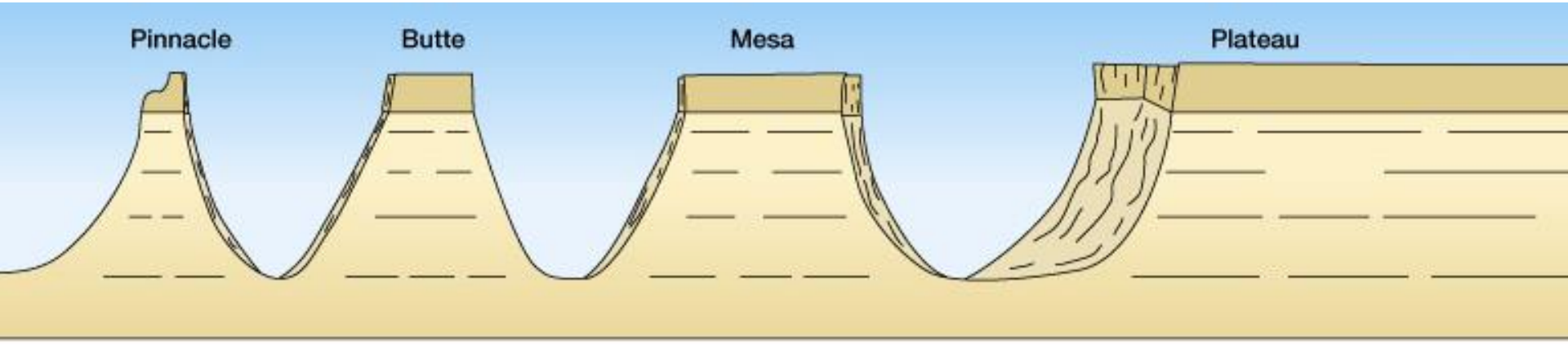
Desert TOPOGRAPHY





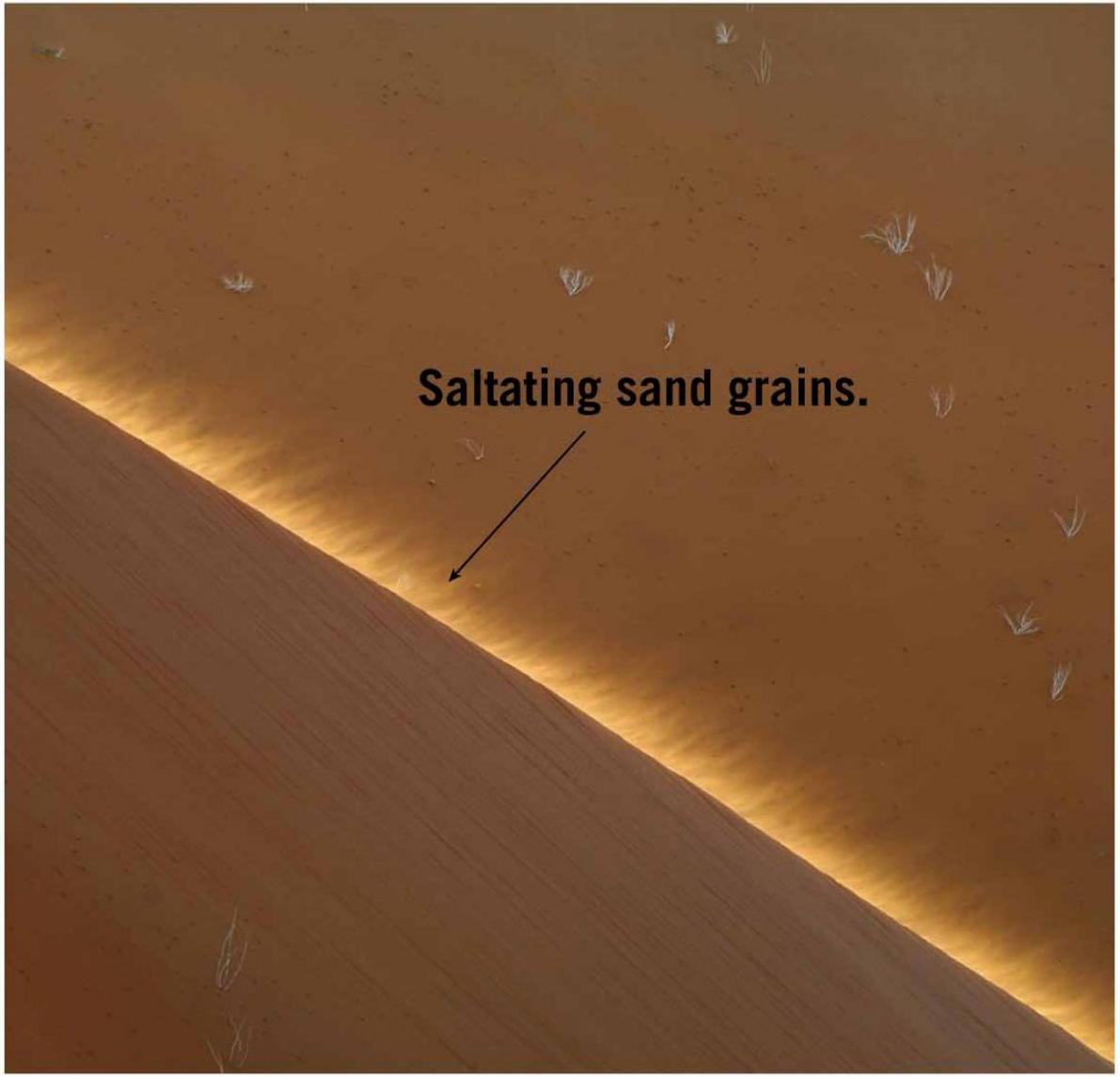
Differential Erosion


Wyoming
Nevada
Utah
Colorado River


Pinnacle
Butte
Mesa
Plateau

Transportation by Wind

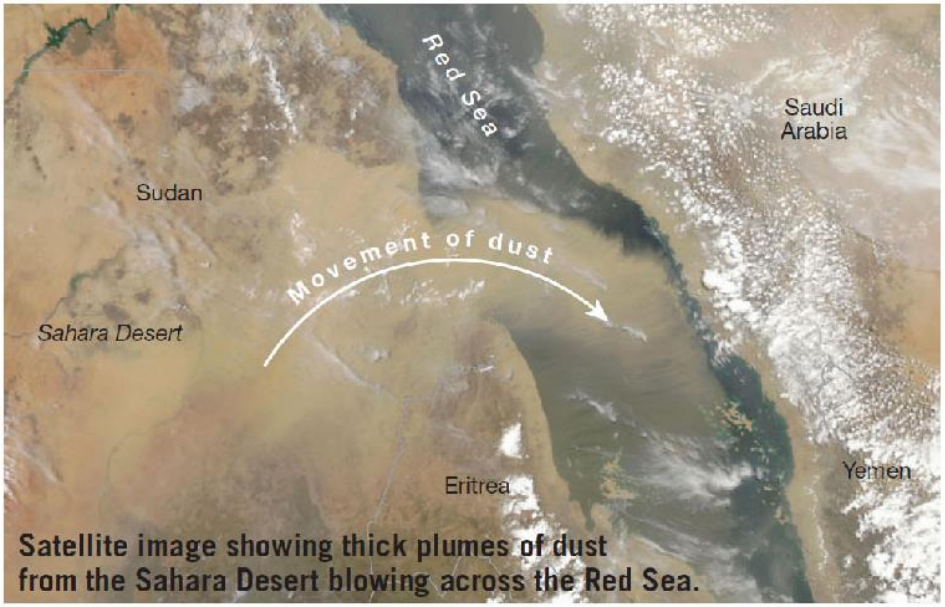
Saltation:
