

WETTER OR NOT

Actions to Ease the Current Drought and Prepare for the Next



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Background: California is in the third year of a severe drought. Our state's climate is characterized by extreme variability alternating between prolonged droughts and major floods, a situation that is predicted to worsen as climate change progresses. Yet, we fail to manage our state's finite water resources to prepare for increasing exposure to more severe and prolonged droughts. We can and must change that approach. The state has made some progress in the past year, but we have a very long way to go. There are many actions that can be taken to reduce the vulnerability of California's water supplies, economy, and environment to future droughts. . The above organizations offer the following recommendations for state, federal and local agencies and legislators, to help California respond to the current drought and improve our preparedness for future extended droughts.

The current drought is affecting different regions in different ways. Low flows have devastated salmon runs, increased disease outbreaks among migrating birds, worsened the condition of other native wildlife, and contributed to an outbreak of potentially toxic blue-green algae (the cause of the shutdown of Toledo's water supply earlier this year) in the Delta. Many cities, rural communities, and agricultural interests have suffered severe impacts. Some of the most vulnerable communities who are 100% reliant on groundwater have seen their only sources of water run dry. Hydropower generation has been greatly reduced, leading to increased use of natural gas, with higher costs for customers and increased pollution. If the drought continues, the impacts on all sectors are likely to grow significantly.

The drought's impacts highlight the need for comprehensive action *now* to ensure that California has water policies and supplies that will protect its economy and environment both in the near future and during inevitable future droughts. Australia's decade-long drought should serve as a cautionary case study. One of the lessons learned from Australia's Millennium Drought is the importance of taking ambitious action to reduce demand early – well before it is clear that a dry period will become an extended drought. Such actions can increase stored water to meet future needs.

Indications of the urgent need for a new approach to meeting California's future water demands are all around us:

- Over allocation of surface water, chronic groundwater overdraft, and the decline of aquatic ecosystems all point to the inevitable conclusion that California has exceeded "peak water."¹
- California experienced extended droughts in the 1930s and the 1990s. Paleo climate analysis shows that California has faced many periods of severe drought much longer in duration than our current three-year dry cycle.²
- Climate change is anticipated to increase pressure on aquatic ecosystems and water supplies.
- By 2049, California's population is projected to grow from its current 38 million to 50 million.³

Californians are ready for comprehensive action to tackle these threats. Governor Brown's [California Water Action Plan](#) establishes a broad framework for action to improve water supply reliability, and the State Legislature recently enacted historic legislation to manage California's groundwater resources. Building on the Governor's and the Legislature's willingness to provide leadership, this document recommends specific,

¹ Gleick, P.H. and M. Palaniappan. 2010. Peak Water: Conceptual and Practical Limits to Freshwater Withdrawal and Use. Proceedings of the National Academy of Sciences (PNAS), Vol. 107, No. 25, pp. 11155–11162 Washington, D.C. www.pnas.org/cgi/doi/10.1073/pnas.1004812107 (June 22, 2010)

² Steve Hockensmith, "Why State's Water Woes Could Be Just Beginning," News Center. <http://newscenter.berkeley.edu/2014/01/21/states-water-woes/> (January 21, 2014).

³ California Department of Finance, "NEW POPULATION PROJECTIONS: CALIFORNIA TO SURPASS 50 MILLION IN 2049." http://www.dof.ca.gov/research/demographic/reports/projections/P-1/documents/Projections_Press_Release_2010-2060.pdf (January 31, 2013).

near-term actions at the state, federal, and local levels that are designed to implement the Water Action Plan's broad direction. All of these recommendations respond to the drought. All would also set the stage for a more reliable long-term water supply, a more resilient economy, and a healthier environment. Additional mid and long-range actions are also required, on a broad range of issues. Those actions, however, are beyond the scope of this document.⁴

Drought Response Recommendations: The more than fifty specific recommendations contained within this document reflect the following general approaches:

- **Maximize efficiency now.** Conservation and efficiency are the fastest, cheapest, and most cost-effective response to droughts. Immediate action now can maximize the use of water efficient fixtures and appliances, encourage urban behavior change regarding water use efficiency, accelerate agricultural water efficiency, and improve state water conservation policies and programs.
- **Clearly define and prohibit wasteful and unreasonable use of water.** The State Board should incentivize investments in drought resilient supplies by updating and enforcing the state's constitutional requirement regarding water waste.
- **Invest wisely.** Limited state and federal funds to respond to the drought should be focused on the most effective programs. All water utilities should adopt conservation-based water and wastewater rates, as well as adequate budgets to invest in cost-effective drought resilient water supplies.
- **Lead by example.** State agencies and facilities, including the State Water Project, should demonstrate best practices in the management and efficient use of water.
- **Accelerate water recycling and graywater reuse.** The State Board should complete regulations for indirect potable reuse through augmentation of surface reservoirs. In addition, the Board, DWR, and EPA should launch a major new effort to accelerate investments in indirect and direct potable reuse.
- **Increase the availability and reliability of groundwater supplies.** California lags behind the rest of the nation in groundwater management. State agencies should move rapidly to implement the new groundwater management legislation and to clean up contaminated groundwater, particularly in the San Fernando Valley and in communities that are highly dependent on groundwater.
- **Capture and reuse stormwater.** The State Board should establish comprehensive requirements for stormwater retention by municipalities statewide.
- **Expand smart water storage.** State and federal agencies should seek opportunities to re-operate storage and to develop a new generation of smart water storage projects, with a priority for groundwater projects, that provide environmental benefits and cost-effective dry year water supply benefits.
- **Invest in natural infrastructure.** Restoring river, floodplains, wetlands, meadows, and watersheds can create more resilient landscapes capable of providing flood control, water quality and water storage benefits, and drought refugia for species at risk.

⁴ For example, given that the Bay Delta Conservation Plan is not focused on drought issues, this document does not focus on that process. All of the endorsing organizations have serious concerns about the current direction of BDCP. However, all believe that a comprehensive Delta solution is essential and hope that the BDCP will change direction and succeed. This document reflects a recognition that a Delta strategy alone is not enough to protect the state from droughts.

- **Stabilize vulnerable ecosystems and fisheries.** Agencies should take action now to reduce the vulnerability of natural resources during droughts. Healthy ecosystems increase water supply reliability and protect water quality, typically at less cost than most alternatives.

These approaches can stretch our limited water supplies in the near term and put us on a path to a healthy and sustainable water future. Just three of these tools – efficiency, reuse, and stormwater capture – have the potential to produce up to 14 million acre-feet of new supply and reduced demand on the state’s rivers and groundwater, according to the Pacific Institute, the Natural Resources Defense Council, and Professor Bob Wilkinson of UC Santa Barbara (see Figure 1, below). Together, the potential water supplies from these tools dwarf other potential water sources, including taking more water from the Bay-Delta.

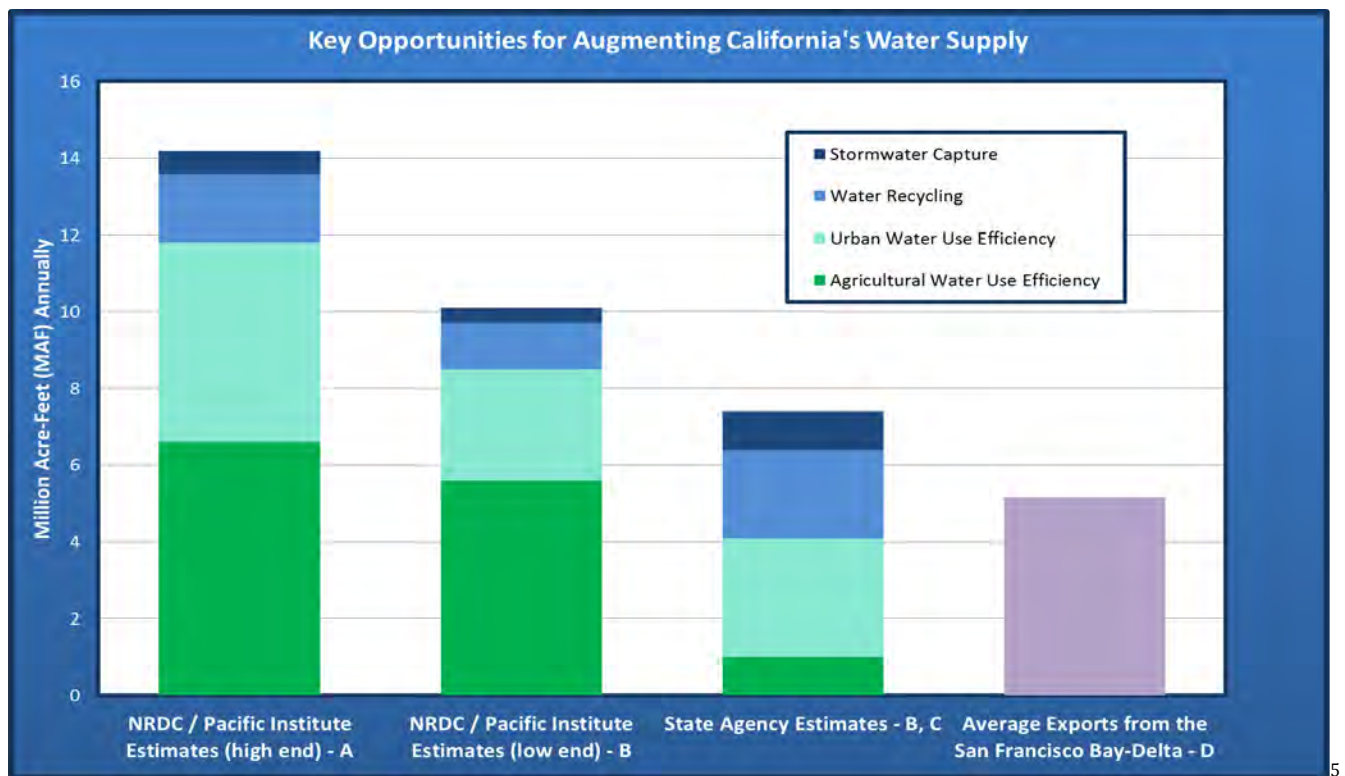


Figure 1 – Quantifying the potential for augmenting California water supplies

⁵ A – Natural Resources Defense Council, Pacific Institute, 2014, ‘The Untapped Potential of California’s Water Supply’ Estimates prepared by NRDC/Pacific Institute/Wilkinson prioritize improvements in efficiency, thereby reducing the estimated potential for water recycling. These estimates are conservative in that they do not account for projected population growth.

