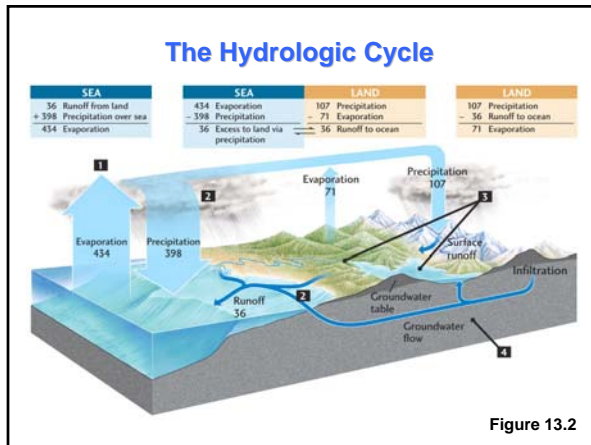


The Hydrologic Cycle

The continuous movement of H₂O from one reservoir to another.



LIVE SCIENCE

Study Reveals Top 10 Wettest U.S. Cities

By Andrea Thompson, LiveScience Staff Writer
 posted: 18 May 2007 04:43 pm ET

Do you think Seattle is the rainiest city in the United States? Well, think again. Mobile, Alabama, actually topped a new list of soggiest cities in the 48 contiguous states, with more than 5 feet of rainfall annually, according to a study conducted by San Francisco-based WeatherBill, Inc.

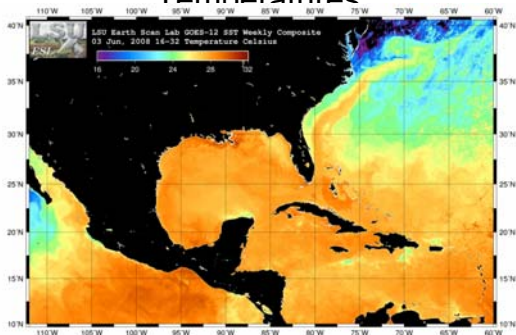
The Southeast dominated the most rainy list, while the Pacific Northwest never enters the list until Olympia, Washington pops up at number 24.

The 10 rainiest cities in the U.S. by amount of annual rainfall include:

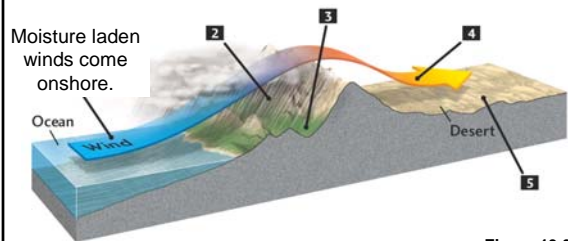
- Mobile, Alabama—67 inches average annual rainfall; 59 average annual rainy days
- Pensacola, Florida—65 inches average annual rainfall; 56 average annual rainy days
- New Orleans, Louisiana—64 inches average annual rainfall; 59 average annual rainy days
- West Palm Beach, Florida—63 inches average annual rainfall; 58 average annual rainy days
- Lafayette, Louisiana—62 inches average annual rainfall; 55 average annual rainy days
- Baton Rouge, Louisiana—62 inches average annual rainfall; 56 average annual rainy days
- Miami, Florida—62 inches average annual rainfall; 57 average annual rainy days
- Port Arthur, Texas—61 inches average annual rainfall; 51 average annual rainy days
- Tallahassee, Florida—61 inches average annual rainfall; 56 average annual rainy days
- Lake Charles, Louisiana—58 inches average annual rainfall; 50 average annual rainy days

Southeastern cities are so prevalent on the list because the warm waters of the Gulf of Mexico fuel storms that frequently soak the region, particularly between June and November.

