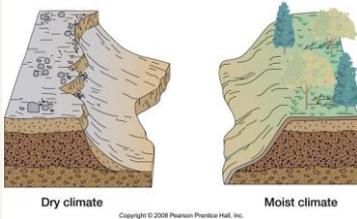


The Topography of Arid Lands

- A Specialized Environment
- Running Water in Waterless Regions
- Characteristic Desert Surfaces—Ergs, Regs, and Hamadas
- The Work of the Wind
- Two Characteristic Desert Landform Assemblages in U.S. Deserts

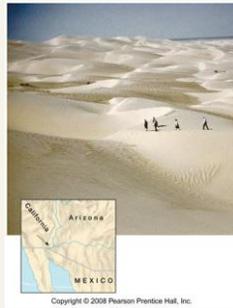
A Specialized Environment

- Special Conditions in Deserts
 - Mechanical weathering dominates, e.g. salt wedging
 - Soil and regolith are thin, leading to rocky terrain (below)



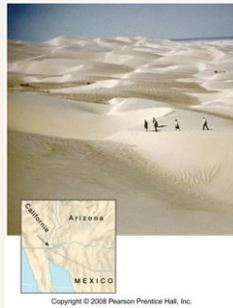
Special Conditions in Deserts

- Impermeable surfaces predominate e.g. caprocks (bedrock) and hardpans (hardened soil).
- So the little rain that falls, ends up as run-off.
- Never gets into groundwater, were plants can draw it up later.
- Sand & Wind – but not all deserts have sand or have landforms shaped mainly by wind.



Special Conditions in Deserts

- Rainfall – occurs as intense convective thunderstorms which leads to brief flooding, and fluvial deposition.
- Interior drainage that does not lead to the sea.
- Lack of continuous vegetation cover.



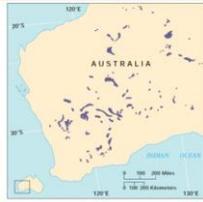
Running Water in Waterless Regions

- Significance of Running Water
 - Aeolian (wind) processes is less significant
 - Sparse vegetation leads to overland flow erosion, and hence large volumes of sediment moved within a short time.
- Surface Water in Deserts
 - Exotic Streams: fed by sources outside the desert. E.g. the Nile travels 2,000 miles thru the Sahara, without additional tributaries!



Desert Lakes

- Playas - Dry lake beds
- Playa lakes tend to be temporary.
- Permanent playa lakes are mostly salty e.g. Great Salt Lake, UT.



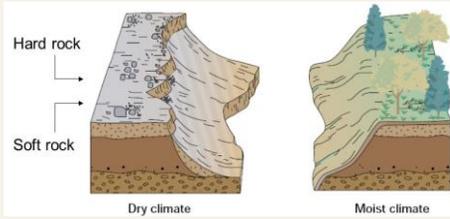
Desert Lakes



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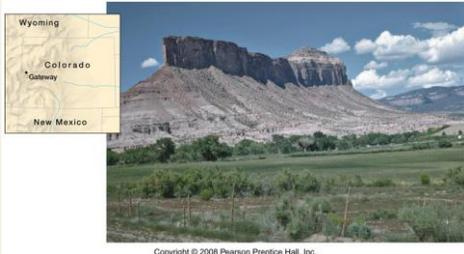
Fluvial Erosion in Arid Lands

- Differential Erosion (common in sedimentary layers)
 - Differential hardness of rock layers



Differential Erosion

- The effects of differential erosion on the Red Cliffs near Gateway in Western Colorado.



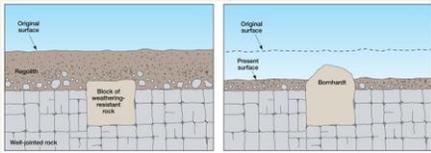
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Residual Erosional Surfaces

- They form Inselbergs ("island mountains")
 - Particularly a type called Bornhardts (resistant rocks that are round). This is how Uluru (Ayers Rock), in Australia was formed.



Residual Erosional Surfaces



Kata Tjuta (the Olgas) in the desert of central Australia.