B – California Department of Water Resources, 2014, ‘State Water Plan Update, 2013’, Table 1.2 Chart displays ‘high-end’ DWR estimates from State Water Plan Update, 2013

C – California State Water Board, 2013, Recycled Water Policy

D – California Department of Water Resources, 2014, ‘Draft BDCP EIR-EIS’

Detailed Drought Response Recommendations

The following recommendations are organized by issue area, and include actions to be undertaken by state and federal agencies, Congress and the State Legislature, and by local water agencies.

Efficiency, Reuse and Stormwater

1. Water Use Efficiency – General

1A. Stop waste and unreasonable use. The State Water Resources Control Board should apply the waste and unreasonable use doctrine and define minimum standards for acceptable water use by sector, thereby advancing efficient water use across all sectors. The State Board's recent adoption of modest statewide water conservation requirements was an important and historic step forward. However, California's constitutional prohibition on waste and unreasonable use remains a powerful yet underutilized tool. What is lacking is a systematic reassessment of the methods and quantities of water use to ensure that the constitutional prohibition is informed by contemporary technology, economics, and social norms. Explicit standards could create presumptions that certain activities or types of water use constitute *per se* waste or unreasonable use, unless individuals can make a compelling showing to the contrary.

The definition of waste changes over time, as new policies and technologies appear, as pressure on water supplies increase, and as the cost of water rises. These recommendations are designed to reflect this evolution and incentivize implementation of the next generation of water management technologies and policies. Likely, there are cases where some of the water uses below would not represent unreasonable and wasteful use. In such cases, water users should be allowed to make a compelling showing to the State Board. Possible applications could include:

- Establishing a maximum reasonable per capita indoor residential water use of approximately 40 GPCD. Many of the recommendations below can help achieve this overall goal.
- Finding that the lack of a comprehensive leak detection and response program by local water agencies represents waste and unreasonable use.⁶
- Defining the use of potable water on golf courses, cemeteries, and other specified types of large commercial landscapes as *per se* waste, by a date certain, without a compelling showing to the contrary.
- Determining that the failure to capture stormwater in certain urban coastal regions is a wasteful and unreasonable use by a date certain.
- Determining that agricultural water use in districts that fail to utilize Critical Efficient Water Management Practices is a *per se* waste and unreasonable use of water, without a compelling showing to the contrary.
- Determining that the continued use of non-water conserving plumbing fixtures in pre-1994 residential and commercial buildings across California constitutes waste and unreasonable use of water.
- Determining that the lack of conservation-based urban water and wastewater rates represents waste and unreasonable use of water.⁷

⁶ Water Loss Control - What Can Be Done?" Alliance for Water Efficiency.

<http://www.allianceforwaterefficiency.org/1Column.aspx?id=2086&LangType=1033&terms=enforcement>

⁷ This could also be accomplished through the Board's conservation regulatory authority. Agencies should be required to make specific findings in new rate proceedings. Approximately ¾ of retail and urban water suppliers reporting to the California Urban Water Conservation Council have adopted tiered or budget-based rates for their single-family

- Determining that the lack of volumetric pricing by wastewater agencies represents waste and unreasonable use of water.⁸ Nationwide, more than half of water utilities have adopted volumetric rate structures with increasing block rates.⁹

1B. The State should establish the next state water use efficiency targets for urban and agricultural water users. California's 20 x 2020 water conservation requirement represents a historic transition toward evaluating the effectiveness of conservation programs on the basis of performance. Many agencies believe that they have already achieved their 20 x 2020 requirements. However, the need for conservation will not end in 2020. Similarly, state agencies and the legislature should consider the next appropriate targets for agriculture, beyond the Critical Efficient Water Management Practices included in SB X7-7. The example of Australia's response to extended drought clearly shows that water use efficiency targets can be significantly increased and achieved if the will to do so exists.

1C. Achieve more efficient use of water in revised State Water Project (SWP) Contracts. During the renegotiation of SWP contracts currently underway, DWR should reform contract terms to include positive incentives, price structures, and conservation requirements to make the use of SWP water more sustainable. The State of California controls a large block of water in the form of SWP Contracts (4.133 MAF). The SWP has only once delivered full contract amounts, and DWR projects average deliveries in the future of 2.4 MAF, 58 percent of contract totals.¹⁰ The use and administration of SWP water should exemplify efficient water management, just as Governor Brown has ordered state facilities to be models of water use efficiency. However, current SWP contracts do not contain pricing or conservation requirements to implement this goal. These changes would help bring demand more in line with realistic delivery levels.¹

residential customers – leaving ¼ of retail water suppliers with less conservation-oriented rate structures. Tiered and budget-based rates are even less common for other customer classes, e.g., multi-family residential, commercial, etc. Required conservation-oriented findings should include: 1) Forecasted sales upon which new rates and charges are based take into account the water supplier's water-saving targets adopted pursuant to state law, as well as conservation anticipated to result from standards, codes, pricing, and agency conservation programs; 2) Operating and capital costs of service attributable to meeting peak summer demand are adequately reflected in the rates and charges for water service during the peak demand period; 3) Within each customer class, the unit cost of water in the adopted commodity charge schedule does not decline at any higher level of consumption.

⁸ About 70% of California households currently pay a flat rate for their sewer service. Therefore, most California households don't receive a price signal regarding their sewer service to encourage water conservation. One key study has estimated that volumetric sewer pricing for residential customers could save 283,000 AF per year in the long-term. Application to commercial customers still on flat rates would add even more to these savings. Michelle Mehta, "Volumetric Pricing for Sanitary Sewer Service in California Would Save Water and Money," NRDC.

<http://www.nrdc.org/water/files/Volumetric-Wastewater-FS.pdf> (January 2012).

⁹ American Water Works Association. 2012 Water and Wastewater Rate Survey. Table 1.

<http://www.awwa.org/portals/0/files/publications/documents/samples/2012waterandwastewaterratesurvey.pdf>

¹⁰ Department of Water Resources, Draft Delivery Reliability Report 2013. Table 6-2. (December 2013)

https://msb.water.ca.gov/documents/86800/202762/DRR2013_Report_20131210.pdf

2. Water Use Efficiency – Urban



Photo Source: Mar Vista Green Garden Showcase

Many urban water agencies in California have made significant progress in increasing water use efficiency over the past quarter century. That progress has allowed many cities to meet the needs of growing communities without increasing water use. However, a great deal of potential savings remain. Increased investment in efficiency and other tools is needed to ensure reliable, drought resilient supplies, as well as healthy aquatic ecosystems.

2A. Develop a comprehensive behavior change strategy to encourage water conservation. According to NASA, lawns are the single largest irrigated crop in America – with three times the acreage of corn.¹¹ One study estimates that there are 2.75 million acres $\pm 25\%$ of turf in California.¹² Additionally, California has over a million swimming pools, and a typical backyard pool without a pool cover in Los Angeles loses nearly 40,000 gallons of water in evaporation each year.¹³ Outdoor water use savings will be greatly increased if we develop more effective strategies to encourage people to be more aware of their water use, more motivated to manage that use and more aware of their options. There are many promising examples of effective behavior change strategies. However, there is currently no clear statewide strategy. Behavior change strategies that the State Board could encourage include:

- Conservation-based water and wastewater rates.

¹¹ "More Lawns than Irrigated Corn," NASA Earth Observatory.
<http://earthobservatory.nasa.gov/Features/Lawn/lawn2.php>

¹² C. Milesi, et al, "Mapping and Modeling the Biogeochemical Cycling of Turf Grasses in the United States," *Environmental Management*, Vol. 36, No. 3, July 2005, p. 433.

¹³ A 24" X 40' pool in coastal portions of the city has evaporation losses of about 35,000 gallons based on pan evaporation rates recorded at LAX. Losses at hotter and dryer inland locations will be higher.

- New data analytics that benchmark customer water use and encourage behavior change.
- Expanded and strategically-designed public education efforts, including traditional and social media.
- A state-wide, user-friendly DIY clearinghouse for the public on water conservation issues – such as by updating and expanding CUWCC's H2Ouse.org.

The state's ambitious effort to reduce smoking is a promising analogue for a similarly ambitious state water conservation public education program. That campaign, which is financed through a cigarette tax, has had a significant impact on California's smoking rates. An effective water conservation campaign would be similar in impact, if different in its approach. But such an effort would require stable funding and should be designed carefully to ensure maximum impact. Denver Water's "Don't be that guy" and California's "Flex Your Power" campaigns provide two other effective models.

2B. Statewide landscape conservation training. DWR should develop a statewide landscape conservation training program. Landscape irrigation represents 43% of California's urban water use¹⁴. In some regions, landscape conservation training courses are significantly increasing the capacity of the public and landscape professionals to design and maintain water conserving landscapes. The California Friendly Landscape Training program developed by MWD and the California Urban Water Conservation Council's "New Normal" symposia are excellent examples. These programs should be scaled up, tailored to local needs and implemented across the state. DWR should develop this program in collaboration with other state agencies, as well as with water agencies and NGOs. DWR should also provide funding for local NGOs to organize community training courses.