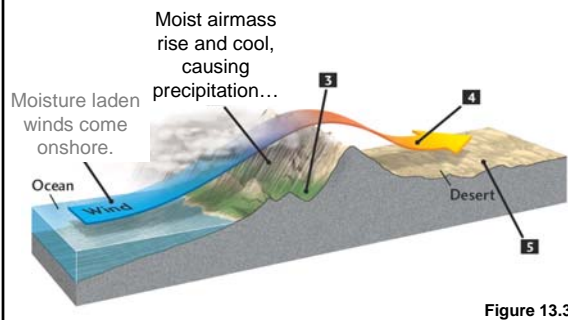
GOM – Sea Surface Temperatures

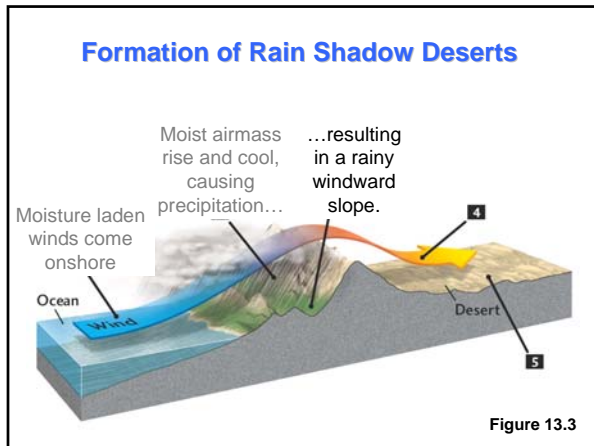


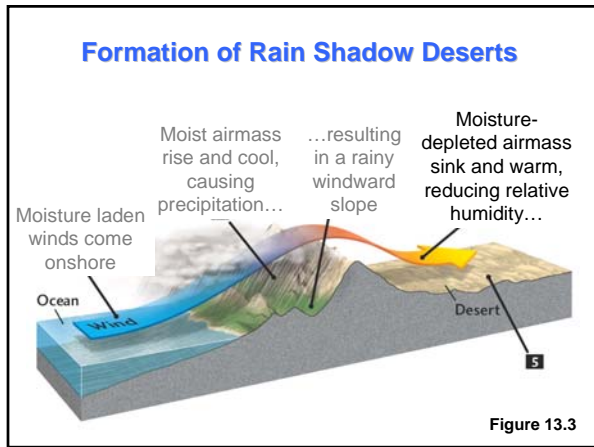
Formation of Rain Shadow Deserts

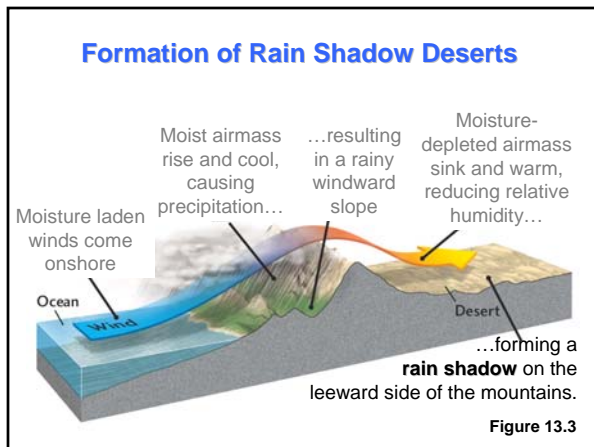


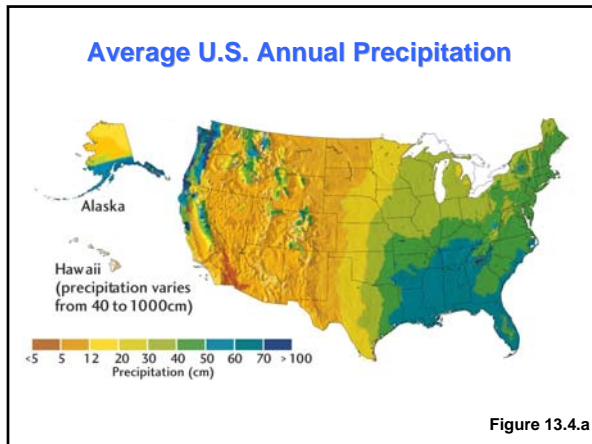
Formation of Rain Shadow Deserts











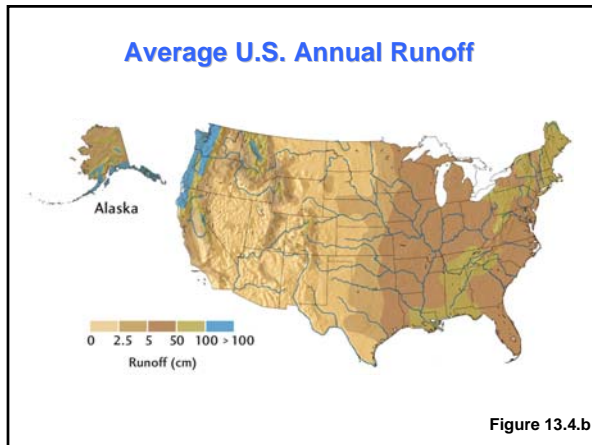
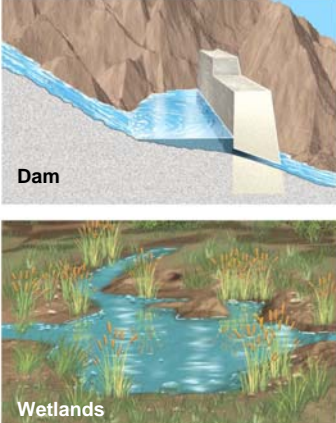


