WHERE WE AGREE:
Building Consensus on Solutions to California's Urban Water Challenges

Heather Cooley, Peter H. Gleick, Kristina Donnelly,
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ABOUT THE PACIFIC INSTITUTE

The Pacific Institute envisions a world in which society, the economy, and the environment have the water they need to thrive now and in the future. In pursuit of this vision, the Institute creates and advances solutions to the world's most pressing water challenges, such as unsustainable water management and use; climate change; environmental degradation; food, fiber, and energy production; and basic lack of access to fresh water and sanitation. Since 1987, the Pacific Institute has cut across traditional areas of study and actively collaborated with a diverse set of stakeholders, including leading policymakers, scientists, corporate leaders, international organizations such as the United Nations, advocacy groups, and local communities. This interdisciplinary and independent approach helps bring diverse groups together to forge effective real-world solutions.

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UC Davis Extension, the continuing and professional education arm of the University of California at Davis, is an internationally recognized leader in educational outreach for individuals, organizations, and communities. For more than 50 years, UC Davis Extension has provided forward-thinking, career-focused courses for working professionals.

ABOUT THE CALIFORNIA-NEVADA SECTION OF THE AMERICAN WATER WORKS ASSOCIATION

Established in 1881, the American Water Works Association (AWWA) is the largest nonprofit, scientific and educational association dedicated to managing and treating water, the world's most important resource. AWWA provides solutions to improve public health, protect the environment, strengthen the economy, and enhance our quality of life. Founded in 1920, the California-Nevada Section is a recognized leader in education and certification of water professionals. Serving over 6,000 members, CA-NV AWWA works for excellence in water utility operations and management, along with policies that support clean, safe, affordable, and reliable water for all.

ABOUT THE UC BERKELEY WATER CENTER

The Berkeley Water Center is an interdisciplinary gathering of over 70 academic faculty, researchers, and postdoctoral and graduate students across several departments at the University of California at Berkeley and the Berkeley National Laboratory pursuing studies in water and promoting water-related research. Together with external partners in the industry, government and nonprofits, researchers at the center incorporate public health, water infrastructure, engineering, natural resource management, agriculture, economics, and law in their studies to cast a wide net across the university community.

ABOUT THE AUTHORS

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Peter Gleick, Ph.D., is a world-renowned expert, innovator, and communicator on water and climate issues. In 1987 he co-founded the Pacific Institute. Dr. Gleick developed the first analysis of climate change impacts on water resources and the earliest comprehensive work on water and conflict, and defined the basic human need and right to water—work that has been used by the United Nations and in human rights court cases. Also, he pioneered and advanced the concepts of the "soft path for water" and "peak water." He received the prestigious MacArthur "genius" Fellowship and was elected as both an Academician of the International Water Academy in Oslo, Norway, and a member of the U.S. National Academy of Sciences. He serves on the boards of numerous journals and organizations and is the author of many scientific papers and nine books. Dr. Gleick holds a B.S. from Yale University and a master's degree and Ph.D. from the University of California, Berkeley.

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Timothy Worley, Ph.D., is the executive director of the California-Nevada Section of the American Water Works Association (AWWA). He leads the largest AWWA section, with 6,000 members working together for excellence in water utility operations and management, and policies that support clean, safe, affordable, and reliable water for all. With master's and doctorate degrees in public policy from Claremont Graduate University, Dr. Worley previously held management positions with the Metropolitan Water District of Southern California, the Rivers and Mountains Conservancy, and Three Valleys Municipal Water District.

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David Sedlak is the Malozemoff Professor in the Department of Civil and Environmental Engineering at UC Berkeley, co-director of the Berkeley Water Center and deputy director of the National Science Foundation engineering research center for Reinventing the Nation's Urban Water Infrastructure (ReNUWIt). Professor Sedlak's research has addressed oxidation of trace organic contaminants with hydrogen peroxide and persulfate, formation of disinfection byproducts, such as NDMA, and the use of natural and engineered systems for potable water reuse. In addition to his research program, Sedlak is the author of *Water 4.0* and serves as editor of the *ACS journal Environmental Science & Technology*.

ACKNOWLEDGMENTS

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Contents

FIGURES

INTRODUCTION

California is entering the fifth year of a drought of extreme proportions. While adverse consequences of the drought are widespread, the drought is also focusing attention on, and producing a rare opportunity to address, longstanding and intensifying water resource challenges. The Pacific Institute—in collaboration with the University of California (UC) Berkeley Water Center, the American Water Works Association (AWWA) California-Nevada Section, and the UC Davis Collaboration Center—convened a diverse group of stakeholders to identify solutions that support the sustainable management of California's water resources. Across California, too much effort is spent on areas of disagreement, and with few exceptions, too little effort is made to find areas of agreement where progress could be made more quickly. The goal of these meetings was to shift away from a focus on disputes toward a focus on positive steps forward. Using a consensus-based approach, the group identified urban water strategies and policies for which there was broad agreement, defined as those areas where at least 75% of the participants were in agreement or strong agreement and no more than 15% in disagreement or strong disagreement.

