California Water Basics

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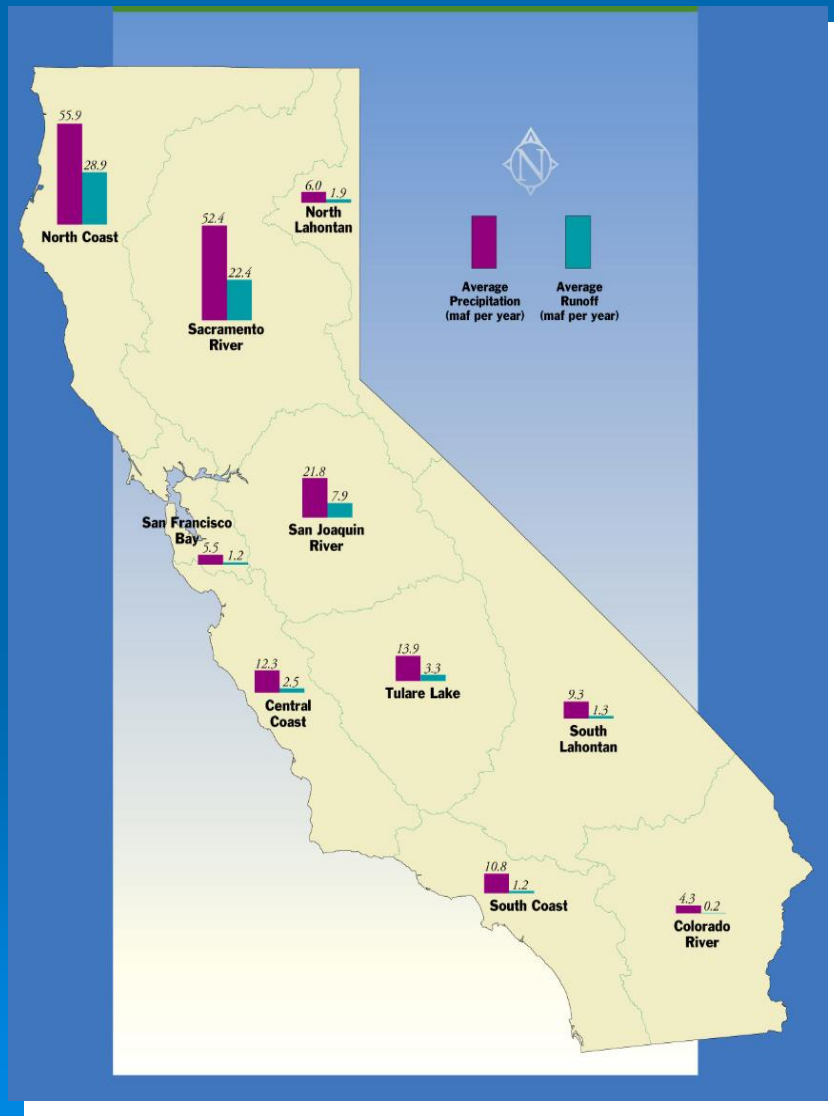
Biennial Water Resources Meeting

