

Adapt, Flee, or Perish



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

J. T. Andrew
Calif. Department of Water
Resources
Climate Prediction Applications
Science Workshop
March 2, 2010



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

DRAFT

**EXPANDED LIST OF EARLY ACTION
MEASURES TO REDUCE GREENHOUSE
GAS EMISSIONS IN CALIFORNIA
RECOMMENDED FOR BOARD
CONSIDERATION**



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

SEPTEMBER 2007



Today's Topics

- Adaptation to climate change in the water sector
- Multi-sector climate change adaptation in California

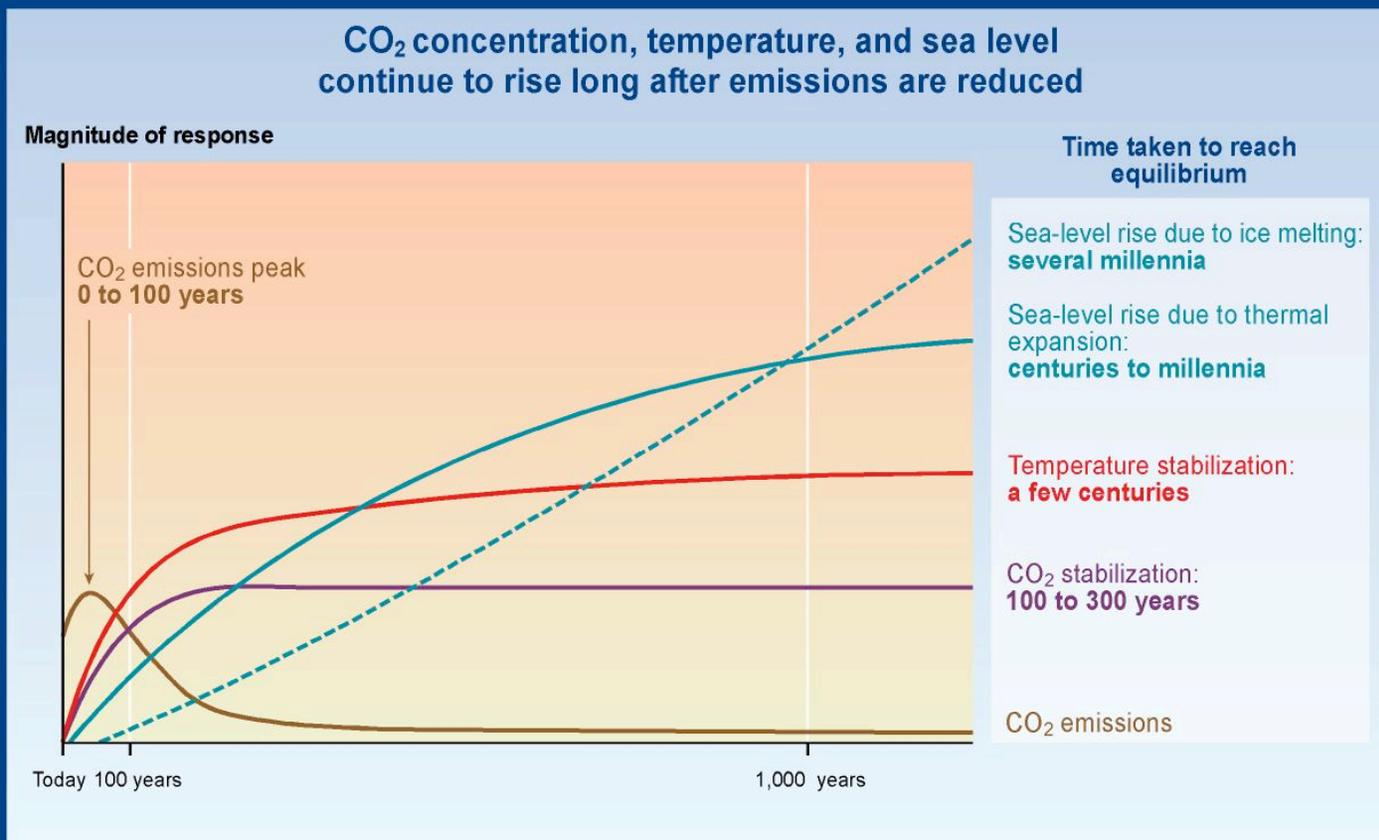


AB 32 (Global Warming Solutions Act)