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Desert Stream Channels or Wadi

- They're called "Wadi" in Arabic. E.g. the Wadi of Egypt.

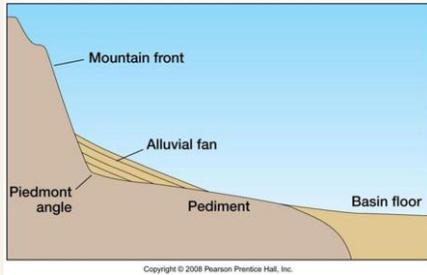


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Mojave Desert, near Baker, CA.

Fluvial Deposition in Arid Lands

- These depositional features are more obvious than erosional features, and they occur in ephemeral stream channels
 - Piedmont zone. This is any zone at the foot of a mountain range where you find:
 - Talus accumulations and alluvial fans

Fluvial Deposition in Arid Lands



Characteristic Desert Surfaces

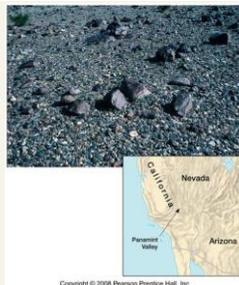
- Erg - A Sea of Sand
- 'Erg' - Arabic for sand
 - Found in the deserts of Arabia, the Sahara and Namibia.
 - The Arabian desert is the sandiest of all deserts; and even then, only a third of it is covered in sand. Moreover, most of that sand is not 'true erg'.
 - "Relict ergs" (covered with vegetation) are found in Western Nebraska. The "Sand Hills" on Hwy 2.



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Characteristic Desert Surfaces

- Reg—Stony Desert
- 'Reg' – Arabic for "stone"
 - Desert pavement
 - Called 'gibber plains' in Australia



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Characteristic Desert Surfaces

- Hamada—Barren Bedrock
- 'Hamada' – Arabic for "rock"
 - Comprises of exposed bedrock or cemented sedimentary material (these are large expanses of bedrock, as opposed to stones scattered all over in a "Reg").



Aeolian Erosion

- Aeolian Erosion
 - Abrasion – wearing away of rock by airborne sand and dust particles
 - Deflation – shifting of loose particles



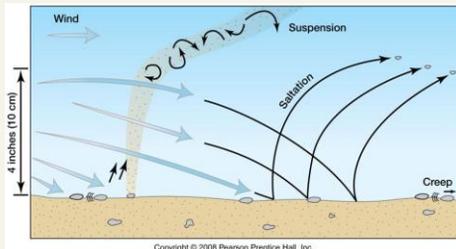
Wind deflation



Sand-blasted rock, or ventifact

Aeolian Transportation

- Suspension, saltation, traction and Creep (just like water movement).



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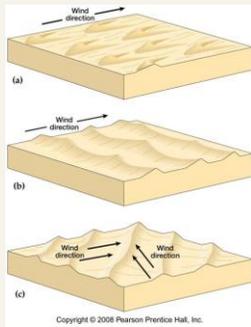
Aeolian Deposition

- Desert Sand Dunes
 - Vegetation and Dune Stabilization
 - Dune migration

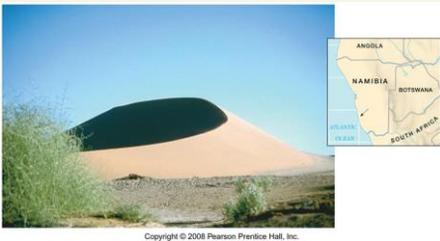


Types of Sand Dunes

- Barchan
- Transverse
- Seif



Barchan in Namibia



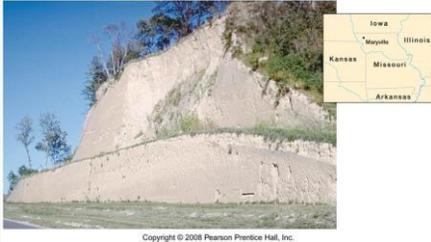
Seif dunes in Simpson Desert



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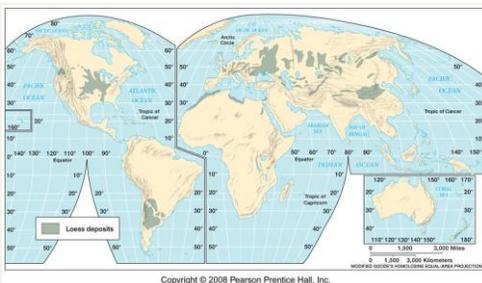
Loess