2C. Lawn to garden rebate programs. DWR should develop a statewide rebate program for residential and commercial turf removal – AKA "lawn to garden" or "cash for grass". For example, the Los Angeles Department of Water and Power (DWP) offers landowners rebates for removing their lawns and installing water-efficient landscaping, which have resulted in the removal of over 1.5 million square feet of lawn and a 20 percent reduction in water use by those households.

2D. Replace non-functional lawns in all State buildings. The state should lead the way on landscape water efficiency by replacing non-functional lawns at all state buildings.

2E. Enforce plumbing replacement deadlines in current law. One of California's landmark water efficiency laws, SB 407 (2009), requires all inefficient plumbing fixtures in pre-1994 residential and commercial buildings in California to be removed and replaced by January 1, 2017, and January 1, 2019, respectively. The Alliance for Water Efficiency calculates that there are likely up to 4 million inefficient toilets remaining in California homes. Replacing those toilets could produce 90,000 acre-feet per year for 20 years – a total of 1.8 million acre-feet – at a cost of \$330 per acre-foot. Enforcement of SB 407 falls to building code officials in cases of buildings undergoing major renovations and additions. In the case of all other existing buildings, enforcement responsibility is shared by cities, counties, and local water suppliers. Yet few, if any, water suppliers or local governments have set out enforcement strategies to meet the plumbing replacement requirements of SB 407. In order to ensure that the water-saving goals of SB 407 are met by the required deadlines, we recommend the following:

- Make plumbing replacement a statewide priority: **DWR should include SB 407**

¹⁴ Department of Water Resources. California Water Plan Update 2013. Volume 3, Chapter 3. Urban Water Use Efficiency. Table 3-2. (October 2014)

http://www.waterplan.water.ca.gov/docs/cwpu2013/Final/Vol3_Ch03_UrbanWUE.pdf

implementation as a statewide priority in DWR's Integrated Regional Water Management (IRWM) Grant Program Guidelines.

- Develop and fund local compliance strategies: **Each newly submitted IRWM Plan should be required to contain a compliance strategy of locally selected incentives and regulations sufficient to achieve SB 407's plumbing replacement requirements.**
- Direct water suppliers to take the lead: **SWRCB should adopt regulations directing water suppliers to require certification of inefficient fixture removal when a new customer seeks water service for a pre-1994 building, and to assist low-income property owners in removing and replacing inefficient fixtures.**
- Fund a toilet retrofit program for low-income residents. Using bond or AB 32 funds, **the State should fund a targeted statewide toilet retrofit program for low-income customers, affordable housing units, and disadvantaged communities.**¹⁵ This program should be designed for completion within 4 years.
- Designate continued use of inefficient plumbing fixtures as wasteful *and unreasonable use of water*: In light of the widespread availability of water-efficient plumbing fixtures at reasonable costs, **the SWRCB should make a finding that the continued use of inefficient plumbing fixtures in pre-1994 residential and commercial buildings after January 1, 2019 constitutes waste and unreasonable use of water.** (See similar recommendation on page 1).

2F. Expedite installation of urban water meters. State legislation should require installation of water meters on all urban water service connections within five years, by December 31, 2019. (The current deadline to complete meter installation is 2025.) State law has long recognized the importance of water meter installation and volumetric billing as essential tools to make efficient use of water and avoid waste. Water metering and volumetric pricing are among the most efficient conservation tools, providing information on how much water is being used and pricing to encourage conservation. All state financial assistance should stipulate this metering completion date as an enforceable condition.

2G. Require sub-metering in new multi-family buildings. State legislation should require the installation of multi-unit sub-metering in new construction as a practical and important step for improving water efficiency in the multi-family sector. Sub-metering ensures water users receive an appropriate signal regarding the volume and cost of their water use, and thus incentivizes residents to use water responsibly. Sub-metering is also useful in identifying leaks. The National Multiple Family Sub-metering and Allocation Study (2004), sponsored by the US EPA, EBMUD, and San Diego County, among others, demonstrated that sub-metering reduces indoor water consumption by nearly 8 kgal per household unit per year. Given the expected growth in new multi-family units, these savings could lead to substantial reductions in water use, as well as associated energy and carbon savings. Moreover, even when accounting for the cost of installing the meters, sub-metering can lead to economic savings through reduced water and energy costs to individual families and building owners and through avoided capital costs for water utilities.

2H. Strengthen building and plumbing codes. New or strengthened provisions for water efficiency should be added to the California Plumbing Code, as well as to the California Energy Commission's Title 24 building standards and Title 20 appliance standards. Stronger requirements for hot water piping can

¹⁵ The Alliance for Water Efficiency calculates that there are likely up to 4 million inefficient toilets remaining in California homes. Replacing those toilets could produce 90,000 acre-feet per year for 20 years – a total of 1.8 million acre-feet – at a cost of \$330 per acre-foot.

reduce the waste of energy and water when showers and faucets are left to run until water is hot enough to use. Appliance and equipment standards should be established or strengthened for faucets, urinals, commercial dishwashers, car washes, and landscape system components, among others.

2I. Expand energy benchmarking of commercial buildings to water benchmarking. The energy benchmarking of commercial buildings now required under AB 1103 should be expanded to include water benchmarking by January 1, 2015, include large multi-family buildings by January 1, 2016, and require annual reporting and public disclosure of energy and water benchmarking data to a publicly available database managed by the California Energy Commission (CEC) for commercial & multi-family buildings by May 1, 2017.

2J. Advance water use efficiency among investor-owned water utilities. The CPUC should commission an independent evaluation of its current Water Revenue Adjustment Mechanism (WRAM) to evaluate its effectiveness in sending a price signal to encourage conservation and in maintaining agency financial health. The WRAM is a “rate decoupling” mechanism that has been in place since 2008. Concerns about the WRAM have been raised in several sectors. This program has been in place long enough to merit a thoughtful evaluation, to see how it could be strengthened.

2K. Provide financial and regulatory support to speed the transition to efficient home appliances, especially clothes washers. Clothes washers on the market today use significantly less water (and energy) than older clothes washers. Given the significant water savings possible with new washers, accelerating the transition to high-efficiency clothes washers would result in immediate water savings and help households to reduce water consumption during the drought. Utility rebates (\$35 to \$75) are currently being offered by energy utilities throughout the state. In some areas, water utilities offer additional incentives, but these oftentimes require a separate application. **The CPUC should encourage all regulated utilities to expand their marketing and promotion of clothes washer rebates, and to better integrate these incentives with similar programs offered by water suppliers in their respective service territories. The CPUC should also target energy savings from cold water conservation programs. The State Board should adopt parallel requirements for publicly-owned water suppliers.** This initiative should be complemented with expanded appliance recycling programs to ensure that old, inefficient clothes washers are permanently removed from service and cannot be refurbished or resold.

2L. Uniform methodology to evaluate water use efficiency investments. DWR, in consultation with the CPUC, should develop a uniform methodology to evaluate water use efficiency investments, by publicly and investor-owned utilities. The investment of public and ratepayer funds in water efficiency in California has never been assessed with consistent evaluation methods, as has been done for many years with energy efficiency investments. A new uniform water efficiency evaluation methodology should be used by all recipients of state grants and loans and in the public reporting of the costs and savings of utility water efficiency programs. For many urban agencies, the cost of water generated through water use efficiency is lower than their marginal cost of water, particularly for agencies that purchase water from wholesale water agencies. Through a rigorous uniform methodology, the CPUC and DWR can encourage more effective efficiency investments. **The CPUC and DWR should ensure that the drought resilience and long-term cost savings from efficiency are fully accounted for in this new methodology.**

3. Water Use Efficiency – Agriculture

3A. Establish statewide programs to increase agricultural water use efficiency: State and federal agencies should look for leading examples of efficient water management practices and develop statewide programs to increase their adoption. Although there are parallels between urban and agricultural efficiency, improving agricultural water use efficiency sometimes involves a different approach. In addition, it is important for agricultural efficiency efforts to be designed in the context of potential interconnection with wetland and riverine ecosystems and groundwater. Water management decision-making should reflect the regional benefits that some agricultural practices provide for fish, wildlife, and waterfowl that may not be realized in other settings. Where instream beneficial uses are impaired due to insufficient flow, a portion of the water conserved with public funds through agricultural efficiency programs should be dedicated to meet instream flow needs.



Photo Source: USDA NRCS

Agricultural water users have a wide range of tools available to increase water use efficiency and reduce water consumption, including:

- Efficient irrigation technologies, including drip and microsprinkler systems.
- The use of soil moisture monitors and pressure chambers to determine plant irrigation needs.¹⁶
- Improved irrigation scheduling, including weather-based irrigation scheduling.
- Software designed to increase the efficiency of water management, including integrating irrigation with energy use and the application of fertilizer and other chemicals.¹⁷
- Regulated deficit irrigation.
- Practices such as improving soil health and the use of cover crops and no-till farming.
- Conservation-based water rates.
- Canal lining.
- Remote monitoring and control systems.
- Tailwater treatment and return systems.
- Shifting to less water-intensive crops.
- Rotational fallowing.
- The use of recycled urban water.

