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Chapter 2 Imperative to Act

About this Chapter

Chapter 2 Imperative to Act lays out the urgent course California must take to ensure that we have enough safe and clean water through year 2050 for California's cities and towns, farms and businesses, and plants and animals when and where they need it. It describes the features of this important road map—themes of this Water Plan and elements of its strategic plan. It also includes key policy recommendations for State government and California for the removal of impediments and harnessing of opportunities that will help us achieve the Water Plan's vision, mission, and goals. Details of meeting these goals—through objectives and their related actions—are explained in Chapter 7 The Implementation Plan.

A Course for Action

An Urgency

California is facing a significant water crisis in its history. After experiencing two years of drought and the driest spring in recorded history, water reserves are extremely low. Even a wet winter in 2008 will not bring total relief. With the Sacramento-San Joaquin Delta ecosystem near collapse, court-ordered restrictions and new regulations on water deliveries from the Delta have reduced supplies from the state's two largest water supply systems—State Water Project and Central Valley Project—by 30 percent. Key fish species continue to decline. In some areas of the state, ecosystems and the quality of underground and surface waters are unhealthy.

Californians need to fundamentally change how we use water. We need to make water efficiency a priority at home, in our communities, on the farm, and at the office.

California must follow a strategic path that manages water resources in a way that provides reliable water supplies for all beneficial uses today and for generations. Droughts, as well as flooding, may be inherent in California's natural cycles, but their intensity and consequences are worsening. Meanwhile, great ongoing challenges require that we manage for future uncertainty. These challenges require a strategic Water Plan with a vision and goals, an implementation plan with objectives and near-term and long-term actions, and recommendations to remove obstacles that stand in our way. The plan must build on fundamental lessons of water resource management learned in recent years.

Update 2009 Strategic Plan

This strategic plan was developed through processes learned during Update 2005, that is, expand the role and participation of other State agencies and of regional planning efforts, engage communities of interest and communities of place, and add a technical advisory group. Through these processes, we refined the strategic plan elements of Update 2005; they are presented here in Water Plan Update 2009 (Box 2-1 Update 2009 Strategic Plan Elements). For further discussion of the 13 objectives and more than 90 related actions, go to Chapter 7 Implementation Plan

PLACEHOLDER Box 2-1 Update 2009 Strategic Plan Elements: Vision, Mission, Goals, Guiding Principles, and Objectives

Update 2009 maps out the role of State government and the water community to ensure that California has sustainable water uses and reliable water supplies in 2050 for all beneficial uses. It describes the paramount challenges that we face today and could face in the future, and it sets a course for action to meet California's urgent water challenges. As part of a comprehensive and thoroughly vetted strategic plan, this Water Plan presents clear goals that inform an implementation plan comprising objectives and related actions, near-term and long-range, for all levels of State government, for all communities throughout the state, and for all water users.

Update 2009 outlines actions, resource management strategies, planning approaches, and analytical methods that can help us manage our water resources to achieve sustainable systems. These strategies and methods pay particular attention to the essential role and responsibility of State government in supporting regional water and flood management and improving statewide water and flood management systems.

Just as we have identified California's urgent needs and the course we must take, we have identified constraints that can impede our way and opportunities that can help us succeed. In this chapter, we present nine recommendations to decision-makers and water users throughout the state (referred to as *California*) and at executive and legislative branches of State government, the Department of Water Resources (DWR), and other State agencies (referred to as *State government*). These recommendations are presented at the end of this chapter. They will help reduce or remove impediments and leverage resources and opportunities to help implement the Update 2009 strategic plan.

The Update 2009 strategic plan sets a course for action that is urgent yet paved with the fundamental lessons learned by California's water community through the experience of recent years. Update 2009 embodies these fundamental lessons that are listed here.

Fundamental Lessons

- Sustainable development and water use, and environmental stewardship foster a strong economy, protect public health and the environment, and enhance our quality of life. Managing for sustainability relies on the full consideration of social, economic, and environmental values in policy- and decision-making. Sustainable water use ensures that we develop and manage our water and related resources in a way that meets present needs while protecting and enhancing our environment and assures our ability to meet the needs of the future.
- Integrated water management including integrated flood management and integrated regional water management is the basis of planning for California's water future with actions that provide multiple benefits. Reducing uncertainties and assessing risks to the

water supply and flood systems are essential for developing plans that also allow us to sustain our water uses, systems, and resources.

- Solutions to California's water and flood management challenges are best planned and carried out on a regional basis. Hydrologic, demographic, geopolitical, socioeconomic, and other differences among California's regions demand that the mix of water management strategies be suited to meet each region's needs for the long term.
- Water conservation, recycling, and greater system efficiency in California must continue to be a fundamental strategy for all regions and individual water users in California. The cumulative effect of each decision to use water more efficiently has an enormous impact on future water supplies and water quality.
- California can better prepare for future droughts and climate change and improve water supply reliability and water quality by taking advantage of the long-term water storage capacity of groundwater basins when managed in closer coordination with surface storage and other water supply sources when available. These supplies include but are not limited to recycled municipal water, surface runoff and floodflows, urban runoff and storm water, imported water, water transfers, and desalination of brackish and sea water.
- California must protect the quality of its water and use available supplies with great efficiency because water will always be a precious resource.
- California needs additional groundwater and surface water storage capacity. Storage gives water managers tremendous flexibility to meet multiple needs and provide vital reserves in drier years.
- Management to sustain the California Delta will require that the Delta ecosystem and a reliable water supply for California be co-equal goals, and that we recognize the Delta as a unique and valued area.
- State government has a lead role in coordinating the water management activities of federal, Tribal, regional, and local governments and agencies and developing stable methods for financing water management actions.
- Science and technology are providing new insights into threats to our watersheds—including our waterways and groundwater basins—from climate change and other stressors. California must use this knowledge to take protective actions and manage water in ways that protect and restore the environment.

Paramount Challenges

Certain challenges are inherent to California's water resources. They also are paramount. These challenges come from the diversity of our state and from global changes whose effects can only be estimated and may not be understood fully for years to come. Following this Water Plan's strategic plan will help us meet these challenges.