- Sets in statute Governor's target (1990 levels by 2020)
- Equals approximately 169 million tons emission reduction
- 30% below projected business-as-usual levels
- Air Board lead, with Cal EPA and other State agencies
- Mix of regulatory and market approaches
- Detailed, aggressive schedule



Adaptation is a Necessity



SYR - FIGURE 5-2

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
OCTOBER 2008



MANAGING AN UNCERTAIN FUTURE

Climate Change Adaptation Strategies
for California's Water

Climate Change Water Adaptation White Paper

www.climatechange.water.ca.gov



Comprehensive Strategy for Adaptation

- **Regional Strategies**
 - Fully implement Integrated Regional Water Management (IRWM)
 - Aggressively increase water use efficiency





DEPARTMENT OF WATER RESOURCES

Comprehensive Strategy for Adaptation

■ Statewide Strategies

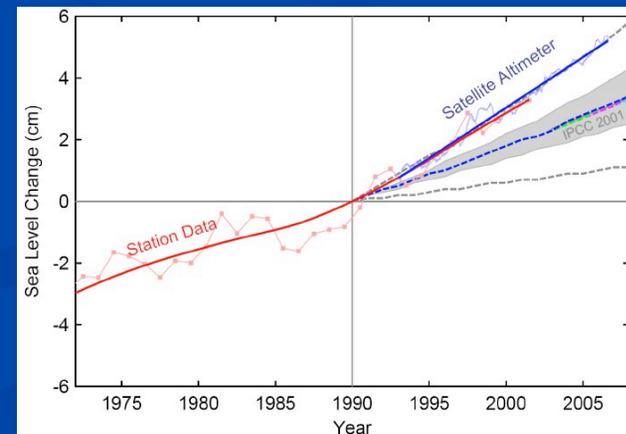
- Practice and promote integrated flood management
- Enhance and sustain ecosystems
- Advance and expand conjunctive management of surface and groundwater resources
- Fix the Delta





Comprehensive Strategy for Adaptation

- Improving Management and Decision-Making Capacity
 - Preserve, upgrade, and increase monitoring and data analysis and management
 - Plan for and adapt to sea level rise
 - Identify and fund focused climate change impacts and adaptation research and analysis





DEPARTMENT OF
WATER RESOURCES

Comprehensive Strategy for Adaptation

Investment Strategies

- Provide sustainable funding for statewide and integrated regional water management



California **Water Plan** Highlights

INTEGRATED WATER MANAGEMENT



Update 2009 • Department of Water Resources

Public Review Draft

January 14, 2009

www.waterplan.water.ca.gov

EXECUTIVE SUMMARY

2009 CALIFORNIA
CLIMATE ADAPTATION
STRATEGY
DISCUSSION DRAFT

A Report to the Governor of the State of California
in Response to Executive Order S-13-2008



Public Review Draft



www.climatechange.gov/adaptation

CLIMATE ADAPTATION STRATEGY

- Executive Order S-13-08
- Statewide adaptation plan covering seven sectors:
 - Water
 - Transportation and Energy Infrastructure
 - Forestry
 - Oceans and Coastal Resources
 - Agriculture
 - Biodiversity and Habitat
 - Public Health
- NAS Sea Level Rise Study
- Transportation systems vulnerability assessment

Cross-Sector Strategies

- Research
- Monitoring
- Integration into plans, policies and common procedures
- Cross-sector collaboration
- Emergency preparedness and response
- Land use planning
- Training and education
- Measuring adaptation success

Adaptation Actions

- Public Health
Promote community resilience
- Biodiversity and Habitat
Establish a system of sustainable habitat reserves
- Oceans and Coastal Resources
Establish State policy to avoid future hazards and protect critical habitat
- Water Management
Develop the full potential of Integrated Regional Water Management

Adaptation Actions (continued)

- Agriculture
Agrobiodiversity
- Forestry
Incorporate existing climate information into policy development and program planning
- Energy
Increase energy efficiency in climate vulnerable areas
- Transportation
Develop a detailed climate vulnerability assessment and adaptation plan for California's transportation infrastructure

