

WATER REUSE EXPERIENCE IN SOUTHERN CALIFORNIA

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Overview



- **The history of the U.S. west is directly linked with the history of water in the west.**
 - We will avoid discussions of the governmental structure and political issues associated with water.
- **Many communities and agencies in southern California have contributed to water reuse.**
 - West Basin is a good example of how water reuse can be implemented from scratch.
 - There are other large-scale recycling programs (Orange County GWR).
 - There have been failed programs that have been reborn 25 years later (San Diego).
- **The purpose of this presentation is to share the reasons why reuse of water in Southern California is an important part of the overall water portfolio and explain some of the drivers toward potable reuse.**

In the eastern U.S., wasting water is using more than you really need.

In the western U.S., wasting water means letting water flow by without using it.

Mark Twain didn't say

***“Whiskey is for drinking and
water is for fighting over”***

but it's a great quote anyway.

Benjamin Franklin did say

***“When the well is dry, we
know the worth of water”***

and it's true.

CALIFORNIA WATER



- Imported Supplies
- Groundwater
- Storm Water
- Water Transfers
- Desalination
- Water Recycling

SOUTHERN CALIFORNIA SUPPLY CHALLENGES



○ Northern California

- Delta Smelt (endangered species) Restrictions
- Unstable Delta levees
- Sierra Snowpack rate of melt