A State of Variability and Extremes

California is often recognized as a land of extremes and variability—its diversity in cultures, ecosystems, geography, and water resources. Precipitation, which is the root of California's water supplies, varies from place to place, season to season, and year to year. Most of the state's snow and rain fall in the mountains in the north and eastern parts of California; most water is used in the valleys and coastal plains. In addition, the state's ecosystem, agricultural, and urban water users have variable needs for the quantity, quality, timing, and place of use. The water system faces both the threat of too little water to meet needs during droughts and too much water during floods.

The physical and institutional realities within California do not allow for a one-size-fits-all approach to water management and planning. California's large (State/federal) and smaller (local/regional) projects and programs must work together to make water available in the right places and times and to move flood waters.

Challenges are greatest during dry years and droughts as we have experienced yet again in 2007 and 2008. In drier years water dedicated to the environment is curtailed sharply, and less water is available for agriculture. Greater reliance on groundwater during dry years results in high costs for many users and more groundwater overdraft. At the same time, water users who have already increased efficiency may find it more challenging to achieve additional water use reductions during droughts. Longer droughts create numerous problems including extreme fire danger, economic harm to urban and rural communities, loss of crops, and the potential for species collapse and degraded water quality in some regions. As competition grows during dry years among water users, water management becomes more complex and, at times, contentious.

Multiple Water Uses

California's changing and growing demands for water comes from many sectors. The state's population continues to grow, estimated to increase from about 36.7 million people in 2005 to about 59.5 million by year 2050. As we prepare for a growing population, we must also identify existing water-related needs and potential solutions for disadvantaged and disproportionately impacted communities.

California is the nation's leading agricultural producer. This multibillion dollar industry plays a vital role in the state's economy and is an important contributor to the world food supply.

Through the California Water Plan, we can learn how State water law, planning, and management intersect with Tribal water issues and find ways to ensure Tribal representation and participation in water planning processes—statewide and regional.

Californians today realize that water is a vital natural resource for people and the environment and that water management activities must occur in the context of resource management and environmental protection and stewardship.

PLACEHOLDER Box 2-2 Director's Perspective on Challenges and the Way Forward

Climate Change

California is already seeing the effects of climate change on hydrology (snowpack, river flows), storm intensity, temperature, winds, and sea levels. Planning for and adapting to these changes, particularly their impacts on public safety and long-term water supply reliability, will be among the most significant challenges facing water and flood managers this century.

For more than 200 years, California water and flood management systems have provided the foundation for the state's economic vitality, providing water supply, sanitation, electricity, recreation, and flood protection. However, the climate patterns that these systems were based upon are different now and may continue to change at an accelerated pace. These changes collectively result in significant uncertainty and peril to water supplies and quality, ecosystems, and flood protection.

Climate change impacts to hydrology and water resources management may be significant. The trends of the last century—especially the increases in hydrologic variability—will likely intensify in this century. Abrupt changes in climate could also strike. We can expect to experience more frequent and larger floodflows and deeper droughts.

As part of the Update 2009 process, DWR published *Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water* (2008). The report urges a new approach to managing California's water and other natural resources in the face of climate change. Its recommendations are incorporated in the Water Plan's objectives and related actions (Chapter 7 The Implementation Plan). See also Box 2-3 Water-Energy Climate Action Team.

Box 2-3 Water-Energy Climate Action Team

The Water-Energy Climate Action Team (WET-CAT) is one of several subgroups of the Climate Action Team supporting AB 32 Scoping Plan, California's policy blueprint containing the broad overview of the programs, measures, and approaches that will help the state achieve the required reductions of greenhouse gas emissions required under the Global Warming Solutions Act (AB 32).

WET-CAT developed five basic strategies for reducing GHG from the water-energy sector: two in water reuse (water recycling and urban water reuse); end-use water conservation and efficiency; reduction of the energy intensity of the water system; and renewable resources development.

Climate Action Team subgroup reports can be found at http://www.climatechange.ca.gov/climate_action_team/index.html. The water-energy sector summary also is included in Volume 4 the Reference Guide.

Future Uncertainty

California’s water and flood managers and planners must deal with a broad range of uncertainty. Uncertainty is inherent in the existing system and in all changes that may occur in the future. One simple example of this is that water managers can be certain that the flows in California’s rivers will be different next year compared with this year; uncertainty lies in not knowing the magnitude or timing of those changes. The threat of a chemical spill that may disrupt water diversion presents uncertainty. Future protections for endangered species may require modifications in water operation procedures that are unknown today. There are many uncertainties about how the system functions today. For example, scientists are trying to understand the reasons for the pelagic fish decline in the Delta, the condition of levee foundations, and the extent of groundwater recharge and overdraft to name a few.

Change may occur gradually over the long term or short term, or they can occur suddenly. Gradual changes can include things like variation in population by region, shifts in the types and amount of crops grown in an area, or changes in precipitation patterns or sea level rise. Sudden changes can include episodic events such as earthquakes, floods, droughts, equipment failures, chemical spills, or intentional acts of destruction. The nature of these changes, the uncertainties about their occurrence, and their potential impacts on water and flood management systems can have big influences on how to respond to the changes.

Key Initiatives and Commitments

A primary theme of Update 2005 and Update 2009 is that our policies, decisions, and actions must lead to long-term, sustainable water resource use that enhances our environment, our economy, and our communities. With creative flexibility, discipline, and innovation, we can use our groundwater and surface water resources wisely in ways that sustain their viability, expand the economy, protect the environment, and assure Californians a high quality of life. Our policies and actions must ensure sustainable water uses and reliable water supplies. On these two premises, we have identified foundational actions (use water efficiently, protect water quality, and expand environmental stewardship) and initiatives (expand integrated regional water management and improve statewide water and flood management systems). See Figure 2-1 (Integrated Water Management).



Figure 2-1 Integrated Water Management

In Water Plan Update 2009, we build on these initiatives and foundational actions by identifying the commitments we must make to water resource management. These commitments are necessary for managing and planning in a way that ensures California's sustainable water use and reliable water supplies through 2050 and for future generations.

- Coordinating government planning and management
- Integrating resource planning and management
- Adapting to climate change
- Managing for uncertainty, risk, and sustainability

Coordinating Government Planning and Management

Collaboration

California's water management system is large and complex and requires cooperation and collaboration among decision-makers at all levels of State, federal, Tribal, regional, and local entities. A 21-member State Agency Water Plan Steering Committee provides policy input, oversight, and program management. Through the committee, DWR seeks policy information from federal agencies and Tribal governments and their representative.