movement characterized by bouncing along the surface, part of the "bed load" carried by wind



Transportation by Wind

Suspended load:
includes fine particles held aloft and transported as dust storms

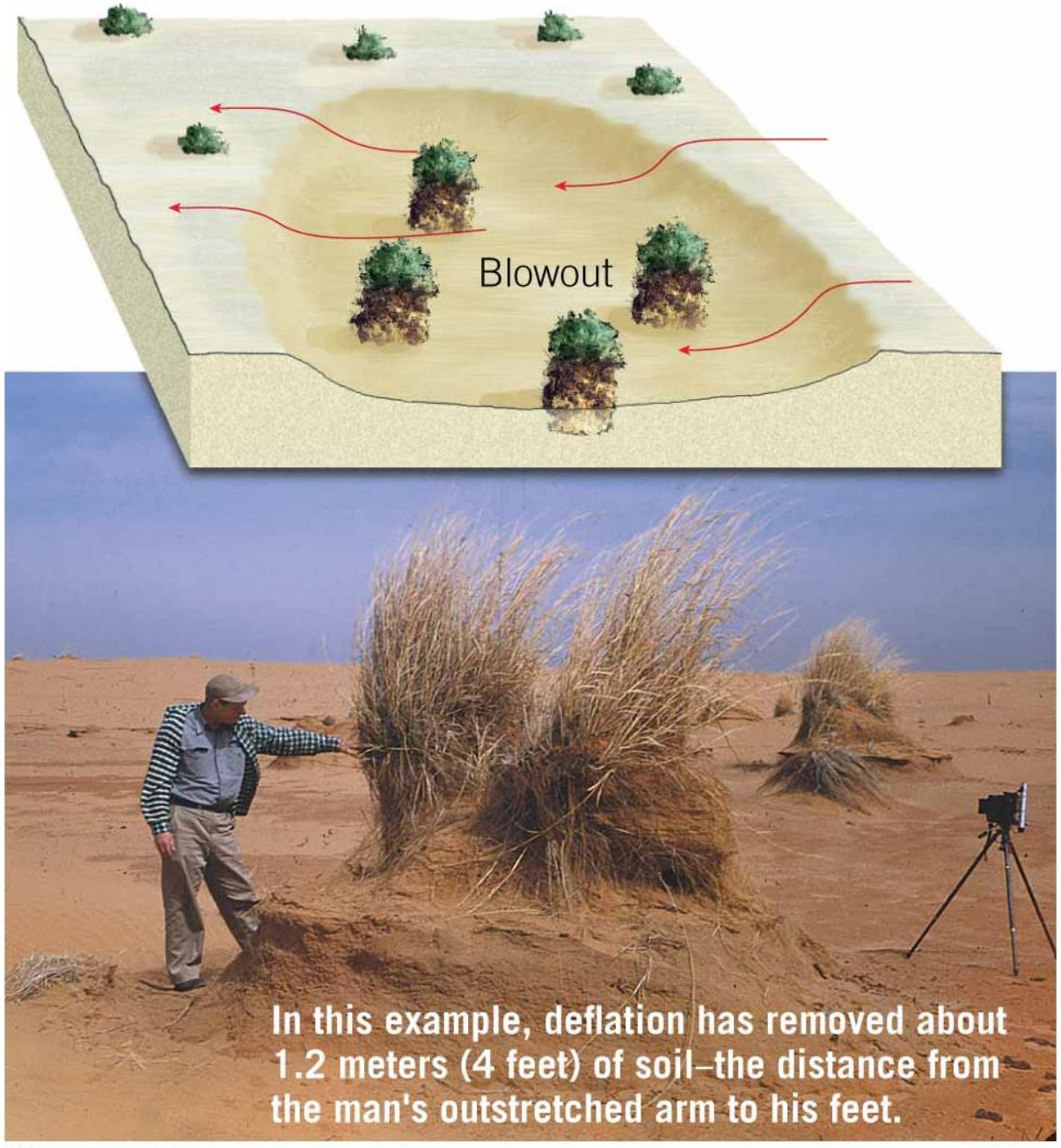

A dust storm blackens the Colorado sky in this historic image from the Dust Bowl of the 1930's.



