

1  **Deserts and Winds**

Earth 10th Edition – Chapter 19

2  **Deserts: summary in haiku form**

Deserts expanding
yet rivers get diverted
to make desert "bloom."

3  **Key Concepts**

- Distribution and causes of "deserts."
- Weathering and water in arid regions.
- Transportation of sediment by wind.
- Erosion by wind.
- Wind-related sedimentary deposition.

4  **Distribution & causes of dry lands**

- Dry regions cover 30 percent of Earth's land surface
- Two climatic types are commonly recognized
 - ☒ Desert or arid
 - ☒ Steppe or semiarid

5  **Desert and steppe regions of the world**

6  **Distribution and causes of dry lands**

- Dry lands are concentrated in two regions
 - ☒ Subtropics
 - ◆ Low-latitude deserts
 - ◆ In the vicinities of the Tropics of Cancer and Capricorn
 - ◆ Areas of high pressure and sinking air that is compressed and warmed

7  **Subtropical high pressure belts and dry regions**

8  **Global Wind Patterns with Hadley Cells**

9  **Distribution and causes of dry lands**

- Dry lands are concentrated in two regions
 - ☒ Middle-latitudes
 - ◆ Located in the deep interiors of continents
 - ◆ High mountains in the path of the prevailing winds produce a *rain-shadow* desert

10  ***Rainshadow Deserts are the Result of Major Mountain Ranges***

11  **Rainshadow desert**

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13  ***Rainshadow Deserts are the Result of Major Mountain Ranges***

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15  **Geologic processes in arid climates**

- Weathering
 - ☒ Not as effective as in humid regions
 - ☒ Mechanical weathering produces unaltered rock and mineral fragments
 - ☒ Some chemical weathering in deserts does produce
 - ◆ Clay
 - ◆ Thin soils
 - ◆ Oxidized minerals

16  **Geologic processes in arid climates**

- Role of water in arid climates
 - ☒ Practically all streambeds are dry most of the time
 - ☒ Desert streams are said to be *ephemeral*
 - ◆ Carry water only during periods of rainfall
 - ◆ Different names are used in various regions
 - Wash and arroyo (western United States)

- Wadi (Arabia and North Africa)
- Donga (South America)
- Nullah (India)

17  **Geologic processes in arid climates**

● Role of water in arid climates

☒ Desert rainfall

- ◆ Rain often occurs as heavy showers
- ◆ Because desert vegetative cover is sparse, runoff is largely unhindered and flash floods are common
- ◆ Poorly integrated drainage systems and streams lack an extensive system of tributaries
- ◆ Most of the erosion work in a desert is done by running water

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19  **A dry channel contains water only following heavy rain**

20  **Dry vs. Wet:**

21  **Canyon Country: might be raining elsewhere!**

22  **And you won't know until you hear a roaring sound...**

23  **Basin and Range:**

Evolution of a desert landscape

- Characterized by interior drainage
- Landscape evolution in the Basin and Range region
 - ☒ Uplift of mountains – block faulting
 - ☒ Interior drainage into basins produces
 - ◆ Alluvial fans
 - ◆ Bajadas
 - ◆ Playas and playa lakes

24  ***Basin and Range***

25  ***Landscape Evolution***

26  ***Death Valley***

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30  **Basin and Range:**

Evolution of a desert landscape

- Landscape evolution in the Basin and Range region
 - ☒ Ongoing erosion of the mountain mass
 - ◆ Produces sediment that fills the basin
 - ◆ Diminishes local relief
 - ◆ Produce isolated erosional remnants called *inselbergs*

31  **Inselbergs in southern California**

32  **Wind in the desert**

- Transportation of sediment by wind
 - ☒ Differs from that of running water in two ways
 - ◆ Wind is less capable of picking up and transporting coarse materials
 - ◆ Wind is not confined to channels and can spread sediment over large areas

33  **Wind in the desert**

- Transportation of sediment by wind
 - ☒ Mechanisms of transport
 - ◆ Bedload
 - Saltation – skipping and bouncing along the surface
 - About 20 to 25 percent of the sand transported in a sandstorm is moved this way

- ◆Suspended load
- 34 **Wind in the desert**
 - Wind erosion
 - ☒Wind is a relatively insignificant erosional agent with most erosion in a desert performed by intermittent running water
 - ☒Mechanisms of wind erosion
 - ◆Deflation
 - Lifting of loose material
 - Deflation produces blowouts (shallow depressions) and desert pavement (a surface of coarse pebbles and cobbles)

35 **Formation of a desert blowout**

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37 ***Formation of desert pavement***

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40 **Wind in the desert**

- Wind erosion
 - ☒Mechanisms of wind erosion
 - ◆Abrasion
 - Produces ventifacts (stones with flat faces) and yardangs (wind sculpted ridges)
 - ◆Limited in vertical extent

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43 **Wind in the desert**

- Wind deposits
 - ☒Significant depositional landforms are created by wind in some regions
 - ☒Two types of wind deposits
 - ◆Dunes
 - Mounds or ridges of sand
 - Often asymmetrically shaped
 - Windward slope is gently inclined and the leeward slope is called the slip face

44 **Formation of sand dunes**

45 **Formation of Cross Bedding**

46 ***Sand Dune Types***

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49 **Kelso Dunes, Mojave National Preserve**

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55 **Wind in the desert**

- Wind deposits
 - ☒Two types of wind deposits
 - ◆Loess
 - Blankets of windblown silt
 - Two primary sources are deserts and glacial outwash deposits
 - Extensive deposits occur in China and the central United States

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58  **End of Chapter**