Corning, CA

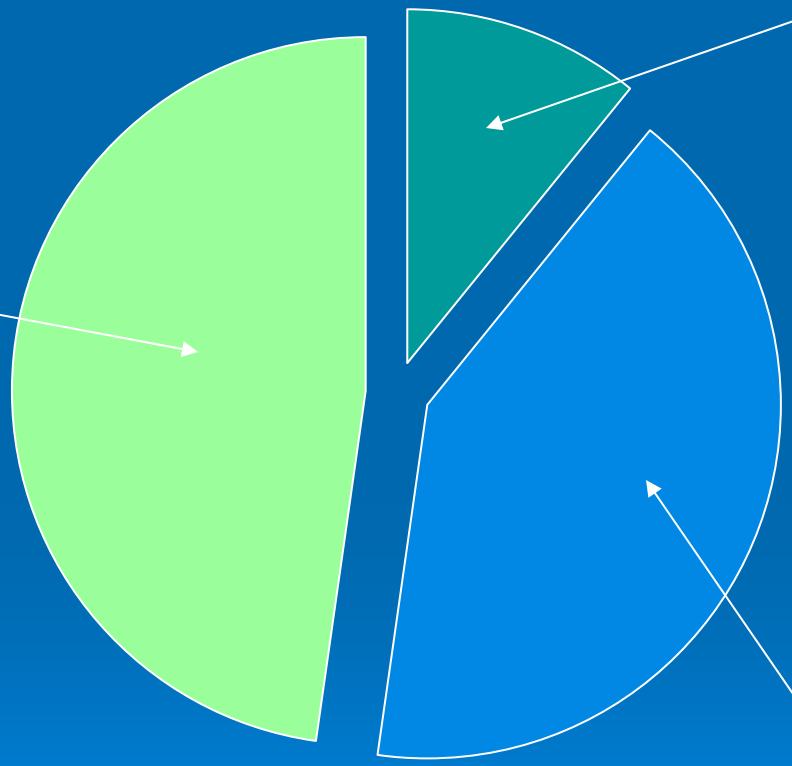
December 3, 2008

California Hydrology



- Mediterranean climate – dry summers, mild winters
- In average year, 82 million acre-feet of water used for agriculture, environment and cities
- More precipitation in north than south, reverse of population location

Major Uses of Water



Urban (interior, landscape needs)

Environment (natural flows, Wild & Scenic River flows, Delta outflow, etc.)

Urban
Agriculture
Environment

Agriculture (on-farm use, evapotranspiration, conveyance losses)

2000 Water Year, defined as average

Triad of Water Interests

Agriculture

Urban

Environmental

- Duels to influence policy
- Each deemed to have virtual veto over new projects or policy
- Alliances can shift

Major Water Issues

- Water sometimes not available when and where needed
- Intense disputes over water development, management
- Population growth

- Aging infrastructure needs maintenance, upgrades
- Need for more new supplies and diversification
- Supply shortfalls in water-short years
- Climate Change

Jones Tract, 2004

Point of Conflict: Delta Issues

- Drinking water for 23 million Californians, irrigation for millions of acres of farms in Central Valley

- Crumbling levees - flooding risks of farmlands, growing urban areas in Delta

- Fragile ecosystem – native fish crash

- Stakeholders divided on possible solutions – Peripheral Canal, barrier gates, pumping rates

Point of Conflict - Groundwater

- 30% - 45% of total supply
- Landowners enjoy almost unfettered right to use groundwater below their land
- Attempts to develop statewide groundwater management policy unsuccessful

Point of Conflict – Flood Management

- Can levees and dams prevent major floods?
- Old, fragile levees - Delta and entire Central Valley
- Big concern with the finding of state liability for a 1986 levee break
- New Orleans flooding further heightened concerns

Sacramento Weir, 2005 (DWR)

Point of Conflict – ESA

- Endangered Species Act has required changes in water projects
- Chinook salmon decline

2002 = 775,000 spawning adults

2008 = 58,000 spawning adults

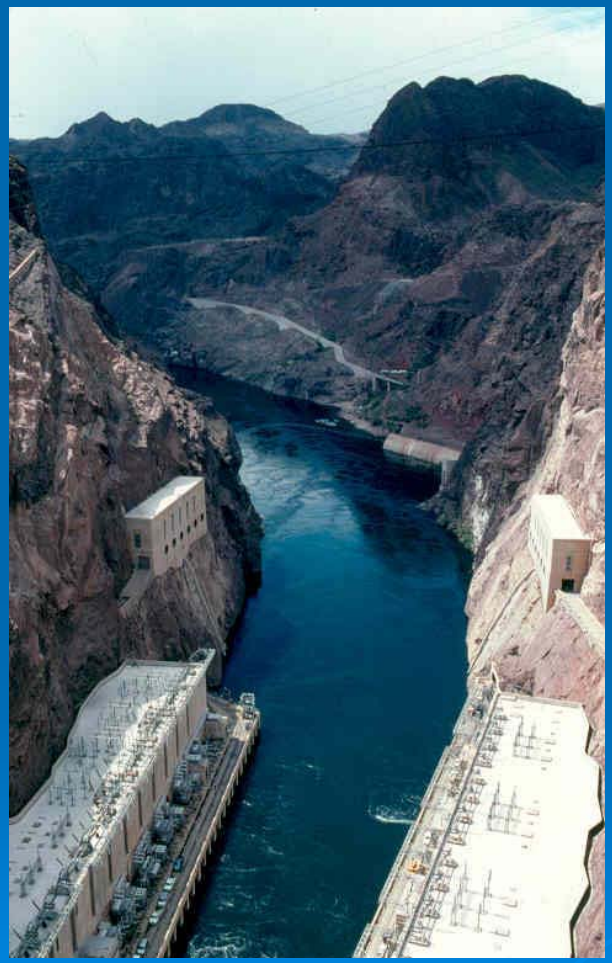
- Focus on habitat protection

Point of Conflict – New Water Sources

- Urban, agricultural interests often favor new storage facilities
- Environmentalists - more conservation, recycling, water reuse
- State Water Plan - stresses diversifying sources (e.g., recycling, desalination)