Table 13.1: Average Discharges of Major Rivers of the World

River	Water Flow (m ³ /s)
Amazon, South America	175,000
La Plata, South America	79,300
Congo, Africa	39,600
Yangtze, Asia	21,800
Brahmaputra, Asia	19,800
Ganges, Asia	18,700
Mississippi, North America	17,500



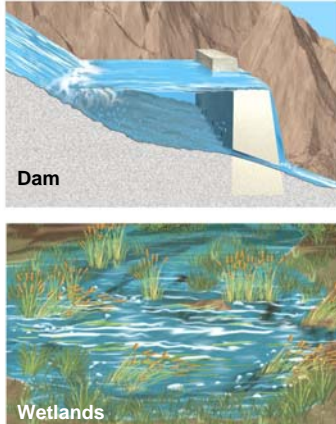
Dam

Wetlands

Dry Period:

Streams bring in small amounts of water... and carry away small amounts.

Figure 13.5




Dam

Wetlands

Wet Period:

Streams bring in large amounts of water... which is stored... and slowly released during dry periods.

Figure 13.5



Vasey's Paradise

Groundwater discharges from the wall of Marble Canyon to form a series of natural springs.

Figure 13.6

Porosity

The percent void space in a rock or sediment.

It is a measure of the potential volume of water that can be stored in a rock.

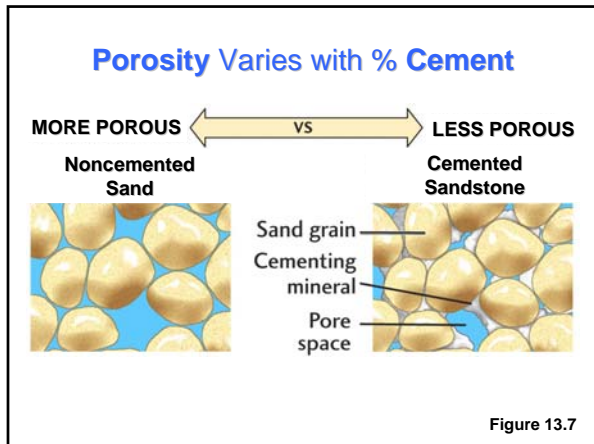
Permeability

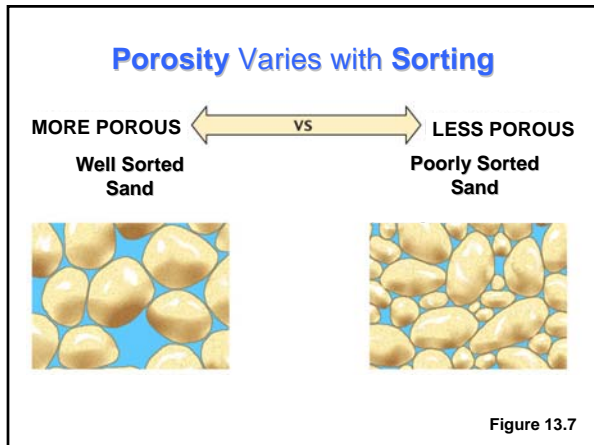
The ability of a material to transmit a fluid.

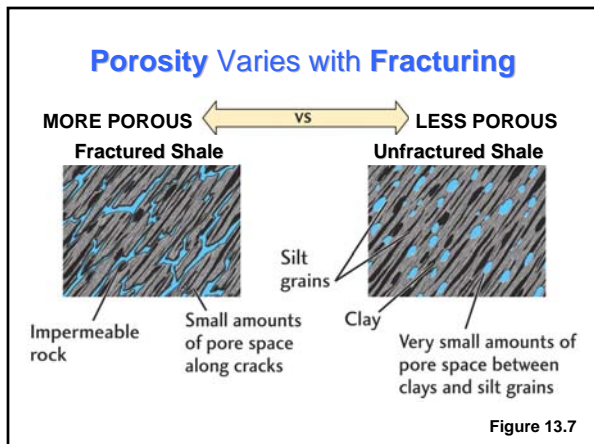
It is a measure of how fast the fluid can travel through the rock or sediment

Aquifer

A geologic unit capable of storing and transmitting water in sufficient quantities to supply wells.







