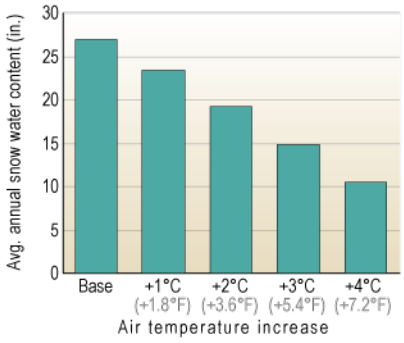
Climate Change:

By and large, California's reservoirs and water delivery systems were designed, and operating rules have been developed, using historical hydrology – an assumption that the past is a good guide to the future. With climate change, that assumption may no longer be valid.

What Has Already Happened?

Looking over the past century, the following changes are evident:

- California's temperature has risen one degree Fahrenheit, mostly at night and during the winter, with higher elevations experiencing the greatest increase.
- Average early spring snowpack in the Sierra Nevada has decreased by about 10 percent, a reduction of 1.5 million acre-feet of water in storage (one acre-foot of water is enough for one to two families for one year). Seasonal snowpack of the Sierra Nevada is California's largest surface water storage.
- Sea level along California's coast has risen 7 inches.
- Flood peaks in the state's rivers have increased.
- Climate patterns are more variable.



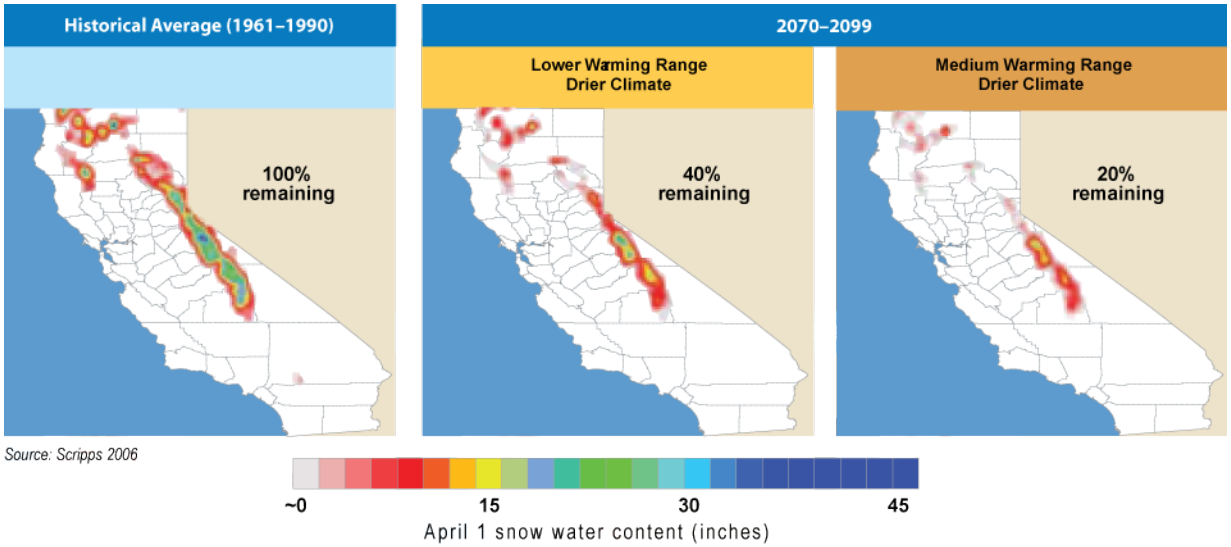
Average Annual Snowmelt for Upper Feather River Basin

Warming air temperatures may cause some of our precipitation to shift from snow to rain. This would lead to a reduction in the amount of snowpack, an important natural reservoir for storing water in the winter and later augmenting the water supply as spring snowmelt. Climate-change-induced shifts in the timing and the amount of snowmelt runoff may require revising traditional water planning practices. The Upper Feather River Basin provides water for Lake Oroville, the main water supply reservoir for the State Water Project.

