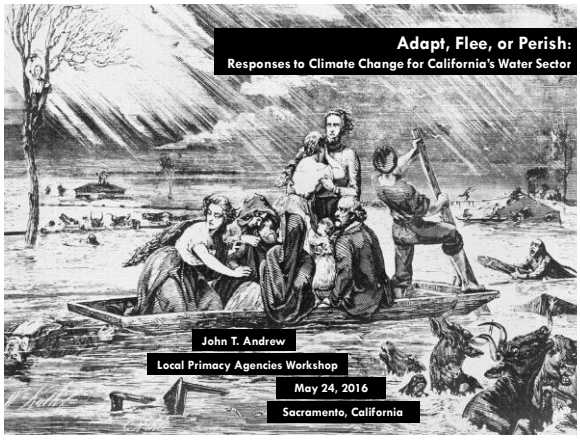


Today's Topics

- Background on California water
- Historical and current indications of climate change
- Projected climate change impacts to water resources
- Adapting to climate change

DWR's Roles & Responsibilities

Mission statement:
"To manage the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments."

- Plan, design, construct, operate, and maintain California's State Water Project, the nation's largest state-built water and power development and conveyance system
- Improve and maintain Central Valley flood management systems and provide statewide flood management financial assistance
- Protect and restore the Sacramento-San Joaquin Delta
- Educate the public about the importance of water and its proper use
- Regulate the safety of 1200 dams
- Regional water management, focusing on technical & financial assistance to local agencies to advance Integrated Regional Water Management
- Statewide planning, focusing on data and updating the California Water Plan (Bulletin 160 Series)

3

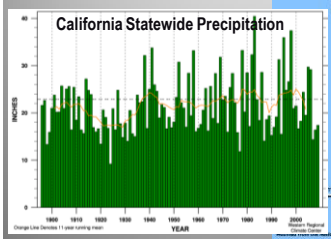
A great deal about California, on its own preferred terms, does not add up.

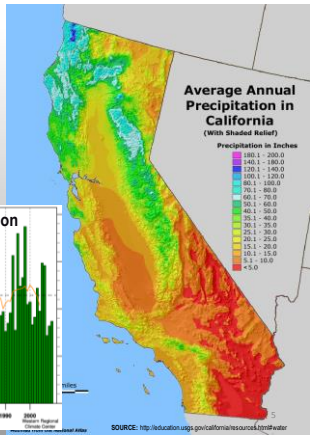
Joan Didion (2004)

California Precipitation

Variable & Extreme
Over Time & Location

Most precipitation occurs
November - March

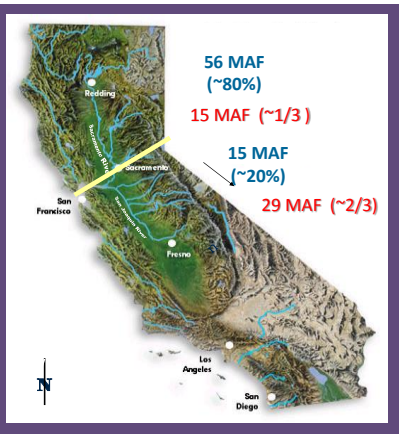




California's Major River Systems

Distribution of Average Runoff

Distribution of Water Use



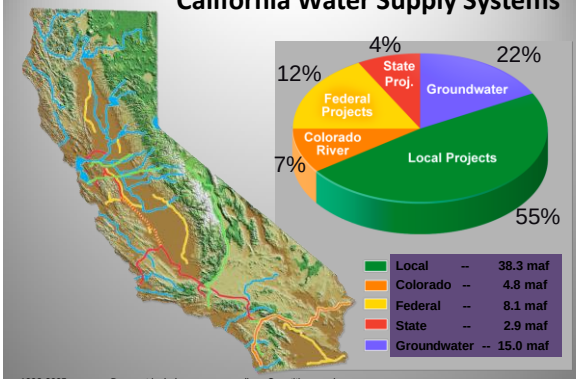
56 MAF (~80%)