Satellite image showing thick plumes of dust from the Sahara Desert blowing across the Red Sea.

Wind Erosion

Deflation & Blowouts: *the lifting and removal of loose material, often forming shallow depressions in sandy regions*

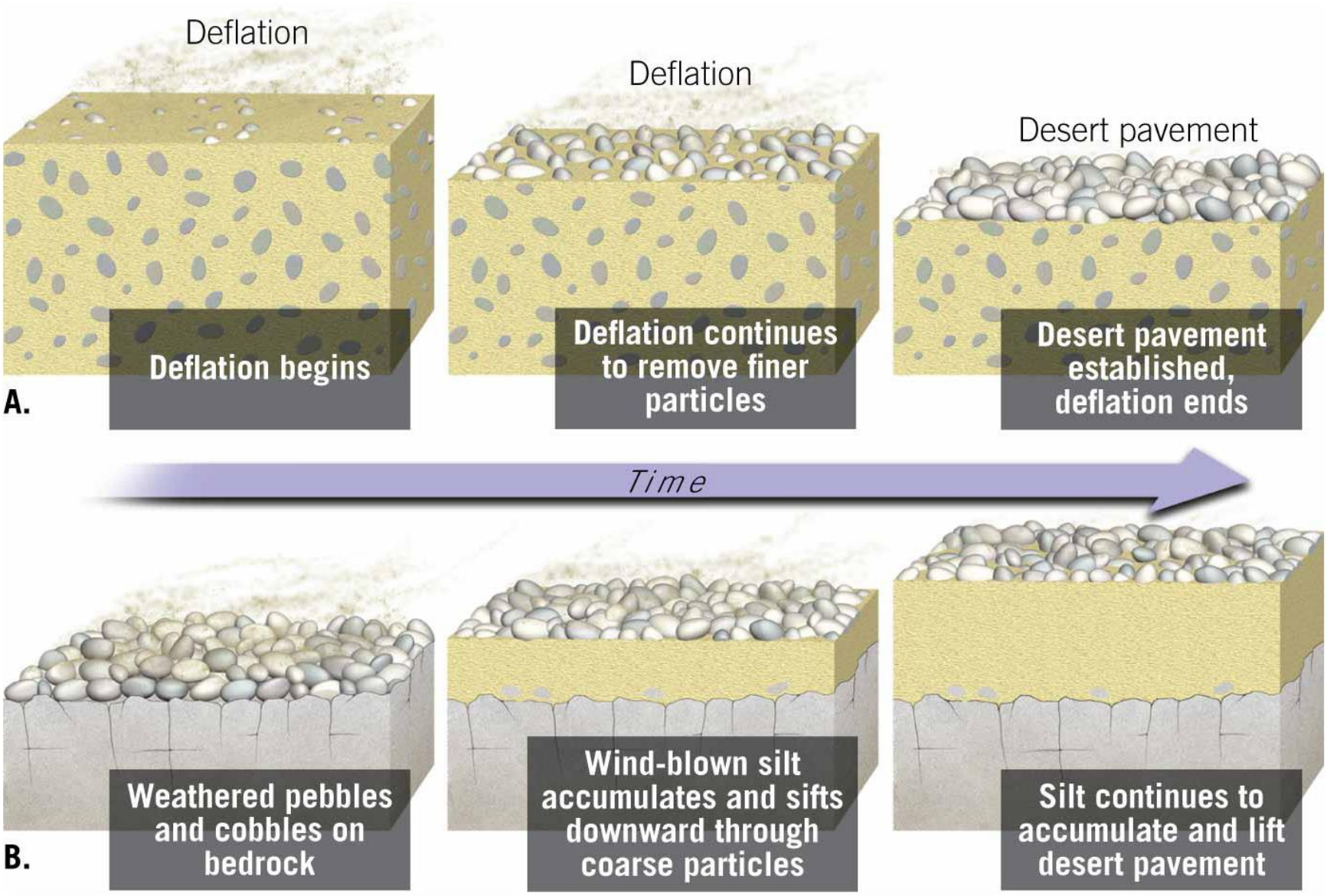


Wind Erosion

Desert Pavement:
veneer of pebbles and cobbles that form a crust on top of desert soil, helps to prevent deflation and other erosion