Source: DWR 2009

Decreasing California Snowpack

These figures show projections of how two climate scenarios may reduce Sierra snowpacks to 40% and 20% of recent historical averages



Source: Scripps 2006

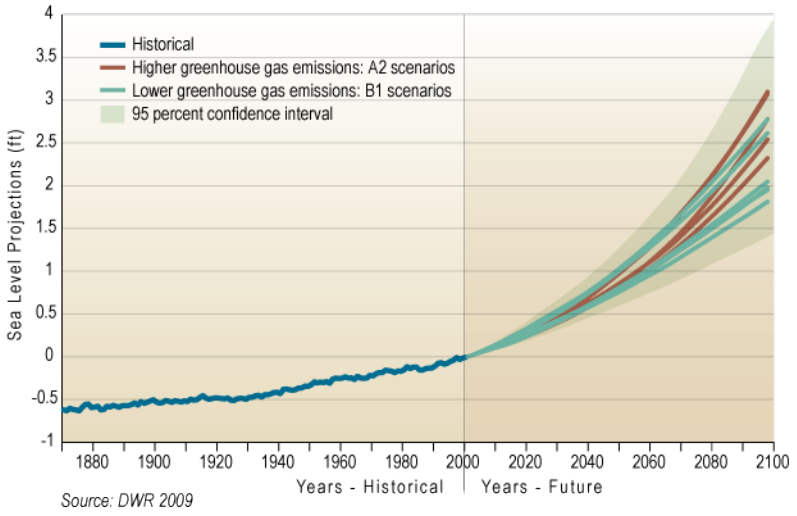
Future Hydrology Unlike the Past

What More is Expected?

Looking forward to the year 2050 and on to the end of the century, more changes can be expected:

- California's mean temperature may rise 1.5 degrees to 5.0 degrees Fahrenheit by 2050 and 3.5 degrees to 11 degrees by the end of the century.
- Sierra Nevada snowpack may decrease by 25 to 40 percent by mid-century, a storage volume about 3.8 million acre-feet to 6 million acre-feet, from a little less to a little more than the capacity of California's largest constructed surface reservoir.
- Average annual precipitation may show little change, but more intense wet and dry periods can be expected – more floods and more droughts.
- Flood peaks will become higher and natural spring/summer runoff will become lower.
- Studies show a possible global sea level rise of 4 to 16 inches by mid-century and 7 to 55 inches by the end of the century.
- Higher sea levels will increase salinity in the Delta.

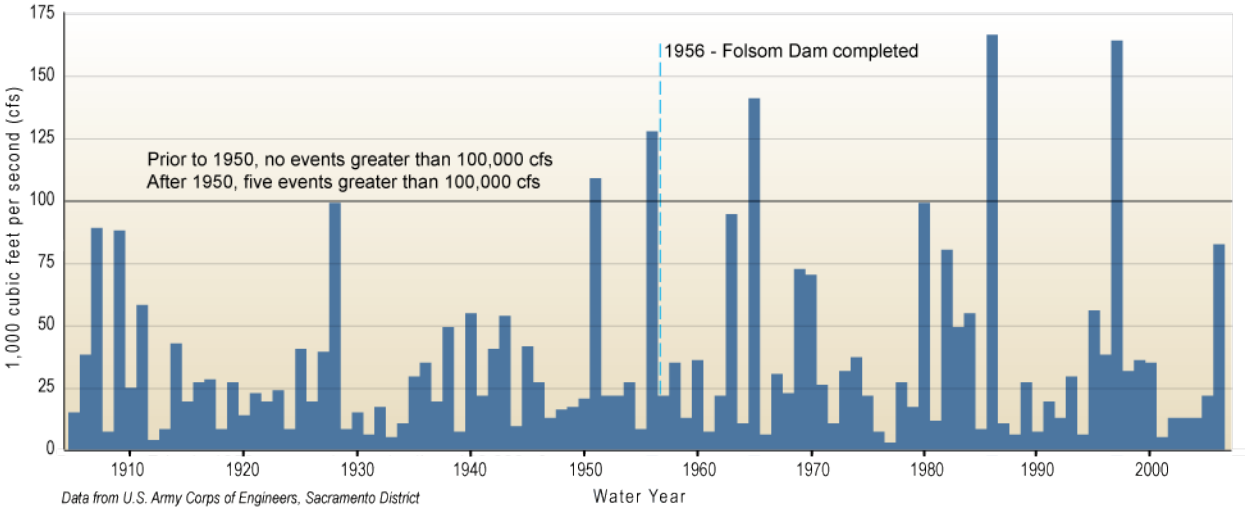
Historical and Projected Sea Level at Golden Gate



Source: DWR 2009

American River Runoff Annual Maximum 3-Day Flow

The five highest floods of record on the American River have occurred since 1950.