California agriculture is a remarkably diverse industry, in terms of the number and value of crops grown, and the efficiency of irrigation practices. This diversity is shown by wide variation in the value of water, as used by different crops in California, which ranges from \$50 per acre-foot for irrigated pasture to \$2,000 per acre-foot for fruits and nuts.¹⁸ Over the past several decades, California agriculture has slowly but

¹⁶ University of California at Davis. Fruit and Nut Research and Information
http://fruitsandnuts.ucdavis.edu/pressure_chamber/ (Accessed, October 2014)

¹⁷ <http://www.puresense.com> (Accessed, October 2014)

¹⁸ Hanak, Ellen, et al. Public Policy Institute of California. (Page 91) "Managing California's Water: From Conflict to Resolution." http://www.ppic.org/content/pubs/report/R_211EHR.pdf (2011)

steadily increased its efficiency, as shown in the following metrics:

- Total agricultural water use in California has declined modestly since the 1980s, as a result of increased efficiency and the retirement of some farmland.
- Over the past 40 years, yields have increased an average of 1.42 percent per year.¹⁹
- The inflation-adjusted gross revenue of California agriculture increased by 84 percent from 1967-2009, growing from \$19.9 billion (in 2007 dollars) to \$36.6 billion.
- Agricultural revenue generated per acre-foot of applied water in California increased by 115 percent over 40 years, from \$638 dollars per acre-foot (in 2007 dollars) in 1967 to \$1,373 per acre-foot in 2007.²⁰
- The percentage of flood irrigated cropland in California decreased from 67 percent in 1990 to 43 percent in 2010, and the use of microsprinklers and drip irrigation over this period rose from 15 to 38 percent.²¹

This progress shows a long track record of water use efficiency and agricultural management improvements that can help maximize the significant additional savings that remain in the agricultural sector, as shown in the figure on page iii. The following recommendations provide additional detail.

3B. Increase the adoption of critical agricultural water efficiency measures. The State should examine whether irrigation districts that have not implemented mandatory water efficiency measures are unreasonably using water. The Water Conservation Act of 2009 requires districts to measure the amount of water delivered to their customers and to charge their customers at least in part based on the volume of water delivered. However, one third of districts reviewed in the Fall of 2013 had no clear plan to measure water deliveries, and approximately one half of districts reviewed had no concrete plan to price water volumetrically.²² DWR should also assess the need for additional workshops and other efforts to increase the capacity of districts to comply with this requirement.

3C. Modernize irrigation water delivery systems to allow flexible delivery time and pressurized water service. Modern delivery infrastructure will facilitate improvements in on-farm irrigation methods, which have the potential to save 5.6 to 6.6 million acre-feet of water annually.²³ Additionally, piped deliveries will reduce evaporation, spillage, and seepage losses while water is in transit. Spills alone can account for up to 20 percent of a water district's total water use. To speed up the transformation of California's irrigation water delivery systems, the State should:

- **Set standards for irrigation delivery. DWR should modify the current list of required efficiency practices to incorporate specific standards of water delivery service and a specific timeframe.** Within ten years, all districts should offer 24-hour arranged demand delivery or better and provide water service through pressurized or low-volume compatible delivery systems.

¹⁹ Ibid. (Page 89)

²⁰ Rich, Jim. "Comparing Changes in Applied Water Use and the Gross Value of Output for California Agriculture, 1967 to 2007." California Water Plan Update 2009, Volume 4 Reference Guide.
http://www.waterplan.water.ca.gov/docs/cwpu2009/0310final/v4c07a01_cwp2009.pdf (Draft paper, August 4, 2009)

²¹ Tindula, G., Orang, M., and Snyder, R. (2013). "Survey of Irrigation Methods in California in 2010." *J. Irrig. Drain Eng.*, 139(3), 233-238.

²² O'Connor, Claire, and Christian-Smith, Juliet, "A Review of Agricultural Water Management Plans," NRDC.
<http://www.nrdc.org/water/files/ca-agricultural-water-planning-IP.pdf> (2013).

²³ Natural Resources Defense Council, Pacific Institute, 2014, 'The Untapped Potential of California's Water Supply'

- **Provide cost-sharing assistance to upgrade distribution systems. The State should offer cost-share programs and financing partnerships for irrigation districts to upgrade their infrastructure.** This could be done through water bond proceeds, AB32 auction proceeds, or through a minimum investment requirement, as discussed below.

3D. Uphold statutory requirements for agricultural water management planning. Both the Department of Water Resources and the State Board should enforce the prohibition against grants and loans to irrigation districts that have not completed a required water management plan. The Water Conservation Act of 2009 requires irrigation districts that service more than 25,000 acres to complete Agricultural Water Management Plans (AWMPs). The first AWMPs were due by December 31, 2012, but only a handful of districts completed their plans on time. Districts that fail to complete their required AWMPs are ineligible for state water grants and loans. Nevertheless, DWR selected at least four non-compliant districts for state loans, totaling almost \$5 million.²⁴

3E. Encourage water use efficiency in CVP agricultural water contracts. The federal Central Valley Project is the largest water delivery system in the nation. It delivers millions of acre-feet of water annually, primarily to agricultural water users. **In new and revised water delivery contracts, the Bureau should include the following provisions:**

- Realistic contract quantities to reflect the amount of water that the CVP can reliably deliver to its contractors.
- Water pricing designed to promote efficiency and ensure timely repayment of past interest-free taxpayer investments in irrigation storage and delivery systems.
- Updated water conservation requirements that reflect current state requirements and the Critical Efficient Water Management Practices discussed above.

3F. Encourage healthy soil with cost-shares, education and outreach. State and federal drought relief resources, including a minimum of \$25 million for the Natural Resources Conservation Service's Environmental Quality Incentives Program (EQIP), should be directed toward cost-share programs, education, and outreach, with a priority on encouraging improved soil health on California farms. Healthy soil is more resilient to dry weather. Farmers can improve soil health through the use of practices such as no-till and cover cropping. Each 1% increase in Soil Organic Matter can store an additional 20,000 gallons of water in the soil profile. No-till corn farmers use 30% less irrigation water than their conventional tilling peers, on average.²⁵ Cover cropping can further reduce irrigation water requirements by up to 35%.

²⁴ Some of these districts have since completed their plans. DWR staff has prepared a map showing compliant water districts as of October 2014, available at

https://cwc.ca.gov/Documents/2014/10_October/October2014_Agenda_Item_14_Attach_1_AWMPMap.pdf

²⁵ "Agricultural Resources Management Survey Farm Financial and Crop Production Practices, Crop Production Practices for Corn 2010: All Survey States, Crop Insurance Report, Tillage System Row Group," USDA Economic Research Service. http://www.ers.usda.gov/data-products/arms-farm-financial-and-crop-production-practices/tailored-reports-farm-structure-and-finance.aspx?reportPath=/ARMSr4/CrossTab-FinanceDefault&survey_abb=CROP&subject_num=1&report_num=17&series=TILLTYP&fips_st=00&series2=FARM&tatYear=2010 (accessed July 10, 2014).

4. Water Recycling and Graywater



Photo Sources: (L) Rusty Clark, (R) Peter Craven, <https://creativecommons.org/licenses/by-nc-sa/2.0/>

4A. Adopt regulations for indirect potable reuse through the augmentation of surface storage. The State should ensure that the State Board has the resources needed to produce regulations, as required by law, regarding indirect potable reuse (IPR) through augmentation of surface storage. The State Legislature and Congress should provide additional funds to complete required scientific investigations to assist in the development of regulations regarding direct potable reuse.

The State Board has adopted a goal of increasing water recycling over 2002 levels by 1 MAF by 2020 and 2 MAF by 2030.²⁶ The Orange County Water District's Water Factory 21, one of the world's largest recycling facilities, and the Los Angeles Sanitation District's Whittier Narrows Plant have used highly treated water for many years to recharge groundwater. Allowing recycled water to be used to augment surface reservoirs would be a major step forward to achieve these goals by allowing cost-effective water recycling. Water Code § 13560 requires the state to adopt uniform water recycling criteria for surface water augmentation by December 13, 2016. An expert panel²⁷ and an advisory group²⁸ have been formed to provide recommendations regarding this process. The water code also requires an investigation of the feasibility of developing criteria for direct potable reuse. On July 1, 2014, this program was moved from the Department of Public Health to the State Board.²⁹

²⁶ "Recycled Water Policy," State Water Resources Control Board.

http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2013/rs2013_0003_a.pdf (Adopted 2009, amended 2013).

²⁷ "Recycled Water - Expert Panel to Advise on Developing Uniform Recycling Criteria for Indirect Potable Reuse via Surface Water Augmentation and on the Feasibility of Developing Such Criteria for Direct Potable Reuse," State Water Resources Control Board.

http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/RW_SWA_DPRexpertpanel.shtml (July 21, 2014).

²⁸ "Recycled Water - Advisory Group on Feasibility of Developing Criteria for Direct Potable Reuse," State Water Resources Control Board.

http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/RW_DPR_advisorygroup.shtml (September 2, 2014),

²⁹ "Division of Drinking Water Programs," State Water Resources Control Board.

<http://www.swrcb.ca.gov/drinkingwater/index.shtml> (September 5, 2014).

The State Board staff has not yet released draft regulations regarding indirect potable reuse through augmentation of surface storage. Given the significant potential for expanded recycling to increase water supplies, the Board should:

- Ensure that adequate resources are dedicated to the timely completion of surface water augmentation regulations and the report to the California Legislature on the feasibility of uniform criteria for direct potable reuse.
- Allocate resources to study research gaps identified by the Direct Potable Reuse Expert Panel.
- Support public education and outreach, at both a statewide and community level, to build awareness that recycled water can provide California a safe, reliable, and sustainable water supply.