California Water Management and Climate Change

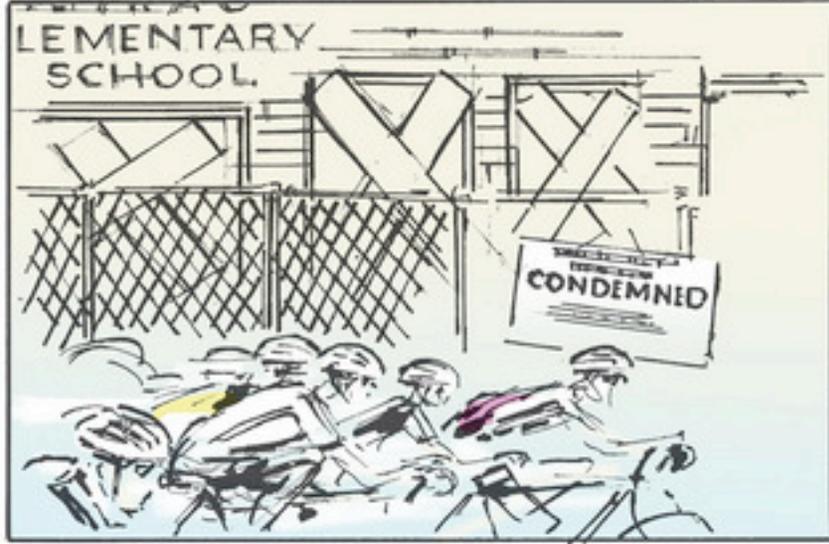
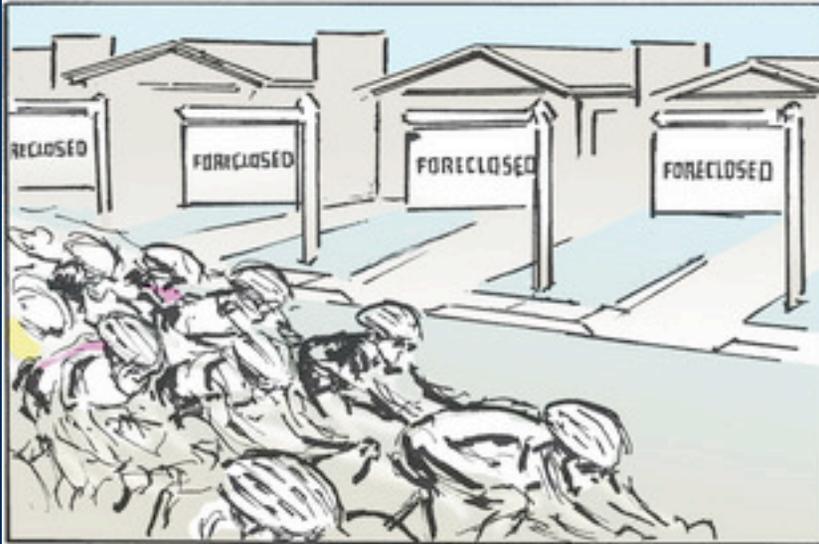
- Climate change presents significant challenges for the management of California's water resources.
- California water managers must focus on mitigation and especially adaptation.
- Climate change responses must be thoughtfully integrated with water supply reliability, environmental protection, public 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