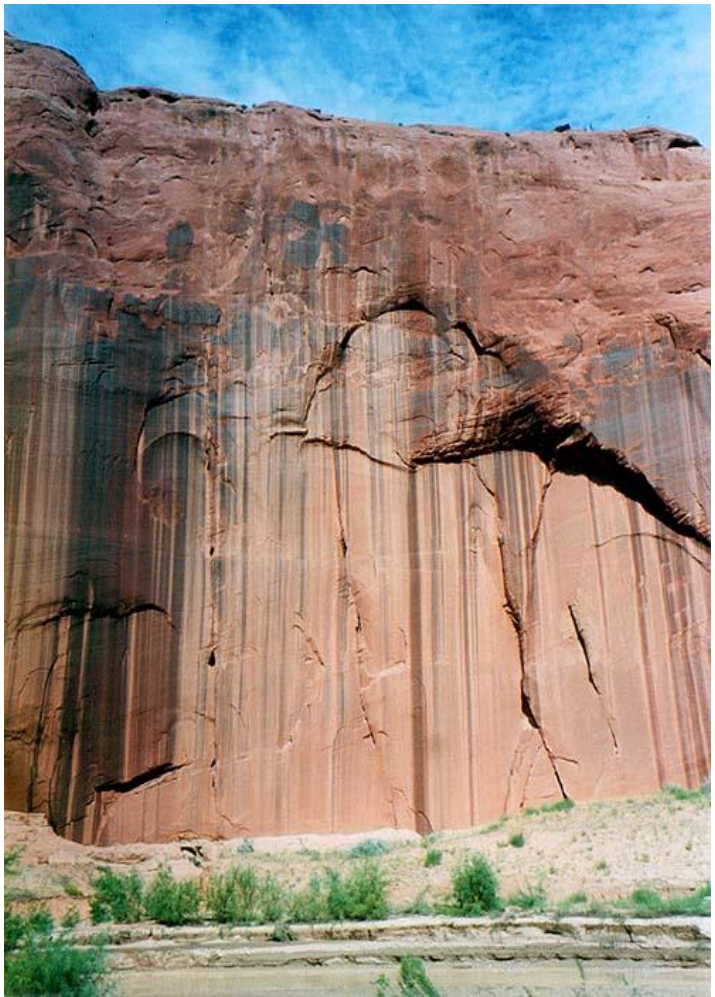
Wind Erosion

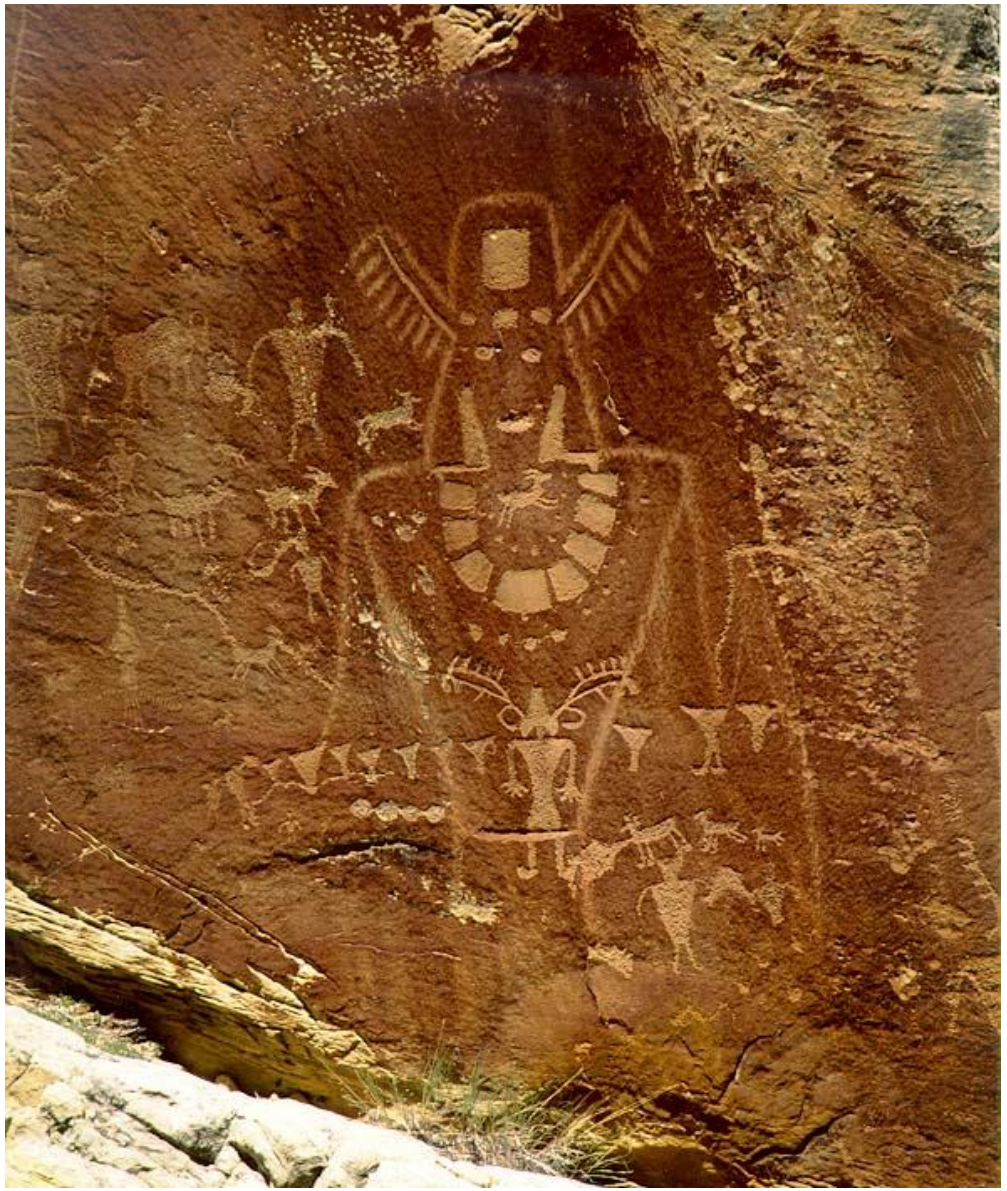
Desert Pavement: *formation process is still not fully understood – 2 hypotheses*