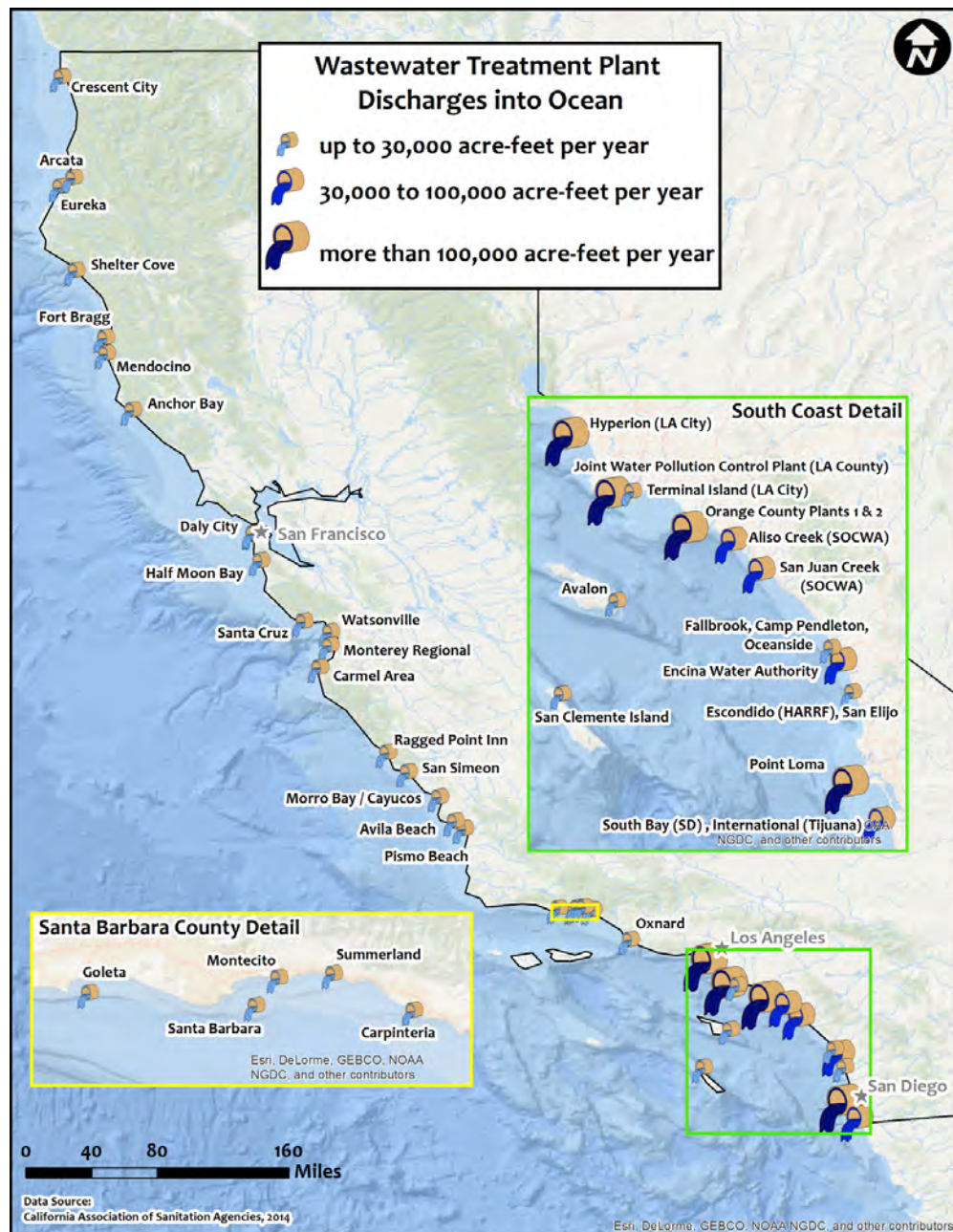


Figure 2 – Annual wastewater treatment plant discharges to ocean in California

4B. Accelerate water recycling in California by prohibiting ocean discharge of wastewater. By prohibiting ocean discharges from wastewater treatment plants, the State Legislature or the State Board could dramatically accelerate the adoption of water recycling and significantly improve the drought resistance of urban communities. The State of Florida will prohibit ocean discharges from wastewater treatment plants in South Florida after 2025 – finding that “the discharge of domestic wastewater through ocean outfalls wastes valuable water supplies that should be reclaimed for beneficial purposes.”³⁰ Today, approximately 670,000 acre-feet of water is recycled annually in California, but millions more are discharged into the ocean.³¹ As indicated in Figure 2 above, significant ocean outfalls are located along the entire California coastline, with the greatest concentration in Southern California.

Agriculture was the largest use of recycled water in the 2009 Municipal Wastewater Recycling Survey, accounting for 37% of recycled water use. The 2009 Survey data suggests that only 13% of the nearly 5 million acre-feet of treated municipal wastewater was recycled in 2009. Achieving the State Board’s goals will require accelerated investment in recycling.

4C. State water recycling roadmap. The State Board, DWR and other state agencies should develop a state water recycling roadmap to identify and resolve key regulatory, governance, funding and other obstacles to large-scale recycling projects. This roadmap should be developed through workshops with water agencies, NGOs other stakeholders. One possible element in such a roadmap is for the State Board to work with targeted urban water agencies to develop more ambitious salt management programs. The accumulation of salt in wastewater represents a significant constraint on water recycling, particularly in inland urban communities that have limited brine disposal options (with the exception of communities served by the Inland Empire Brine Line.) When designing recycling programs in inland communities, care must be taken to avoid impacts on rivers dependent on wastewater discharges.

4D. Model set of ordinances for graywater use in new buildings. Graywater and blackwater use can make significant inroads in the use of treated municipal water for toilet flushing, landscaping and commercial processes and cooling uses. However, municipalities have varying standards, if any, for graywater use in new buildings. **DWR, in cooperation with the Department of Public Health, the Building Standards Commission, the State Board, local agencies, and NGO stakeholders, should draft a set of model local graywater ordinances,** which would provide a consistent policy baseline in the same way as the Model Water Efficiency Landscape Ordinance. A model graywater ordinance for new construction should:

- Streamline the permitting process by requiring a single point of contact for customers/developers to obtain graywater related permits from the authority having jurisdiction, using San Francisco Public Utilities Commission (SFPUC) as a model.
- Require dual-plumbing in new single-family homes to collect graywater separately from blackwater, using the City of Tucson’s Ordinances 10579 and 11089 as models.
- Incentivize and/or require blackwater reuse in new commercial and large multi-family residences, using SFPUC’s program as a model.

³⁰ Fl. Ann. Stat., Title XXIX, §§ 403.089(9), (9)(c)(2)

³¹ “Water Reuse Potential in California,” Issue Brief. <http://pacinst.org/wp-content/uploads/sites/21/2014/06/ca-water-reuse.pdf> (June 2014).

5. Stormwater



Photo Sources: (L) Steven Vance, (R) Dan Reed, <https://creativecommons.org/licenses/by-nc-sa/2.0/>

5A. Establish requirements for municipal stormwater retention for water quality and water supply benefits. Stormwater capture and retention practices such as infiltration and onsite capture and reuse have the potential to add hundreds of thousands of acre-feet to local water supplies for communities throughout California. Practices exist to capture and put to beneficial use stormwater runoff at both regional and distributed scales, with large opportunities available to augment groundwater supplies through infiltration. **The State Board should issue a precedential order to reaffirm municipalities' legal obligation to achieve water quality standards and TMDLs. Municipalities should retain 100% of non-stormwater runoff; retain where feasible the runoff produced by rainfall up to and including runoff from the 85th percentile, 24-hour storm event for each watershed management area, and treat any additional runoff not retained to that level.** Where identified as feasible, particularly in areas of the state with strong groundwater recharge potential, the State Board should require retention of the 90th or 95th percentile, 24-hour rain event.

5B. Exercise EPA's authority to advance stormwater capture. The Clean Water Act provides EPA with the authority to exercise "residual designation" authority over sites that generate significant water quality contamination. Unfortunately, EPA denied a petition from NRDC and other environmental groups to exercise this authority over commercial, institutional, and industrial sites in key regions, including Region 9, which includes California.³² Such a designation by EPA would set the stage for improved stormwater capture and infiltration, particularly by large facilities that have the resources to implement stormwater management programs. This would help reduce coastal pollution, improve water supplies and lessen the burden on local municipalities working to manage their stormwater. **EPA should revisit this decision and develop a residual designation program designed to improve stormwater management in key watersheds with particularly challenging water quality – and supply – problems.** The EPA has exercised this authority in Massachusetts and Maine.³³ Such a program would clearly be valuable in California.

³² "Testing the Waters 2014 A Guide to Water Quality at Vacation Beaches," NRDC. <http://www.nrdc.org/water/oceans/ttw/action-plan.asp> (2014).

³³ "NPDES Stormwater Permit Program," US EPA. <http://www.epa.gov/region1/npdes/stormwater/>

6. Cross-Cutting Recommendations

6A. Create a state water technology office. The State should create a water technology office in the Governor's Office of Planning and Research.³⁴ This office would be responsible for highlighting opportunities to develop new technologies to extend California's water resources while reducing reliance on stressed rivers and estuaries. In addition to developing new water management and efficiency opportunities, this office would ensure that California is at the cutting edge in developing a new global water technology industry, bringing jobs and economic benefits to the state. Large numbers of new jobs are available in innovative water industries.³⁵

6B. Improve the Integrated Regional Water Management Program. DWR is working on a strategic plan for the future of Integrated Regional Water Management in California. As a part of this effort, DWR should track and publicly report on the expenditure of and accomplishments related to AB 1249 and the 10% of IRWM funds dedicated to meeting the needs of disadvantaged communities. Specifically, DWR should identify where those funds have been invested in projects that address identified disadvantaged community needs.