TOUR OF CALIFORNIA



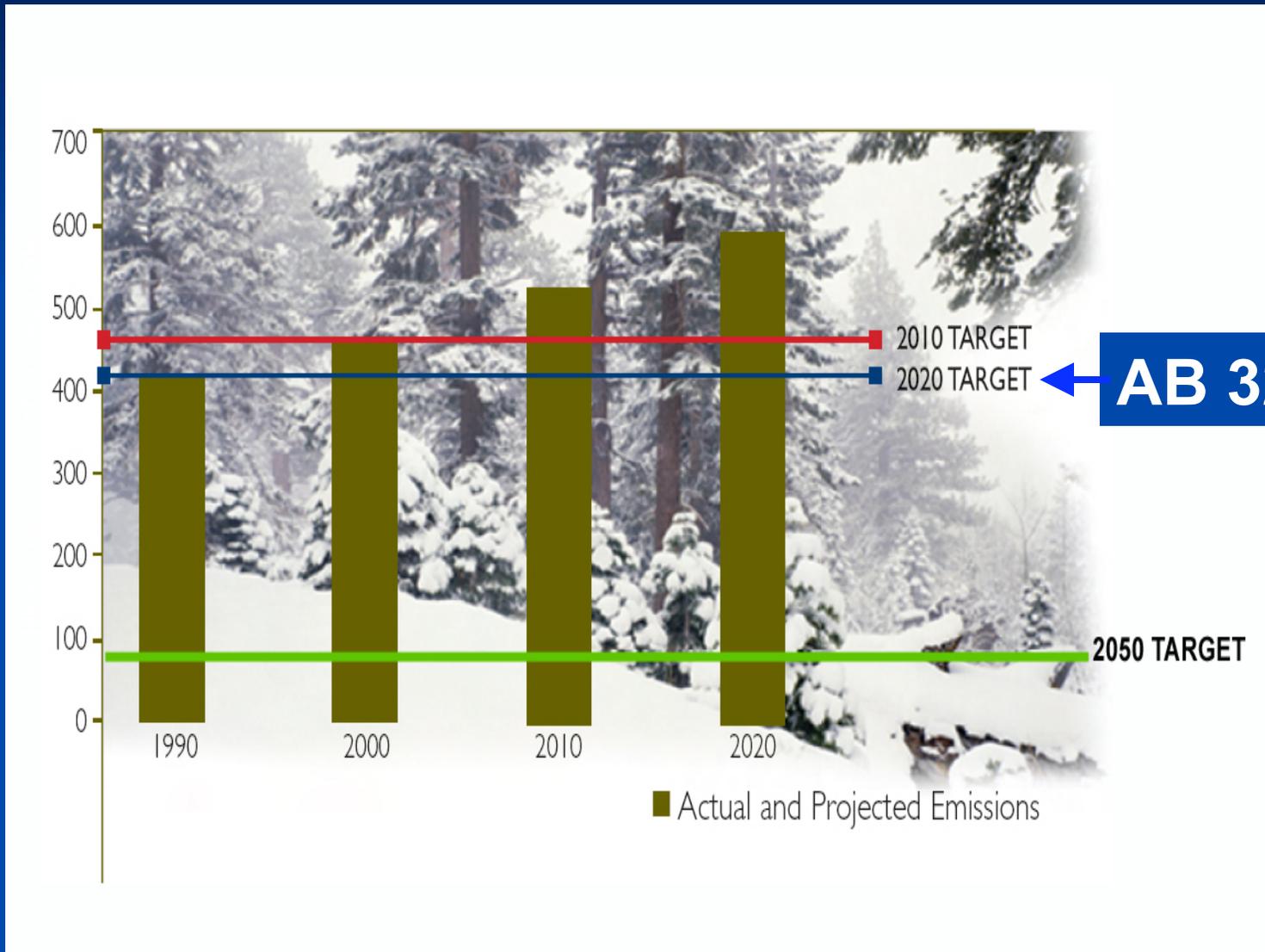
CAS – What it Does

- Prepares state agencies for climate impacts
- Centralizes information sources for consistency and statewide coordination
- Coordinates development of climate adaptation planning tools for statewide use
- Calls for unprecedented planning and coordination at all levels
- Provides an example approach for addressing adaptation

Elements of the CAS

- Adaptation – explanation and approach
- Synthesize statewide impacts from the latest research
- Assess impacts on climate-sensitive sectors (Oceans/Water/Infrastructure/Public Health/Forestry/Agriculture/Biodiversity)
- Sector adaptation strategies (near-term, long-term)
- Overall strategies (Executive Summary) – a comprehensive approach to adaptation