Porosity and Permeability of Different Aquifer Types

Type of Aquifer	Porosity	Permeability
Gravel	Very High	Very High
Coarse- to fine sand	High	High
Fine-grained sand & silt	Moderate	Mod - Low
Sandstone, mod. cemented	Mod - Low	Low
Fractured Shale	Low	Low
Metamorphic Rocks	Low	Very Low
Unfractured Shale	Very Low	Very Low

Table 13.2

Types of Aquifers

- **Unconfined** Aquifer: the permeable layer extends to the surface. It consists of an **unsaturated** zone separated from the **saturated** zone by the **groundwater table**.
- **Confined** Aquifer: the permeable layer is overlain and underlain by a less permeable layer (aquitard or aquiclude)

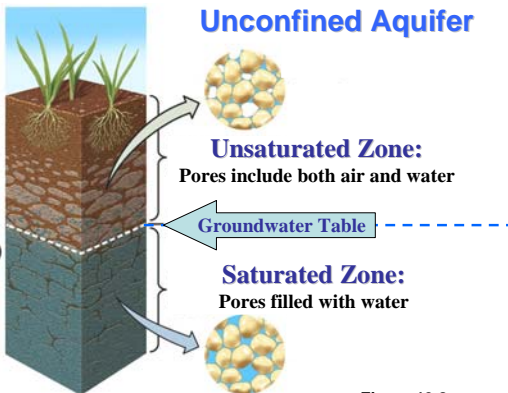


Figure 13.8

Dynamics of an Unconfined Aquifer in a Temperate Climate

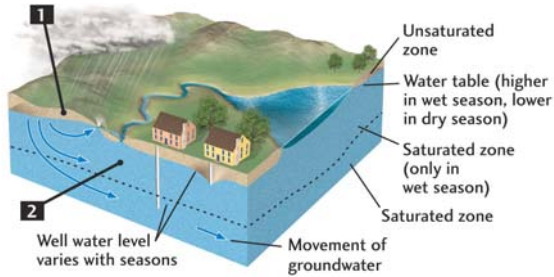


Figure 13.9

During the Wet Season...

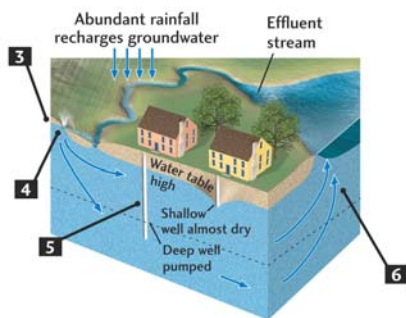


Figure 13.9

During the Dry Season...

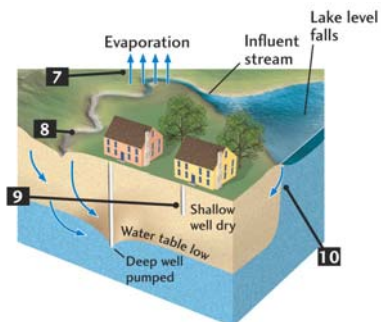


Figure 13.9

Types of Aquifers

- **Unconfined** Aquifer: the permeable layer extends to the surface. It consists of an **unsaturated** zone separated from the **saturated** zone by the **groundwater table**.
- **Confined** Aquifer: the permeable layer is overlain and underlain by a less permeable layer (aquitard or aquiclude)

