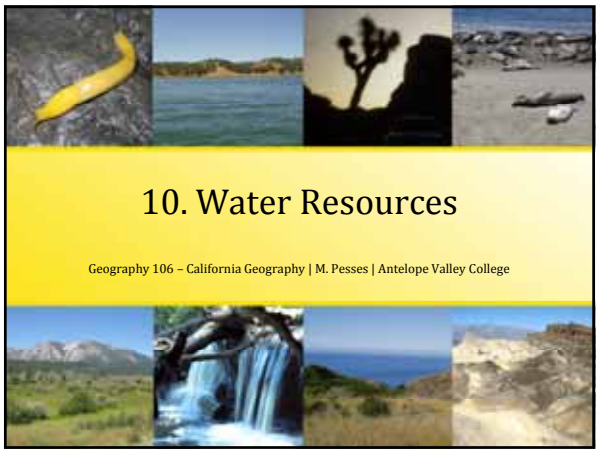
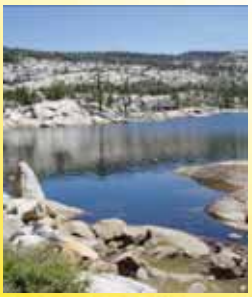


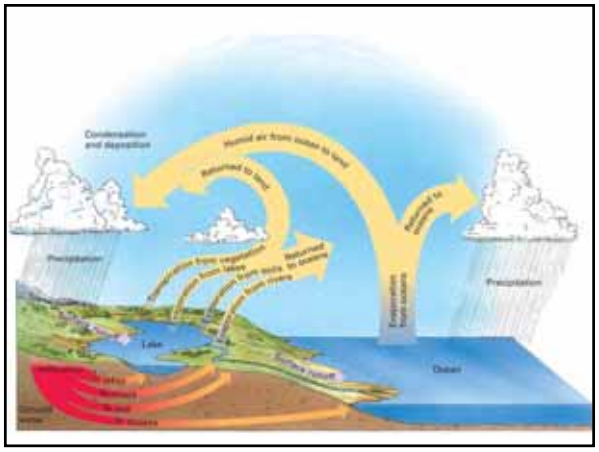
10. Water Resources

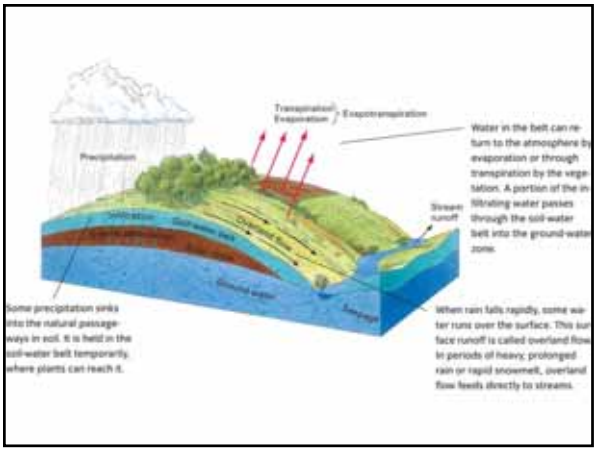
Geography 106 – California Geography | M. Presses | Antelope Valley College