Box 2-4 Strategic Growth Council

Following the approval of Proposition 84 (2006), the Legislature and Governor sought a way to improve State agency collaboration and funding and accountability for the \$5.4 billion in bond funds. In 2008, SB 732 established the Strategic Growth Council to take actions toward coordinating State agencies programs to improve air and water quality, improve natural resource protection, increase the availability of affordable housing, improve transportation, meet the goals of the California Global Warming Solutions Act of 2006, encourage sustainable land use planning, and revitalize urban and community centers in a sustainable manner.

Companion State Plans

State government's leadership and role in the water community requires that the Water Plan incorporate water issues, initiatives, and information from other State agencies. The work of the Steering Committee revealed a broad overlap of water management and complexity of functions related to water management by many State departments.

A comprehensive water plan must embrace companion State programs and policies in order to better understand the full possibilities and constraints for water managers. Update 2009 attempts to cross-reference and coordinate with other State programs to be as accurate, up-to-date, and complete as possible. Key State plans that helped inform this Water Plan's strategic and implementation plans are discussed in Chapter 3 Companion State Plans.

Integrating Water Management

The new and continuing challenges of California's diverse and extreme conditions require a new approach to water management—one that is multi-faceted. Integrated water management approaches water management at all fronts and on many levels—regionally and statewide, for multiple uses and benefits, with various resource management strategies, for sustaining water uses and systems, and while weighing the risks of uncertain futures. Integrated water management employs the principles of integrated resource planning and management (Box 2-5).

Integrated water management actions provide a broad variety of benefits, including meeting existing and future water demands; improving the quality of water sources and supplies; providing flexibility to deal with extreme hydrological events, such as droughts and floods; and restoring and enhancing ecosystems to help sustain our natural resources. An umbrella approach, integrated water management comprises the principles and actions of integrated regional water management and integrated flood management.

Box 2-5 Integrated Resource Planning and Management

Integrated resource planning is a comprehensive approach to resource management and planning that emerged in the late 1980s in the electric power industry. As applied to water management, integrated resource planning is a systems approach that explores the cause-and-effect relationships affecting water resources wherever the planning entity's operations affect water use, quality, and supply. It analyzes all the interrelated water management components in a given region, among regions, or statewide. The focus is on the interrelation of the different water management components with the understanding that changes in the management of one component will affect the others. Because these components are often not confined to the boundaries of a single water management agency, county, or city, a consensus-based, cross-jurisdictional, regional approach may be required to formulate comprehensive, win-win solutions to identified problems.

Integrated Regional Water Management

Over the past decade, California has improved its understanding of the value of regional planning and made significant steps in implementing integrated regional water management.

Regions have opportunities not available to individual water suppliers. Water suppliers that form partnerships with each other and with local governments, Tribes, and organizations in their region can accomplish projects and provide benefits that no single agency can do alone. For example, partnerships are allowing local governments and agencies to:

- improve water supply reliability by establishing emergency connections with neighboring water suppliers;
- increase operational flexibility by participating in regional groundwater and conjunctive management;
- protect water quality by participating in regional watershed management;
- reduce costs by cooperating with other agencies on water and resource management strategies like water conservation and outreach programs;

- facilitate new projects by contributing to local habitat conservation plans; and
- help achieve many other regional resource management objectives.

Partnerships have led to Integrated Regional Water Management plans and regional eligibility for grant funds. Integrated regional water management relies on a diversified portfolio of water strategies. Early coordination with land planning agencies will help water suppliers and land planners anticipate and plan for future growth, and ensure that additional regional growth will not exceed water suppliers' capabilities. Ultimately, regional partnerships will enable optimal and effective management of water and other resources within a region, and the resulting regional plans will provide efficient solutions, consider other resource issues, and enjoy broad public support.

Proposition 84 on the November 2006 ballot provides for \$1 billion dollars of additional State government investment in integrated regional water management. Recent experience in the Proposition 50 IRWM grant program, as well as other bond-funded grant programs for water supply projects, indicates that bond funds can provide significant leverage for investment of local funds, which could result in an investment of as much as \$5 billion in the state's water infrastructure and programs as a result of the proposition. This investment could result in water supply improvements of 1.2 million acre-feet of water annually (see Table 2-1) and many other regional benefits like improving water quality, healthier ecosystems, and greater flood protection.

Table 2-1 Propositions 13 and 50 program costs and water yield benefits

Grant program	Water supply and demand reduction benefits (in af/year)	Bond funding (in million\$)
Proposition 13		
Groundwater Storage	340,000	\$245.0
Water Use Efficiency	60,000	\$65.0
Southern California Integrated Watershed Program	175,000	\$235.0
Water Recycling	130,000	\$40.0
Subtotal	705,000	\$585.0
Proposition 50		
Water Use Efficiency	34,600	\$27.5
Desalination	31,000	\$46.0
Integrated Regional Water Management (estimated)	500,000	\$400.0
Subtotal	565,000	\$473.0
Total	1,260,000	\$1,058.0

af = acre-feet

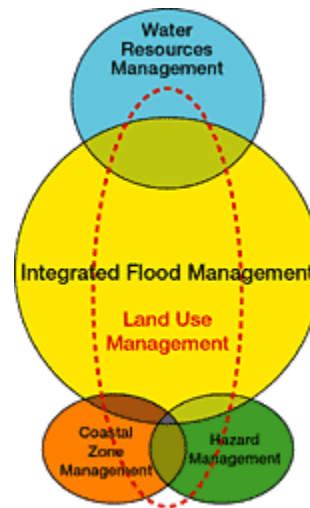
(from Benefits of Investment in Integrated Regional Water Management, October 2006)

Integrated Flood Management and Emergency Response

Many Californians currently face unacceptable risk of harm and damage from floods. The personal safety and economic stability of large segments of our population rely on flood management systems that do not meet modern engineering standards. The need to improve public safety through integrated flood management is urgent as more people have chosen to live and work in flood-prone areas and climate changes make large floodflows more likely.