Confined Aquifer

Recharge Area:
where the confined aquifer is recharged by infiltration

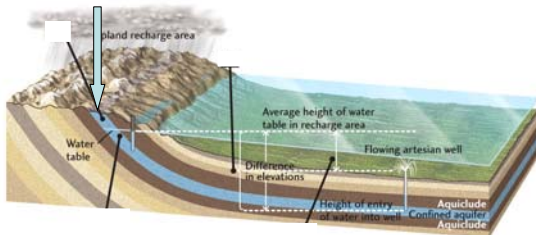


Figure 13.10

Confined Aquifer

Recharge Area:
where the confined aquifer is recharged by infiltration

Pressure Surface:
Height to which water will rise in the confined aquifer

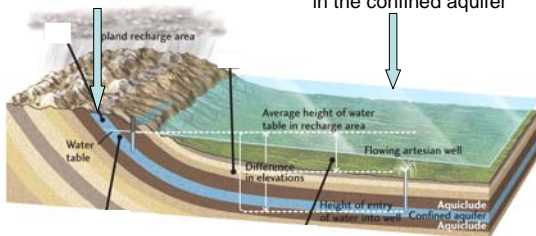
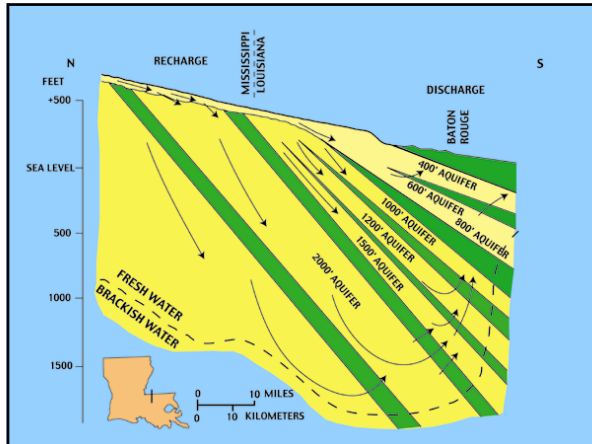


Figure 13.10



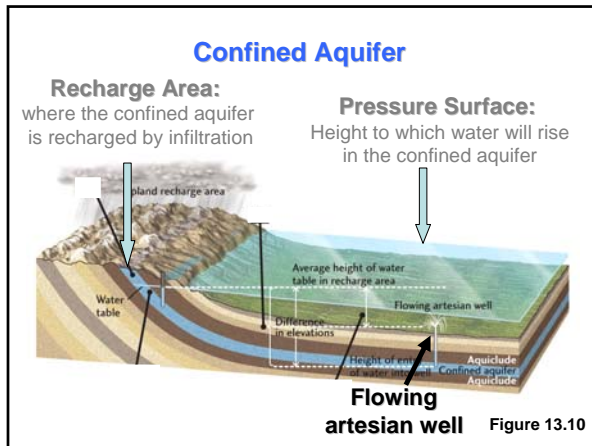
The Recharge Area of a confined aquifer is the area where rainfall enters (recharges) the aquifer.

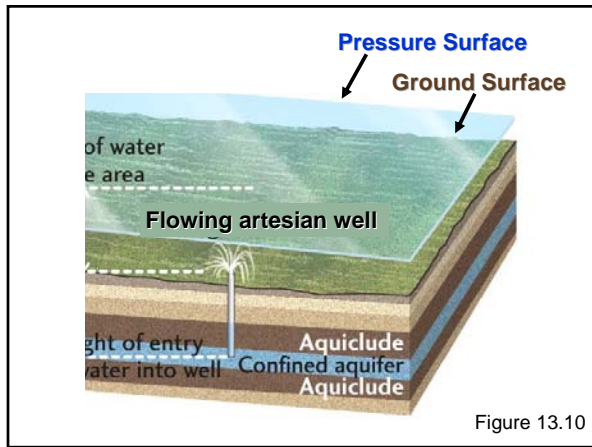
The **Pressure Surface** is the level to which water will rise in wells in confined aquifers.

Note the Difference Between:

- **Groundwater Table:** the level to which water will rise in an **unconfined** aquifer
- **Pressure Surface:** the level to which water will rise in a **confined** aquifer *

* If the pressure surface is above the ground surface, the water will flow freely out of the ground. Such wells are called **flowing artesian wells**.