Today

- Water basics
- California's water supply



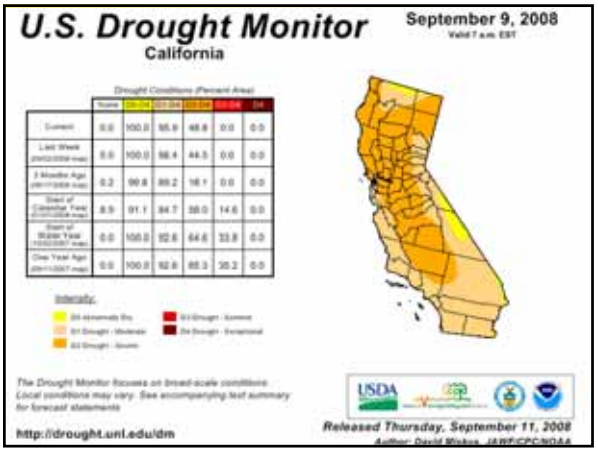


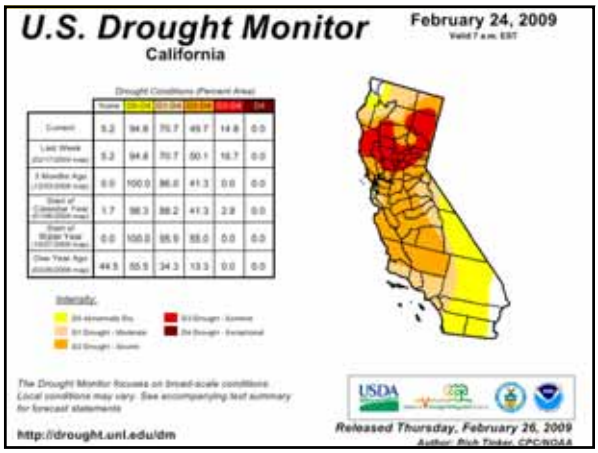


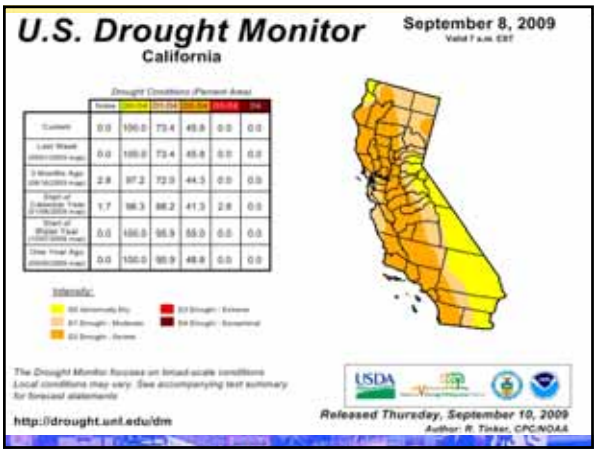
Med. Climate

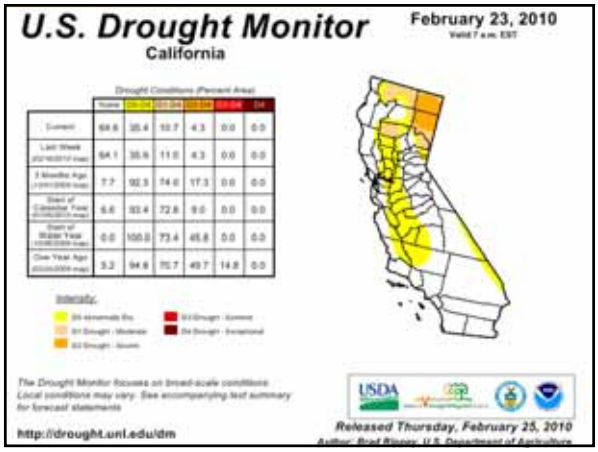
Dry summers

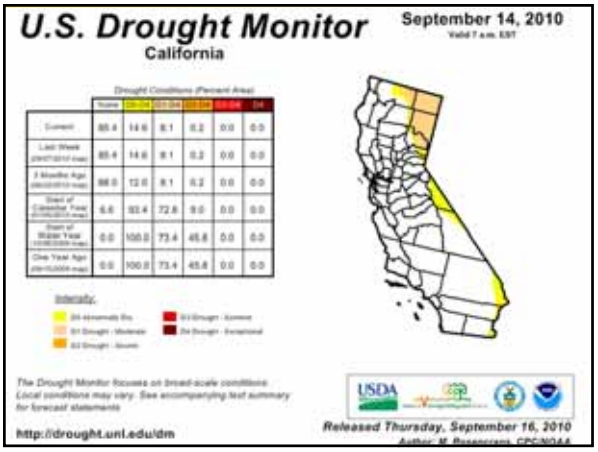
- Hidden by development of the state

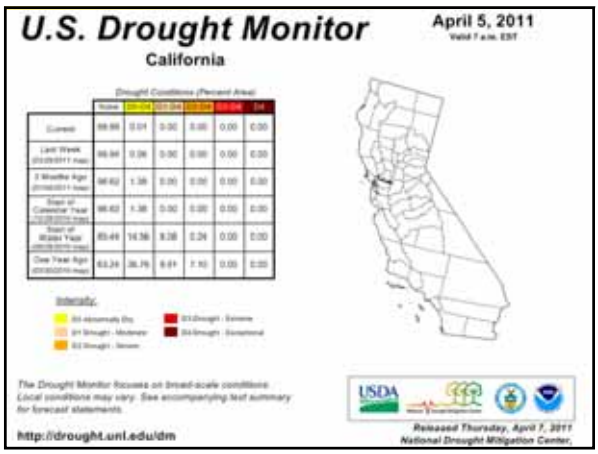


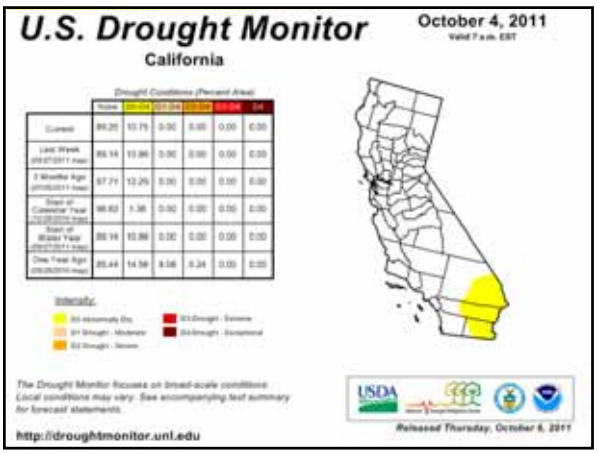

U.S. Drought Monitor
California
February 24, 2009
Valid 7 a.m. EST
Drought Conditions (Percent Area)
None
D0-D4
D1-D4
D2-D4
D3-D4
D4
Current 5.2 94.8 70.7 49.7 14.8 0.0
Last Week 5.2 94.8 70.7 50.1 16.7 0.0
3 Months Ago 0.0 100.0 86.0 41.3 0.0 0.0
Start of Calendar Year 1.7 98.3 88.2 41.3 2.8 0.0
Start of Water Year 0.0 100.0 95.9 55.0 0.0 0.0