These areas of broad agreement are presented in this report. While wide-ranging, the strategies and policies presented are not exhaustive. Each stakeholder likely supports strategies and policies beyond those identified in this report and may prioritize among them differently. Moreover, the application of these strategies, and preferences among them, may vary according to local needs. Additional work could be done to fill in gaps and prioritize among the strategies identified. Moreover, greater stakeholder engagement may be needed to reflect a broader set of perspectives and to advance these strategies. Nevertheless, these areas of agreement should help policymakers and water managers focus on solutions that have a strong likelihood of public and political support.

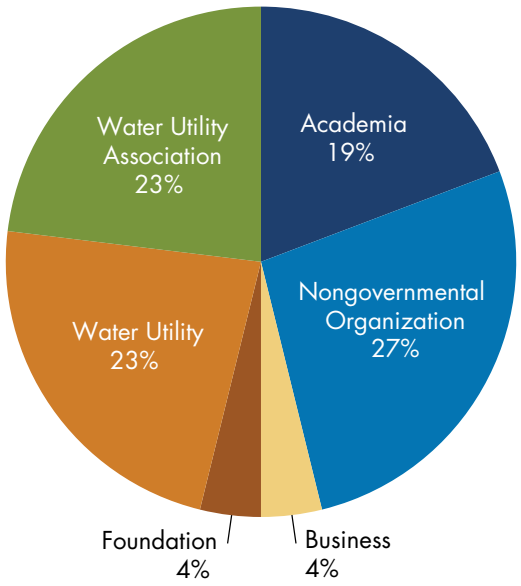
BACKGROUND AND DESIGN OF THE "WHERE WE AGREE" WORKSHOPS

Workshop participants represented a diverse set of stakeholders and included approximately 20 representatives from select water utilities in the urban sector, groups with representation from water utilities, community and environmental groups that focus on California water issues, academics, and members from the private sector (Figure 1). While the composition of the workshop was broad, we note that we did not have representation from some stakeholder groups, such as agriculture or small water systems in rural areas. The focus of these meetings was issues of importance to urban water users. While the organizers and participants in the workshops recognize the very significant challenges facing agricultural water users, those issues were agreed to be beyond the scope of this project. Given the success of these meetings, we believe that similar

processes could be developed to address the specific needs, opportunities, and constraints of rural water systems and the agricultural sector.

Figure 1.

Breakdown of meeting participants.



The first "Where We Agree" workshop, held in Oakland, California, in May 2015, was a high-level discussion about challenges and opportunities for urban water systems in California. Prior to the workshop, the organizers developed 41 test statements in five key areas: (1) demand management; (2) local and regional water supplies; (3) integrated water resource management; (4) ecosystem protection and restoration; and (5) water rates, financing, and governance. Each statement was read to the group, and participants had a chance to ask clarifying questions and engage in brief discussion. Participants then used anonymous electronic voting to indicate their level of agreement with the statement: strongly disagree, disagree, neutral, agree, and strongly agree. Participants were divided into smaller groups to explore opportunities and challenges in these key areas. Each participant selected three areas of greatest interest and rotated through each of these small-group discussions. The small groups then came back together at the end of the day to report on their conversations. This information was captured for use in this report.

The second and third workshops were held in September in Los Angeles, California, and in December 2015 through a web conference to discuss specific strategies and policies that might be most useful and successful in addressing long-standing water management challenges in the five key areas noted above. Prior to these workshops, the organizers used the reports from the first workshop to propose sets of test policy alternatives in each area. Participants again used anonymous electronic voting to indicate their level of agreement with policy statements. Results were available in real time to permit detailed discussion on areas of agreement and disagreement. In some cases, statements were modified based on the discussion in order to reach agreement. In this final report, we present those water strategies and policies for which there was broad agreement, defined as those statements where at least 75% of the participants were in agreement or strong agreement and no more than 15% in disagreement or strong disagreement.

This summary report was prepared by the Pacific Institute with contributions by the UC Berkeley Water Center, the UC Davis Collaboration Center, and the American Water Works Association (AWWA) California-Nevada Section. All meeting participants reviewed these findings and were given the option to remove their name from this report; however, the inclusion of participant names in this report does not imply their specific support or disagreement with any particular finding. Since the goal of the discussion was to uncover areas of broad agreement, it is important to affirm that, for any finding, there could be some who were in disagreement.

WATER CONSERVATION AND EFFICIENCY

Water conservation and efficiency are widely recognized as essential for meeting current and future water needs in urban areas. California has made real progress in implementing water conservation and efficiency over the past several decades. Without these past efforts, our current challenges would be much more severe, demands on limited water supply would be much higher, and ecosystem damage would be much worse. Despite this progress, there is still potential to further reduce our demand for water in urban areas without affecting the services and benefits that water provides, due in part to technological advances, rising water costs, and shifts in public perception about the value of water.

There was agreement that additional opportunities exist for urban conservation and efficiency improvements across California, including *inside* and *outside* homes, businesses, and institutions. Workshop participants recognized that conservation and efficiency are an effective and environmentally sound way to meet future water needs. They acknowledged that there is a mix of tools to capture these savings, including pricing, incentives, standards and codes, and education and outreach. In addition, they agreed that water utilities should take all economically reasonable measures to prevent, detect, and repair leaks in their operating systems. Meeting participants broadly supported the following strategies for expanding water-use efficiency in California's urban areas:

- **Public Education Campaign**: There is growing awareness of the value of water and the importance of water efficiency and other water stewardship practices. Participants supported strategic investments in a well-coordinated, statewide public education and messaging campaign. However, they cautioned that research is needed on how to do it most effectively and that these investments should not be so large that they take away from other priorities.
- **Funding**: Many water conservation and efficiency measures are acknowledged to be cost-effective compared to new supplies. At the scale of the individual water user, however, some measures, such as installing efficient appliances or industrial equipment, may have a higher initial cost than inefficient ones, even if they provide savings over the life of the device. While some customers may be able and willing to make these investments, others may not. Incentives can help increase uptake of efficiency measures and technologies. Participants supported expanding funding

High-efficiency clothes washer.