- Another aeolian feature that can be outside of deserts
- It is wind-blown silt; fine texture, no horizontal layering



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Loess Deposits



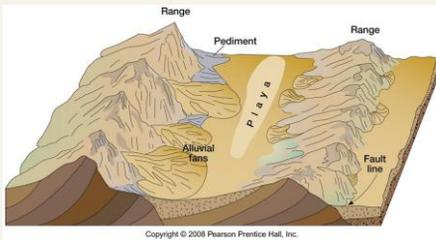
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Two Characteristic Desert Landform Assemblages in U.S. Deserts

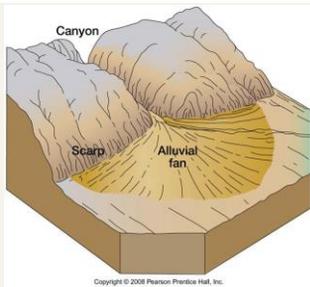
- Basin-and-Range Terrain
- Mesa-and-Scarp Terrain



Basin-and-Range Terrain



Piedmont Zone - Alluvial Fan



Playa (dry lake bed)



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Salt Pan

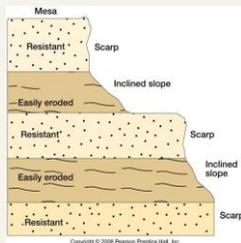
- Death Valley, CA



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Mesa-and-Scarp Terrain

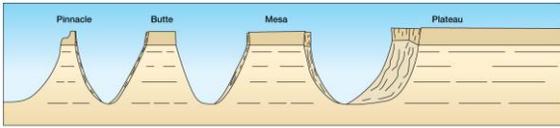
- Horizontal layers of differential rock
 - 'Mesa' is Spanish for 'table'
 - Slopes have multiple scarps. 'Scarp' is short for 'escarpment'
 - Due to differential weathering: the resistant rocks become 'scarps' and softer rock become gentler inclined slopes.



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Residual Landforms

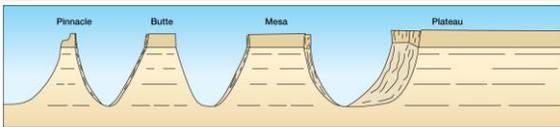
- ❑ Flat-topped summits in horizontal sedimentary strata
- ❑ Hard cap rock; if they are bounded on one or more sides by a prominent escarpment, they're called plateaus.
- ❑ Plateaus are "tablelands" (bigger than Mesas)



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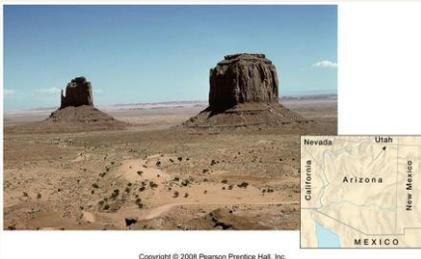
Residual Landforms

- ❑ Buttes are just eroded remnants of mesas
- ❑ Pinnacles are the smallest remnants



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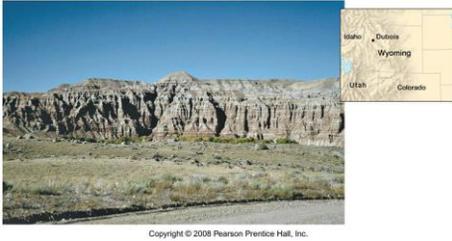
Mitten Buttes, Monument Valley, AZ



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Badlands

- Innumerable ravines and gullies



Arches and Natural Bridges

- Combination of weathering and fluvial erosion.