○ Colorado River

- Drought
- Competition for supplies

○ MWD Allocation

○ Need for new water supplies to meet future growth

Population Affected by Current Drought: 37,007,923



U.S. Drought Monitor California

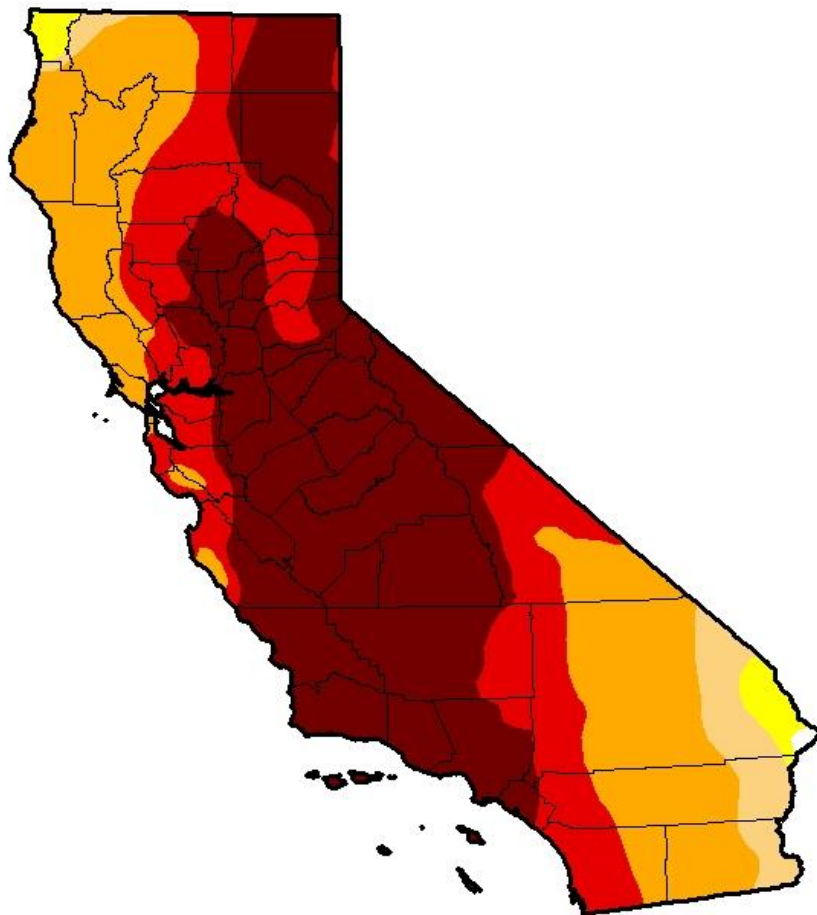
April 7, 2015

(Released Thursday, Apr. 9, 2015)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.15	99.85	98.11	93.44	66.60	44.32
Last Week <i>3/31/2015</i>	0.15	99.85	98.11	93.44	66.60	41.41
3 Months Ago <i>1/8/2015</i>	0.00	100.00	98.12	94.34	77.94	32.21
Start of Calendar Year <i>12/31/2014</i>	0.00	100.00	98.12	94.34	77.94	32.21
Start of Water Year <i>9/30/2014</i>	0.00	100.00	100.00	95.04	81.92	58.41
One Year Ago <i>4/8/2014</i>	0.00	100.00	99.81	95.21	68.76	23.49



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

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NCDC/NOAA



<http://droughtmonitor.unl.edu/>

First Ever Mandated 25% Urban Usage Reduction



Los Angeles Times
latimes.com
THURSDAY, APRIL 2, 2015
\$2.00 DESIGNATED AREAS HIGHER © 2015 EST

Brown gets tough on water

L.A. pledges massive sidewalk repairs
By Emily Alpert Reyes

Los Angeles is pledging to spend more than \$1.3 billion over the next three decades to fix its massive backlog of broken sidewalks and make other improvements to help those with disabilities navigate the city as part of a tentative deal being described as a landmark legal settlement.

The proposed agreement would resolve a lawsuit filed by attorneys for the disabled, who argued that crumbling, impassable sidewalks and other barriers prevented people in wheelchairs or others with mobility impairments from accessing public pathways in vio-



In a first for the state, the governor orders mandatory drought restrictions, including a 25% urban usage cut.

By Bettina Boxall, Chris Megerian and Matt Stevens

PHILLIPS, Calif. — Standing in a brown field that would normally be smothered in several feet of snow, Gov. Jerry Brown on Wednesday ordered cities and towns across California to cut water use by 25% as part of a sweeping set of mandatory drought restrictions, the first in state history.