Source: iStockphoto.com/polasen.

opportunities for water-efficiency investments, including options such as using cap-and-trade revenue, utility energy-efficiency budgets, and pollution fees.

- **Metering**: Water meters have been in use for decades in most California communities; however, despite a requirement for metering on all water connections by 2025, more than 200,000 urban water connections in the state remain unmetered at this time (Pacific Institute 2014). Metering has been shown to reduce household water use when it is coupled with effective pricing structures (Maddaus 2001; Tanverakul and Lee 2013) and is essential for effective management of water systems (e.g., for identifying leaks). Most multi-family units have a single master meter and are billed for water and wastewater service through rent or some other fee that is not tied to actual water use. While it may be difficult to retrofit some older multi-family buildings, submeters have been shown to reduce water use by 15% (Mayer et al. 2004) and could be implemented in new and some older developments. Participants supported comprehensive, universal metering in all of California's urban areas, taking into account the cost-effectiveness of retrofitting existing older multi-unit buildings.
- **Retrofit-on-Resale Ordinances**: In 2009, California enacted Senate Bill (SB) 407 (Padilla), which requires the replacement of all inefficient plumbing fixtures in commercial and residential properties with efficient models by 2017 for single-family homes and 2019 for multi-family homes and commercial properties. The law makes compliance a condition for some—but not all—building permits after 2017, but otherwise, the law as written does not provide a mechanism to ensure compliance. Participants supported the use of retrofit-on-resale ordinances to accelerate the uptake of efficient appliances and fixtures in existing developments. While participants were not asked about enforcement of a retrofit-on-resale ordinance, other discussions suggested a need and support for improving ordinance enforcement.
- **Evaluation, Measurement, and Verification of Water Efficiency Measures**: Currently, data on the benefits of water-use efficiency measures are limited. Yet accurate, transparent, and consistent assessments of water-efficiency measures are needed to demonstrate the performance, and ultimately the value, of investments in these areas. Participants supported the development of uniform methods and approaches for evaluating the water and non-water benefits of water-use efficiency activities and programs, also referred to as evaluation, measurement, and verification, or EM&V. This information can inform funding decisions and increase support for these decisions.
- **Water System Audits**: Water efficiency discussions are often focused on more customary targets on the customer's side of the meter (or the demand side); however, significant opportunities for efficiency improvements may also be present in the water utilities' own distribution systems. Although an old mind-set of "acceptable unaccounted water" has long been discredited, utility best practices for identifying non-revenue water losses (both "apparent" and "real") are only now becoming more widespread. A first step on the path to economically sound water-loss control is to produce a system water audit with high validity, using standard methods and freely available audit tools. SB 555, enacted in 2015, now requires annual auditing by urban water utilities with expert validation. Without weighing in on any specific bill pending at the

time, workshop participants endorsed state support and encouragement of validated audits as a means for increasing utilities' efficiency and reducing real water losses.

Urban landscapes were identified as a key opportunity for improving urban water-use efficiency. According to a Department of Water Resources report on California waste balances (Department of Water Resources 2014), about half of California's urban water use, equivalent to 4.2 million acre-feet per year, is outdoors, largely for watering landscapes but also for such uses as washing cars or sidewalks and filling pools or spas. About 70% of outdoor use is residential, representing use by both single- and multi-family homes. Commercial businesses and institutions account for the remaining 30% of outdoor water use. The highest rates of outdoor use are in the hot, dry areas of the state and in communities where water is inexpensive. In these areas, outdoor water use can account for up to 80% of total urban use.

Low water-use landscape in Oakland, California.

A major focus of drought response efforts in urban areas has been to promote a shift toward more sustainable urban landscapes in California. Participants were broadly supportive of these efforts and of the following strategies:

- **Landscape Standards and Metrics**: State and local landscape standards are inconsistent, and many do not include key elements of sustainable landscapes, such as onsite stormwater retention. Effort is needed to more clearly define and align these standards. Workshop participants were supportive of developing water standards and metrics for sustainable urban landscapes.
- **Model Water Efficient Landscape Ordinance**: California's first model landscape ordinance was adopted in 1992 and was updated in 2009 and 2015. The most recent revision, prompted by Governor Jerry Brown's Drought Executive Order of April 1, 2015, includes a reduction in the landscape water budget as well as incentives for greywater usage and recommendations for onsite stormwater retention. Anecdotal evidence suggests that enforcement of the landscape ordinance has been poor in some areas. Workshop participants supported further enhancements to the model landscape ordinance and efforts to track and improve enforcement.
- **Education and Outreach**: Public interest in sustainable, California-friendly landscapes is at an all-time high because of the drought. Participants supported expanding education and outreach on California-friendly landscapes, targeted and tailored to the right audiences, including those responsible for making landscaping decisions.