Desert varnish -

oxidation of iron and manganese, useful for dating desert surfaces





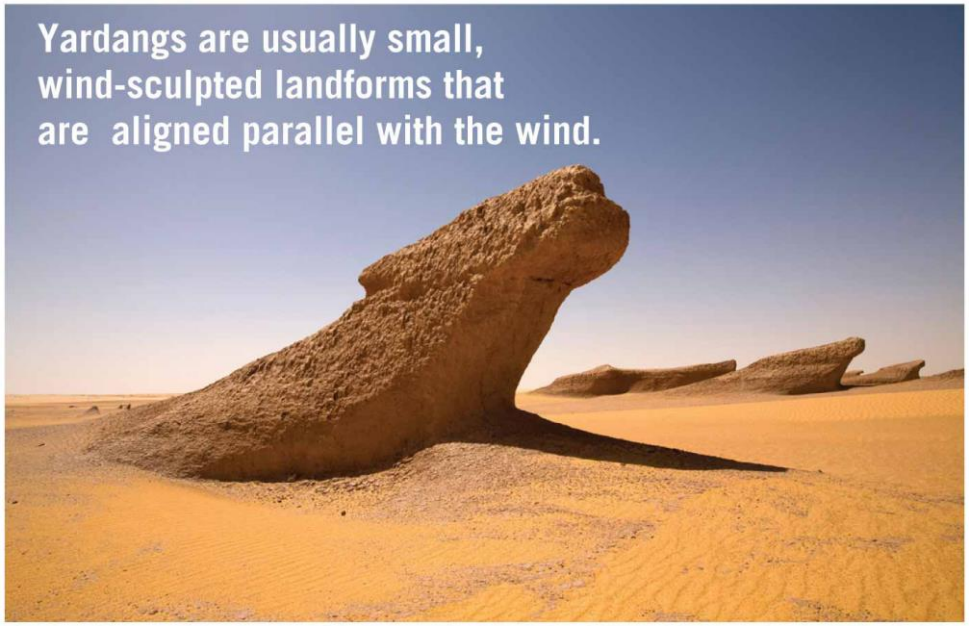
Wind Erosion

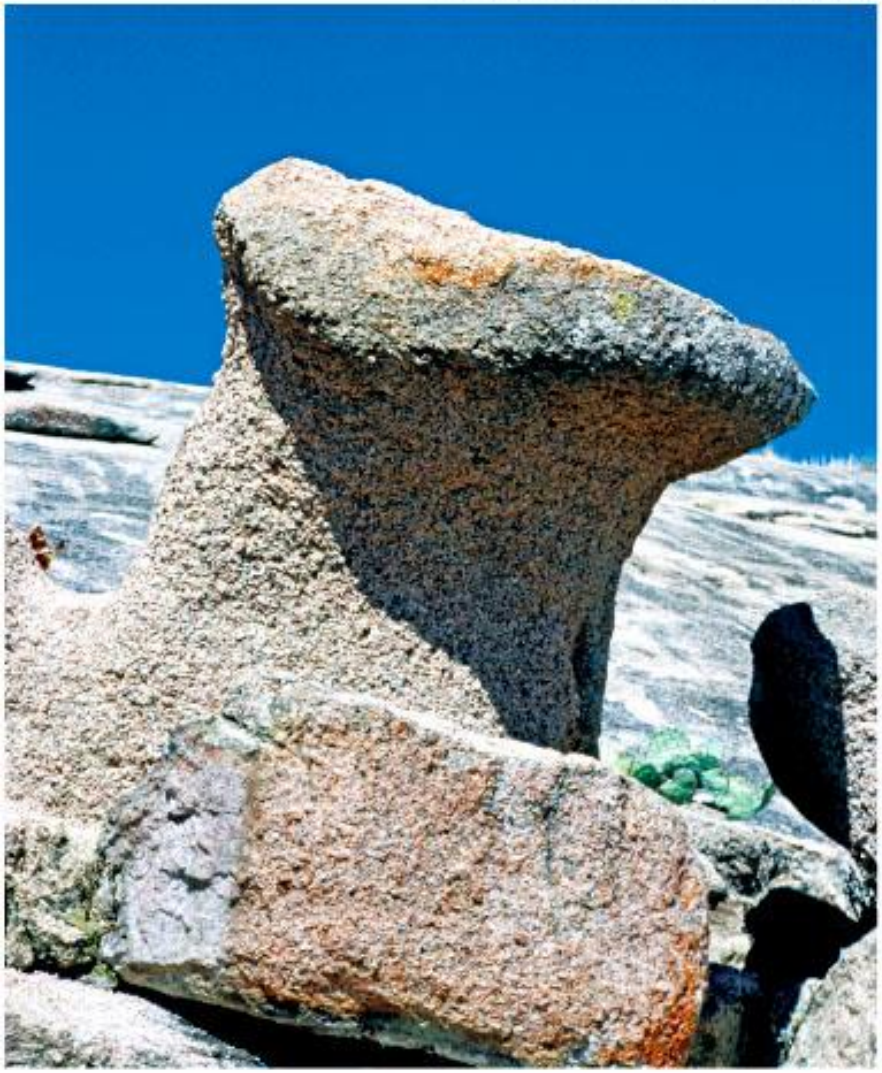
Ventifacts: *stones shaped and polished by sandblasting*

Yardangs: *small, wind-sculpted landforms that are aligned parallel to the wind*

A.

B.