One Year Ago 44.5 55.5 34.3 13.3 0.0 0.0
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://drought.unl.edu/dm
USDA
Released Thursday, February 26, 2009
Author: Rich Tinker, CPC/NOAA

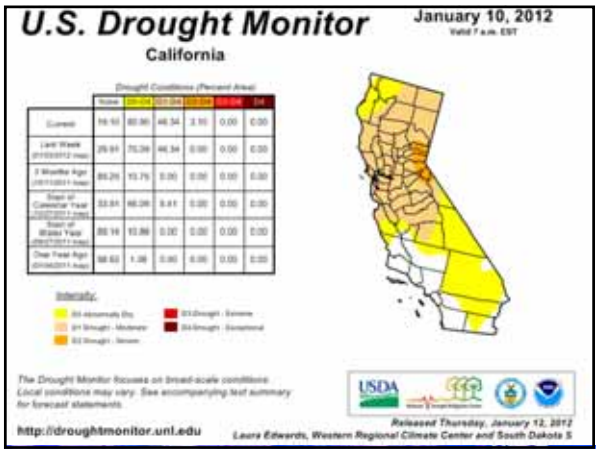

U.S. Drought Monitor
California
September 8, 2009
Valid 7 a.m. EST
Drought Conditions (Percent Area)
None
D0-D4
D1-D4
D2-D4
D3-D4
D4
Current 0.0 100.0 73.4 45.8 0.0 0.0
Last Week 0.0 100.0 73.4 45.8 0.0 0.0
3 Months Ago 2.8 97.2 72.0 44.3 0.0 0.0
Start of Calendar Year 1.7 98.3 88.2 41.3 2.8 0.0
Start of Water Year 0.0 100.0 95.9 55.0 0.0 0.0
One Year Ago 0.0 100.0 95.9 48.8 0.0 0.0
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://drought.unl.edu/dm
USDA
Released Thursday, September 10, 2009
Author: R. Tinker, CPC/NOAA