Floodplains are formed by periodic inundation and the deposition of sediment. Over time, the repeated process creates a landform that is favorable for human settlement, due to the relatively flat land, good soils, and easy access to water. Sparse settlements have grown into urban areas, greatly complicating the task of flood management, as many people have chosen to live in locations that are within historic floodplains.

Traditionally, flood management practices largely focused on reducing flooding and susceptibility to flood damage through physical measures intended to store floodwaters, increase the conveyance capacity of channels, and separate rivers from adjacent populations. Although this approach may reduce the intensity and frequency of flooding, it limits the natural role of floodplains and relies on a false premise that flood protection can completely eliminate flooding.



(figure from <http://www.apfm.info/ifm.htm>)

In recent years, flood managers have recognized the potential for natural watershed features to reduce the intensity or duration of flooding. Undeveloped floodplains can store and slowly release floodwaters. Wetlands can act as sponges, soaking up floodwaters, filtering runoff, and providing opportunities for infiltration to groundwater. Healthy forests and other open spaces can slow runoff during smaller flood events, reducing peak flows, mudslides, and sediment loads in streams.

A challenge for flood managers is to integrate these natural functions with more traditional flood protection methods, thus reducing floodflow peaks and their subsequent impacts during small and frequent flood events, while simultaneously providing other water resource benefits. To address this integration, the FloodSAFE California initiative and this update of the Water Plan promote the concept of integrated flood management, a comprehensive approach to flood management that considers land and water resources at a watershed scale within the context of integrated water management and aims to maximize the benefits of floodplains, minimize the loss of life and damage to property from flooding, and recognize the benefits to ecosystems from periodic floods.

Integrated flood management does not rely on a single approach to flood management, but instead uses various techniques, including traditional (meaning structural) flood protection projects, non-structural measures (such as land use practices), and reliance on natural watershed functions, to create an integrated flood management system. Depending on the characteristics of individual watersheds, this may include the flood-specific management strategy introduced in Update 2009 (Volume 2)—flood risk management—as well as other resource management strategies that can provide flood management benefits including agricultural land stewardship; conjunctive management; conveyance; ecosystem restoration; forest management; land use

planning and management; surface storage; system reoperation; urban runoff management; and watershed management.

Adapting to Climate Change

With the state's water resources already stressed, additional stress from climate change will only intensify the competition for clean, reliable water supplies. While doing its part to reduce greenhouse gas emissions and expand the use of clean energy sources (called *mitigation strategies*), California's water community must concentrate its efforts on *adaptation strategies* to respond to the anticipated changes. The Intergovernmental Panel on Climate Change (Fourth Assessment Report 2007) states that adaptation "will be necessary to address impacts resulting from the warming which is already unavoidable due to past emissions." As understanding of climate change increases, the challenge for California's water community is to develop and implement strategies that improve resiliency, reduce risk, and increase sustainability for water and flood management systems and the ecosystems upon which they depend. See discussion of AB Scoping Plan in responses section, Chapter 4 California Water Today.

Water managers must play dual roles when it comes to climate change; they must engage in both mitigation and adaptation.

- *Mitigation* refers to the reduction of greenhouse gas (GHG) emissions from water-related energy use. Water utilities use energy to reliably provide quality water to customers, while wastewater utilities in turn use energy to safely collect, treat, and dispose of wastewater to protect public health and the environment. GHG emissions reduction is a critical responsibility of water managers, and efficiency in water and energy use should be pursued at every opportunity. At the same time, though, water already provides enormous benefits to California's energy system and climate change mitigation efforts by generating hydroelectric power, California's largest source of GHG emissions-free energy.
- *Adaptation* refers to the ways in which our society and culture will need to change to cope with a changing climate. Several of the water plan objectives and actions will help California adapt to climate change and are ready for immediate adoption.

Planning for Uncertainty, Risk, and Sustainability

Update 2009 acknowledges that two initiatives—expand integrated regional water management and improve statewide water and flood management systems—are central to securing reliable and clean water supplies through 2050. To enhance their effectiveness, Update 2009 incorporates three key considerations into the planning approach:

- 1) Recognize and reduce uncertainties inherent in the system.
- 2) Assess the risks that can hamper successful system management and select management practices that reduce the risks to acceptable levels.
- 3) Keep an eye toward approaches that help sustainability of the resources and water and flood management systems.

We elaborate on this approach in Chapter 5 Managing an Uncertain Future.

Reducing Uncertainty and Assessing Risk

Today, as part of integrated water management (which includes integrated *regional* water management and integrated *flood* management), California's water managers must recognize that conditions are changing and that they will continue to change. Traditional approaches for predicting the future have been based on projecting past trends into the future. Today, there is better understanding that strategies for future water management must be dynamic, adaptive, and durable. In addition, the strategies must be comprehensive and integrate physical, biological, and social sciences and economics.

California's water management system is large and complex and requires a great deal of cooperation and collaboration among decision-makers at all levels of State, federal, Tribal, regional, and local entities. Update 2005 stressed the importance of a common analytical approach for these entities to understand and manage the system, especially when management actions compete for the same resources. The entities must make sound investments that balance risk with reward, given today's uncertainties and those that may occur in the future.

Update 2009—as will future California Water Plan updates—promotes adopting a common approach for data standards and for understanding, evaluating, and improving regional and statewide water management systems. DWR will develop the Water Plan Information Exchange (Water PIE) for accessing and sharing data and networking existing databases and Web sites, using GIS software to improve analytical capabilities and developing timely surveys of statewide land use, water use, and estimates of future implementation of resource management strategies.

This approach incorporates consideration of uncertainty, risk, and sustainability into planning for the future:

- 1) **Uncertainty.** There are enormous uncertainties facing water managers in planning for the future. How water demands will change in the future, how ecosystem health will respond to human use of water resources, what disasters may disrupt the water system, and how climate change may affect water availability, water use, water quality, and the ecosystem are just a few uncertainties that must be considered.
- 2) **Risk.** Each undesirable event has a certain chance of occurring and a set of consequences. For example, a chance of a levee failure with a certain sized flood event can be estimated with associated economic and human consequences. Likewise, a specific severity of drought may occur on average of once during a 30-year period and carry economic consequences of many billions of dollars.

By reducing the uncertainties, the “true” risks can be better understood. Chapter 5 Managing an Uncertain Future and Chapter 6 Integrated Data Analysis provide more detailed description of this approach, risk assessment, and reducing uncertainty.

