Klamath River...Dams

[Map showing locations of Klamath River, J.C. Boyle Dam, Iron Gate Dam, and Copco Dams 1 and 2]

[Image of a dam and reservoir]

Todd Trumbull / TNC
Fish ladders- a set of stairs with water flowing over them that have been added to some dams to help migrating fish such as salmon get upstream.
Usable Water is Rare

![Diagram showing water distribution]

- Oceans: 97.22%
- Fresh water: 2.78%
- Belowground water: 22.22%
- Ice and glaciers: 77.28%
- Water bodies: 0.47%
- Atmospheric water: 0.03%
Groundwater

- Aquifers- small spaces found within permeable layers of rock and sediment where water is found.
- Unconfined aquifers- an aquifer that is simply porous rock covered by soil.
- Confined aquifers- an aquifer surrounded by a layer of impermeable rock or clay.
Groundwater
Groundwater

- Water table- the uppermost level at which the water in an area fully saturates the rock or soil.
- Recharge- the input process of water percolating into an aquifer.
- Springs- water from an aquifer that naturally percolates up to the surface.
Cone of depression- drawdown of water table by well(s)...may deprive other wells of water.
Saltwater intrusion - when the pumping of fresh water out of a well is faster than the recharge. Near coastal areas this can cause salt water to infiltrate the aquifer.
Groundwater and Oil/Gas Drilling
The Ogallala Aquifer

Figure 9.4
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Surface Water Streams, rivers, ponds, lakes and wetlands.

Figure 9.7
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Productivity in a lake:

- **Oligotrophic** - low amounts of nutrients such as phosphorous and nitrogen.
- **Mesotrophic** - a moderate level of productivity
- **Eutrophic** - high levels of productivity
Rivers and Streams

- Importance: Settlement, transport, agriculture.
Surface Water...Wetlands
Many functions if “intact”.

1. Image of a bird in a wetland.
2. Image of a pond with vegetation and water lilies.

[Description: The image illustrates the importance of wetlands for biodiversity and ecosystem services. Wetlands provide habitats for various wildlife species, such as the bird shown, and are essential for water purification, flood control, and carbon sequestration. They are integral to the health of the environment and should be protected and conserved.]
Atmospheric Water... Precipitation...Issues
Precipitation... Impervious Surfaces Drought

Impervious surfaces and urbanization affect runoff characteristics in the metro Atlanta, Georgia area.
Snowpack

Too much

Too little
Levees- an enlarged bank built up on each side of the river.

Dikes- similar to a levee but built to prevent ocean waters from flooding adjacent land.
Levee and Dike keeps river in channel holds back sea
Altering the Availability of Water

- **Dams** - a barrier that runs across a river or stream to control the flow of water.
- **Reservoir** - the area where water is stored behind the dam.
Benefits of Dams/Reservoirs

- Electricity Generation
- Reliable Source of Drinking Water
- Water for Agriculture
- Recreation
- Flood control
- Perform work...mills
- Extreme examples:
  - Three Gorges Dam (China)
  - Hoover Dam (Nevada)
Alterning the Availability of Water

- Aqueducts - canals or ditches used to carry water from one location to another.
- Colorado Aqueduct to Los Angeles
- Catskill Aqueduct to New York City
Altering the Availability of Water

- Desalination - removing the salt from salt water to obtain fresh water.

Figure 9.14
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Agriculture, Industry and Household Needs

- Agriculture - the largest user of water around the world.
Irrigation techniques:

- **Furrow irrigation** - a trench that is flooded with water.
- **Flood irrigation** - the entire field is flooded with water.
- **Spray irrigation** - an apparatus that sprays water across a field.
- **Drip irrigation** - using a slow dripping hose that is laid on or buried beneath the soil.
- **Hydroponic agriculture** - crops grown in fertilized water and no soil.
Agriculture... Hydroponics
Agriculture, Industry and Household Needs

- Industry - the second largest user of water worldwide.
Power Generation uses water
Agriculture, Industry and Household Needs

- Households - the third largest user of water worldwide.
Household Water Usage

Toilet
Bathing
Laundry
Cooking/Drinking
Water Use in the House

PRE-1980s TOILET
- 5.0+ gallons per flush

HIGH-EFFICIENCY TOILET TODAY
- 1.28 gallons per flush
The Future of Water Availability

- Water ownership - people can have rights to water use, but they do not own the water.
- Water conservation - using techniques such as more efficient water fixtures, faucets, and washing machines.
Water ownership?
Himalaya Mts. ...Great Lakes
Combine these measures with use of graywater
Water Conservation
Shower water
- Bath water
- Sink water
- Washing machines

Can use for:
- Landscape water
- Car washing
- Toilet flushing

Toilet water is the major source of contaminated wastewater.