MWD's Diamond Valley Lake

Point of Conflict – the Colorado River



Hoover Dam

- Significant source of irrigation water and drinking water for Southern California
- California was chronic over-user. 5.2 million acre feet used annually when 4.4 million acre feet entitled
- Unprecedented drought led to 2007 shortage agreement

Point of Conflict – Water Rights

- Guarding water rights can lead to complex and expensive legal battles
- Water rights issues can involve the Delta
- Water rights figures in transfers from one user to another
- Groundwater has separate legal regime from surface water

Frederic Remington - Fight for the Water Hole (1901)

The People Own All Surface Water in California

Norman Rockwell “Freedom of Speech” 1942.

- California Constitution provides that all surface water belongs to the people
- Constitution requires any given right must put water to highest beneficial use
- Constitution prohibits waste or unreasonable use of water

Water Rights

Two types of rights:

- **Riparian** – own land adjacent to a river
- **Appropriative** – permitted to divert water from a river for use elsewhere

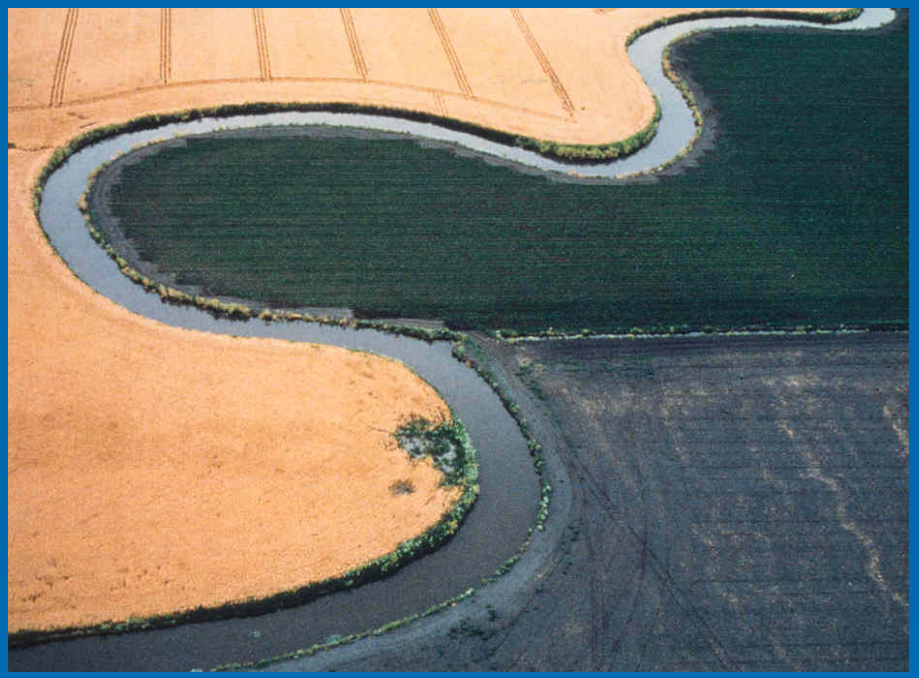
- Water rights can be more valuable than the land itself

- The ability to “appropriate,” or move water, helped California develop cities and farms far from adjacent rivers

Riparian Rights

- Property owners adjacent to streams have a right to divert natural flow.

- Riparian rights take priority over other claims.



Appropriative Rights

- Beginning with Gold Rush, water moved away from original source to area of use
- Such appropriative rights based on seniority – first in time, first in right
- Dams and aqueducts allow movement

Public Trust

- Courts have increasingly applied the doctrine of public trust to California's resources equation.

- The doctrine establishes that fish and wildlife, beauty and recreation are all public benefits of streams and lakes and gives these protection consideration.

- 1983 California Supreme Court ruling upheld public trust values of Mono Lake in case against Los Angeles.