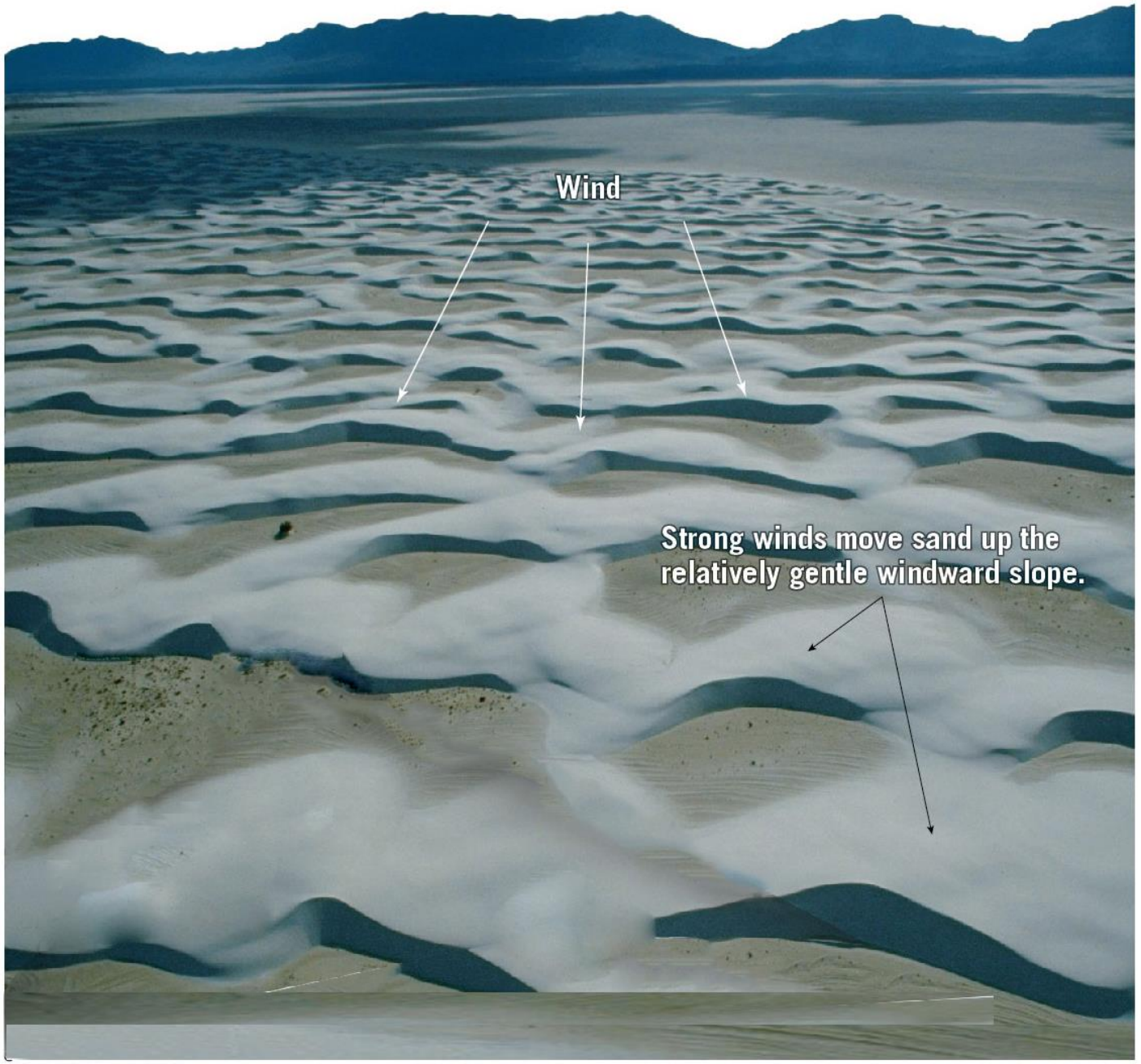




A

B

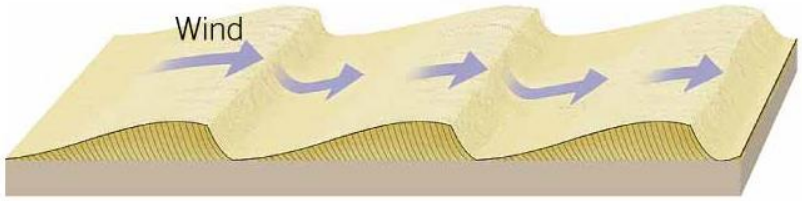
Wind Deposits



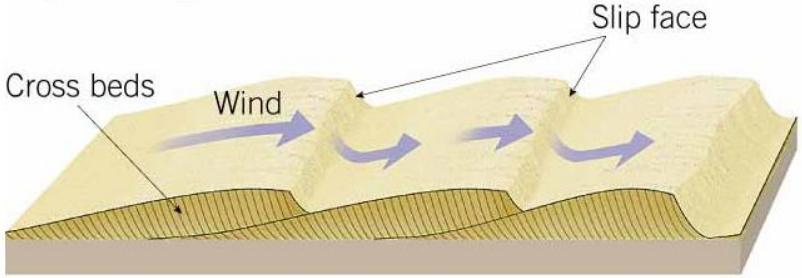
Wind Deposits

As sand accumulates at the dune crest, the slope steepens and some of the sand slides down the steep *slip face*.