Managing for Sustainability

California's water resources are finite and require more careful management for sustainability of resources than has been practiced during the first 150 years of this state's history. A system that is sustainable should meet 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 the ecosystem, water use, land use, and other uses are given current management practices and expected future changes. It has become increasingly evident to decision-makers, water managers, and planners that we need to manage for the long-term sustainability of resources. This is especially true in the face of climate change, population growth, degraded and dysfunctional ecosystems, and evolving environmental mitigation measures.

Given the uncertainties and risks in the water system, some management strategies may provide for a more sustainable water supply, flood management, and ecosystem than another set of management strategies. Recognizing that change will continue to occur and that additional uncertainties and risks are likely to surface in the future, water management actions must be dynamic, adaptive, and durable.

PLACEHOLDER Box 2-6 Place Value on Sustainability (quote)

Multiple Future Scenarios

Prior to Update 2005, water plan updates based planning assumptions on a single likely future. Now, the use of multiple future scenarios provides decision-makers, water managers, and planners more information about how different management actions might perform under a range of possible future conditions and uncertainties.

By considering different potential future conditions (scenarios), Update 2009 provides a broad assessment of different combinations of resource management strategies (response packages) that can be used to manage our water and flood systems more sustainably. These provide a statewide view of potential response package.

Update 2009 uses three baseline future scenarios to better understand the implications of future conditions on water management decisions. The scenarios are referred to as baseline because they represent changes that are likely to occur without additional management intervention beyond those currently planned. Each scenario affects water demands and supplies differently. Each scenario includes assumptions about how 80 different factors, like population or irrigated farmland, would describe its future. These are factors over which the water community has little control.

- **Scenario 1 – Current Trends.** Recent trends are assumed to continue into the future. In 2050, nearly 60 million people live in California. Affordable housing has drawn families to the interior valleys. Commuters take longer trips in distance and time. In some areas where urban development and natural resources restoration has increased, irrigated crop land has decreased. The state faces lawsuits on a regular basis: from flood damages to water quality and endangered species protections. Regulation lacks a comprehensive plan, creating uncertainty for local planners and water managers.
- **Scenario 2 – Blueprint Growth.** Private, public, and governmental institutions form alliances to provide for more efficient planning and development that is less resources intensive than current conditions. Population growth is slower than currently projected—about 45 million people live here. Compact urban development has eased commuter travel. Californians embrace water and energy conservation. Conversion of agricultural land to urban development has slowed and occurs mostly for environmental restoration and flood protection. The state’s legislature has enacted several comprehensive programs to improve water quality, protect fish and wildlife, and protect communities from flooding.

- **Scenario 3 – Expansive Growth.** Future conditions are more resource intensive than existing conditions. Population growth is faster than currently projected with 70 million people living in California in 2050. Families prefer low-density housing, and many seek rural residential properties, expanding urban areas. Some water and energy conservation programs are offered but at a slower rate than trends in the early century. Irrigated crop land has decreased significantly where urban development and natural restoration have increased. Protection of water quality and endangered species is driven mostly by lawsuits, creating a patchwork of regulations.

More detailed descriptions of these scenarios are in Chapter 5 Managing an Uncertain Future.

Regional Water Portfolios – an Array of Management Responses

A response package is a set of resource management strategies from Volume 2 designed to provide multiple benefits for a given region under conditions described by a given future scenario. The performance of several different response packages can be compared for each scenario to determine the best performing package. Having response packages for multiple future scenarios can help identify management responses that perform well when compared across the array of possible future conditions.

No single response package will work for all of California as each region has its own needs, constraints, and opportunities. Water Plan participants and regional representatives have been working to define response packages for each region. Chapter 5 Managing an Uncertain Future presents examples of possible resource management strategies that may be part of response packages for each region.

Response packages help decision-makers, water managers, and planners practice integrated water management, develop Integrated Regional Water Management plans, and promote integrated flood management, thereby providing resource and infrastructure sustainability.

Conclusion

With new urgency, this Water Plan follows the Update 2005 road map to sustainable water uses and reliable water supplies—to use water efficiently, improve water quality, and expand environmental stewardship. Update 2009 marks a new chapter in the way California must manage her water resources. It is the state’s blueprint for integrated water management and sustainability—statewide and regional.

We must adapt and evolve California’s water systems more quickly and effectively to keep pace with ever changing conditions now and in the future. Population is growing while available water supplies are static and even decreasing. Climate change, as evidenced by changes in snowpack, river flows, and sea levels, is profoundly impacting our water resources. The Delta and other watersheds and ecosystems continue to decline. The state’s current water and flood management systems are increasingly challenged by legal remedies and regulatory protections, with economic and societal consequences. The entire system—water and flood management, watersheds, and ecosystems—has lost its resilience and is changing in undesirable ways.

So where do we start? — From all directions! — It is imperative that decisions about California water account for and reduce uncertainty and risk, and that investments make our water management systems, flood protection systems, and ecosystems more sustainable. New to this

Water Plan is an integration of water resource and flood management. This approach will be challenging, but it can yield significant public safety benefits, protect water supplies, and improve the environment. A prime and urgent example is developing and then implementing a durable Delta Plan for its sustainable management.

Update 2009 may truly be called California's Water Plan because it embodies countless deliberations between and among the brightest minds in government and private agencies, Tribes, cities, farms, industry, and environmental organizations. As a result, Update 2009:

- Provides an investment guide for State, federal, Tribal, and regional strategies to reduce water demand, improve operation efficiency, increase water supply, improve water quality, advance environmental stewardship, and improve flood management;
- Integrates objectives and strategies from numerous State agencies and initiatives and offers more than 100 near- and longer-term actions to achieve them;
- Describes 27 resource management strategies that each region can select from to develop a unique and diverse water portfolio suitable for managing an uncertain future; and
- Outlines new analytical methods and tools to help plan for future effects of climate change, population growth and development patterns, economic change, and other factors outside the water community's control.

We must invest—significantly and uninterrupted—in California's aging and increasingly inadequate water and flood systems. Californians have recognized the need to invest in our water and flood systems, but funds from bond to bond are neither sufficient nor sustainable. California needs more stable and continuous sources of revenue to invest in statewide and regional integrated water management and to build resilience back into the state's water and flood management systems, as well as into the watersheds, groundwater basins, and ecosystems that support them.

