

Presentation 4 – Better Practices for *Water* and *Energy*



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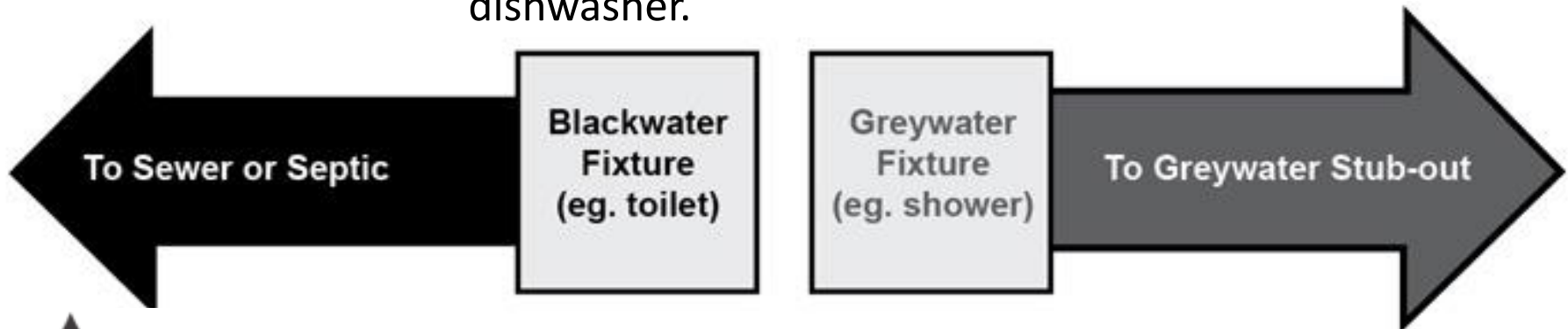
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Better Practices for Water Sustainability

Classifications of Used Water

- There are generally a few classifications of water that undergoes treatment.
 1. Blackwater – Comes from the Toilet, also called Sewage
 2. Greywater – Comes from commercial buildings and households; usually water used for cleaning, cooking, etc.
 - Dark Greywater – A subcategory of Greywater which contains heavy pollutants, usually from the sink or dishwasher.



Desalination

Why Desalination?

Desalination is a group of processes to remove salt and minerals from sea water or polluted water in order to obtain potable drinking water.

Used around the world in regions that lack access to clean water



Primary Methods of Desalination

1. Multi-Stage Flash (MSF) -- 13.5-25.5 kWh/m³

- Makes up more than half the world's desalination
- Involves vaporizing water directly into steam.
- A condensate collector stores the pure water vapor

2. Multiple-Effect Distillation -- 6.5-11 kWh/m³

- Similar to MSF except the process takes place in tubes rather than tanks.
- This process uses thermal energy for heat transfer that can be reused.

Primary Methods of Desalination

3. Vapor-Compression -- 7-12 kWh/m³

- This process involves evaporating and distilling seawater through a vapor compression refrigeration cycle
- The compressed vapor is condensed to pure liquid.