Average U.S. Annual Precipitation

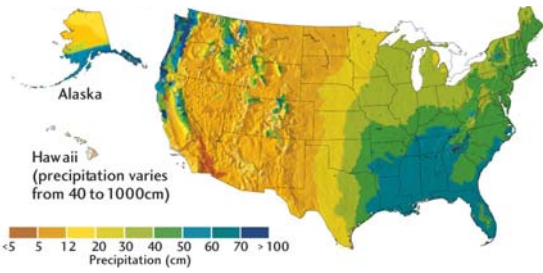


Figure 13.4.a

Formation of a Cone of Depression

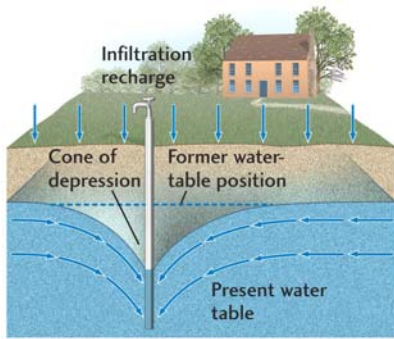
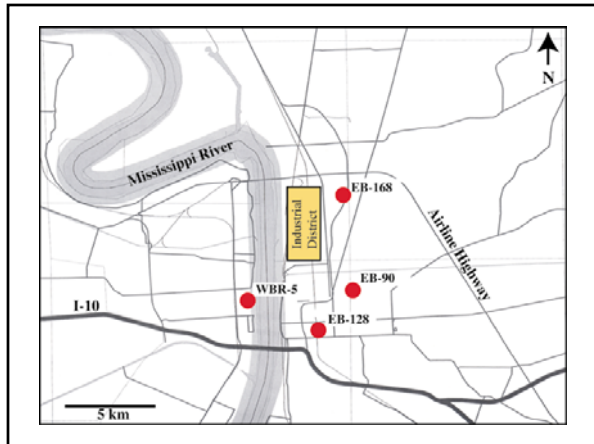
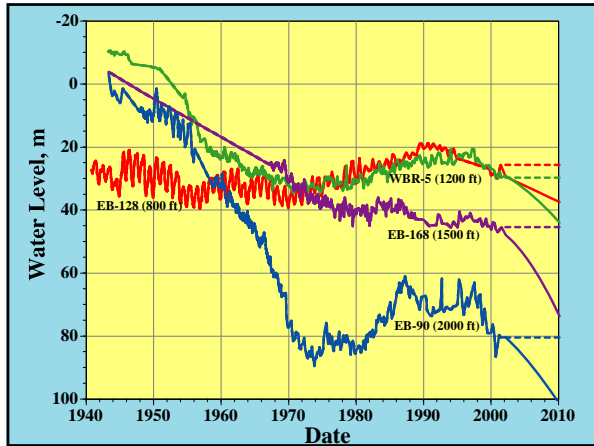
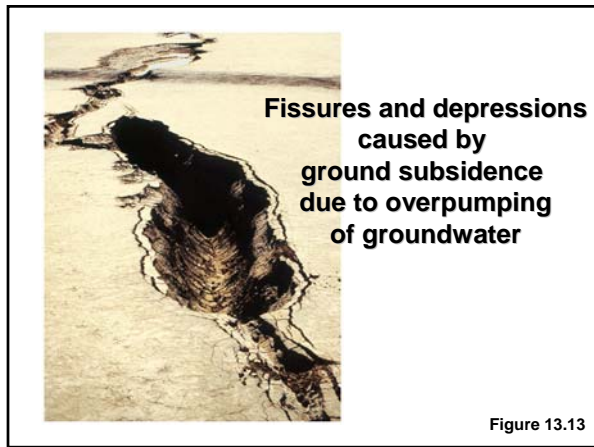


Figure 13.12









The thickness of the fresh groundwater floating on top of the salty groundwater is affected by the balance between groundwater recharge and discharge

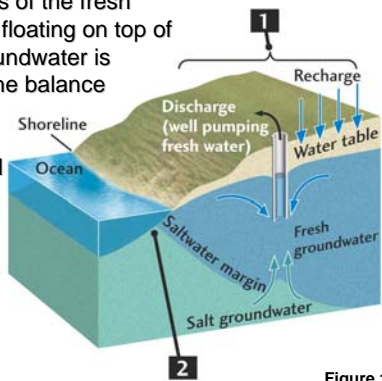


Figure 13.14

If the rate of discharge increases too much (by overpumping), the saltwater will rise, causing **saltwater intrusion** in the well