Recommendations

California Water Plan Update 2009 identifies the most pressing water management issues and challenges faced statewide and by regions and the available opportunities and assets. Chapter 7 lays out objectives and related actions to achieve reliable water supplies and sustainable water uses through 2050. But impediments remain. They can and may keep California from realizing the goals and full implementation of this Water Plan. Through the Water Plan process, we have developed recommendations to reduce and remove these impediments and leverage resources and opportunities.

These recommendations are as varied as the constraints they are intended to change—institutional, legal, knowledge, information, skills/capacity, resources, funding, schedule, and public awareness. They are directed at decision-makers and water users throughout California (referred to as *California*) and at the executive and legislative branches of State government, DWR, and other State agencies (referred to as *State government*).

California needs to act on these recommendations to improve drought contingency planning, make flood management improvements, and adapt to climate change. California needs to invest the water and flood bond funds that the public has approved to implement these recommendations and realize this Water Plan.

1. California should implement the Water Plan's related actions as the key to achieving its goals and objectives.

State, federal, Tribal, regional, and local governments and agencies, public and private organizations, and water users should implement the actions of California Water Plan Update 2009 to achieve its goals and objectives. They should in partnership adopt an integrated, collaborative, multi-benefit, and transparent approach toward resource planning and management. Californians, acting as individuals, make daily choices that can impact water supplies and quality and not waste water. State government should create incentives for citizens to aggressively participate in water protection and conservation efforts. These efforts may be modeled after energy conservation efforts conducted by the State.

By statute, the California Water Plan cannot mandate actions nor authorize spending for its recommendations. But in preparing the California Water Plan, DWR has sought participation from other State agencies, federal, Tribal, regional, and local governments and agencies, the public, and nongovernmental entities. California's local and regional entities, State agencies, federal agencies, and California Native American Tribes should use the California Water Plan as a guiding document. California Water Plan Update 2009 reflects our common priorities and values that promote sustaining California's water and environmental resources and ensuring safe, high-quality, and reliable water supplies and improved flood protection for our communities and industry.

2. California needs a water finance plan with stable and continuous funding from an array of revenue sources for statewide and regional integrated water management. The finance plan should recognize the critical role of public-private partnerships and the principle of beneficiary pays; include alternative revenue sources; and guide investment decisions based on sustainability indicators.

State government should lead an effort to identify and prioritize funding strategies to finance regional and statewide water resources planning, programs, infrastructure, monitoring, and technology research. State government needs to clearly articulate when, and for what actions, to use public investments from State and federal sources. California's water finance plan should recognize the critical role of local public and private partnerships and the principle of beneficiary pays; include alternative revenue sources like State bonds, incentive-based water pricing and user fees; and guide investment decisions based on sustainability indicators.

Although recent bond measures have provided a down payment for improving California's water and flood systems and the environment, the State Legislature should conduct a formal assessment of State and local financing mechanisms to provide a continuous, stable source of revenue to sustain the programs described in Water Plan Update 2009. Activities in need of certainty and continuity in funding include but are not limited to the following: regional water planning and management for water efficiency, quality and supplies; environmental stewardship; updating county and city general plans to address climate change impacts and adaptation; inspection and maintenance of flood management facilities; observational networks; and water-related climate change adaptation research. State and local governments and water purveyors should implement

incentive programs and cost-avoidance on-bill financing to promote water efficiency improvements and retrofits by urban water users.

3. California should manage its water resources with ecosystem health and water supply reliability and quality as equal goals, with full consideration of public trust uses whenever feasible.

Healthy, functioning ecosystems and reliable water supplies are primary and co-equal goals for management that can sustain California's water resources and management systems. To achieve this, State government should exercise continuous supervision over California's water resources, the flows and quality of rivers, streams and navigable waters, and the lands beneath them and from which they flow.

State government should protect public trust uses whenever feasible. State agencies should explicitly consider public trust values in the planning and allocation of water resources. State government should protect the public's rights to commerce, navigation, fisheries, recreation, ecological preservation, and related beneficial uses.

4. State government should effectively lead, assist, and oversee California's water resources and flood planning and management activities that regions cannot accomplish on their own.

State government should lead water and flood planning and management activities that: (a) regions cannot accomplish on their own, (b) the State can do more efficiently, (c) involve interregional, interstate, or international issues, or (d) have broad public benefits.

These activities include, but are not limited to: (1) preparing California Water Plan updates as a public forum to integrate State, federal, Tribal, regional, and local plans to meet the state's future agricultural, urban, and environmental water demands and water management objectives; (2) operating and maintaining the State Water Project and State-federal flood management system; (3) providing regulatory oversight to protect public health and safety and public trust values, including water quality, environmental protection, flood management, and dam safety; (4) participating in major regional initiatives, and (5) forming public-private partnerships to implement regional programs like the Colorado River Quantification Settlement Agreement.

5. State and federal government should lead and support planning, monitoring, and scientific research to help California adapt and mitigate for climate change impacts.

State and federal government should lead and support efforts to predict and prepare for the effects of global climate change on our water resources, water management systems, and water-dependent ecosystems. State and federal government should work with and assist researchers to monitor, predict, and prepare for the effects of global climate change on California's water and flood protection systems and the environment. DWR should develop alternative flow data to help State, federal, Tribal, regional, and local governments and planners test the potential effects of global climate change on different resource management strategies; and to help water facility operators test alternative reoperation strategies.

California is already seeing the effects of climate change on hydrology (snowpack, river flows), storm intensity, temperature, winds, and sea levels. Planning for, mitigating, and adapting to these changes, particularly their impacts on public safety and reliable, high-quality, long-term supplies of water, will be one of the most significant challenges facing water managers this century.

Although the existing system has some capacity to cope with climate variability, extreme climatic events may become more frequent with growing populations in their path, demanding improvements in drought and flood preparedness and emergency response and recovery plans.

6. California should improve the coordination of land use policies and practices; economic development decisions; and water, flood, and natural resource planning and management.