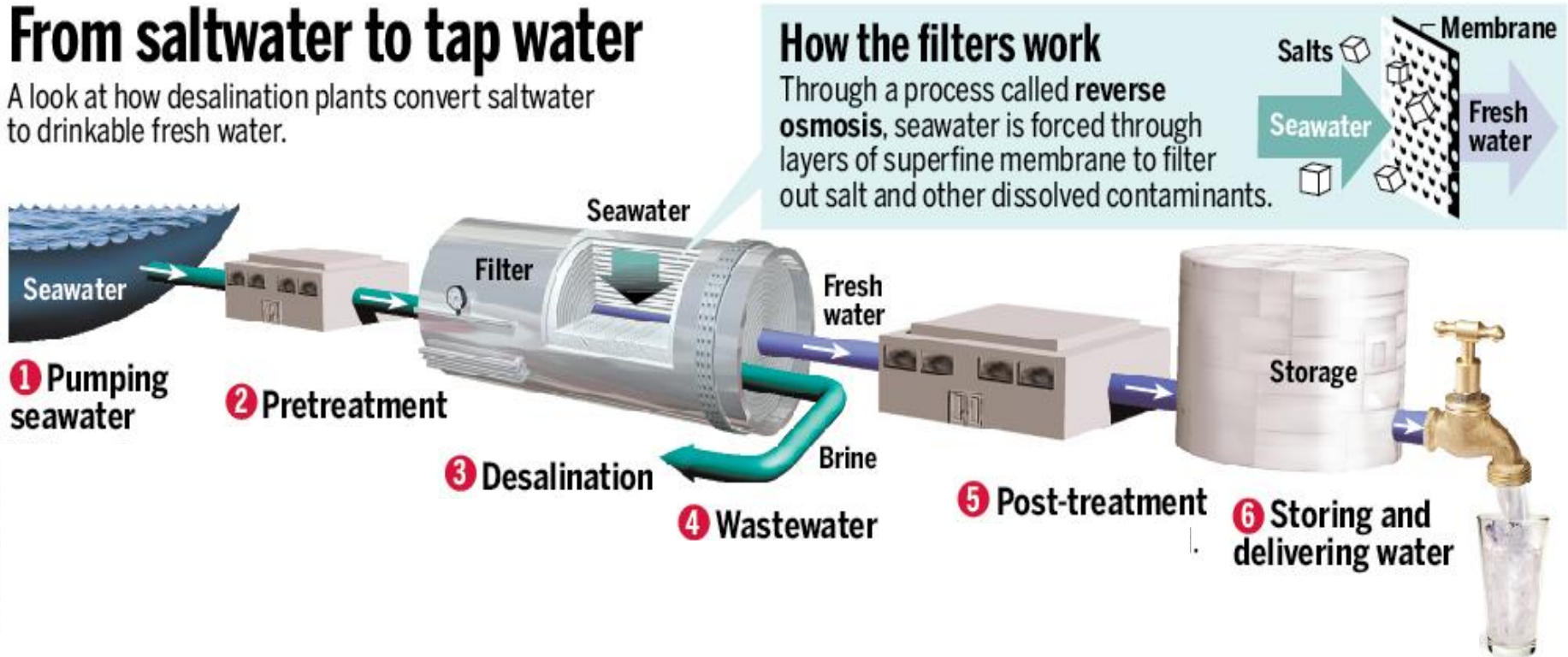
4. Reverse Osmosis -- 3-5.5 kWh/m³

- Involves filtering water through membrane pores (ranging from 0.1 to 5000 nm).
- These membranes can intercept bacteria, protozoa, and other microorganisms.
- Very energy efficient

Desalination Process

From saltwater to tap water

A look at how desalination plants convert saltwater to drinkable fresh water.



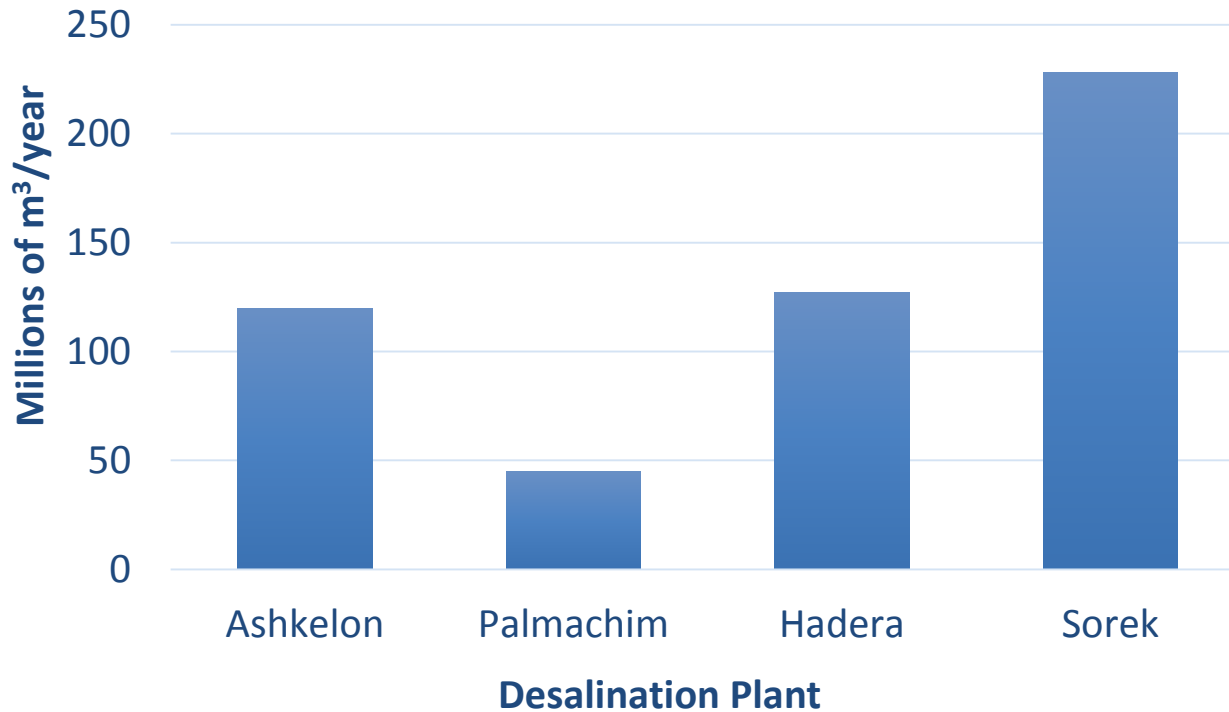
Sources: Bay Area Regional Desalination Project, McClatchy-Tribune