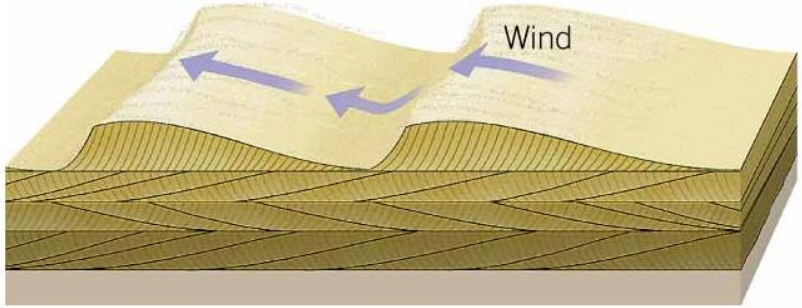
Wind Deposits



Dunes commonly have an asymmetrical shape and migrate with the wind.



Sand grains deposited on the slip face at the angle of repose create the cross-bedding of dunes.

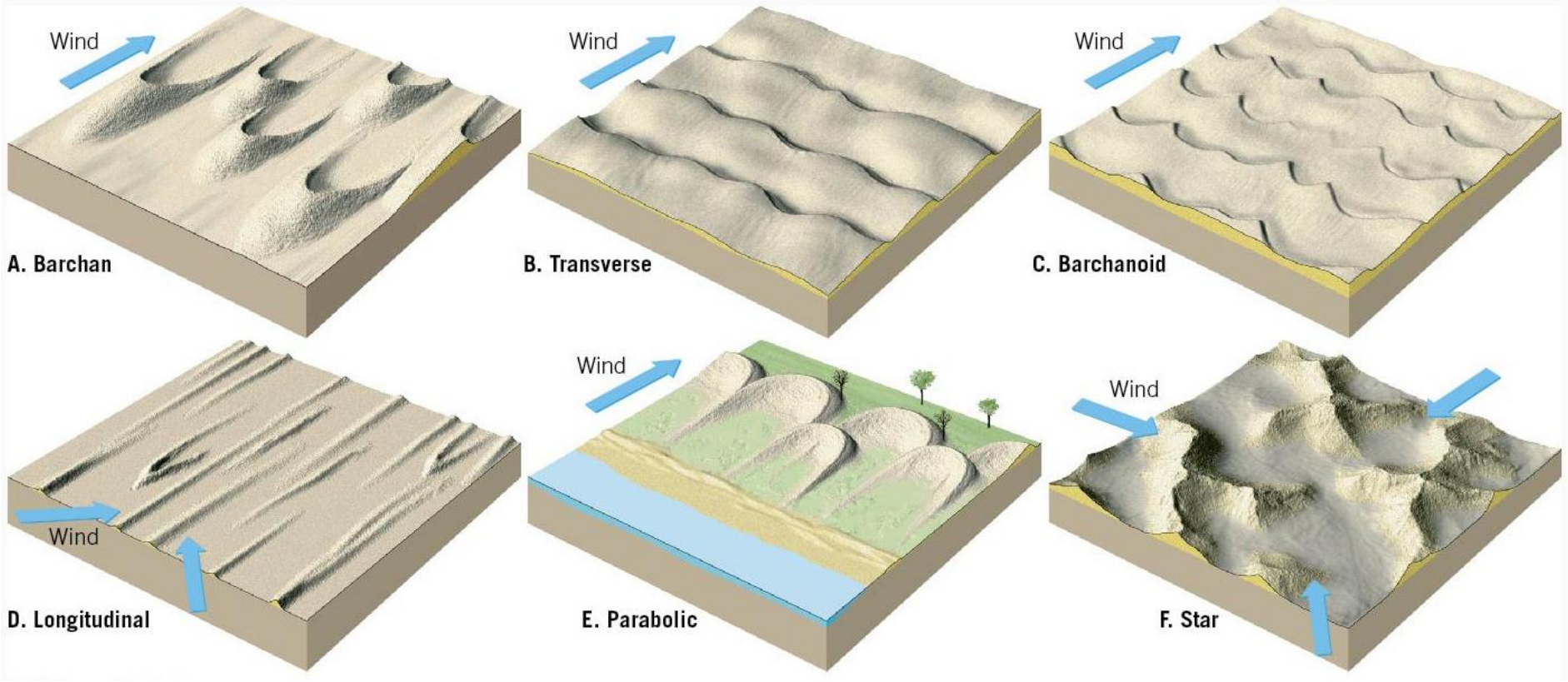


When dunes are buried and become part of the sedimentary rock record, the cross bedding is preserved.

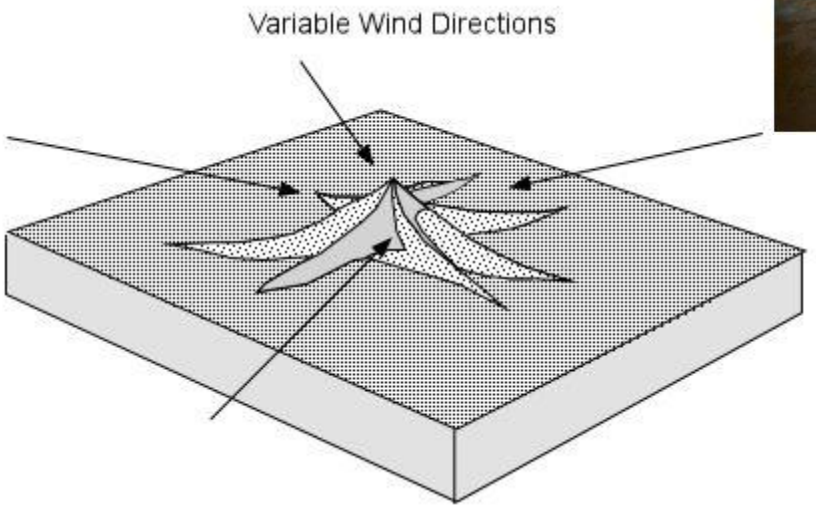
Cross beds are an obvious characteristic of the Navajo Sandstone in Zion National Park, Utah.