15 MAF (~1/3)

15 MAF (~20%)

29 MAF (~2/3)

California Water Supply Systems

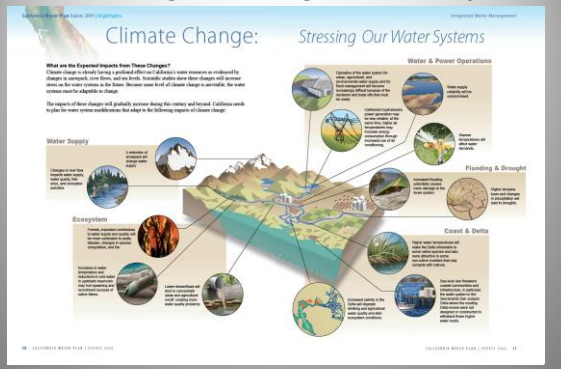


1998-2005 average. Does not include reuse or recycling. Quantities vary by year.

Strong on climate, California is notoriously weak on weather.

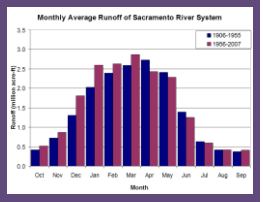
Carey McWilliams (1949)

Climate Change: Stressing Our Water System



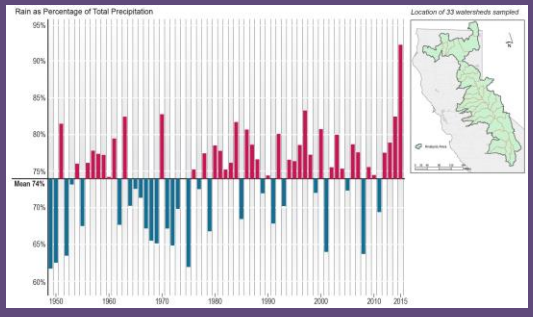
In the Past 100 years…

- 1ºF rise in average temperatures
- 10% overall loss of snowpack in the Sierra Nevada
- Changes in runoff timing
- An average sea level rise of 7" along the California coast

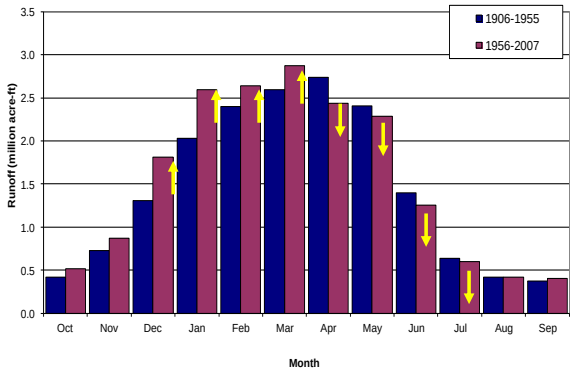


Lyell Glacier, Yosemite National Park, California, USA circa 1903 (upper) and 2003 (lower)