Participants supported expanding efforts to promote efficiency among commercial, industrial, and institutional customers. Of the water delivered to urban areas each year, commercial businesses (such as hotels, restaurants, and office buildings) and institutions (such as schools, prisons, and hospitals) account for about 23% of California's urban water use (DWR 2014). Another 6% is used by industry to manufacture a wide range of products, from chemicals and electronics to food and beverages. Past conservation and efficiency efforts were largely focused on residential customers. While there are some unique challenges in realizing water savings potential from nonresidential customers, there is growing interest in capturing these savings. Participants broadly supported the following:

- **Water Use Benchmarks and Performance Targets**: Benchmarking allows a business to compare its performance with that of a similar organization. It can help the business identify potential water and financial savings, as well as track and monitor progress toward a performance target. Water use will vary across business types and sectors but can be tailored to a particular business by normalizing the water use according to a performance indicator. A performance indicator for a hotel, for example, may be the number of rooms, while that of an elementary school may be the number of students. Participants supported developing water benchmarks and performance targets for commercial, industrial, and institutional sectors using a standardized classification system, such as the North American Industry Classification System (NAICS).
- **Best Management Practices**: Water best management practices (BMPs) refer to a set of proven, widely accepted technologies and practices that businesses can implement to achieve water savings and meet performance targets. Participants supported the development of BMPs for commercial, industrial, and institutional sectors as well as reporting on implementation of those BMPs. In 2013, the state's Commercial, Industrial, and Institutional Task Force released a two-volume report identifying BMPs for common end uses (e.g., toilets, faucets, and cooling towers) and for some industry-specific end uses. This report could serve as a useful starting point for establishing BMPs for major water-use sectors.

WATER RECYCLING AND REUSE

Water recycling and reuse provides a reliable, local water supply that reduces vulnerability to droughts and other water-supply constraints. It can also provide economic and environmental benefits; for example, by reducing energy use, diversions from rivers and streams, and pollution from wastewater discharges. Despite these benefits, in many urban areas water is used once, treated, and discharged into the environment. According to a 2009 statewide survey, the most recent survey available, California only beneficially reuses about 13% of the wastewater generated each year (State Water Board and DWR 2012).[1] In some areas, far higher rates of water reuse occur; for example, recycled water meets roughly 28% of total water demands in the Irvine Ranch Water District's service area.

Participants recognized and supported water reuse at a variety of scales using a range of treatment technologies, from a more decentralized building- or district-scale system to a more centralized municipal scale. For example, a home

1 Onsite reuse—including the use of greywater—is also practiced in communities across California, although data are not available to estimate these volumes.

may be equipped with a greywater system that collects wastewater from a clothes washer and uses it irrigate a garden. Likewise, wastewater may be treated at a centralized facility and used for nonpotable purposes like irrigation or to boost potable water supplies through groundwater recharge, surface-water augmentation, or direct introduction into a drinking water system.

Implementing water reuse is a site-specific decision that needs to reflect local conditions. In coastal areas, for example, recycling treated wastewater before discharging it into an ocean or estuary provides a new source of supply and reduces pollution in the receiving body of water. However, recycling water in the upper watershed could reduce water available for important downstream uses, such as for fish habitat, recreation, and drinking water. Simply put: one size does not fit all. Workshop participants broadly supported expanding water recycling and reuse in California by pursuing key opportunities and overcoming barriers, as follows:

- **Water Reuse Permitting and Funding**: Funding is often cited as a significant impediment to expanding recycled water programs and meeting the state's water recycling goals. Proposition 1, which earmarked $625 million for recycled water projects, provided a significant boost in available funding. Likewise, in response to the governor's drought declaration, the State Water Resources Control Board (State Water Board) provided low-interest loans for recycled water projects through the Clean Water State Revolving Fund. Yet, a recent survey by WateReuse California identified a capital funding need of nearly $5.2 billion to develop recycled water projects across the state. Workshop participants supported coordinating and streamlining water reuse permitting and funding.

Recycled water pipeline in San Rafael, California.

Source: Data Instincts.

- **Recycled Water Storage**: One barrier for expanding nonpotable water reuse is the seasonal mismatch between the availability of recycled water and the demand for that water. The availability of recycled water is driven by indoor water use, which is fairly constant throughout the year. However, demand for recycled water, especially for irrigation, peaks during the summer months. As a result, excess nonpotable recycled water may be discharged into a nearby water body during the winter months. Greater balancing of the supply and demand of recycled water would allow for more efficient and effective use of that resource. Workshop participants supported removing barriers to allow for increased storage of nonpotable recycled water to meet seasonal water demands.

Las Gallinas Valley Water District's advanced water purification facility in San Rafael, California.

Source: Data Instincts.