Wind Deposits

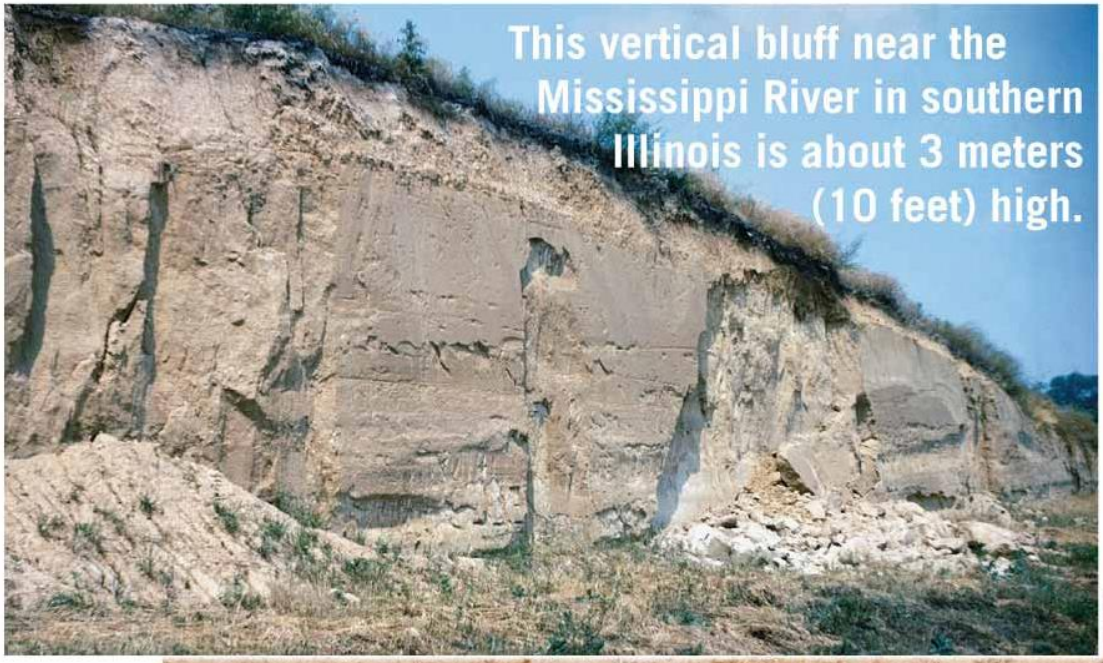
Types of sand dunes *– the type varies by sand availability, wind type and direction*



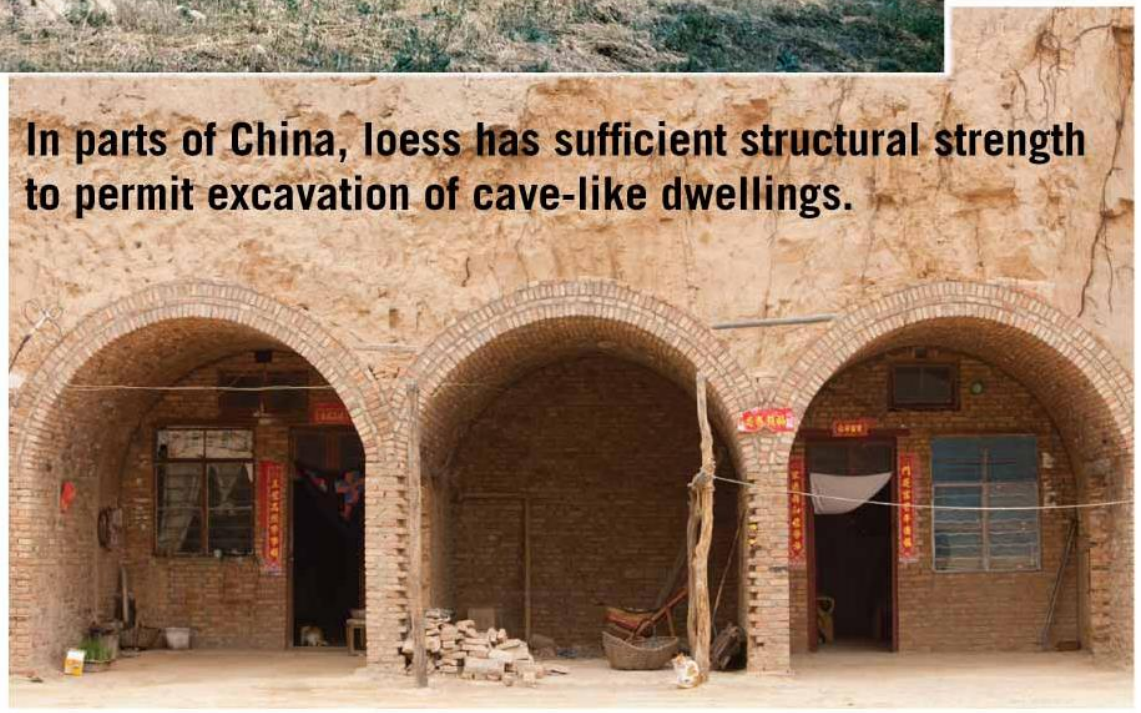
Star Dunes



Wind Deposits



Loess Deposits: *massive deposits of wind blown sediments*



Loess houses, China