Class 15a: Water resources

- Water supply and demand
- Modification of waterways
- Water quality and pollution

Availability of water

- Only 3% of Earth's water is fresh
- Only 0.003% is available
- Surface water: streams, lakes, etc.
- Groundwater: found in aquifers

Demand for water

- Since 1950, per capita water use has tripled: why?
- 1 billion people lack safe water
- Depends on climate, population, level of development

Demand for water

- U.S. individual use: 180 gallons/day
- Lettuce: 6 gallons
- Glass of milk: 48 gallons
- Eggs: 63 gallons each
- Loaf of bread: 145 gallons
- Pound of beef: 8,500 gallons

Demand for water

	Agriculture	Industry/ energy	Household
World	70%	25%	8%
U.S.	41%	49%	10%
SW U.S.	85%		

Politics of water

- Military tool since 2500 B.C.
- Jordan R., Tigris and Euphrates, Nile, etc.
- “Environmental security”
- Cooperation among riparian nations needed
- Water wars?

Aral Sea

- Was the world's fourth largest lake; now 80% gone
- Central Asian desert climate
- Irrigation on Amu Darya, Syr Darya
  - Cotton, rice
  - Commercial, not subsistence, farming

Aral Sea

- Increased salinization
- Fishing industry gone
- Salts and dust from dry lakebed
- Rivers slow, contaminated
- Climate even more continental
- “Ten times worse than Chernobyl”

Ogallala Aquifer

- Equivalent to a Great Lake; 25-100 years left
- Cattle, wheat, corn, cotton (1/5 of U.S. cropland)
- Drinking water for 2 million
- “Groundwater mining”
  - Potentially renewable resource
  - Used up to 22 times faster than replaced

Solutions?

- More groundwater (not long-term)
- Diverting rivers (Columbia? Ob?)
- Towing icebergs (expensive)
- Desalination (expensive, energy-intensive)

Solutions?

- Conservation!
- Est. 65-70% of water is lost (50% in U.S.)
- True pricing
  - Less federally subsidized water in West
  - More metering (Sacramento)
- More efficient irrigation
- Reclaiming and recycling

Modification of streams

- Your responsibility!
- Channelization
  - What and where
  - Downstream, upstream consequences
- Effects of cities, deforestation

What is water “quality”?

- Depends on the use
- Drinking, swimming, fishing, aquatic life, industry, etc.
- 2000 EPA assessment: 40% of streams, 45% of lakes, 14% of coasts did not meet quality standards

Water quality and pollution

- Biological or chemical pollutants
  - Pathogens, silt, metals, chemicals
- Point sources: specific location
- Non-point sources: dispersed location
  - Agriculture, industry, mining, residences

Agricultural runoff

- 1/2 to 2/3 of stream pollution in U.S.
- Excess fertilizer
  - Eutrophication
  - Algae blooms, “dead zone”
- Herbicides, pesticides
- Animal wastes (factory farms)

Industrial/mining runoff

- Metals, arsenic from gold mining
- PCBs from industry
- Mercury from industry, mining
  - Concentration in Arctic
  - Cultural, health implications

Clean Water Act (1972)

- Set U.S. water quality standards
- Goal of no discharge by 1985
- Focus on “end of pipe”
  - Cheaper to violate?
- Eastern rivers, Great Lakes greatly improved
- Considered a legislative success story