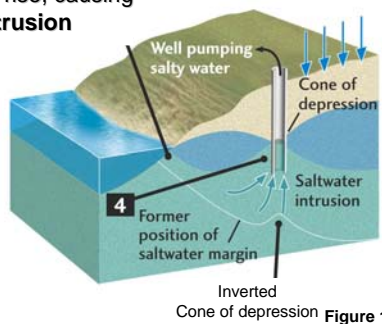


Figure 13.14

U.S. Groundwater Withdrawals: 1950-1995

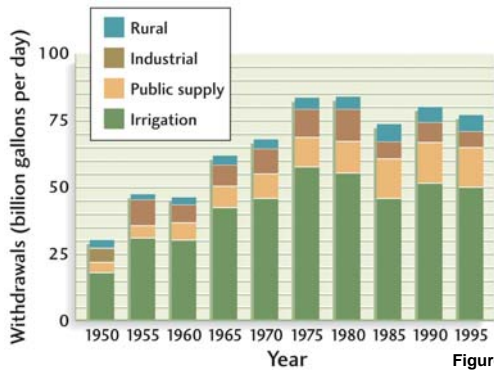
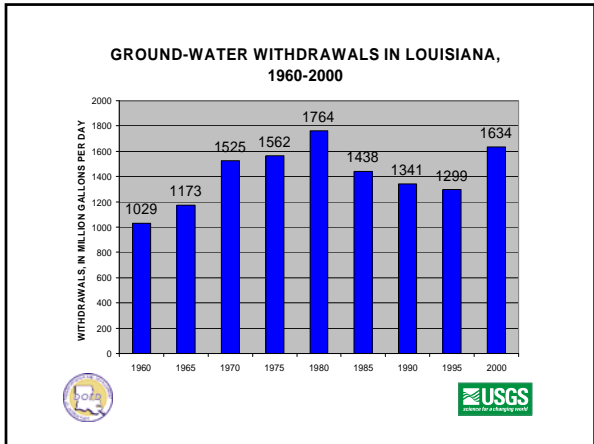
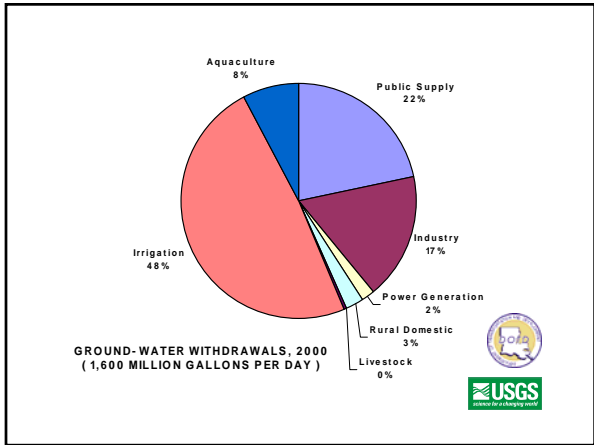
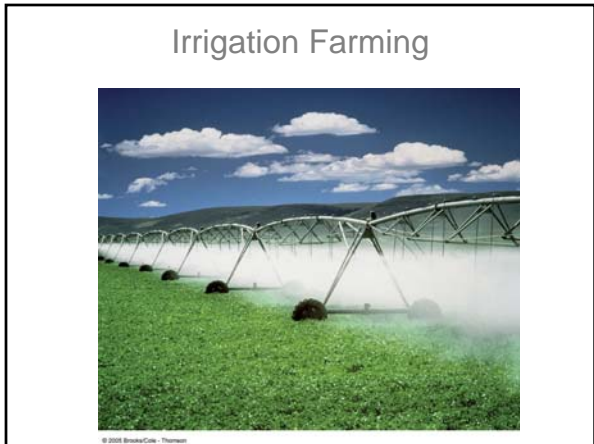
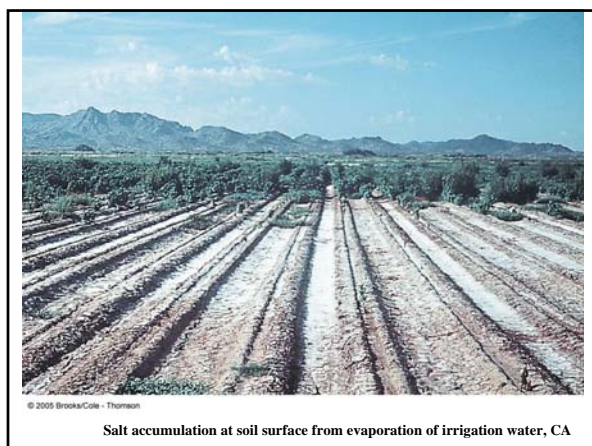