Data from U.S. Army Corps of Engineers, Sacramento District

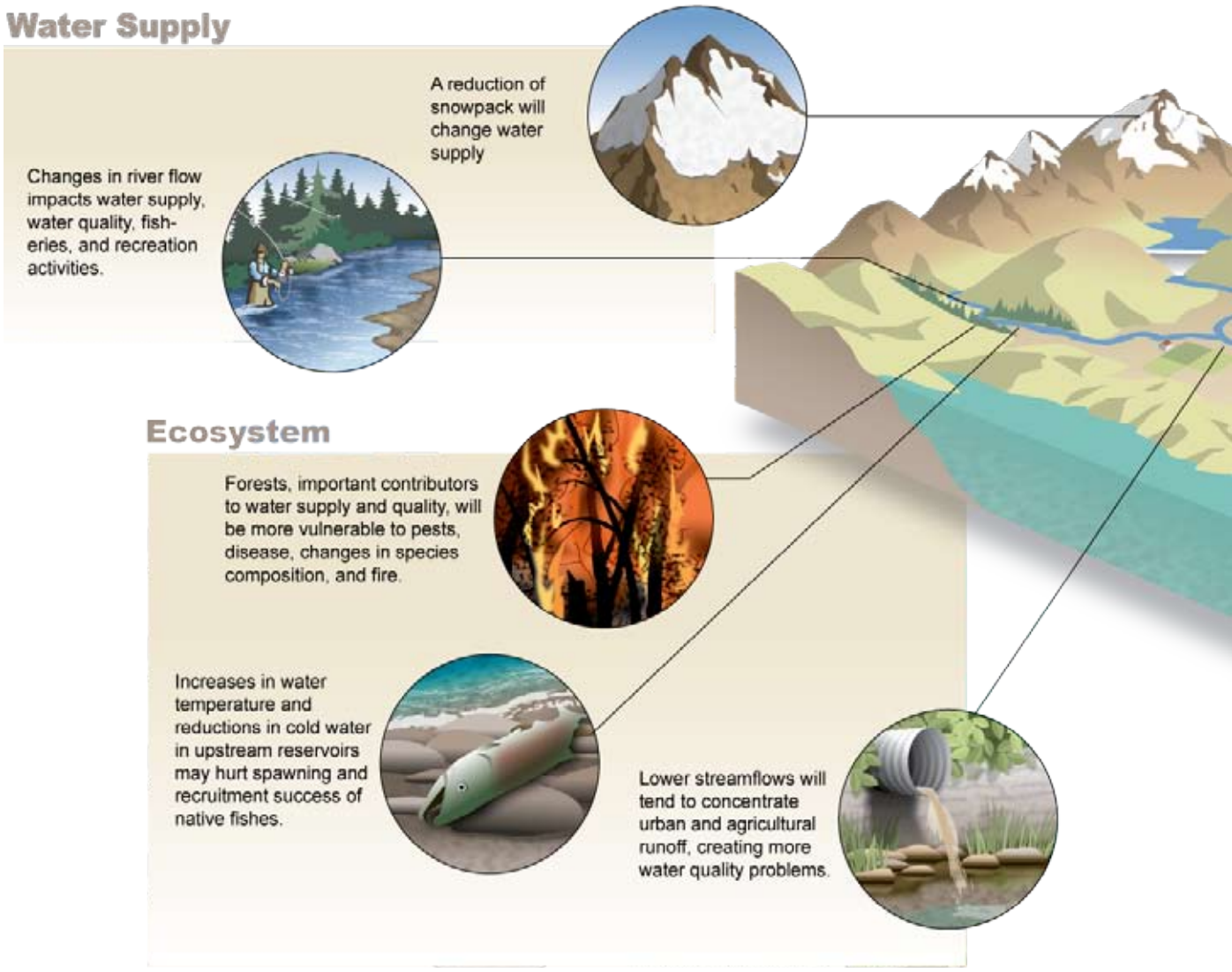
Read more on climate change in Volume 1 Chapter 5 Managing an Uncertain Future and Chapter 6 Integrated Data and Analysis. Find technical and support articles in Volume 4 Reference Guide.