- **Water Reuse Regulations**: Water reuse has been practiced in California for more than 100 years. Most applications of water reuse, however, have been for irrigation and other nonpotable uses. There is growing interest in reusing highly purified wastewater that has been subject to advanced treatment for potable applications. A recent study found that potable reuse could augment the state's water supplies by as much as 1.1 million acre-feet per year (Raucher and Tchobanoglous 2014). State regulations for using recycled water to replenish groundwater were finalized in 2014. With advice from an expert panel, the State Water Board is currently developing uniform criteria for augmenting drinking water reservoirs with advanced treated recycled water and is examining the feasibility of developing criteria for direct potable reuse. Meeting participants supported providing resources and staffing to the State Water Board to expedite the development of potable reuse regulations and to update nonpotable reuse regulations.
- **Greywater Usage**: Greywater refers to wastewater from a household or office building that has not been contaminated with fecal matter or large amounts of organic matter; i.e., all streams except from toilets and kitchen sinks. Sources of greywater include sinks, showers, baths, clothes washers, or dishwashers. Title 24 of the California Plumbing Code, which sets the regulatory standards for greywater systems, was updated in 2009 to provide greater flexibility in developing these systems. Local entities, such as municipalities and county governments, can pass local ordinances that are at least as effective as the state standard. A model greywater ordinance has not been developed, and as a result, there are varying standards for greywater systems across the state. Meeting participants supported removing barriers to the implementation of onsite greywater usage in a range of settings. They also supported the development of a model local greywater ordinance for new buildings in order to protect public health and promote effective greywater systems in California.
- **State Water Reuse Road Map**: In 2002, the state Recycled Water Task Force, a collaborative effort of the state and multiple stakeholders, issued a report with recommendations to address obstacles, impediments, and opportunities for expanding recycled water usage in California. Many of these recommendations have been achieved, and both potable and nonpotable water reuse applications have expanded. Today, a different

set of challenges and opportunities has emerged. Meeting participants supported convening a similar group to create a water reuse road map for potable and nonpotable applications. Such a road map would identify and resolve key regulatory issues, governance challenges, funding gaps, and other obstacles to expanding water reuse in California, while recognizing economic and geographic differences.

- **Onsite Water Reuse**: There is growing interest in treating and reusing wastewater for onsite nonpotable purposes, such as irrigation, cooling towers, toilets, or urinals. The City and County of San Francisco, for example, recently adopted an ordinance requiring that new buildings over 25,000 square feet use onsite treated nonpotable water or other alternate water sources for toilet and urinal flushing and irrigation. Workshop participants supported incentivizing decentralized, onsite reuse systems in new commercial and large multi-family residences, while protecting public health.

Rainwater harvesting system in Los Angeles, California.

Source: TreePeople.

STORMWATER CAPTURE

For more than a century, storm water has been viewed as a liability, and most urbanized areas were designed to remove this water as quickly as possible. Urban runoff, however, washes pesticides, metals, and other pollutants into inland and coastal waters and can worsen erosion in these systems. While urban areas cover 6% of California's land area, runoff from these areas is the primary source of impairment for 10% of all rivers, lakes, and reservoirs, and 17% of all estuaries (State Water Board 2010). In addition to improving water quality, stormwater capture and use in urban areas can provide a local water-supply option and enhance the reliability of the water supply. Thus, stormwater is increasingly viewed as both a pollutant source challenge that must be better managed and as an asset in a water-short state. Workshop participants broadly supported expanding stormwater capture in California's urban areas through the following approaches:

- **Stormwater Policies and Guidelines**: Stormwater runoff is regulated as a point-source discharge under the current regulatory framework. Yet, stormwater runoff behaves differently than other point discharges, such as those from a wastewater treatment plant, because it is diffuse, episodic, and highly variable, based on the size and frequency of the rainfall event. Current stormwater permit requirements tend to be prescriptive; that is, they are based on implementation of BMPs

Bioswale on Elmer Avenue in Los Angeles, California.

Source: Council for Watershed Health.

rather than performance. This approach has hindered the development of multi-benefit projects that provide water-supply and water-quality benefits. Workshop participants supported the adoption of stormwater policies and guidelines to facilitate stormwater capture and use, including specific ones described below.

- **Stormwater Retention Incentives**: Incentives are one tool for promoting stormwater capture and use in urban areas, and they can take a variety of forms. These may include financial rebates to new or existing developments that install rain barrels or rain gardens. They may also include reductions in stormwater fees or fast-track reviews for projects that incorporate low-impact design elements, such as permeable pavement or green roofs. Workshop participants supported establishing incentives for stormwater retention to supplement water supplies in municipalities.
- **Stormwater Capture and Use Goals**: California has adopted several statewide goals to promote more sustainable use of the state's water resources. For example, SBX7-7 and more recently Governor Brown's Executive Order B-29-15 set forth goals to reduce urban water use. In 2013, the state established a goal to increase the annual use of recycled water over 2002 levels by at least one million acre-feet by 2020 and at least two million acre-feet by 2030. Similarly, the state adopted a goal to increase annual stormwater use over 2007 levels by at least 500,000 acre-feet by 2020 and at least one million acre-feet by 2030. Workshop participants supported the development of more detailed, regional stormwater capture and use goals for California.