Beneficial Use

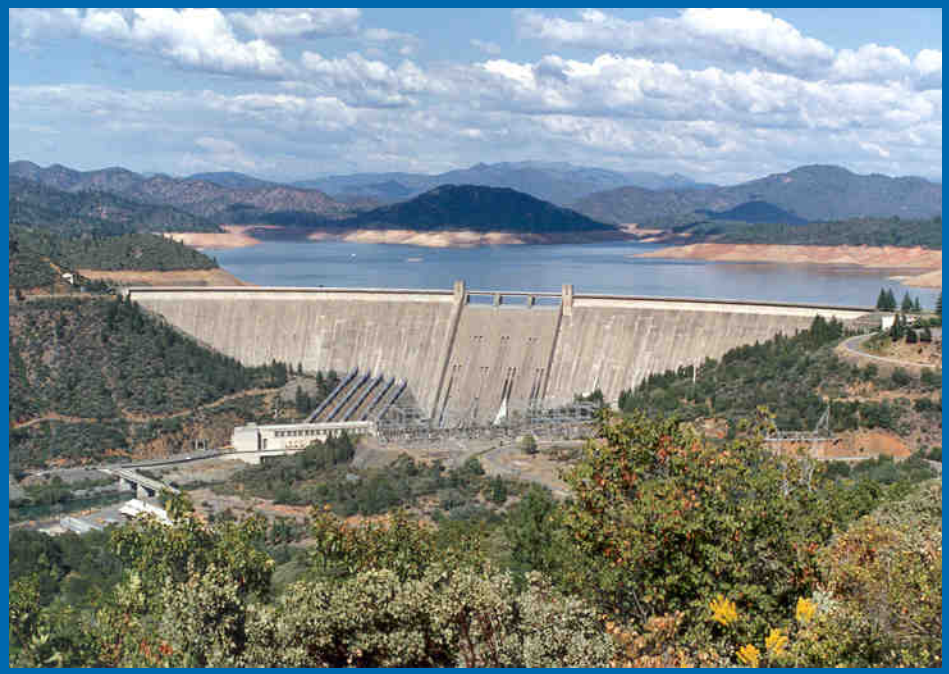
- **Beneficial Use –** Water can be diverted from a specified source and put to beneficial, nonwasteful use.
- Commonly included municipal and industrial uses, irrigation, hydroelectric generation, and livestock watering.
- Concept been broadened to recreational use, fish and wildlife protection, and enhancement and aesthetics

Groundwater Law & Management

- Law of correlative rights
- California has no statewide management program or permit procedure to regulate groundwater appropriations.
- Some basins have adopted voluntary management plans
- In Southern California, many groundwater basins have been adjudicated, with courts establishing the pumping rights of many parties.

Major Water Projects

Federally Funded Projects



Shasta Dam

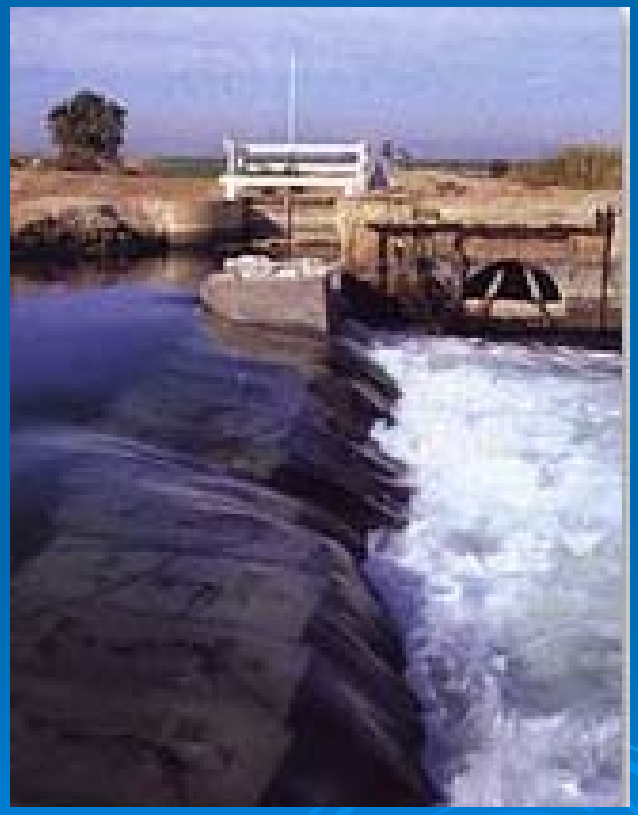
- 35 federally funded dams, reservoirs and canals. Built by U.S. Army Corps of Engineers and U.S. Bureau of Reclamation.
- **Central Valley Project** (CVP), which begins on the Sacramento River at Shasta Dam and ends near Bakersfield.
- Has developed over 8 million acre feet.

State-Funded Projects - SWP

- State Water Project (SWP) consists of 29 dams and reservoirs and runs almost 600 miles from Northern to Southern California.
- Planned to deliver 4.2 million acre-feet; actually delivers about 3.1 million acre-feet.
- About half for farmers in the San Joaquin Valley and half for urban users in Southern California and the Bay Area.