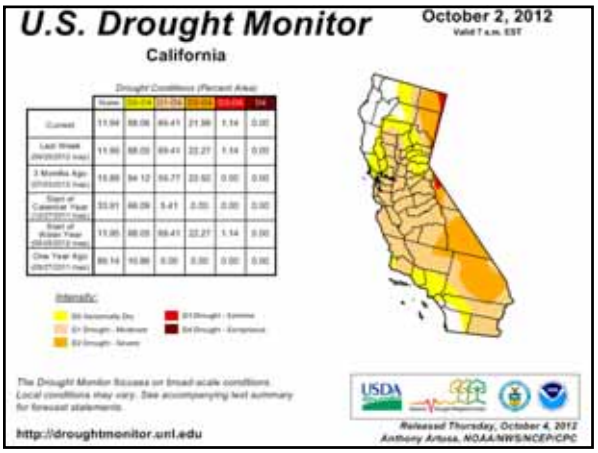

U.S. Drought Monitor
California
February 23, 2010
Valid 7 a.m. EST
Drought Conditions (Percent Area)
None
D0-D4
D1-D4
D2-D4
D3-D4
D4
Current 64.6 35.4 10.7 4.3 0.0 0.0
Last Week 64.1 35.9 11.0 4.3 0.0 0.0
3 Months Ago 7.7 92.3 74.6 17.3 0.0 0.0
Start of Calendar Year 6.6 93.4 72.6 9.0 0.0 0.0
Start of Water Year 0.0 100.0 73.4 45.8 0.0 0.0
One Year Ago 5.2 94.8 70.7 49.7 14.8 0.0
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://drought.unl.edu/dm
USDA
Released Thursday, February 25, 2010
Author: Brad Rippey, U.S. Department of Agriculture

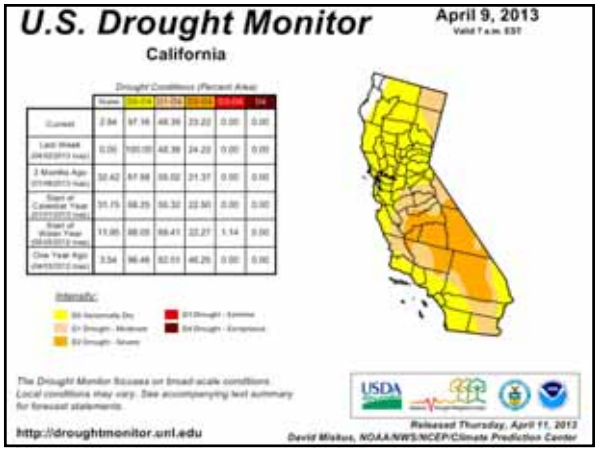

U.S. Drought Monitor
California
September 14, 2010
Valid 7 a.m. EST
Drought Conditions (Percent Area)
None
D0-D4
D1-D4
D2-D4
D3-D4
D4
Current 85.4 14.6 8.1 0.2 0.0 0.0
Last Week 85.4 14.6 8.1 0.2 0.0 0.0
3 Months Ago 88.0 12.0 8.1 0.2 0.0 0.0
Start of Calendar Year 6.6 93.4 72.6 9.0 0.0 0.0
Start of Water Year 0.0 100.0 73.4 45.8 0.0 0.0
One Year Ago 0.0 100.0 73.4 45.8 0.0 0.0
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://drought.unl.edu/dm
USDA
Released Thursday, September 16, 2010
Author: M. Pasecnick, CPC/NOAA