Climate Change:

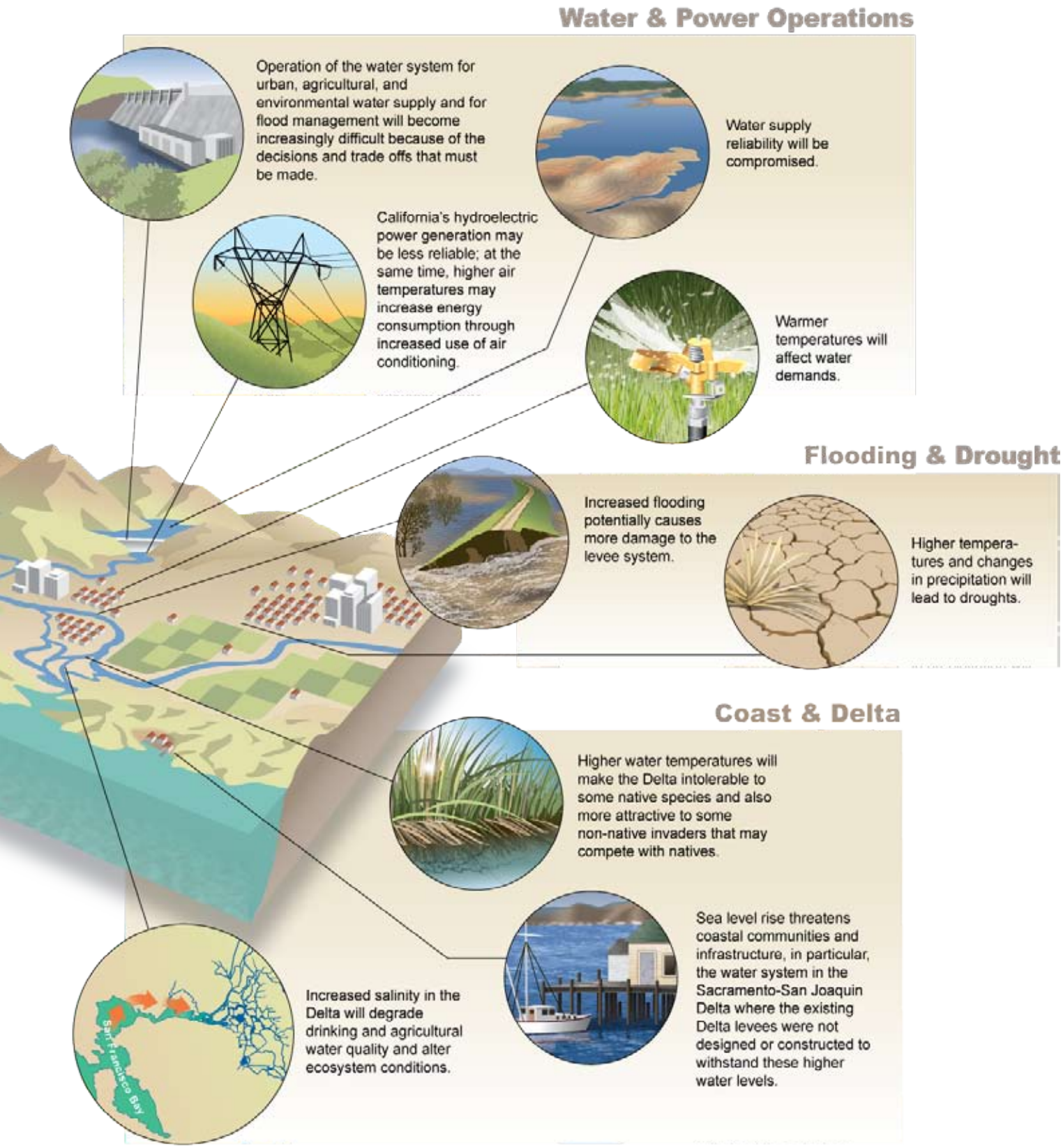
What are the Expected Impacts from These Changes?

Climate change is already having a profound effect on California's water resources as evidenced by changes in snowpack, river flows, and sea levels. Scientific studies show these changes will increase stress on the water systems in the future. Because some level of climate change is inevitable, the water systems must be adaptable to change.

The impacts of these changes will gradually increase during this century and beyond. California needs to plan for water system modifications that adapt to the following impacts of climate change:



Stressing Our Water Systems



California Water Plan Update 2009:

Integrated Water Management

The California Water Plan updates have been important sources of information for water planners since 1957. But unlike prior Water Plan updates, which were primarily products of the Department of Water Resources, Update 2009 truly can be viewed as the state's Water Plan. It has benefited from the first interagency California Water Plan steering committee representing 21 state government agencies with jurisdictions over different aspects of water resources and integrates their companion planning documents. In addition, a 45-member advisory committee, expanded regional outreach, greater involvement of California Native American Tribes, and coordination with federal agencies provided broad participation in plan preparation.