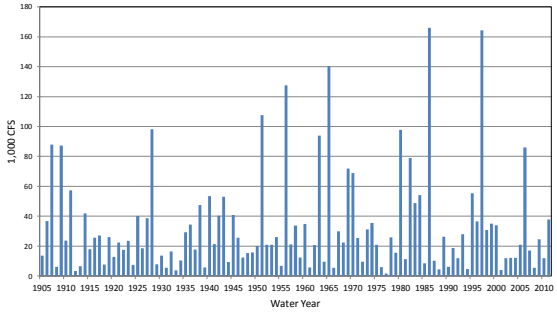
Changing Trend of Rain vs. Snow



Monthly Average Runoff of Sacramento River System

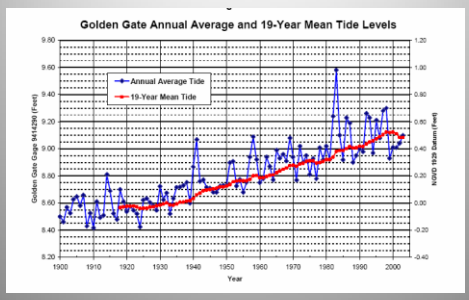


American River Runoff
Annual Maximum 3-Day Flow
Unimpaired Runoff at Fair Oaks



Data from Corps of Engineers Sacramento District

Sea Level Rise

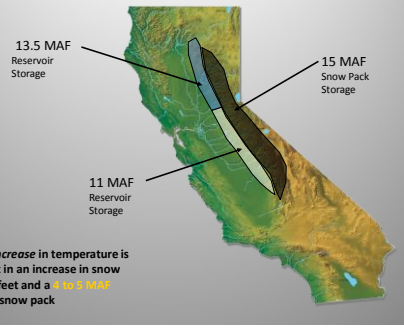


Source: Roos, 2003

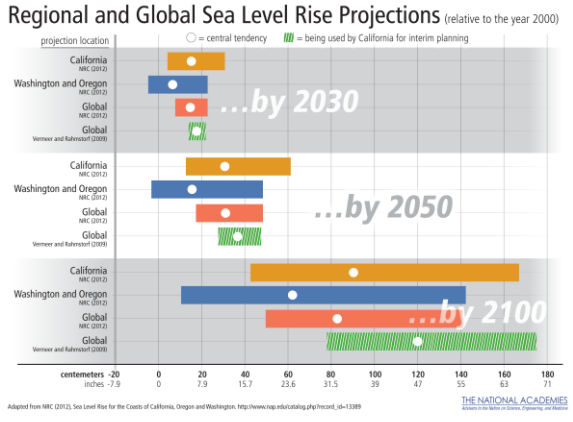
In the Next 35 years…

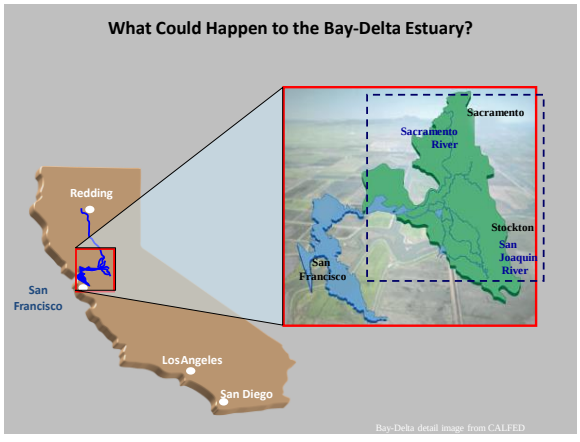
- 1 – 3.6°F temperature rise
- 25 - 40 % reduction in snowpack
- Sea level rise: 5”-24”
- Less summer/fall runoff
- More intense wet and dry periods

Expected Storage Capacity Impacts from Runoff Changes



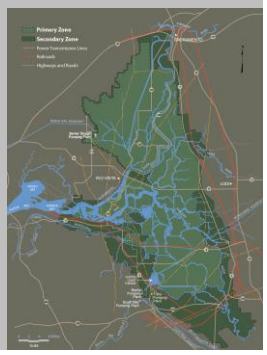
A moderate 3°C *increase* in temperature is projected to result in an increase in snow elevation of 1500 feet and a 4 to 5 MAF *decrease* in Sierra snow pack


Regional and Global Sea Level Rise Projections (relative to the year 2000)
projection location
= central tendency
= being used by California for interim planning
California
NRC (2012)
Washington and Oregon
NRC (2012)
Global
NRC (2012)
Global
Vermeer and Rahmstorf (2009)
...by 2030
...by 2050
...by 2100
centemeters -20 0 20 40 60 80 100 120 140 160 180
inches -7.9 0 7.9 15.7 23.6 31.5 39 47 55 63 71
Adapted from NRC (2012), Sea Level Rise for the Coasts of California, Oregon and Washington, http://www.nap.edu/catalog.php?record_id=13389
THE NATIONAL ACADEMIES