Calif. Emissions Reduction Targets



California's GHG Emissions

cars and trucks = 40%



energy = 33%



industrial = 20%



agriculture = 6%



waste = 1%



Water, Energy and Climate Change

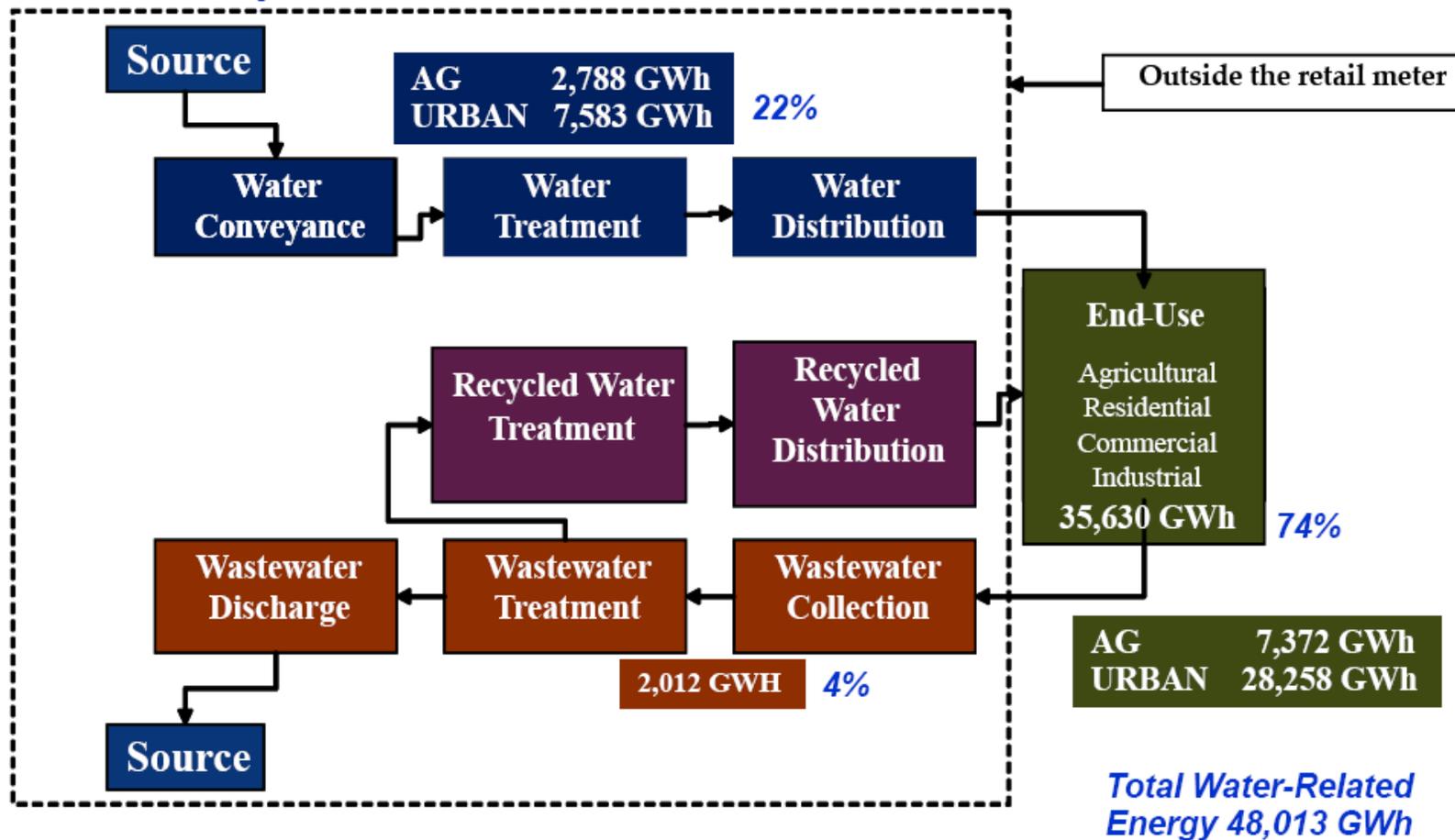


Future water management activities must carefully consider strategies to reduce greenhouse gas emissions.