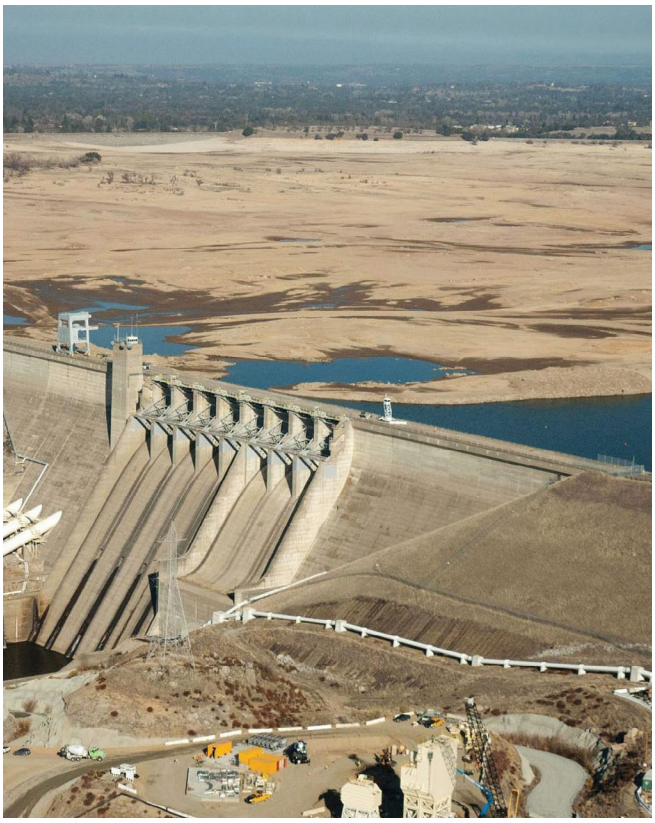
DROUGHT PLANNING

California is in the midst of the most severe drought on instrumental record and, by some estimates, the most severe in a millennium. Climate-change research suggests that the state's climate will become more variable, with more frequent and intense periods of drought. The current drought has highlighted weaknesses in California's water-management systems as well as opportunities to improve planning and resilience for future droughts. Workshop participants broadly supported improving drought planning through the following approaches:

- **Drought Planning**: Urban water suppliers with 3,000 or more customer connections (or those that provide more than 3,000 acre-feet of water annually) are required to develop an Urban Water Management Plan (UWMP) every five years. Current UWMP guidelines require the

water utility to develop a drought contingency plan for a single dry year (generally the lowest annual runoff for a watershed since 1903) and for multiple dry years (lowest average runoff for a watershed for three or more consecutive years). Given the severity of the current drought and projected climate change, workshop participants supported expanding state and local drought planning to include droughts of longer duration, such as 10 years, as well as expected climate changes.

- **Data and Information**: Data on water-supply conditions and water use are essential for developing effective drought responses and changing water policies when needed. Drought response efforts in California, however, have been hampered by limited data in some circumstances. Workshop participants supported enhancing data collection and real-time analysis to inform decision making and improve drought response.
- **Water Transfers**: For several decades, California has maintained a water market that allows for the temporary, long-term or permanent transfer of the right to use water in exchange for compensation. Temporary water transfers among and between agriculture, municipalities, and the natural environment can allow for a response to drought or other short-term water-supply constraints and help moderate the economic impacts of those constraints. However, water transfers, even short-term ones, can result in socioeconomic and environmental impacts that are often not well understood. Workshop participants supported a process to identify and reduce constraints on short-term water transfers during drought, provided that they are protective of ecosystems and communities.



Evidence of drought at Folsom Lake, California.

Source: California Department of Water Resources.

FINANCING WATER SYSTEMS

California's water and wastewater infrastructure consists of hundreds of reservoirs and treatment plants and thousands of miles of pipes that deliver clean water to homes and businesses and remove wastewater. This infrastructure has provided enormous social, economic, and environmental benefits. Yet, there is mounting evidence that the state's water and wastewater infrastructure is deteriorating. In 2012, for example, the American Society of Civil Engineers gave California's water infrastructure a "C" grade and estimated that $4.6 billion in investment is needed every year over the next decade simply to raise that grade to a "B" (ASCE 2012). Additional investments will be needed to meet the needs of a growing population, restore ecosystems, and adapt to climate change.

According to Hanak et al. (2014), local revenue sources, such as water and sewer bills and property taxes, provide 84% of the $30 billion in annual water-related spending. The state and federal government contribute far less, at 12% and 4%, respectively. Workshop participants agreed on the need for reliable and adequate funding for water-related infrastructure and broadly supported the following:

