ARID LANDS AND DESERTIFICATION

Qattara Depression – low area in NW Egypt
- ⇒ 443 feet below sea level
- ⇒ Helped defeat the great German general Rommel the 'Desert Fox" in WWII
- ⇒ Gibleh – searing hot winds that generate dust storms

Deserts
- ⇒ Mean different things to different people
- ⇒ One third of Earth's surface
- ⇒ All deserts are dry: but they can be hot or cold, high elevation or low
- ⇒ Very fragile environments

Kinds of Deserts

A desert is defined as a region with precipitation values less than 25cm (10inches), with high evaporation levels, resulting in low biological activity.

1) Polar Desert
   - ⇒ Perpetual snowline cover
   - ⇒ Intense cold
   - ⇒ Antarctica and Greenland

2) Subtropical Desert (also called trade wind deserts)
   - ⇒ Largest dry expanses
   - ⇒ Subsiding air from global air circulation
   - ⇒ Have low or no precipitation
   - ⇒ Sahara, Australia

3) Mid-Latitude Deserts
   - ⇒ Topographic (mountain) genesis
   - ⇒ Related to rainshadow, but at a much larger scale
   - ⇒ Gobi and Asian deserts

4) Rainshadow Deserts
   - ⇒ Closer to ocean than mid-latitude classification generally
   - ⇒ Also the result of subsiding air over a mountain
   - ⇒ Great Basin Deserts, Mojave

5) Coastal Deserts
   - ⇒ Adjacent to cold Eastern Boundary ocean currents
   - ⇒ Atacama in Chile - double trouble – may be the driest place on Earth

Semi-arid Grasslands (BS climates) – typically adjacent to true deserts (BW climates)

Desertification

Deserts of Infertility – created by human misuse of a semi-arid area
- ⇒ Results in desertification of the semi-arid land

Causes of Desertification:

1) Over Grazing
2) Trampling of soil by livestock
3) Clearing of land (trees) for fuel without restoration
4) Surface mining without reclaimation
5) Depletion of groundwater for desert irrigation and urban growth
6) Replacement of natural vegetation in semi-arid regions with cultivated crops
7) Soil salinization due to evaporation on irrigation water

Q: Does climate cause desertification, or does desertification cause climate change?

Clue: temperatures recorded in areas overused, Mexico

Desertification may be reversible, but it will be slow. Why?

1) Desert Ecosystem is slow anyway
2) Little bacterial help in soil
3) Little species diversity – already specialized
4) Not much water

Chinese are working in the Gobi towards reclaimation of desertified areas.

⇒ Drought resistant grasses, trees, shrubs
⇒ Drip irrigation techniques

Natural Recovery Area – Kuwait – due to 1991 Gulf War

⇒ More birds now
⇒ Fewer recreational vehicles

Winds as a Geologic Agent in Deserts

Wind Erosion is accomplished by:

1) Deflation: blown away
2) Abrasion: sand blasted

Sand can move and accumulate in dunes, which can overtake areas.

Mitigation of this sand movement can be accomplished by:

1) Build fences
2) Wind brakes
3) Drought resistant trees such as Tamarisk
4) Wind tolerant plants: Beach grasses (Elymus), Hottentots Fig ("Ice plant") (Carpobrotus)

Arid Regions, Winds and Human Health

Dust storms routinely affect air quality

- ⇒ Middle East
- ⇒ Can blow across oceans (Africa → South America → Pacific Ocean)
- ⇒ Caribbean air quality – 17x increase in asthma in Barbados since 1973 (corresponds with drought in Sahel of Africa)
- ⇒ Originates in Africa and Middle East
- ⇒ Chinese dust → "Yellow Dragon" - gets here
- ⇒ Fallout of herbicides and pesticides is common world wide
    - Even in Arctic (found in animal tissues and human breast milk)

Case Studies

12.1 Sahel's Seventeen-Year Drought: Evidence of Climate Change, Misuse of the Land, or Western Pollution

- ⇒ Desertification began with slash/burn farming
- ⇒ Slashing exposes topsoil to wind erosion
- ⇒ 1968-1985 – drought conditions climatically
    - Results in wind blowing away topsoil
- ⇒ Burkim Faso – since 1985, green again
- ⇒ 2002 – aerosol studies of $S0_2$ – from coal fires and emissions
- ⇒ Interestingly – once western world had emission control, the rain came back
- ⇒ El Nino years and overgrazing also were factors

12.2 Is Desertification Swallowing China?

- ⇒ 1990s – 20 sand storms/yr, up from 8 in 1960s
- ⇒ "Yellow Dragon" – 2002 – 30,000tons of sediment on city
- ⇒ Beijing games helped