The success of water and flood management actions and infrastructure depends on land use policies and practices and development decisions made by local officials and planners, State, federal, and Tribal land managers, the building industry, and homeowners. Closer integration of land use policies and practices, development decisions, and water and flood planning and management can help protect groundwater recharge areas, help restore natural processes in watersheds to increase infiltration, slow surface runoff and reduce flood peaks, improve water quality, augment the natural storage of water, and increase regional self-sufficiency.

To achieve this:

- State government should assist local governments with data, technical, and financial assistance.
- Local governments should update General Plans to address drought, water quality, and flood risks in light of existing and future climate change impacts.
- Regional partnerships should develop and update Integrated Regional Water Management plans in close coordination with local General Plans; State, federal and Tribal land management plans; transportation Regional Blueprint Plans; and energy, ecosystem, and resource plans.
- Federal agencies as trustees of about 50 percent of California lands should partner with local, State, and Tribal governments and agencies in developing their land and resource management plans.

7. California should renovate and improve its aging water, wastewater, and flood infrastructure.

California should maintain, rehabilitate, and improve aging water and flood infrastructure—especially drinking water, sewage treatment and collection systems, and flood protection facilities—operated by State, federal, Tribal, and local entities.

State government should lead an effort, with input from public and private owners of water infrastructure, to identify and prioritize water infrastructure maintenance of key components with regional or statewide significance. Improvements may include refinements in the way water systems are operated, additional conveyance capacity, and new water storage. This effort should also identify and implement financing strategies for continued public investments in the resulting infrastructure maintenance plan.

8. California should articulate and update as needed the roles, authorities, rights, and responsibilities of federal, Tribal, State, and local governments and agencies responsible for water resource and flood planning and management.

California should articulate and update as needed the respective roles, authorities, rights, and responsibilities of federal, Tribal, State, and local governments and agencies responsible for water and flood planning and management, and update them as needed. In light of the growing role of

Tribal and local agencies and governments in regional water and flood planning and management, State government should redefine how to empower and assist them to implement their regional water plans and programs.

State government should also conduct an internal review of how State agencies do business and identify ways to make these agencies more efficient, effective, and responsive to Californians. State government should continue an interagency water forum like the State Agency Steering Committee for Water Plan Update 2009 to strengthen coordination among State agencies responsible for water supplies, water quality, flood protection, environmental stewardship, and ocean water desalination.

9. California should increase public understanding and awareness of the value and importance of water, water quality, and water conservation.

Water is a limited resource, and State government needs to do more to assist water agencies in developing and disseminating information about the importance of water issues. Despite experiencing significant droughts and floods, Californians are not aware of the critical issues confronting them. It is the responsibility of State government to help the public understand the importance of efficient water use and how to protect water quality.

DWR and other State agencies should make public outreach and education a priority and achieve efficient dissemination of materials by forming partnerships with respected groups experienced in education, while avoiding advocacy organizations. Outreach should include high-quality, balanced water information, including programs as part of early grade school education. With education, Californians will have a better understanding of all available water opportunities and challenges, including desalination, recycling, groundwater and surface water storage, and especially conservation, which must become a public ethic.

Box 2-1 Update 2009 Strategic Plan Elements: Vision, Mission, Goals, Guiding Principles, and Objectives

Vision

California has 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.

Mission

Updating the California Water Plan provides State, federal, Tribal, regional, and local governments and organizations a continuous strategic planning forum to collaboratively:

- Recommend strategic goals, objectives, and near-term and long-term actions that would conserve, manage, develop, and sustain California's water resources and management systems;
- Prepare response plans for floods, droughts, and catastrophic events that would threaten water resources and management systems, the environment, property, and the health, welfare and livelihood of the people of California; and
- Evaluate current and future water conditions, challenges, and opportunities.

Goals

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.

Guiding Principles

1. **Use a broad, stakeholder-based, long-view perspective for water management** to (1) promote multi-objective planning with a regional focus, (2) coordinate local, regional, inter-regional, and statewide initiatives, (3) recognize distinct regional problems, resources, and

assets, and (4) emphasize long-term planning (30-50 year horizon) while identifying near-term actions needed to achieve the plan.

2. **Promote management for sustainable resources on a watershed basis.** Wisely use natural resources to ensure their availability for future generations. Promote activities with the greatest multiple benefits regionally and statewide. Consider the interrelationship between water supplies, water conservation, water quality, water infrastructure, flood protection, energy, recreation, land use, economic prosperity, and environmental stewardship on a watershed or ecosystem basis.
3. **Increase regional drought and flood preparedness.** Evaluate and implement strategies that reduce the impacts of droughts and floods in the region. In California, drought contingency planning and integrated flood management are important components of regional water planning.
4. **Increase regional self-sufficiency.** Implement resource management strategies that reduce dependence on long-term imports of water from other hydrologic regions, particularly for meeting additional future water demands and during times of limited supply such as a drought or interrupted supply after a catastrophic event, such as an earthquake. As part of a diverse water portfolio, short-term water transfers between regions that are environmentally, economically, and socially sound, can help increase regional self-sufficiency overall.
5. **Promote regional coordination and collaboration among local governments and agencies, public and private organizations, and Tribal governments and Tribal communities,** particularly those that are involved in activities that might affect the long-term sustainability of water supplies, water quality, and flood protection within the region. Regional planning should include a public review process with open and transparent decision-making and substantive Tribal consultation, as well as education and outreach for the public, tribes, stakeholders, and decision-makers.
6. **Determine values for economic, environmental, and social benefits, costs, and tradeoffs to base investment decisions on sustainability indicators.** Evaluate programs and projects recognizing economic growth, environmental quality, social equity, and sustainability as co-equal objectives. When comparing alternatives, determine the value of potential economic, environmental, and social benefits; beneficiaries; costs; and tradeoffs. Include a plan that avoids, minimizes, and mitigates for adverse impacts.
7. **Incorporate future variability, uncertainties, and risk in the decision-making process.** Use multiple future scenarios to consider drivers of change and emerging conditions, such as population growth and climate change, when making planning, management, and policy decisions.
8. **Apply California's water rights laws, including the longstanding constitutional principles of reasonable use and public trust, as the foundation for public policymaking, planning, and management decisions on California water resources.** Recognize that certain natural resources including water, tide and submerged lands, the beds and banks of navigable rivers, and fish and wildlife resources are owned by the public and held in trust for present and future generations of Californians. Effectively applying existing water rights laws and the twin principles of reasonable use and public trust will provide water for future generations while protecting ecosystem values.
9. **Promote environmental justice—the fair treatment of people of all races, cultures, and incomes.** State-sponsored or public-funded resource management projects must include meaningful community participation in decision-making, and consider factors like community demographics, potential or actual adverse health or environmental impacts, and benefits and burdens of the project on stakeholder groups.
10. **Use science, best data, and local and indigenous peoples' knowledge in a transparent and documented process.** When appropriate and possible, use data, information, planning methods, and analytical techniques that have undergone scientific review.