Framework The Water Use Cycle



Estimates adjusted Oct 2006



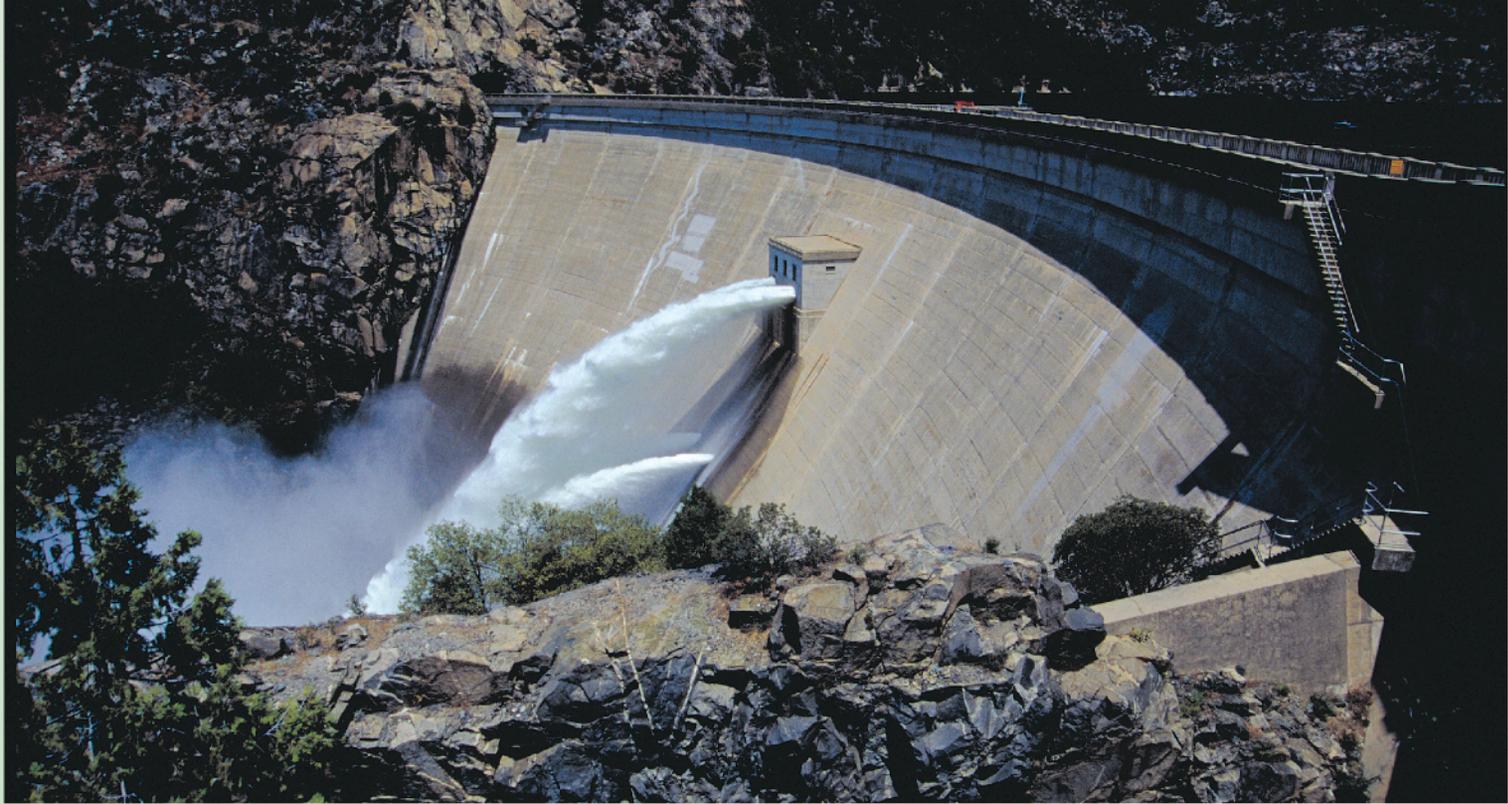
Governor's Climate Action Team

Water-Energy Subgroup



- Water conservation
- Water recycling
- Energy intensity of water systems
- Urban runoff and stormwater reuse
- Renewable energy production

O'Shaughnessy Dam



Common Energy-Water Tradeoffs

Energy Use	More	<p>Seawater desalting</p> <p>Wastewater reuse</p> <p>Conjunctive use</p> <p>Wastewater treatment</p> <p>Large dam removal</p> <p>Drip irrigation-SW</p> <p>Fish screens</p>	<p>Water treatment</p> <p>Pumping</p>
	Less	<p>Water conservation</p> <p>Crop yield improvements</p> <p>Solar generation substitution?</p> <p>Hot water conservation</p>	<p>Shade trees</p> <p>Evaporative cooling</p> <p>Reforestation</p> <p>Biofuels Production?</p> <p>Shale oil Production?</p>

Less 0 More

Water Use or Environmental Impact

Climate Change Impacts on California's Water Resources



- Reduced snowpack, impacting water supply and hydropower
- Earlier snowmelt results in increased flood control demand on reservoir space
- Higher water temperatures impacts ecosystem
- Sea level rise impacts the Delta, threatens levees and increases salinity
- Increased demand in all sectors