BAY AREA NEWS GROUP

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Desalination – On a Large Scale

Israeli Water Desalination Facilities



These plants alone provide Israel with nearly half its freshwater as 2015 and 70% by 2050.

Total Output
520 million m³/year or roughly 420,000 acre ft./year

*Assuming an average American household consumes about **0.45 acre ft. per year**, these plants could provide water to about **930,000 homes annually**.*

Ashkelon Desalination Plant

- The Ashkelon Plant is a well known desalination plant that uses reverse osmosis.
- Its maximum output as of 2010 is roughly 120 million m³/year.



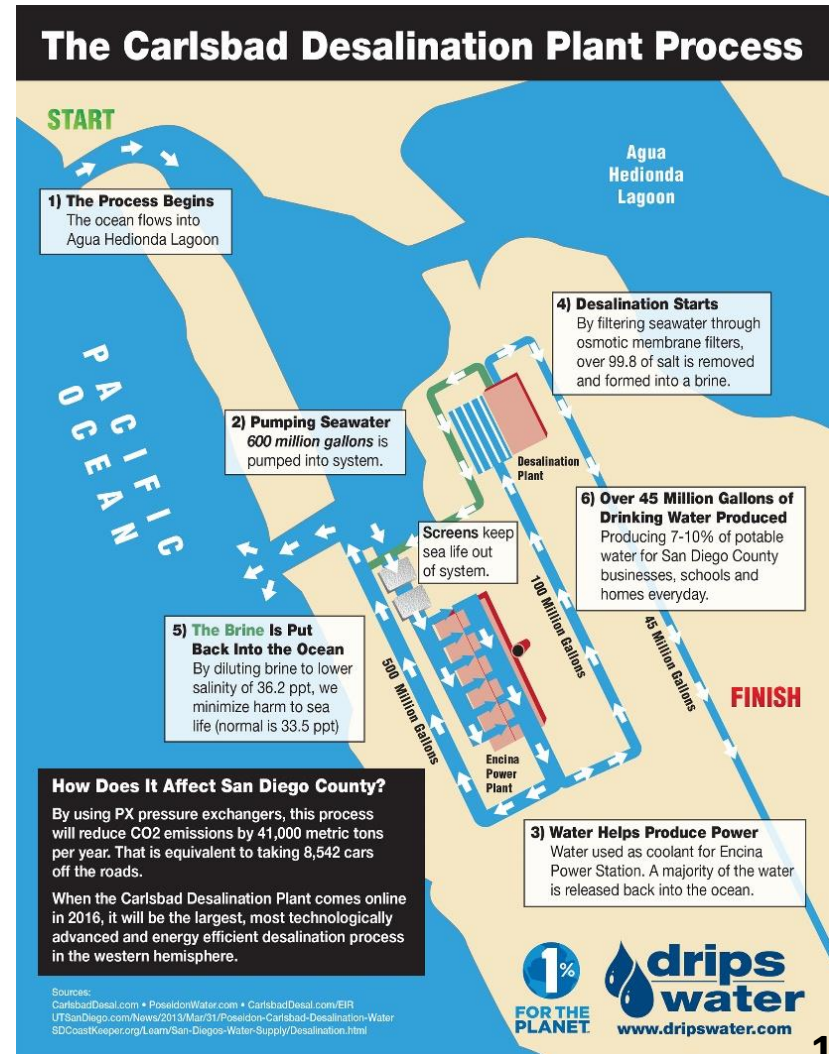
Ashkelon Desalination Site



In fact, the company that developed many of these plants, such as the one in Ashkelon, is constructing the plant in Carlsbad, CA. The company is called *IDE Technologies*.