U.S. Drought Monitor
California
April 5, 2011
Valid 7 a.m. EST
Drought Conditions (Percent Area)
None
D0-D4
D1-D4
D2-D4
D3-D4
D4
Current 99.99 0.01 0.00 0.00 0.00 0.00
Last Week 99.94 0.06 0.00 0.00 0.00 0.00
3 Months Ago 98.62 1.38 0.00 0.00 0.00 0.00
Start of Calendar Year 98.62 1.38 0.00 0.00 0.00 0.00
Start of Water Year 83.49 16.56 8.08 0.24 0.00 0.00
One Year Ago 63.24 36.76 8.01 7.10 0.00 0.00
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://drought.unl.edu/dm
USDA
Released Thursday, April 7, 2011
National Drought Mitigation Center,


U.S. Drought Monitor
California
October 4, 2011
Valid 7 a.m. EST
Drought Conditions (Percent Area)
None
D0-D4
D1-D4
D2-D4
D3-D4
D4
Current 89.25 10.75 0.00 0.00 0.00 0.00
Last Week 89.19 10.86 0.00 0.00 0.00 0.00
3 Months Ago 87.71 12.29 0.00 0.00 0.00 0.00
Start of Calendar Year 98.62 1.38 0.00 0.00 0.00 0.00
Start of Water Year 89.19 10.86 0.00 0.00 0.00 0.00
One Year Ago 85.44 14.56 8.08 0.24 0.00 0.00
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://droughtmonitor.unl.edu
USDA
Released Thursday, October 6, 2011

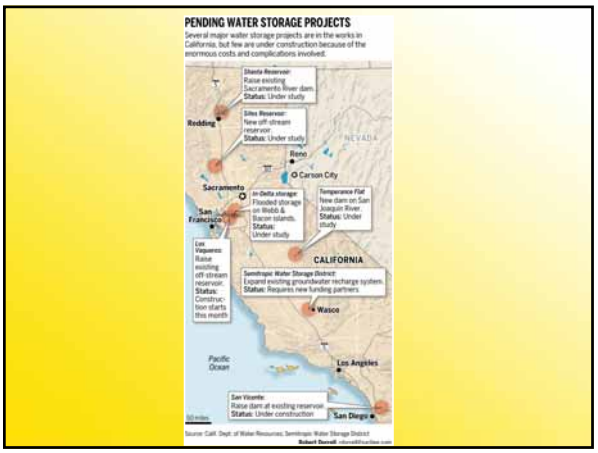






Lakes & Reservoirs

- Storing water from wet years
- Political & environmental costs

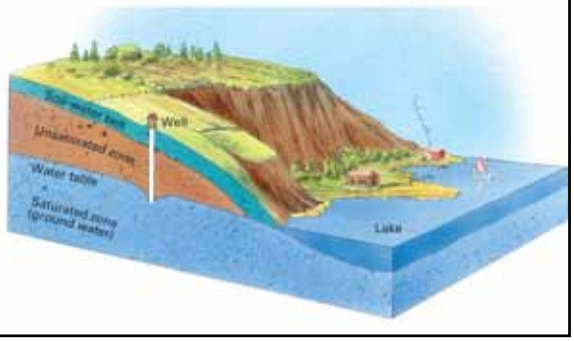


Where does our water come from?

City	Sources
Lancaster	Groundwater, Feather River/Cal. Aqueduct/State Water Proj.
Palmdale	Groundwater, Feather River/Cal. Aqueduct/State Water Proj., Local reservoirs
Santa Clarita	Groundwater, Feather River/Cal. Aqueduct/State Water Proj.
Los Angeles	Groundwater, Feather River/Cal. Aqueduct/State Water Proj., Colorado River, Owens & Mono Basins/L.A. Aqueduct