Locally Funded Projects

- 600 cities and local agencies provide water through projects and imported supplies.
- Local systems include San Francisco's Hetch Hetchy project, East Bay Municipal Utility District's Pardee and Camanche Reservoirs, and Los Angeles' Owens Valley and Los Angeles Aqueducts.



Groundwater

- Groundwater does not exist in underground lakes but in water-bearing formations called aquifers.
- About 30% (15 million acre-feet) of state's water comes from groundwater in normal years; 40%-45% in drought years.
- California uses more groundwater than any other state – approx. 40% of population gets drinking water from groundwater

Water and Energy

- 20% of state's electricity used to bring water to consumers and send it away for sewage treatment.
- SWP is single-largest power consumer in California
- Installed pumping capacity is about 2,600MW
- SWP is the fourth largest power generator in California
- Installed generation capacity is about 1,500MW

Hyatt Powerplant below Lake Oroville is in a cavern the size of two football fields.

The Delta

The most important aspect of California's complicated water picture is the Delta, where the Sacramento and San Joaquin rivers meet.

Delta Water Quality Decisions

State Board sets salinity and flow objective to maintain Delta water quality:

- 1978 – (D-1485) Water quality should be at least as good as if SWP and CVP not built

Federal State standoff on Delta flows led to Bay-Delta Accord and compromise standards.

- 1995 – (D 1641) adopted by State Board

- 2006 – Delta Water Quality Control Plan that updates the 1995 plan. Agencies asked to help assist improving salinity objectives.

The Delta Affects Everybody

- 2/3 of all Californians rely on Delta water
- Irrigates 45% of fruits and vegetables grown in the U.S.
- 80% of commercial fish pass through Bay Delta. Habitat for 1700 species
- Delta levees - flood control and water quality protection
- Major recreation center and commerce pathway

Water Quality

- Good water quality necessary to support beneficial uses of water in State
- Focus shift from point sources (e.g., refineries, wastewater) to nonpoint sources, such as urban and agricultural runoff
- Nonpoint source runoff California's #1 water quality problem

Water Quality Regulation

State Porter-Cologne Water Quality Control Act (1969)

- Goal to obtain the highest reasonable water quality, while considering the demands on the waters and the values involved.

- **Federal Clean Water Act** (1972) focused on industrial and municipal point sources of specific pollutants

- State Water Board has the ultimate say over water quality policy. Regional Boards issue Waste Discharge Requirements, initiate enforcement actions against violators, and monitor local water quality.

Total Maximum Daily Loads (TMDLs)

What is a TMDL?

Maximum amount of pollution that a waterway can hold before it's polluted

- Written plan describes how an impaired water body will meet water quality standards
- A description of required actions to remove impairments
- Allocation of responsibility in the form of actions – "who does what"

The federal Clean Water Act requires states to develop TMDLs for impaired waterbodies. The State Water Board oversees.

Urban Runoff

Urban runoff flows – “dry weather” runoff - flows from storm drains in streets to creeks, lakes and rivers.

Pollutants enter storm drains

- Motor oil, pesticides, brake dust, pet waste, paint and household chemicals

Harmful effects of polluted runoff

- Degraded drinking water supplies
- Degraded recreational use and wildlife
- Beaches, lakes and creeks closed

Agricultural Runoff

- “Conditional” waivers established by regional water boards, to reduce runoff from irrigated agricultural lands
- Requires growers to monitor runoff, report findings and clean up sources of discharges when standards exceeded

Nitrates

Nitrates cause oxygen depletion in water

- The most pervasive groundwater problem
- Source of pollution: municipal and industrial wastewater, septic tanks, animal wastes and car exhaust
- Impacts:
  - Environment – kills aquatic life and promotes algae
  - Drinking water – “blue baby” syndrome
  - Agriculture – starves crops

Meeting Future Needs

- Agricultural, urban and environmental needs presents significant challenge
- Combination of answers: water transfers, storage, conservation, conjunctive use of groundwater, water recycling and desalination.
- Protect and preserve water quality
- Stakeholders must work together to find common ground.

Current Situation

- **Drought**: worst water crisis in history

  Agricultural crops are being plowed under

  Housing and business projects delayed

  Regional water authorities institute mandatory water rationing

- **Gov & Sen. Feinstein propose $9.3 billion bond**:

  Increased water storage

  Improved water conveyance to reduce water shortages

  Restored Delta ecosystem

  Increased conservation and tools to use water more efficiently

- **Conservation:** more communities involved