Existing Desalination in CA

- Carlsbad plant up and running by end of 2015
- Catalina Island
- Santa Barbara plant made during drought – never used due to higher cost than traditional methods.



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Large Scale Recycling

Recycling Water

- Involves purifying wastewater or sewage
- Water can be used in utilities, irrigation, toilets, and in some cases for drinking and reservoir replenishment
- Drinking water obviously must meet higher standards than basic grey water



Image Courtesy of Lenntech

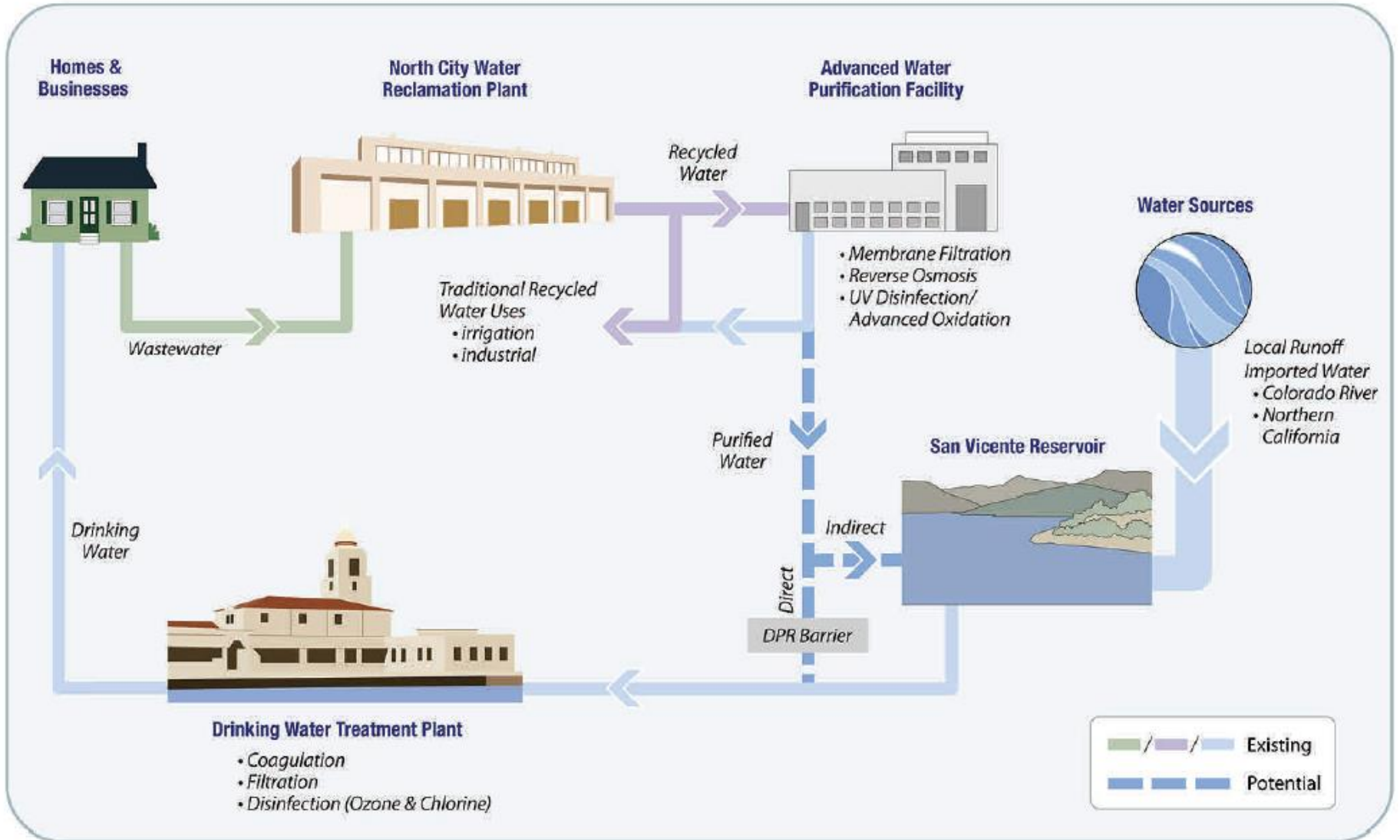
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Recycling Water

- Once again, Israel is on the forefront of sustainability in terms of water.
- As of 2010, they are able to recycle and essentially reuse 80% of their sewage as drinking water.