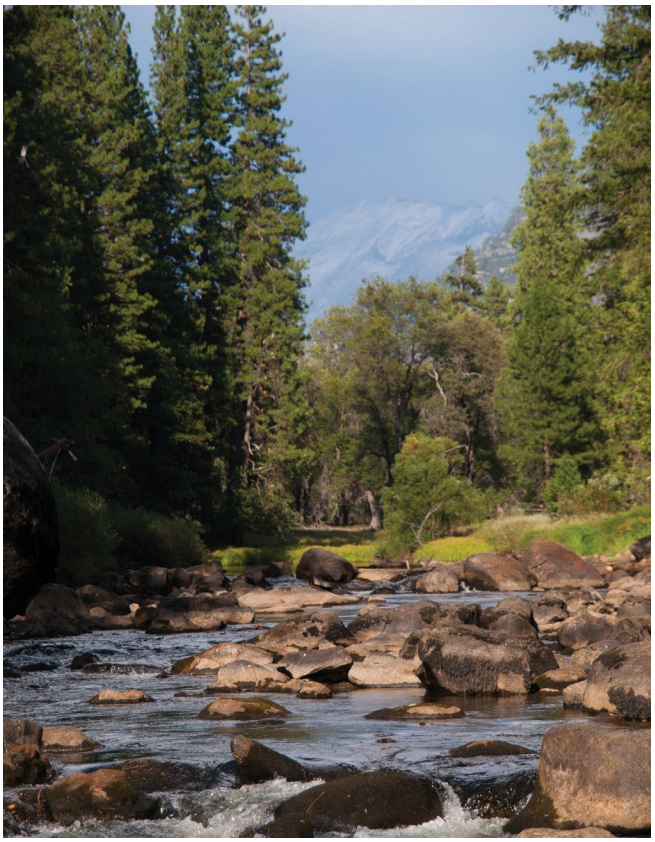
- **Beneficiary-Pays Principle**: There was strong support for the beneficiary-pays principle, whereby those who benefit from a system would pay for it. Participants noted that despite this agreement, there is a lack of understanding about what this principle means and a potential for varying interpretations. Moreover, it was acknowledged that the environment "doesn't have a checkbook" and that some individuals and communities simply cannot afford to pay for even basic water service. Thus, participants agreed that while the beneficiary-pays principle is a key component of financing water systems, it may be necessary to support those unable to pay for these benefits. In particular, participants supported increasing targeted funding and technical assistance for disadvantaged communities.
- **Watershed-Based Volumetric Fee**: There is growing awareness that state bonds are inadequate and unreliable for making needed water-related investments. Moreover, the use of general obligation bonds can conflict with the beneficiary-pays principle. Volumetric water-use and water-extraction fees have been popular topics over the past several years, as the water community seeks to develop alternative financing mechanisms. Participants broadly supported the creation of a watershed-based volumetric water-usage fee to fund water projects that would be paid for by beneficiaries. Some participants, however, disagreed with a usage fee, expressing a specific concern about a loss of local control and lack of specificity about the use of these funds. Safeguards would be needed to ensure that funds remain under local control and that uses are consistent with the beneficiary-pays principle.
- **Rate Structures**: Investments in water systems will be made largely through water rates, which is consistent with the beneficiary-pays principle outlined above. In addition to ensuring that water rates are sufficient to cover the cost to build, operate, and maintain systems, water rates can also provide a means of reducing waste and inefficiency by sending a price signal to the customer. Participants supported developing documents and providing assistance for water utilities to develop rate structures that promote efficiency while maintaining revenue sufficiency and reliability and meeting equity and affordability needs; such guidance would be especially helpful for smaller systems that may not have the technical capacity or resources to develop these structures. Additionally, participants supported tiered pricing for water rates.
- **Reform Proposition 218**: Proposition 218, passed by California voters in 1996, has several provisions that affect water pricing. One key element is the requirement that water utilities must establish a clear connection between water rates and the cost of providing water service. Some interpretations of this requirement limit the water utilities' ability to use water rate revenue to provide discounted water rates for low-income customers or to pay for the administration of low-income assistance programs. Workshop participants supported reforming Proposition 218 to allow for the use of water rate revenue for low-income assistance programs. Additionally, while recognizing the

importance of linking cost to rates, participants supported reforming Proposition 218 to give water suppliers additional flexibility to develop conservation tiers that charge more (on a per-gallon basis) for high water users. Conservation tiers may already be allowed under Proposition 218, assuming that the agency's underlying cost structure is consistent with tiered pricing; however, participants acknowledged that reform may provide additional support to those concerned about Proposition 218 limitations.

WATERSHEDS AND INTEGRATED WATER MANAGEMENT

Water management activities—water supply, wastewater, drainage, and flood management—are often conducted by multiple entities, with little coordination among these institutions. Integration across water management activities, however, can foster innovative solutions and result in projects that provide multiple services and benefits. For example, low-impact development (LID) is an alternative stormwater management approach that uses soils, vegetation, and permeable surfaces to allow stormwater to infiltrate back into the ground. LID can minimize the impacts of polluted urban runoff on local streams and the marine environment, reduce local flooding, recharge local groundwater supplies, and improve water supply reliability and flexibility. Integrating such stormwater solutions with water supply, habitat restoration, and floodplain management solutions can be both cost-effective and resource-conserving. The state of California has put substantial resources and emphasis into Integrated Regional Water Management (IRWM) programs to encourage such integrated, multi-benefit solutions.

Workshops participants agreed that planning for projects and programs at a watershed scale can help identify potential impacts across projects, sectors, and agencies, as well as recognize synergies and multi-benefit projects. They further agreed that an integrated approach can build and support capacity for better water decision making and implementation. Finally, they acknowledged that investments in restoring natural systems are needed to assure the continuation of ecosystem services that benefit human society and promote environmental stewardship as a societal goal. Workshop participants broadly supported watershed and integrated management through the following approaches:



Stream in Yosemite National Park, California.

Source: William Warby/Wikipedia Commons.

- **Watershed Restoration Projects**: Restoring degraded watershed resources and functions are necessary to improve surface-water quality, protect ecosystems, and provide maximum beneficial use of future water resources.

However, restoration funds are available sporadically, often tied to state bonds or specific mitigation or compensation efforts, such as the Bay-Delta. Workshop participants supported expanding and protecting funding for watershed restoration projects.