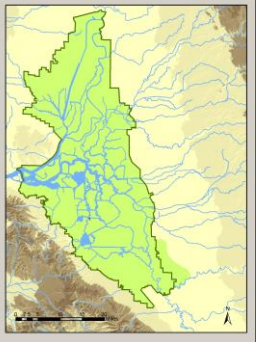

What Could Happen to the Bay-Delta Estuary?
Redding
San Francisco
Los Angeles
San Diego
Sacramento
Sacramento River
Stockton
San Joaquin River
San Francisco
Bay-Delta detail image from CALFED

Implications of Sea Level Rise in the Delta

- Salinity intrusion degrades water quality, requires additional water to repel the sea
- Habitat changes, losses
- Levee failure
- Inundation
- Interruption of water supplies statewide

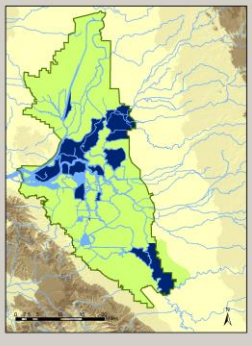


Projected Sea Level Rise



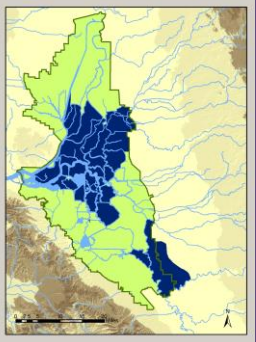
The Delta today.

Projected Sea Level Rise



Areas most at risk in the Delta with 1-foot sea level rise.

Projected Sea Level Rise

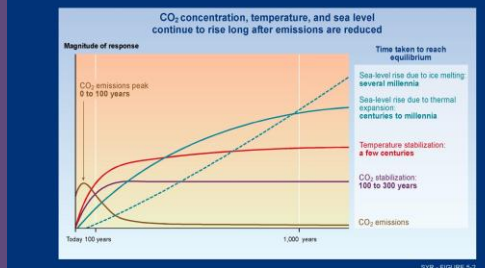


Areas most at risk in the Delta with 2-foot sea level rise.

Adapt or flee, now as ever, is nature's inexorable imperative.

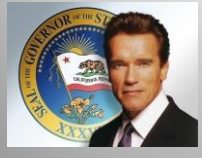
H.G. Wells (1945)

Adaptation is a Necessity



"Politicians discussing global warming"
Isaac Cordal

Governor Arnold Schwarzenegger on Global Warming



" I say the debate is over. We know the science. We see the threat. And we know the time for action is now."

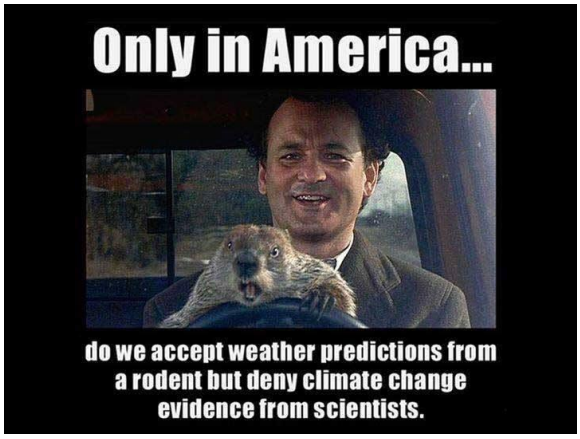
United Nations World Environment Day Conference, June 1, 2005, San Francisco

Climate Change Water Adaptation White Paper
www.climatechange.water.ca.gov

Integrated Regional Water Management
48 Regional Water Management Groups

- Foster partnerships & expand solution opportunities
- Diversify water portfolios & integrate supplies
- Leverage resources & economies of scale to reduce costs
- Integrate data, tools & resources management
- Implement multi-benefit actions with sustainable outcomes