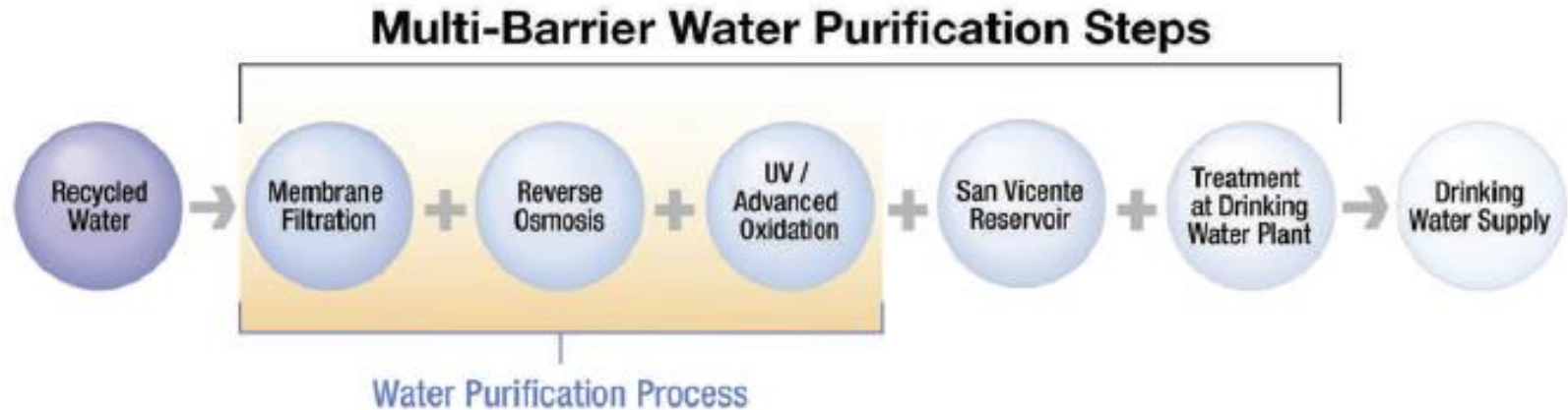


Water Purification Process



Large Scale Recycling

- In order to process large amounts of water in a clean manner, companies have adopted this idea of Multi-Barrier Steps.
- Each step, or barrier, of the purification process is a method of filtering out solid particles, bacteria, and other pollutants.
- These steps may seem redundant, but they ensure that every drop of water meets the standards of safe irrigation and/or drinking respectively.
- *(This also reassures the many people who feel doubtful about drinking water that came from sewage.)*



Pure Water San Diego

Clean Beyond Common Standard

PURIFIED RECYCLED WATER is wastewater that has passed through **multiple protective barriers**