From Carle, 2004

Groundwater



Groundwater

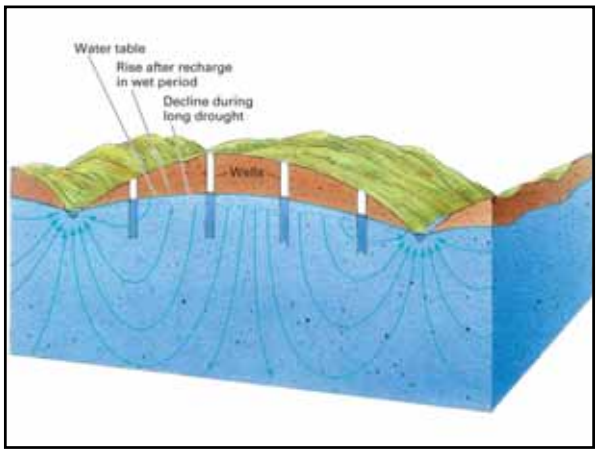
Aquifer

- rock layer that is permeable to groundwater flow and usable for wells and springs

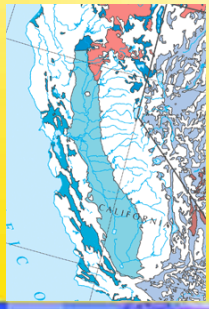
Groundwater

Water Table

- The upper limit of the water that collects in an aquifer



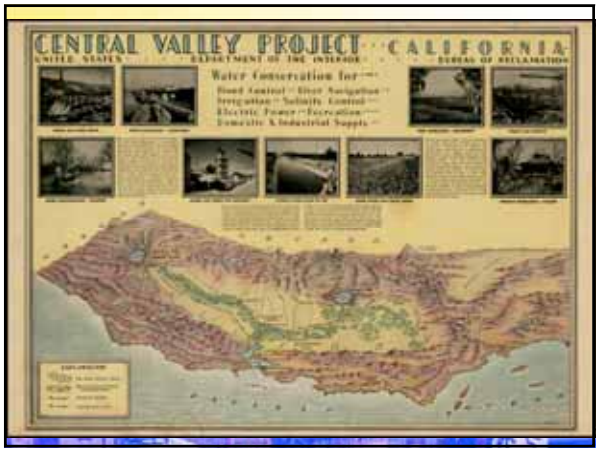
1920s-1930s Central Valley



- Overdraft of aquifer
- "…so recently seemed limitless, had only a few more decades of economic life." Reisner, p. 336
- Central Valley Project

Central Valley Project

- Socializing water distribution
- For "small farmers"
  - 160-320 acres
- Flaunted by huge companies



The State Water Project

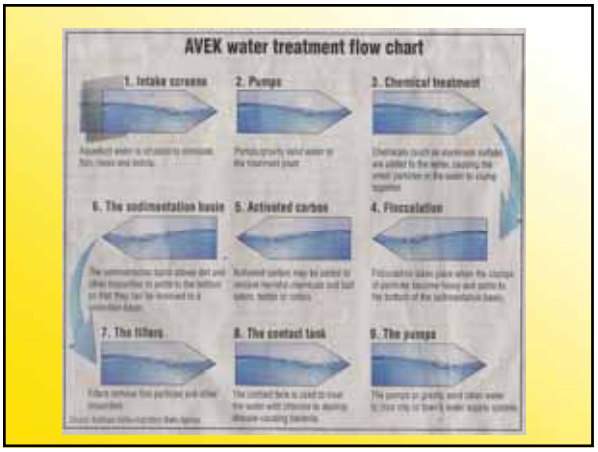
State Water Project

- Voted on in 1960
  - Southern support outweighed Northern resistance
- Finished in 1973

State Water Project

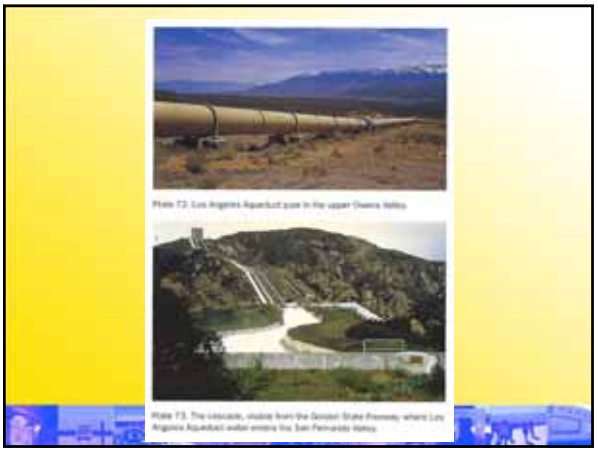
Single largest energy user in state

- Generates ¾ of electricity needed through hydroelectric plants



Owens Valley & L.A. Aqueduct

- Completed in 1913
- City got water rights by buying 300,000 acres of Owens Valley (98% of private land in valley)