Confluence of the Arroyo Seco and Los Angeles River

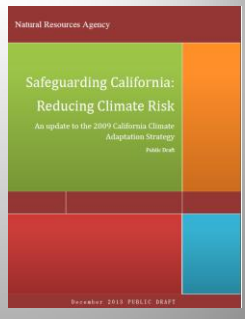


Policy guidance for state decision makers

Updates the 2009 California Climate Adaptation Strategy

Highlights climate risks, accomplishments, & recommendations in nine sectors

Part of California's integrated strategy to respond to climate change



http://resources.ca.gov/climate_adaptation/

California Water Management and Climate Change

- Climate change presents significant challenges for the management of California's water resources.
- California water managers must focus on mitigation and especially adaptation.
- Climate change responses must be thoughtfully integrated with water supply reliability, environmental protection, public safety, and public health actions.
- We must embrace an entirely new way of thinking about water resources planning and management.

John T. Andrew, P.E.
Assistant Deputy Director
Department of Water Resources
(916) 651-9657
jandrew@water.ca.gov

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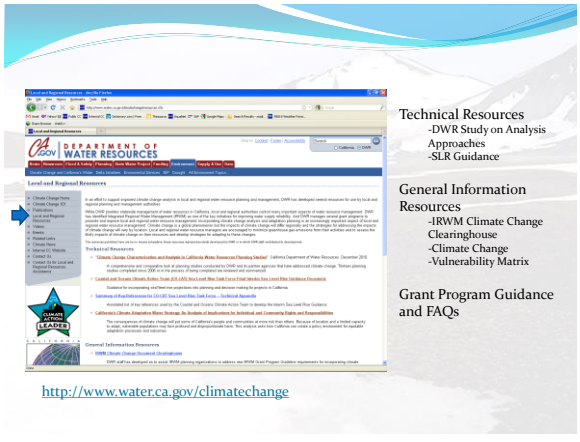


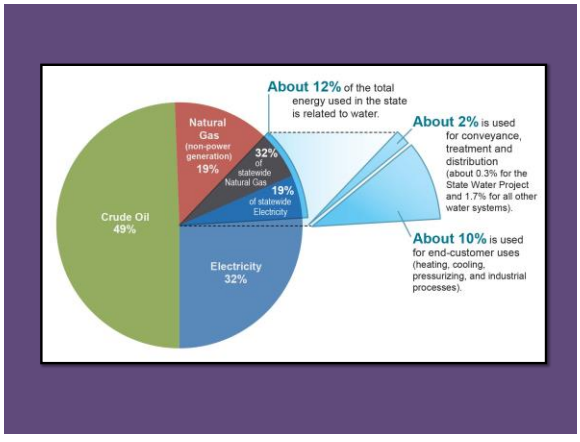
http://www.water.ca.gov/climatechange

Technical Resources
- -DWR Study on Analysis Approaches
- -SLR Guidance

General Information Resources
- -IRWM Climate Change Clearinghouse
- -Climate Change
- -Vulnerability Matrix

Grant Program Guidance and FAQs


Mitigation & Adaptation Efforts
Statewide
CALIFORNIA ADAPTATION PLANNING GUIDE
PLANNING FOR ADAPTIVE COMMUNITIES
2009 CALIFORNIA CLIMATE ADAPTATION STRATEGY
Regional and Global Sea Level Rise Projections
...by 2030
...by 2050
...by 2100
Our Changing Climate 2012
LOCAL CLIMATE SNAPSHOTS


About 12% of the total energy used in the state is related to water.
About 2% is used for conveyance, treatment and distribution (about 0.3% for the State Water Project and 1.7% for all other water systems).
About 10% is used for end-customer uses (heating, cooling, pressurizing, and industrial processes).
Natural Gas (non-power generation) 19%
32% of statewide Natural Gas
19% of statewide Electricity
Crude Oil 49%
Electricity 32%