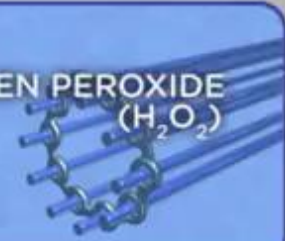
MEMBRANE
FILTRATION



REVERSE
OSMOSIS

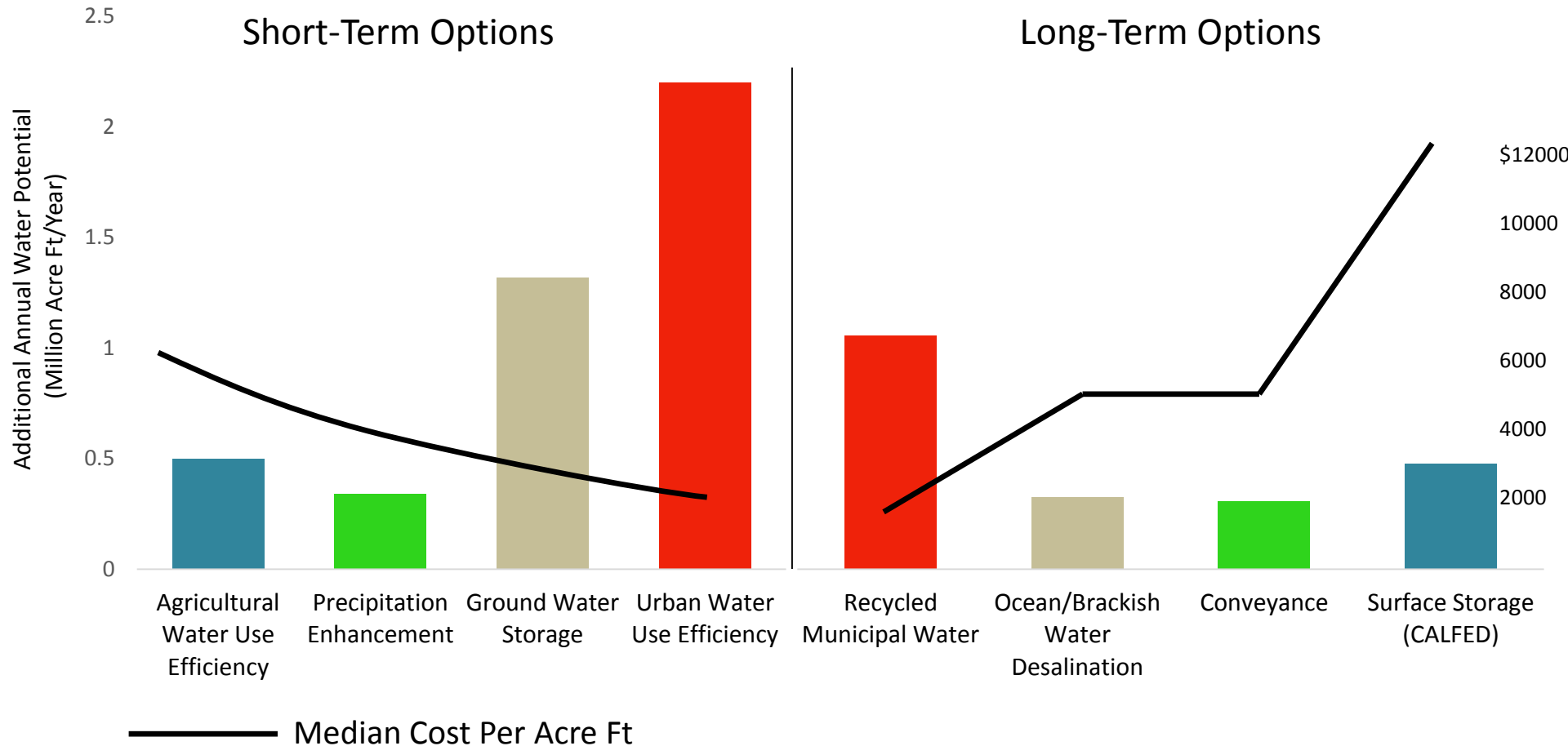


UV with
HYDROGEN PEROXIDE
(H₂O₂)