The goal of the IRWM process is to produce greater integration in water management planning and implementation. This should result in more ambitious efforts to develop new water sources providing multiple benefits, including efficiency, stormwater and recycling, as well as more effective efforts to meet the water-related needs of disadvantaged communities. However, IRWM has been subject to criticism, from some water agencies and community groups, for bureaucratic inefficiency and a lack of inclusiveness and transparency. DWR's draft strategic plan should set the stage for a more robust conversation about strengthening the IRWM program, which could be a key to developing more effective regional strategies to reduce vulnerability to droughts. A thoughtful updating of the IRWM process is particularly important because of the role this process plays in distributing bond funds.

Communities where residents rely exclusively on wells for their drinking water are at particular risk during droughts, as contaminants in the groundwater become more concentrated with less water available to dilute them. AB1249 (Salas) Chaptered in 2014 requires IRWM regions impacted by nitrate, arsenic, perchlorate or hexavalent chromium to report on the location and extent of contamination and describe what efforts are underway, or needed to address these impacts. This legislation also requires DWR to consider whether the regional water management group has included projects in their application that help address the impacts caused by contamination, including projects that provide safe drinking water to small disadvantaged communities. **DWR should ensure that IRWMs adhere to this new law, which will become effective January 2015.**

³⁴ Newsha K. Ajami, Barton H. Thompson Jr., David G. Victor, The Hamilton Project and Stanford Woods Institute for the Environment, *The Path to Water Innovation*. (Page 29.)
https://woods.stanford.edu/sites/default/files/files/path_to_water_innovation_thompson_paper_final.pdf (October 2014)

³⁵ Pacific Institute, Sustainable Water Jobs: a National Assessment of Water-Related Green Job Opportunities. (January 2013). <http://pacinst.org/publication/sustainable-water-jobs/>

Expanding System Capacity

Environmentally and economically sound surface and groundwater storage, conjunctive use, groundwater management, river, wetland and floodplain restoration and watershed restoration efforts are all tools that can help us weather prolonged drought. These investments in natural and physical infrastructure can be most effective in banking water in wetter years for use during drought periods. In addition, natural infrastructure and healthy watersheds also result in cleaner water supplies. However, those facilities must be operated to preserve stored water for drier years and to avoid further ecosystem impacts.

7. Groundwater Clean Up and Management



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7A. Improve statewide groundwater management. State agencies should make the implementation of newly enacted groundwater management legislation a high priority. Specifically, the **Department of Water Resources should move rapidly to include the following in groundwater sustainability guidelines:**

- Clear and specific guidance on options for setting appropriate target groundwater levels and management strategies to protect stream flows and accompanying surface water rights. The USGS might be broadly acceptable as an objective institution to provide guidance regarding sustainable groundwater levels and connections with surface water resources. USGS has served this role in the Klamath Basin.

- Detailed protocols for a wide range of options to recharge groundwater during wetter periods, to support withdrawals in severe droughts without undesirable long-term groundwater level declines or environmental impacts.
- Model groundwater accounting frameworks that are applicable for widely different current conditions, from dramatically over-drafted basins to basins where levels are currently stable and surface-groundwater connections are still intact.

DWR should update the basin prioritization process to ensure appropriate attention is given to groundwater basins where groundwater pumping impacts locally important stream flow and groundwater-dependent ecosystems, even though total pumping volumes and overlying populations may be comparatively small. Without improved management, these basins could be subject to particularly significant ecosystem impacts in dry years.

The Administration and the legislature should develop an administrative adjudication process that is compatible and consistent with the strong sustainability requirements in the 2014 legislation.

The Administration and the legislature should ensure that adequate information regarding groundwater management, including well log information, is available to the public, to ensure transparency and support effective decision-making.

Accelerate clean-up in small communities dependent on contaminated groundwater. With the passing of the water bond in November 2014, the State Board will need to develop guidance to ensure that the funds dedicated small communities dependent on contaminated groundwater are spent effectively and promptly. The drought is imposing multiple burdens on some rural communities with contaminated groundwater supplies. First, natural groundwater recharge is lower, resulting in higher nitrate concentrations. And second, pressure on surface water sources has increased, making access to replacement supplies even more difficult. The Board and DWR should work to ensure that IRWM regions are employing open and good governance practices that encourage the participation of all stakeholders, especially historically marginalized populations in tribes and disadvantaged communities.

The State Board should also work with the agencies responsible for developing groundwater management programs under the newly-passed state groundwater management legislation, in order to coordinate water supply and water quality management, including implementing well abandonment and rehabilitation programs and mapping groundwater quality.

Finally, the State Board should accelerate related programs including groundwater anti-degradation guidance, the irrigated lands program and other efforts.

7B. Accelerate San Fernando Valley groundwater clean-up. EPA should collaborate with LADWP to accelerate clean up in this critical basin. Superfund is an important program to remediate environmental contamination. It was not, however, designed as a water supply or a drought response program. The San Fernando Valley is a highly important water resource, not just as a source of dry year supply, but also as a potential storage basin for stormwater and water recycling. In light of the drought, EPA should make this basin a priority – not just to reduce contamination, but also to maximize its utility as a water resource.

8. Natural Infrastructure

8A. Expand floodplain restoration as part of the Central Valley Flood Protection Plan update and other processes.

Substantial floodplain and wetland restoration throughout the Central Valley can provide habitat benefits for fish and wildlife and can also better absorb high-water flood flows during flood events. Additional potential benefits include improved water quality, recharging depleted groundwater basins, and allowing for improved reservoir operations and expanded water supply storage. (See related recommendation below.) **The Central Valley Flood Protection Planning process should identify target restoration acreages adequate to support fish and wildlife objectives, and develop an implementation plan for achieving regional goals.** (See related recommendation under federal financing.)



Photo Source: kqedquest, <https://creativecommons.org/licenses/by-nc/2.0/>

8B. Make progress in restoring the San Joaquin River. State and federal agencies should prioritize funding to complete seepage and flood management projects along the San Joaquin River below Friant Dam. The restoration of the San Joaquin River will help restore depressed groundwater levels along part of the river. However, river restoration will also require resolving the seepage concerns of landowners along other portions of the river. A joint state-federal partnership is required to address this need, as well as flood management concerns. The federal government is a party to the San Joaquin River restoration agreement. The State has been slow to deliver on its pledge of \$200 million for river restoration to finance both river restoration and flood management projects. It has also been slow in making progress regarding flood management and seepage issues.³⁶ Proposition 1E represents a critical and time-limited source of funds. Resolving seepage issues and releasing the full San Joaquin River restoration hydrograph will provide benefits including ecosystem restoration, groundwater supply recharge, water quality improvements, and local and downstream flood protection.

³⁶ The San Joaquin River settlement and the Central Valley Flood Management Planning Program have extensive efforts to engage water users, NGOs and other stakeholders.

9. Smart Water Storage



Photo Source: Mark Stevens, <https://creativecommons.org/licenses/by-nc-sa/2.0/>

9A. Create Corps of Engineers pilot projects to integrate new technologies and dam reoperation. The Corps of Engineers should develop new technology pilot projects to improve weather forecasting and improve the operation of federal flood control facilities. Carefully designed reoperation projects have the potential to both improve flood protection and water supply benefits from surface storage facilities. This potential is highlighted by the fact that, in 25 of California's largest reservoirs, a total of 6 million AF of storage space is currently reserved for seasonal flood management operations.³⁷ This approach could have significant promise in Northern California, such as in the Russian and American River watersheds. In Southern California, the Corps and water agencies should explore the potential for expanded collaboration on the reoperation of COE flood facilities, to better integrate with local groundwater recharge programs. In the Central Valley, the reoperation of state, federal, and local surface storage projects can be facilitated through floodplain restoration. (See related floodplain recommendation above.)

9B. Manage storage funds with drought benefits in mind. Public funds for water storage – from the recently approved water bond or other sources – should be carefully managed to ensure broad, cost-effective water supply and environmental benefits. The management of these funds in coming years should include:

³⁷ Prof. Jay Lund, University of California at Davis, Personal communication. (October 2014)

- Cost-effective South of Delta storage, paired with updated, more protective Bay-Delta standards.
- The development of a state analysis regarding the most strategic and cost-effective storage investments – rather than a project-by-project decision-making process.
- Criteria or regulations to ensure that the playing field is not biased in favor of surface storage projects.
- Priority for projects that would not increase Delta diversions in years that are not categorized as wet, paired with compliance with the state policy to reduce reliance on the Delta as a water supply source overall .
- Priority for projects that can be implemented rapidly.
- Independent evaluation of ecosystem benefits from storage projects.
- Maintaining existing legal protections for the McCloud River and state and federal Wild and Scenic Rivers.
- Priority for groundwater and natural floodplain storage projects.

9C. Restore watersheds. State and federal funds should be allocated to watershed restoration projects, with the goal of safeguarding water quality and improving water availability. For example, forest and meadow restoration projects can provide water supply and ecosystem benefits, including cost-effective yield enhancement, reduced stream temperatures, and improved dry season stream flows.³⁸ **At the state level, such restoration efforts could be funded through IRWM and other funding sources. With appropriate policy guidance to ensure the restoration of ecosystem health, additional funding could also help state and federal forest managers improve their watershed management efforts.** The Sierra Nevada and other watersheds upstream of the Delta are the primary sources of the state's water supply, and the quality and quantity of water that flows through the region are directly linked to the health of these watersheds. Degraded conditions due to past management practices in forested watersheds can impose significant costs on water agencies through decreased water quality, reduced quantity and poor timing of flows, and increased sedimentation in the wake of unnaturally severe catastrophic fires. For example, wildfires in 1996 and 2002 resulted in dramatic sedimentation in Denver Water's Strontia Springs Reservoir, costing the agency tens of millions of dollars.³⁹ Investment into projects that restore and better manage forests and meadows in the Sierra Nevada and in other important watersheds throughout the state can reduce wildfire intensity, improve water quality, and increase water yield.