- **Best Practices for Integrated Regional Water Management (IRWM)**: Participants supported the overall concept of IRWM and noted that it is "simply the way water resources are managed today, at least in developed economies." Participants also recognized, however, that the "state of the art" of IRWM and, in particular, some of the programs being encouraged and funded in California, are not as robust, creative, or "integrated" as they need to be. Participants believed strongly that integrated water management is essential and could include stormwater capture, projects promoting water recycling, water quality cleanup efforts, habitat improvement/restoration with flood management, and other multi-benefit projects. However, they identified institutional barriers to the state's IRWM process and noted a lack of training and guidance on its implementation. Moreover, while guidelines have been created for IRWM implementation, these guidelines are too broad. Participants supported a comprehensive and critical evaluation of IRWM programs in order to develop voluntary best practices for its implementation.
- **Road and Highway Design Standards**: Road construction, maintenance, and improvements can have adverse impacts on the water quality of streams and wetlands and aquatic environments for a variety of reasons, including by increasing erosion, blocking water flow, impeding habitat use, and disturbing riparian zones. Caltrans plays a major role in highway design specifications and standards across the state, as do cities, counties, and others involved in road construction or permitting. Improving road design specifications can provide a great potential to improve watershed functions and health. Workshop participants supported developing and implementing consistent and protective road and highway design and maintenance standards to protect aquatic environments and water quality.

WATER STORAGE

Water storage, especially surface water storage, remains a contentious issue in California, with strong disagreements about the degree to which it can solve the state's water challenges. While views diverged on surface storage, there was much broader agreement on the need for investment in groundwater storage and for the re-operation of reservoirs:

- **Investment in Groundwater Storage**: California's overdrafted aquifers provide significant water storage opportunities and could help the state respond to a changing climate, and particularly to reductions in snowpack due to warmer temperatures. With passage of the Sustainable Groundwater Management Act and Proposition 1 (the Water Quality, Supply, and Infrastructure Improvement Act of 2014), there is tremendous interest and opportunity in boosting groundwater recharge in California. While groundwater recharge projects are being developed in parts of California, there is no strategy so far to integrate these resources with one another, with surface reservoirs, or with the infrastructure needed to move water around. Workshop participants supported prioritizing investment in cost-effective groundwater storage projects and developing an integrated

strategy for maximizing the potential of these projects.

- **Reservoir Reoperation**: California's water reservoirs are often operated for multiple purposes, such as for recreation, flood control, and water storage. Rules for operating these reservoirs were established decades ago and have rarely been modified to reflect improvements in hydrologic modeling, weather forecasting, or changing climate conditions. Workshop participants supported state and federal agencies seeking opportunities to reoperate storage projects and re-evaluate engineering designs, reservoir operating rules, contingency plans, and water-allocation policies in order to improve statewide reservoir management. Participants were also interested in exploring opportunities for cost-effective, environmentally appropriate offstream surface storage to deal with reduced snowpack.

CONCLUSIONS

The recent severe drought provides a rare opportunity to improve California's long-standing and intensifying water resource challenges. Within the water community, we have spent far too much time, energy, and money debating a small set of controversial projects or water-management strategies instead of exploring opportunities for developing technologies and policies with broad support. The meetings held as part of the "Where We Agree" project successfully identified many key areas of agreement around urban water issues supported by a broad set of stakeholders. These include expanding investments in water conservation and efficiency, reuse, stormwater capture, and groundwater storage; better integrating water management at the watershed scale; improving ecosystem management and drought planning; providing targeted support to disadvantaged households and communities; and a number of other areas of agreement. This effort represents a first step toward building consensus on solutions to address California's urban water challenges. We encourage local, state, and federal policy makers to take advantage of this information in their efforts to improve the effective management and operation of California's urban water systems.

References

American Society of Civil Engineers (ASCE). (2012). California Infrastructure Report Card 2012. Reston, Virginia.

Department of Water Resources. (2014). California Water Balances, 1998–2010. California Department of Water Resources. Sacramento, California.

Hanak, E., B. Gray, J. Lund, D. Mitchell, C. Chappelle, A. Fahlund, K. Jessoe, J. Medellin-Azuara, D. Misczynski, J. Nachbaur, and R. Suddeth. (2014). Paying for Water in California. Public Policy Institute of California. San Francisco, California.

Maddaus, L. (2001). Effects of Metering on Residential Water Demand for Davis, California. Brown and Caldwell. Sacramento, California.

Mayer, P. W., E. Towler, W. B. DeOreo, E. Caldwell, T. Miller, E. R. Osann, E. Brown, P. J. Bickel, and S. B. Fisher. (2004). National Multiple Family Submetering and Allocation Billing Program Study. Aquacraft, Inc. and the East Bay Municipal Utility District.

Pacific Institute. (2014). Metering in California. Oakland, California. Retrieved on February 24, 2016 from http://pacinst.org/wp-content/uploads/sites/21/2014/09/pacinst-metering-in-california.pdf.

Raucher, R., and G. Tchobanoglous. (2014). The Opportunities and Economics of Direct Potable Reuse. WateReuse Research Foundation. Alexandria, Virginia.

State Water Resources Control Board (State Water Board). (2010). 2010 Integrated Report: Clean Water Act Section 303(d) List/305(b) Report. Sacramento, California.

State Water Resources Control Board (State Water Board) and Department of Water Resources (DWR). (2012). Results, Challenges, and Future Approaches to California's Municipal Wastewater Recycling Survey. Sacramento, California.

Tanverakul, S. A., and J. Lee. (2013). Residential Water Demand Analysis Due to Water Meter Installation in California. World Environmental and Water Resources Congress 2013: Showcasing the Future. American Society of Civil Engineers.

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