Small Scale Water Recycling

Immediate and Long-Term Solutions



Source: California Coast Keeper Alliance 2009

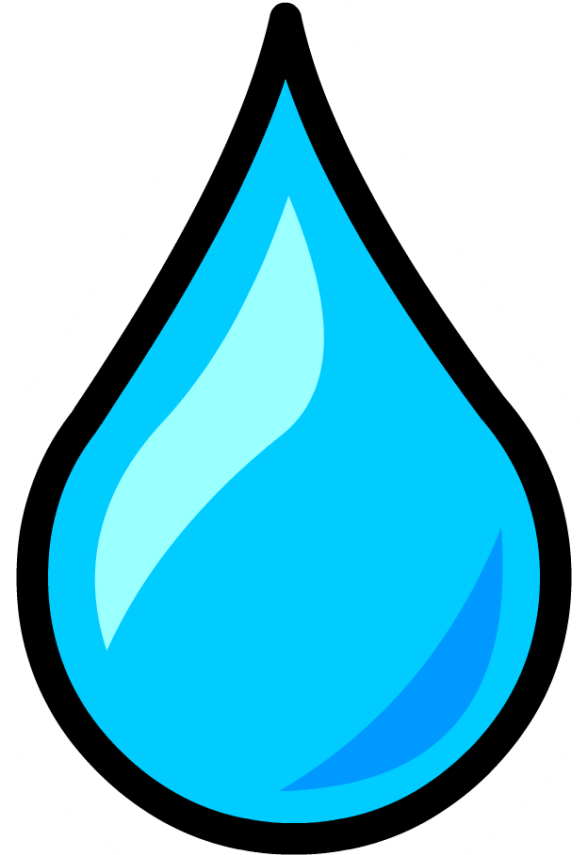
Immediate Solution: Efficiency

Urban Water Use Efficiency

- California average reduction in June: 27%
- Next Goal: 32%

Benefits

- Reduce agricultural sacrifice
- Minimal resources to enforce



Best Micro-Scale Water-Saving Techniques

- ✓ Check faucets, pipes, and toilets for leaks can save from 20-200 gallons per day
- ✓ Water-saving shower heads reduce waste up to 3 gallons per minute
- ✓ Use Biodegradable soap so water can be easily used on plants
- ✓ Low-flow faucet aerators



Rainwater Capture Systems

Rainwater harvesting is the capture, diversion, and storage of non-potable water for later reuse.

-City of San Diego

Approximately 600 gallons of rainwater can be harvested from one inch of rain falling on a 1,000 square foot roof.

Rainwater Capture Systems

Advantages

- Reduces demand on other sources such as ground and surface water
- Reduces water bill
- Water easily made suitable for irrigation
- Reduces floods and soil erosion