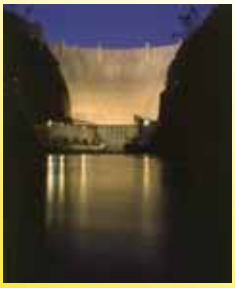
The Salton Sea

- Early attempt to use the Colorado to irrigate Calif. deserts (1877)
- 1905 water floods into Salton Sink
- 1 ½ years of filling created "sea"
- Simply collects farming wastewater now

Dividing the River

The Colorado River Compact of 1923
- Divided up the river into an upper and lower basin

In 1928 the Hoover Dam was approved
- So was the All-American Canal into the **Imperial Valley**



Variability

- Colorado River Discharge
  - 1917 = 24 million acre feet
  - 1934 = 5.03 million acre feet
  - 1977 = 5.02 million acre feet
  - 1984 = 24.5 million acre feet
  - 2002 = 3.1 million acre feet
- A family uses anywhere from ¼ to 1 acre foot of water a year

Glen Cyn. Dam & Lake Powell

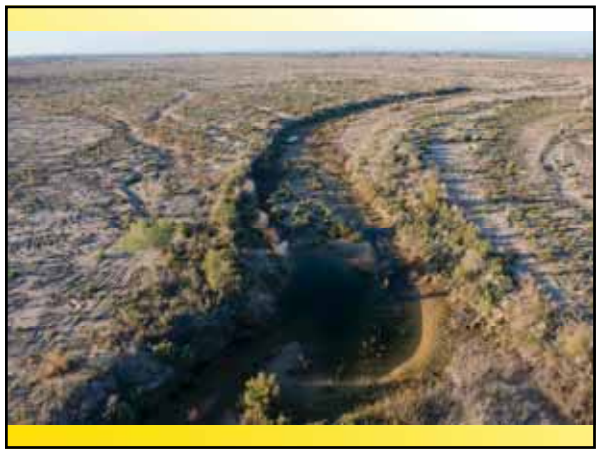
- Lake Powell was formed over porous sandstone
  - **1.5 million acre feet total lost** when Lake Powell is at its capacity
    - Through sandstone
    - Evaporation
    - Used by water plants

Floods

- A 1982-1983 El Nino event caused heavy precipitation and snow pack in the Rockies
  - The river's ability to handle high discharge was set aside in favor of other water and power interests
  - Had to increase releases from Hoover to save that dam, but this flooded downstream communities like Needles, California

Drought

- Starting in 1999, severe drought in the West
  - Still affecting the west
- Estimated that 13 years of normal to "reset the system"



New Research

Barnett and Pierce, 2009, PNAS

- Climate change and Colorado River water resources don't mix
  - Various models
    - If climate change reduces runoff by 10%, Colorado misses scheduled deliveries 58% of the time by 2050
    - 20% reduction = 88% missed by 2050
- *Keep in mind the nature of scheduled deliveries!*

Salinity

When water is used, salts are left behind. Every time a farmer irrigates a field, every time a managed wetland is flooded, every time an industrial facility conducts some water-requiring process, and every time you or I take a shower, we contribute to the salinity problem because the water we use and release has a higher salinity concentration than what we started with. Sometimes this is because we add salt intentionally (home water softeners, plant fertilizers), but even when no salts are added to the system, evaporation and consumptive use act to concentrate unused salts. (p. 1)

Central Valley Regional Water Quality Control Board, 2006

Next Time

Chinatown