³⁸ Jim Wilcox, "Water Management Implications of Restoring Mesa-scale Watershed Features." http://www.feather-river-crm.org/images/pdfs/wm_implications.pdf (November, 2009)

³⁹ New York Times, "To Protect Tap water, Cities Sharing Costs of Slowing Wildfires." <http://www.nytimes.com/gwire/2011/08/18/18greenwire-to-protect-tap-water-cities-sharing-costs-of-s-38859.html?pagewanted=all> (August 18, 2011.). <http://www.denverwater.org/AboutUs/History/CheesmanReservoirHistory/FacingNature/> (Accessed October 2014)

Planning for Drought

Preparation for extended droughts should begin with a state analysis of the potential disruptions that could be caused by the decade long droughts seen elsewhere, as well as in California's paleo climate history. Drought planning should include modernizing California's antiquated approach to water rights and planning for dry year water transfers. Drought planning should pay particular attention to the needs of the most vulnerable communities. Finally, preparation should include science-based dry year ecosystem protection requirements. In addition to protecting our natural resources, such actions will also avoid unnecessary future water project constraints.



Photo Source: bennowich, <https://creativecommons.org/licenses/by-nc-sa/2.0/>

10A. Adopt and enforce drought standards for the Delta and its tributaries. The State Board has begun the process of establishing new flow requirements to protect the public trust values of the Bay-Delta ecosystem. **In that process, the Board should specifically establish protective standards not only for individual dry years, but also for prolonged droughts.** The Board should ensure an adequate level of protection that reflects the natural variability in the system. **The next Bay Delta Water Quality Control Plan should strive to eliminate pressure to weaken or waive environmental requirements during prolonged droughts.** The ecosystem already suffers greatly during droughts. The Board should set standards that provide an appropriate baseline of protection during prolonged droughts – and then enforce those standards.

10B. Implement drought actions to protect salmon and the fishing industry. The Department of Fish and Wildlife should undertake an ambitious series of actions to help healthy salmon populations survive droughts, including the following:

- Screening, improvements to agricultural drainage canals, and dry year rescue operations to prevent the loss of upstream migrating salmon in diversion and drainage canals.
- Habitat restoration programs to increase upstream cold water habitat.
- Policies reflecting that flow requirements already include weaker dry year protections and should not be further eroded when fisheries, including fall run Chinook salmon, are at their most

vulnerable.

- Emergency hatchery management measures, including direct injection of salmon eggs into gravel after water temperatures fall.

The state doesn't currently have a drought plan to protect the state's salmon fishery, despite the state's adopted salmon doubling policy. Some drought measures might only be appropriate in the driest years. However, projected impacts on the entire 2014 year class suggest the need to consider innovative actions.

10C. Develop and implement drought actions to protect wetland-dependent species. The Department of Fish and Wildlife and the U.S. Fish and Wildlife Service should collaborate to develop and implement drought management strategies and projects to avoid and minimize impacts to wetlands and wetland dependent species, including migratory birds. In particular, this should include the following:

- Strategies and projects to ensure adequate water supplies for federal refuges and state wildlife areas during droughts.
- Oversight of water transfers to ensure that any transfers involving crop idling or substitution do not negatively impact habitat for migratory birds and other species.

10D. Plan for dry year transfers. Water transfers during dry years should be facilitated through advanced state planning, environmental review and permitting. For example, voluntary easements restricting the planting of permanent crops on carefully chosen agricultural land could ensure ongoing agricultural activities, provide habitat benefits, and facilitate dry-year transfer agreements. Once land is converted to permanent crops, the ability of farmers to adjust to dry conditions is limited and dry-year transfers from that land become infeasible. Thus, the current large-scale conversion of land to permanent crops can increase risk that farmers face during droughts and also inhibit dry-year flexibility that can benefit others. Easements on some land limiting the planting of permanent crops could increase flexibility and sustainability.

10E. Plan for a decade-long drought. DWR should lead an effort to model likely impacts on water users and the environment if the current drought extends to encompass a full decade. The current drought has lasted only three years. However, Australia and the Colorado River Basin have recently experienced decade-long droughts. Paleo-climatologists tell us that California has experienced extended dry periods in the past.⁴⁰ Simply put, California is not preparing for inevitable extended droughts. This puts aquatic ecosystems, communities and the state's economy at risk.

This paper supports carefully designed new water storage, with a priority for multi-benefit groundwater and natural floodplain storage projects. It is important to note, however, that additional storage yields no benefit in extended droughts after stored water is used. In short, we cannot develop enough additional storage to protect California from extended droughts, given current levels of demand. An analysis of an extended drought would highlight the need to develop strategies such as water use efficiency and water recycling that are less vulnerable to extended droughts. (These investments can also increase water in storage during extended droughts.) Such an effort should be founded on key core principles, including restoring damaged ecosystems, prioritizing alternatives that reduce diversions from aquatic ecosystems during droughts, and emphasizing cost-effectiveness and economics. This state modeling effort should, in turn, lead to more ambitious local and regional efforts to develop sustainable water management plans to decrease vulnerability during extended droughts.

⁴⁰ Steve Hockensmith, "Why state's water woes could be just beginning," News Center.
<http://newscenter.berkeley.edu/2014/01/21/states-water-woes/> (January 21, 2014).

10F. Update California's water rights enforcement. The Governor's budget and the State Legislature should provide direction and resources to allow the State Board to update its system for water rights accounting, agency reporting and enforcement. UC researchers recently demonstrated that the Board's existing water rights grant users have rights to a volume of water that is more than five times the state's mean annual runoff.⁴¹ In some basins, current water rights represent 1000% of average annual runoff, with the greatest over commitment in the Sacramento and San Joaquin River systems and on Southern California coastal streams. (This analysis excluded riparian water rights, suggesting that the over allocation of water is even more acute than indicated by this analysis.) Researchers found "substantial uncertainty in how water rights are exercised" and found that the Board's water rights accounting is "inaccurate and incomplete." In summary, they concluded that "the state simply does not have accurate knowledge of how much water is being used by most water rights holders. As such, it is nearly impossible to curtail or re-allocate water in an equitable manner among water users and to effectively manage for environmental water needs." The analysis found that needed reforms are largely within the authority granted by existing law. However, significant additional resources are required to produce a functional water rights system, including reporting of diversions and discharges, and to improve the Board's ability to respond to dry years. The State Board should develop policies for issuing curtailment letters in a timely manner as necessary to protect instream beneficial uses of water and public trust resources. The State Board should also be provided adequate resources to enforce needed water use curtailments.

10G. Create a standardized response for communities without water. The state's emergency drought response for communities that have lost their only source of drinking water has varied greatly and has largely been reactionary. In some cases where communities completely lost their water supply, local, regional and state officials lacked the ability to coordinate and communicate effectively and to determine the appropriate response. **The Governor and legislature should develop standardized emergency guidelines to establish statewide protocols on how to address communities whose wells have gone dry.**

10H. Leverage State academic institutions. In recent years, several UC and CSU campuses have made significant contributions in the California water arena. **The State and Congress should fund strategic expansions in the work of State academic institutions to encourage ambitious efforts to advance the development of sustainable regional water supplies.** For example, UCLA recently announced a "grand challenge" to develop a sustainable energy and water plan for the Los Angeles Region.⁴² This new project has several merits. First, the state has adopted a policy of reducing reliance on the Delta, suggesting the wisdom of ambitious plans for efficiency and local and regional supplies. Second, this effort integrates energy and other related issues. This integrated approach is most likely to identify the positive synergies that can result from increased local self-reliance.

⁴¹ Grantham, Theodore and Viers, Josh, "100 years of California's water rights system: patterns, trends and uncertainty," Environmental Research Letters. <http://iopscience.iop.org/1748-9326/9/8/084012/article> (August 19, 2014).

⁴² <http://www.grandchallenges.ucla.edu/downloads/eands-project-team.pdf>

Financing Sustainable Water Supply Investments

Some financing strategies cut across the individual tools listed above and are addressed in this section. Adequate, reliable funding is a key to tapping into new water supplies. State and federal funding can serve as an important catalyst for new investments. DWR Director Mark Cowin stated recently that “the state has been able to invest roughly \$1.43 billion in grants to help local agencies implement local water supply reliability projects...That funding has leveraged an additional \$3.7 billion of local funding and all told, the projects implemented through this approach have yielded about 2 million acre-feet per year of water supplies.”⁴³ It is, however, important to remember that local and regional agencies provide 84 percent of water and wastewater funding in California.⁴⁴ Ensuring adequate, conservation-oriented water and wastewater rates that protect water utility financial integrity is perhaps the most important single key to financing a more sustainable water supply.

11. State Funding

11A. Direct the State Board to establish green infrastructure, water efficiency, and community drinking water needs as higher priorities in the Clean Water and Safe Drinking Water State Revolving Funds. The State Board should prioritize projects that include green infrastructure and water use efficiency measures in the State Revolving Fund. Current State Board and U.S. EPA policy allows State Revolving Funds to be invested in water use efficiency and other innovative water tools. However, traditionally, little or no SRFs have been devoted to this purpose. (See related recommendation for federal funding.) Further, we recommend that the SDWSRF prioritize sustainable funding for public water systems and community water systems statewide that lack safe, accessible and affordable drinking water.