Update 2009 builds on the framework and resource management strategies outlined by California Water Plan Update 2005 promoting two major initiatives:

- **Integrated regional water management** enables regions to implement strategies appropriate for their own needs and helps them become more self-sufficient.
- **Improved statewide water and flood management systems** provides for upgrades to the large physical facilities, such as the State Water Project, and statewide management programs essential to the California economy.

To minimize the impacts of water management on California's natural environment and make sure that the state continues to have the water supplies it needs, the two initiatives are supported by three foundational actions:

- Use water efficiently to get maximum utility from existing supplies.
- Protect water quality to safeguard public and environmental health and secure the state's water supplies for their intended purposes.
- Expand environmental stewardship as part of water management responsibilities.

Unfold to read the details of **Water Plan's Strategic Plan**

Building on a Framework

Update 2009 uses the same framework presented in Update 2005 and enhances it in several areas:

- Integrates information and recommendations from many state plans and initiatives, particularly those agencies on the Water Plan Steering Committee.
- Incorporates consideration of uncertainty, risks, and resource sustainability into planning for the future to reduce uncertainties, recognize risks to success, and manage for more sustainable water supply, flood management, and ecosystems.
- Includes integrated flood management and drought contingency plan.
- Advances climate change adaptation and mitigation strategies.
- Includes information from Native American Tribes and proceedings from the 2009 California Tribal Water Summit.
- Updates resource management strategies and regional reports.
- Extends regional and statewide water balances to include eight years.
- Includes a plan for improving data, analytical tools, and information management and exchange.
- Further acknowledges that the Water Plan as a living document will continue to evolve and adapt integrated water management.

Update 2009 integrates information and recommendations from key state plans and initiatives.
See Volume 1, Chapter 3 Companion State Plans

Transitioning from Extraction to Sustainable Outcomes

Incorporating the concept of resource sustainability is an ongoing process or approach that will continue to be developed in future Water Plan updates. A system that is sustainable meets today's needs without compromising the ability of future generations to meet their own needs. A sustainable system generally provides for the economy, the ecosystem, and equity.

Over the past few decades, questions have been raised about how sustainable our ecosystems and water, land, and other resources are, given current management practices and expected future changes. California's water resources are finite and now require managing for sustainability—management that may be different than what has been practiced during the first 150 years of the state's history.

To achieve sustainability, resource managers and planners must transition from the past model that places value primarily on water supply yield and extraction to a model that values sustainable outcomes.

Find more about the roadmap to safe and clean water through 2050 in Volume 1 Chapter 2 Imperative to Act and Chapter 7 Implementation Plan.

Unfold to read the details of
Water Plan's Strategic Plan

California Vision 2050:

Update 2009 sets us on a strategic path to managing our water resources in a way that pro

Desired future for California water

California has healthy watersheds and integrated, reliable and secure water resources and management systems that

- Enhance public health, safety, and quality of life in all its communities;
- Sustain economic growth, business vitality, and agricultural productivity; and
- Protect and restore California's unique biological diversity, ecological values, and cultural heritage.

Desired outcomes over the planning horizon 2050

1. California has water supplies that are adequate, reliable, secure, affordable, sustainable, and of suitable quality for beneficial uses to protect, preserve, and enhance watersheds, communities, and environmental and agricultural resources.

2. State government supports integrated water resources planning and management through leadership, oversight, and public funding.

3. Regional and interregional partnerships play a pivotal role in California water resources planning, water management for sustainable water use and resources, and increasing regional self-sufficiency.

4. Water resource and land use planners make informed and collaborative decisions and implement integrated actions to increase water supply reliability, use water more efficiently, protect water quality, improve flood protection, promote environmental stewardship, and ensure environmental justice in light of drivers of change and catastrophic events.

5. California is prepared for climate uncertainty by developing adaptation strategies and investing in a diverse set of actions that reduce the risk and consequences posed by climate change, that make the system more resilient to change, and that increase the sustainability of water and flood management systems and the ecosystems they depend on.

6. Integrated flood management, as a part of integrated water management, increases flood protection, improves preparedness and emergency response, enhances floodplain ecosystems, and promotes sustainable flood management systems.

7. The benefits and consequences of water decisions and access to state government resources are equitable across all communities.

Vision & Mission
•
Goals
•
Guiding Principles
•
Objectives & Actions
•
Recommendations