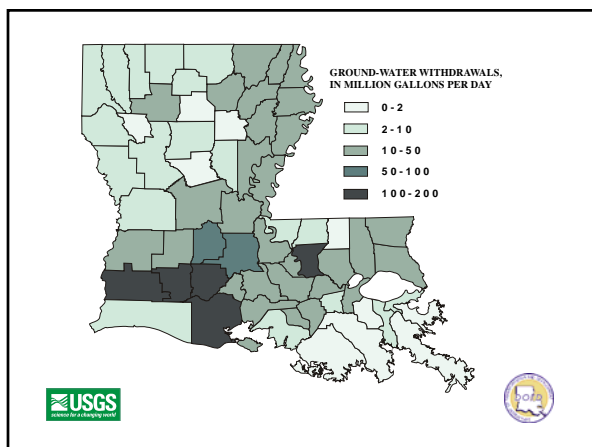
Figure 13.16

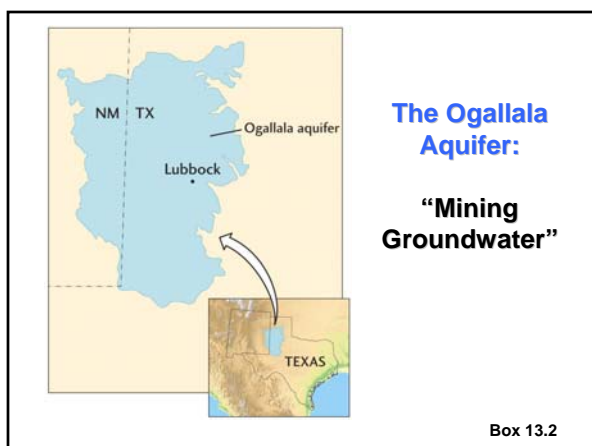












Some Major Features of a Karst Landscape

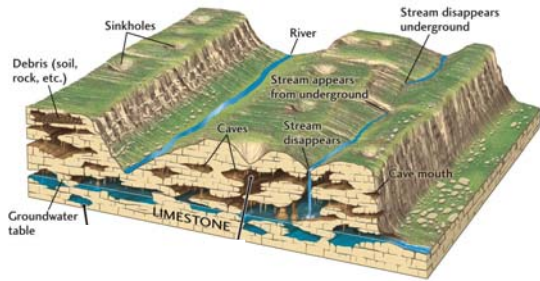


Figure 13.19

The Winter Park Sinkhole, Florida



Figure 13.18

Subsurface Features of a Karst Landscape

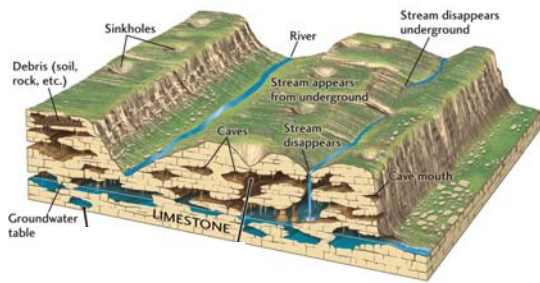


Figure 13.19



Figure 13.17

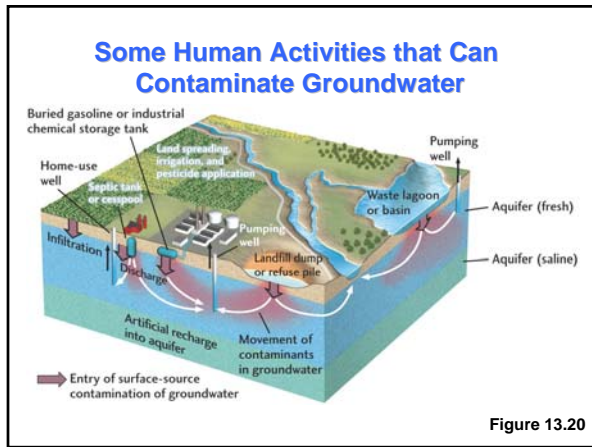


Figure 13.20

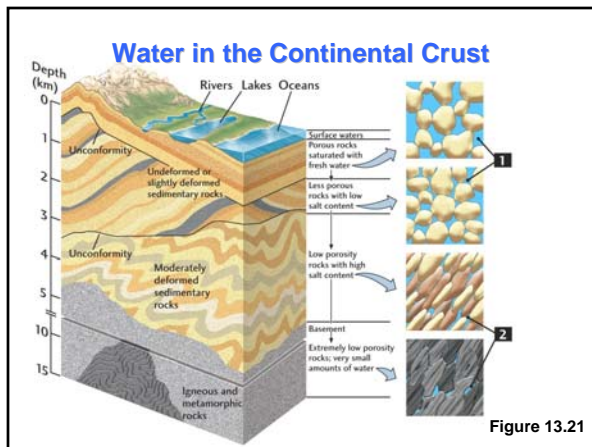


Figure 13.21