11B. Create a statewide water diversion fee to make ecosystems more drought-resilient. The State Legislature or the State Board should create a state-wide volumetric water diversion charge to finance programs to restore healthy aquatic ecosystems that are capable of weathering prolonged droughts. It is widely recognized that California’s aquatic ecosystems and related fish and wildlife are highly degraded from their natural states and are vulnerable to the effects of droughts that at one time they would have survived without long-term harm. Unfortunately, aquatic ecosystem restoration programs are highly under-funded. With the reduction of general fund support in recent years, the restoration programs of the Department of Fish and Wildlife and other state agencies suffer from unpredictable, as well as inadequate, funding. The CVPIA created a CVP-wide restoration fund for federal water users, however, the state has no such program for other water users. This is particularly striking given that the state’s fish and wildlife and its water resources are owned by the public. Currently, publicly-owned water is diverted by users, frequently with no contribution to support broad ecosystem restoration efforts. Such new state restoration funds should be used to restore degraded ecosystems, not provide mitigation for additional water development.

⁴³ DWR Director Mark Cowin’s comments before the Santa Clara Valley Water District.
<http://mavensnotebook.com/2013/10/21/mavens-minutes-santa-clara-valley-water-district-workshop-a-statewide-perspective-on-the-bay-delta-conservation-plan/> (October 11, 2013).

⁴⁴ Ellen Hanak et al. “Paying for Water in California,” Public Policy Institute of California.
http://www.pplic.org/content/pubs/report/R_314EHR.pdf (March 2014).

12. Federal Funding

12A. Increase federal water recycling funding. The Administration and Congress should increase appropriations for the Bureau's Title XVI program. This program has been extraordinarily successful in helping to finance water recycling investments. Since 1992, Title XVI has provided \$556 million in federal funding and leveraged \$1.7 billion in matching funds. As of 2013, the Bureau estimates that the program has generated 390,000 AF of new water supply.⁴⁵ However, in recent years, this program has been routinely underfunded and oversubscribed. (The most recent round of funding was for a mere \$1.9 million.⁴⁶) Achieving California's water recycling goals will require a significant increase in funding. Projects that demonstrate significant technical advancement and cost reduction should be prioritized.

12B. Expand WaterSMART. The Administration and Congress should increase funding for the Bureau of Reclamation's WaterSMART program.⁴⁷ WaterSMART provides significant funding for water use efficiency, recycling and other investments.⁴⁸ Although better funded than Title XVI, additional funding would produce significant water supply benefits.

12C. Initiate DOE water/energy pilot projects. The Administration and Congress should direct DOE to follow California's example and fund pilot projects to demonstrate the energy benefits of carefully designed water conservation programs. Pilot projects could be undertaken in partnership with the California Department of Water Resources water/energy funding program, and should include energy savings from both hot and cold water conservation.

The Department of Energy has provided extensive funding to help finance programs with energy efficiency benefits. Through the ARRA alone, DOE provided \$3.2 billion in funds for energy efficiency and conservation.⁴⁹ However, DOE has directed remarkably few – if any - funds to water conservation programs designed to achieve energy savings. Given that California's water use is responsible for 19% of the state's electricity consumption, water conservation can produce quantifiable energy savings.⁵⁰ The California Energy Commission has found that these savings are remarkably cost-effective.

The State of California understands the multiple benefits of water efficiency improvements, including energy savings. That is a major reason why the 2014 drought bill signed by Governor Brown included \$30 million in greenhouse gas reduction funds to finance water efficiency projects with energy benefits.⁵¹

⁴⁵ Peter Soeth, "Nine Projects Receive \$1.29 Million from Reclamation for Title XVI Water Reclamation and Reuse Feasibility Studies," US Department of the Interior Bureau of Reclamation.

<http://www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=47367> (June 26, 2014).

⁴⁶ "Title XVI – Water Reclamation & Reuse Program," US Department of the Interior Bureau of Reclamation.

<http://www.usbr.gov/WaterSMART/title/> (September 5, 2014).

⁴⁷ "WaterSMART Sustain and Manage America's Resources for Tomorrow," US Department of the Interior Bureau of Reclamation. <http://www.usbr.gov/WaterSMART/> (August 21, 2014).

⁴⁸ "FY 2014 WaterSMART Water and Energy Efficiency Grants," US Department of the Interior Bureau of Reclamation. <http://www.usbr.gov/WaterSMART/weeg/docs/FY2014WaterSMARTWaterandEnergyEfficiency%20Grants.pdf> (2014).

⁴⁹ "ENERGY EFFICIENCY AND CONSERVATION BLOCK GRANT PROGRAM," Energy.gov. <http://energy.gov/eere/wipo/energy-efficiency-and-conservation-block-grant-program>

⁵⁰ "California's Water-Energy Relationship," Page 1. California Energy Commission, <http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF> (November 2005).

⁵¹ "GOVERNOR BROWN SIGNS DROUGHT LEGISLATION," Office of Governor Edmund G. Brown, Jr. <http://www.gov.ca.gov/news.php?id=18432> (March 1, 2014) and "California State Summary: EERE Investments in California," U.S. Department of Energy. <http://apps1.eere.energy.gov/states/pdfs/56423.pdf> (March 2013).

12D. Appropriate and target State Clean Water Revolving Funds. The federal “Green Project Reserve” (GPR) program requires all Clean Water State Revolving Fund programs to devote a minimum percentage of their annual federal capitalization grant to water efficiency, green infrastructure and other programs.⁵² These investments should include projects to benefit low income communities, including leak repair and other infrastructure improvements. Congress can ensure that the SRFs provide water supply and water quality benefits in two ways. **First, the Administration and Congress should provide the SRF with adequate overall funding. Second, the Administration and Congress should specify that at least 20% of State Revolving Funds be spent on GPR projects.**

The ARRA dedicated at least 20% of the SRFs to GPR projects. Due to overwhelming support for these projects, the final percentage of funds dedicated to these multi-purpose projects was even higher. In the final analysis, 30% of ARRA SRFs were dedicated to GPR projects. These projects were “shovel-ready,” cost effective and had willing local partners. Most importantly, nearly all of these projects directly provided clean water and water supply benefits. (See related recommendation above.)

12E. Prioritize Corps funding for floodplain restoration. The Administration and Congress should prioritize Corps of Engineers flood management investments in California that would produce ecosystem restoration and water supply, as well as flood management, benefits. Some traditional levee projects provide flood management benefits, but fail to provide a broader suite of benefits. Floodplain restoration, on the other hand, can also provide groundwater recharge, reservoir reoperation, water supply, water quality, and ecosystem benefits. As a result, multi-purpose floodplain projects can help California prepare for future droughts. **Congress should also provide guidance to encourage the Corps to finance investments that provide ecosystem restoration benefits as a part of multi-purpose floodplain restoration project.** (See related recommendation above.)

⁵² “Green Project Reserve,” US EPA. http://water.epa.gov/grants_funding/cwsrf/Green-Project-Reserve.cfm (September 10, 2013).

13. Local Funding

13A. Supporting water supply investments through local water utility budgets. For many water utilities, the wholesale cost of water has been rising steadily over the past five years. That trend is likely to continue. In some cases, water rates haven't kept pace with utility needs. In particular, the understandable desire to minimize rate increases has slowed the rate of investment in new sustainable water supplies, such as water conservation, recycling, and groundwater cleanup. In the coming years, **urban water utilities should adopt budgets and supporting rate structures sufficient to ensure stable funding for new investments in sustainable water sources.** Those investments can have broad benefits, including the construction of neighborhood parks and green streets, job creation and more. Partnerships with stakeholders can help water utilities make the case to the public and the media for adequate water rates.

13B. Supporting green infrastructure projects. Local agencies should provide resources for residential and commercial landowners to implement green infrastructure projects. For example, a local water agency can offer rain barrels for residential homeowners to use on their property to capture rainfall and use for outdoor irrigation. Local agencies should also be provided state and federal funding to conduct low impact development projects. The State Board's Drought Response Outreach Program for Schools (DROPS) is a successful model, allocating funding to schools for addressing the drought by capturing, treating, infiltrating, or using stormwater while providing multiple benefits. All projects should include an education or outreach component that is designed to increase student and public understanding of the project's environmental benefits and the sustainability of California's water resources.

13C. Proposition 218. The State Board, regional boards and DWR should encourage water agencies and municipalities (e.g. public works departments) to take maximum advantage of the simpler Prop. 218 process for the approval of water-related fees. Proposition 218 has been a significant obstacle to water agency investments. AB 2403, which was recently signed by Governor Brown, clarifies that certain water related fees with a water supply nexus are eligible to utilize the simpler "protest process" established by Prop. 218. State agencies should ensure that water districts and municipalities take advantage of this opportunity to ensure reliable funding for water supply and drought preparation investments, including stormwater, groundwater clean-up, recycling and water use efficiency. This will also serve to help municipalities fund projects and programs for compliance with municipal stormwater permit requirements.

13D. Public agency accounting rules – capitalizing efficiency investments. EPA's Environmental Finance Advisory Board should develop recommendations for the Governmental Accounting Standards Board (GASB) to facilitate stable, long-term public water agency investments in water use efficiency, including the potential to include financing for water use efficiency in agency capital budgets.

The GASB has adopted standards for public agencies that make it very difficult for public water agencies to plan for investments in efficiency as a part of their capital budgets. The GASB is an independent body, not under direct federal control. It does not specifically prohibit debt-financing of water efficiency programs. Rather, their standards require that an asset being financed as part of a capital program be "under the control" of the agency doing the debt-financing. The GASB considers investments in recycling, dams and pipelines to be assets "under the control" of a water agency. However, they do not consider water saved by WUE investments to be "under the control" of the agency. No agency wants to be deemed in violation of GASB rules. This is not a theoretical problem. The Alliance for Water Efficiency has found that communities have been forced to cut their conservation programs when revenue falls. In practice, this accounting requirement means that WUE investments become lower priorities. If this obstacle were overcome, it would be easier for water agencies to plan long-term water use efficiency investments.