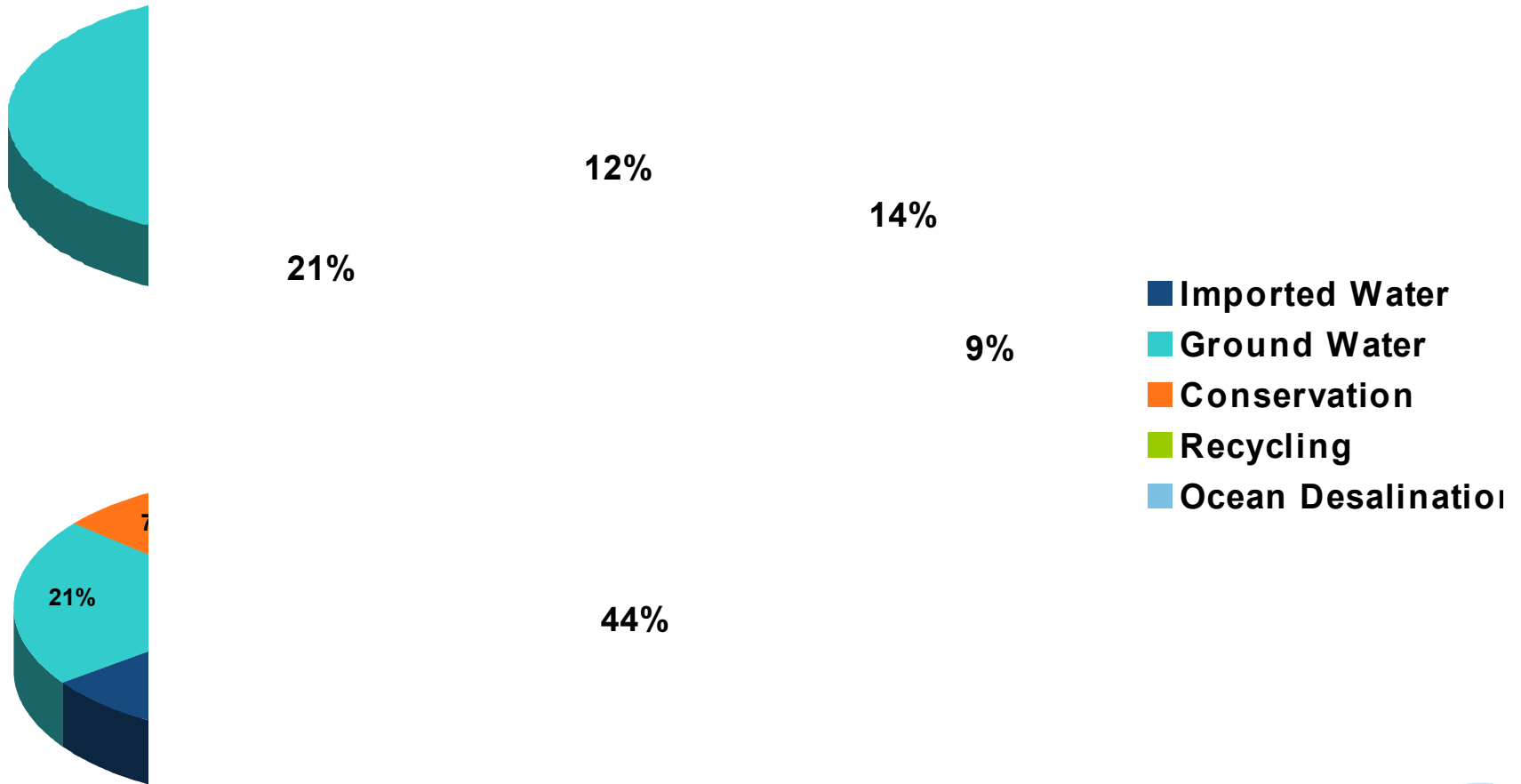
The directive comes more than a year after Brown asked for a 20% voluntary cut in water use that most parts of the state have failed to attain, even as one of the most severe modern droughts drags into a fourth year. It also came on the day that water officials measured the lowest April 1 snowpack in more than 60 years of record-keeping in the Sierra Nevada.

Wearing hiking shoes and a windbreaker in an area that normally requires cross-country skis this time of year, Brown announced the executive order in a Sierr-

Changing Sources of Water Over the Years



Example of Changes in Source Water in Southern California (West Basin MWD)



Implementing reuse may require tailoring water to users needs – West Basin MWD example.



1 Tertiary Water
Irrigation



2 Nitrified Water
Cooling Towers



3 Reverse Osmosis
with AOP
Groundwater Injection



4 Single Pass RO
Low-Pressure Boiler Feed



5 Double Pass RO
High-Pressure Boiler Feed



Reducing Dependence On Imported Water



○ Additional efforts to alleviate reliance on imported water are needed:

- **Increase Groundwater Recharge (where it exists)**
 - Physical/hydrogeologic constraints
- **Provide reuse water to industrial customers (e.g., refineries)**
 - requires infrastructure expansion and lengthy contract negotiations
- **More conservation**
 - The “low hanging fruit” is gone, now more difficult to increase conservation
- **Ocean Desal**
 - Expensive, high energy demand and environmental groups (NGO) oppose
- **Indirect and Direct Potable Reuse**
 - regulatory barriers and public perception (both are becoming less of an issue)
- **System reliability**
 - Originally reuse systems were built as a “supplemental system”, but have become a critical utility. The systems need improvements to keep up with demand.