Objectives

The following is a summary of the Water Plan's 13 objectives. Find further discussion of these objectives and more than 90 related actions in Chapter 7 Implementation Plan.

1. **Expand Integrated Regional Water Management.** Promote, improve, and expand integrated regional water management to create and build on existing partnerships that are essential for California water resources planning, sustainable watershed and floodplain management, and increasing regional self-sufficiency.
2. **Use and Reuse Water More Efficiently.** Use water more efficiently with significantly greater water conservation, recycling, and reuse to help meet future water demands and adapt to climate change.
3. **Expand Conjunctive Management of Multiple Supplies.** Advance and expand conjunctive management of multiple water supply sources—surface water and groundwater—to prepare for future droughts and climate change.
4. **Protect Surface Water and Groundwater Quality.** Protect and restore surface water and groundwater quality to safeguard public and environmental health and secure California's water supplies for beneficial uses when feasible.
5. **Expand Environmental Stewardship.** Practice, promote, improve, and expand environmental stewardship to protect and enhance the environment by improving watershed, floodplain, and instream functions and to sustain water and flood management systems.
6. **Practice Integrated Flood Management.** Promote and practice integrated flood management to provide multiple benefits including better emergency preparedness and response, higher flood protection, more sustainable flood and water management systems, and enhanced floodplain ecosystems.
7. **Manage a Sustainable California Delta.** Promote and practice management for a sustainable California Delta by setting as co-equal goals a healthy Delta ecosystem and a reliable water supply for California and by recognizing the Delta as a unique and valued place.
8. **Prepare Prevention, Response, and Recovery Plans.** Prepare prevention, response, and recovery plans for floods, droughts, and catastrophic events to help residents and communities make decisions that reduce the consequences of these events when they occur.
9. **Reduce Energy Consumption of Water Systems and Uses.** Reduce the energy consumption of water and wastewater management systems to mitigate greenhouse gas emissions (water-related strategies in AB 32 Scoping Plan).
10. **Improve Data and Analysis for Decision-making.** Improve and expand monitoring, data management, and analysis to support decision-making in light of uncertainties that support integrated regional water management and flood and water resources management systems.
11. **Invest in New Water Technology.** Identify and fund applied research on new water technology to help carry out water programs and better manage water systems.
12. **Improve Tribal Water and Natural Resources.** Develop Tribal consultation, collaboration, and access to funding for water programs and projects to have more sustainable Tribal water and natural resources.
13. **Ensure Equitable Distribution of Benefits.** Increase the participation of disadvantaged communities in State processes and programs to achieve fair and equitable distribution of benefits, to consider mitigation of impacts from the implementation of State programs and policies, and to ensure that these programs and policies address the most critical public health threats in disadvantaged communities.

Box 2-2 Director's Perspective on Challenges and the Way Forward

“California will continue to grow as long it is seen as a land of opportunity. Partially because of economic and social pressures elsewhere, this perception -- and reality -- of California will continue to act as a magnet for millions of people.

Our challenge is to provide water -- a clean, reliable supply -- to protect our natural environment, the health of our people and our economy. In the 1960s, when the State Water Project was under construction, Department of Water Resources Director William E. Warne noted, ‘California's destiny is never, so long as the state grows, to resolve her water problem, but always to work at it.’

The decisions we are making now -- how efficiently we use water and where we build our new communities -- dictate how much flexibility we will have in the future and what the quality of life will be for the next generation of Californians.

Most land- and water-use decisions in California are made at the local and regional levels, though rarely is such decision-making integrated. For example, land-use planning that encourages low-density development greatly increases per-capita water demand.

Such development patterns also inevitably lead to more dependence on automobiles, which are the largest source of climate-changing greenhouse gas emissions in California. The resulting climate changes will make it more difficult to maintain reliable water supplies.

Low-density development imposes other costs as well -- it is generally more costly and difficult to provide flood protection for sprawling suburbs, and this growth reduces the availability of agricultural land. In all, such land uses threaten our water-supply reliability and are costly in many other ways. Land use and water planning must be better integrated to ensure that we make informed resource management decisions.

The statewide participation of cities and counties in the development of Integrated Regional Water Management plans is the best way to address water issues today in a way that will have positive benefits for the future. Successful IRWM planning increases regional self-sufficiency through the implementation of regionally appropriate water resource strategies, thereby assuring the quantity and quality of water for future generations of Californians.”

Lester Snow, Director of California Department of Water Resources. “Better Land Use, Better Water User” in Los Angeles Times April 9, 2008

Box 2-6 Place Value on Sustainability (quote)

“Because environmental considerations were secondary at best in the middle of the 20th century, the back bone system we operate today is characterized by very high – and unnecessary – levels of conflict between economic and environmental objectives. The clash between these values in recent years has resulted in political and legal conflict, gridlock, and mutual deterioration in the state of both the economy and the environment.

The central policy goal today, as the Delta Vision recognizes, is to reduce this conflict by investing in a sustainable system. The standard of value in the past for the water industry has generally been the creation of more supply to justify an infrastructure or water management investment. That standard must yield in the future to reflect the enormous value of a sustainable system – one that can provide reliable supplies and a recovering environment far into the future. Similarly, some interests advocate reduced supply as an appropriate measure of value. Both perspectives are off-base. The real prize today is a sustainable system. This may or may not result in increased water supply. The point is that a sustainable system by itself justifies billions in expenditures.”

*Timothy Quinn, Executive Director Association of California Water Agencies,
“Financing the Delta Vision,” April 2008*

The Association of California Water Agencies has formally adopted policy principles embracing environmental and economic sustainability as co-equal priorities for water management in California. The ACWA’s *Environmental and Economic Sustainability Policy Principles* can be found in Volume 4 Reference Guide of this Water Plan.