Issues associated with implementing a Reuse Program

- **Reuse of water cannot happen overnight**
 - Regulatory issues
 - Capital investment
- **Recycled water is often more expensive than potable water**
 - Water quality requirements at the end-use
 - Public safety requirements
 - Treatment
 - Public contact
 - Public consumption
- **Public Perception**
 - “Yuck” factor, “Toilet to Tap” (Original San Diego experience)
 - Union demands for use of reclaimed water (Exxon/Mobil Torrance refinery)
- **Water is a Demand/Supply problem**
 - There are no alternate products for water
- **Water reuse should be part of the long-term planning program for water supply**

Non-potable Reuse is not enough

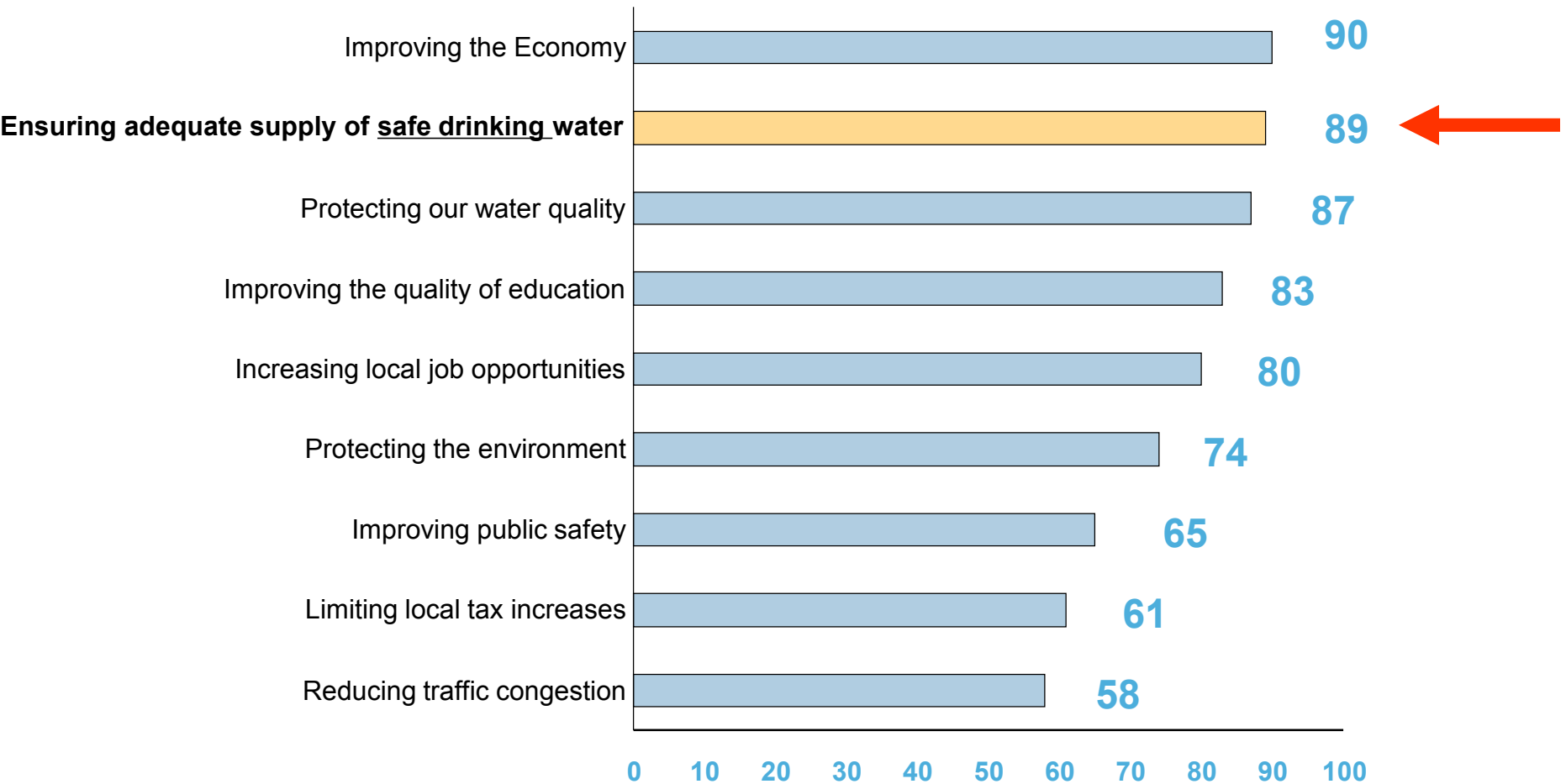


- **Expansion of agricultural irrigation is generally not feasible due to long distance between the source (city) and agricultural demand (rural areas).**
- **Cost and disruption to construct pipe systems to convey recycled water and the need to provide winter water storage further limit agricultural reuse.**
- **Landscape irrigation may not be economical due to dispersed nature of demand.**
- **Cost of providing parallel distribution system is very expensive.**
- **Historically, the value of the water from surface and groundwater supply sources has not reflected the true cost of providing the supply, resulting in a distinct disadvantage for the production of recycled water.**

Public Wants Safe Drinking Water



2009 Water Supply Options Research



Definitions

○ **Non-potable Reuse**

- Water used to meet non-potable demands such as industrial uses, irrigation, etc.

○ **De Facto Reuse**

- Occurs when a community downstream from another community withdraws its drinking water from the same surface water in which the upstream community discharges its treated wastewater.

○ **California Senate Bill No. 918**

- **Indirect Potable Reuse for groundwater recharge**: use of recycled water for replenishment of an aquifer that has been designated as a public water supply source
- **Surface Water Augmentation**: placement of recycled water into a surface water reservoir used as a drinking water supply
- **Direct Potable Reuse**: introduction of recycled water directly into a public water system or into a raw water supply immediately upstream of a water treatment plant

Drivers toward Indirect Potable Reuse (IPR)

- **The need for construction and operation of a parallel recycled water distribution system is avoided.**
- **Alternative sources of water are of poor quality or prohibitively expensive.**
- **Traditional sources of water are being reduced because of diversion to meet environmental protection regulations, reductions in allocations and reductions in flow brought on by climate change.**
- **Groundwater has been over drafted and only poor quality groundwater is available in some areas.**
- **With advanced treatment technologies it is now possible to remove contaminants effectively and reliably to extremely low levels that have no known health effects.**
- **Recycled water is a reliable source of supply which exists in close proximity to demand.**



Drivers toward Direct Potable Reuse (DPR)

- **Many communities lack suitable hydrogeology for groundwater recharge or large reservoirs for surface water augmentation.**
- **Direct potable reuse is potentially less costly than the use of tertiary water for irrigation (when all infrastructure is considered).**
- **DPR can require less energy than other sources of water.**
 - Energy required to deliver 1 ac-ft of water to Orange County (WateReuse 2011)
 - Ocean Desal: 3,700 kwh
 - State Project Water: 3,500 kwh
 - Colorado River Water: 2,500 kwh
 - **Purified Water: 800 – 1,500 kwh (i.e., DPR)**
- **Current technology is sufficient to replace the environmental buffer (aquifer or reservoir) with an engineered storage buffer through a combination of monitoring, storage, and treatment reliability measures. Future technology may obviate the need for engineered storage buffers.**



Potable Reuse is Already Here (we just don't talk about it much)

○ California

- West Basin MWD (on-going IPR)
- Orange County Water District (on-going IPR)
- San Diego (“Pure Water San Diego” 83 mgd DPR system)
- Water Replenishment District (21,000 ac-ft per year IPR under design)

○ Texas

- Colorado River MWD (Big Spring RWPF DPR represents 20% of potable demand)
- Wichita Falls (7.5 mgd temporary DPR blended with 50% surface water)
- Brownwood (DPR approved for construction by TCEQ)
- Others in Texas planning DPR:
 - El Paso Water Utilities
 - Laguna Madre Water District
 - Gulf Coast Water Authority

○ Not just a western states problem

- Tampa, Florida (investigating since the 90s)
- Hollywood, Florida (pursuing IPR)
- Raleigh, NC (pursuing IPR)

○ Every City along the Ohio and Mississippi Rivers (*de facto reuse*)

Questions?



Thank You!

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