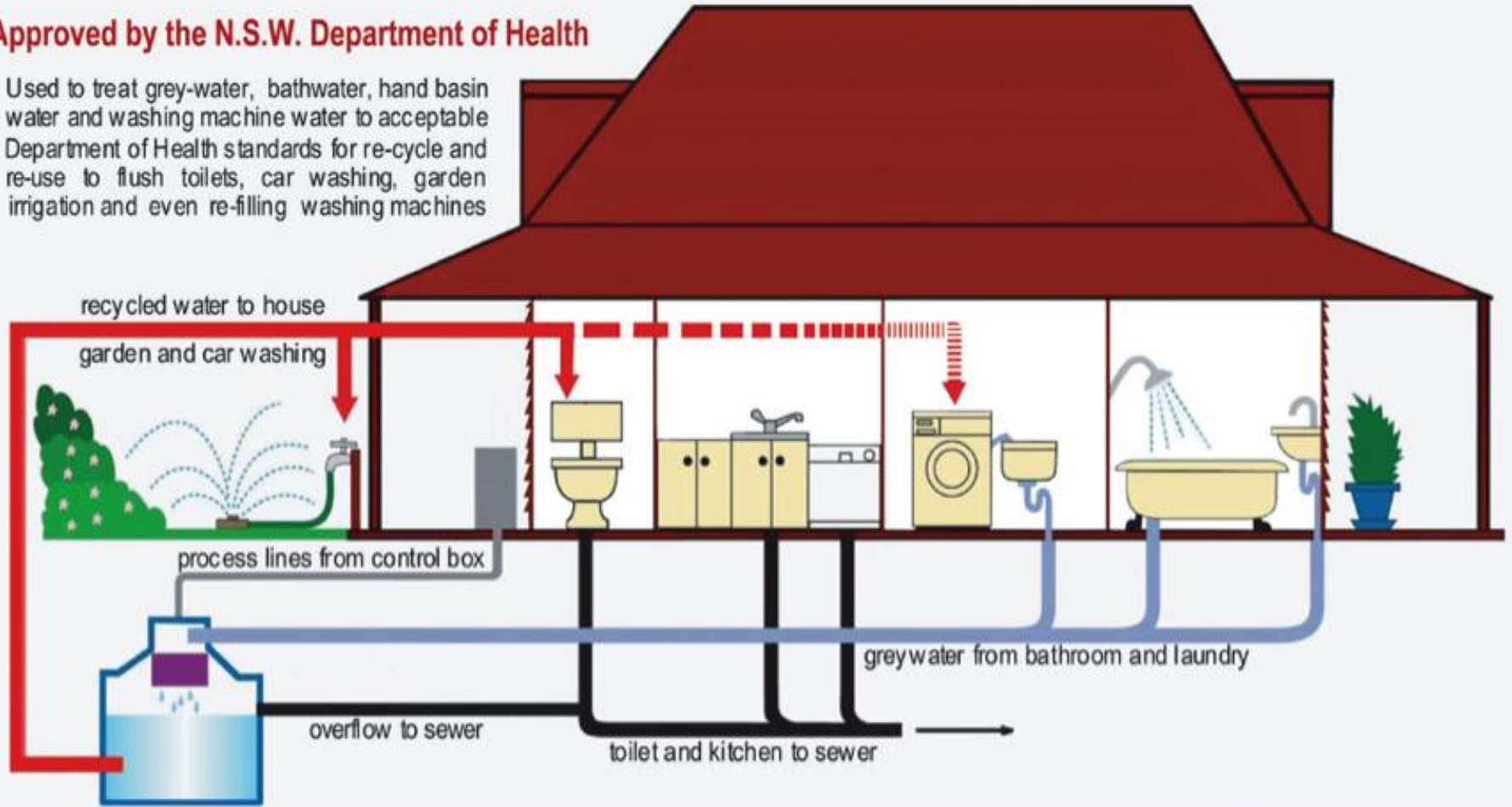
Disadvantages

- Unpredictable rainfall
- Initial cost from \$200 to \$2000
- Regular maintenance due to rodents, mosquitoes, algae growth, insects and lizards
- Roof types may seep chemicals or animal droppings
- Storage limits

Long-Term Solution: Grey Water Recycling

Approved by the N.S.W. Department of Health

Used to treat grey-water, bathwater, hand basin water and washing machine water to acceptable Department of Health standards for re-cycle and re-use to flush toilets, car washing, garden irrigation and even re-filling washing machines



Greywater Recycling Systems

Advantages

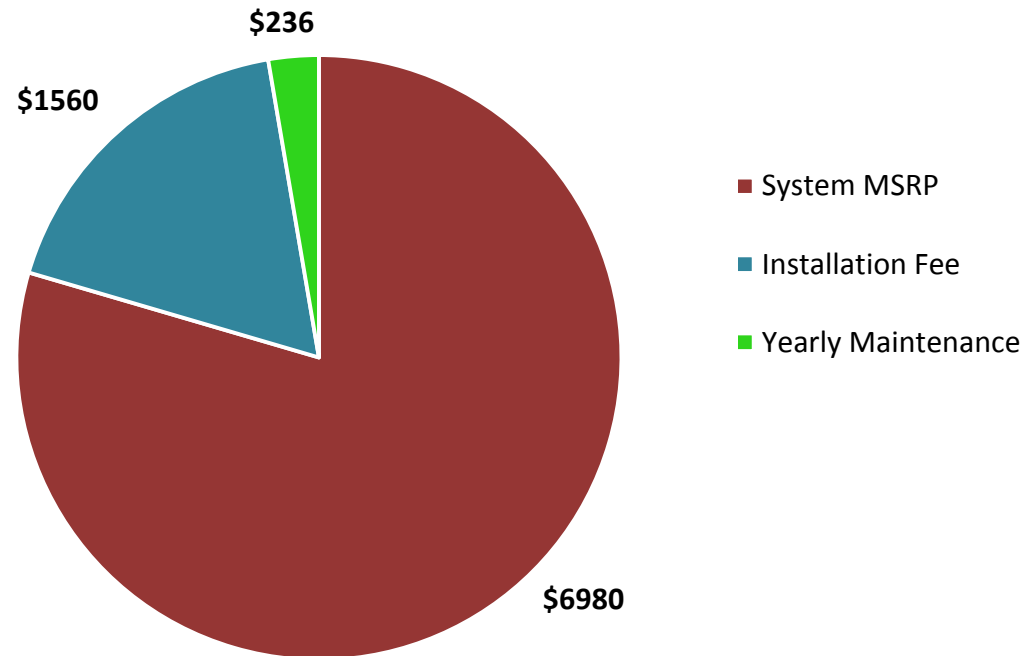
- Reduce use of potable water to irrigate plants
- Reducing monthly water costs
- Minimize the burden on the public wastewater treatment system
- Complements drought tolerant and native landscapes
- Groundwater recharge

Disadvantages

- Health standards of the water and quality concerns
- Excessive filtration necessary to make water suitable for drinking

Cost of Grey Water Systems

- High installation cost
- Construction for individual buildings and homes are not cost effective.
- Long construction and clean up



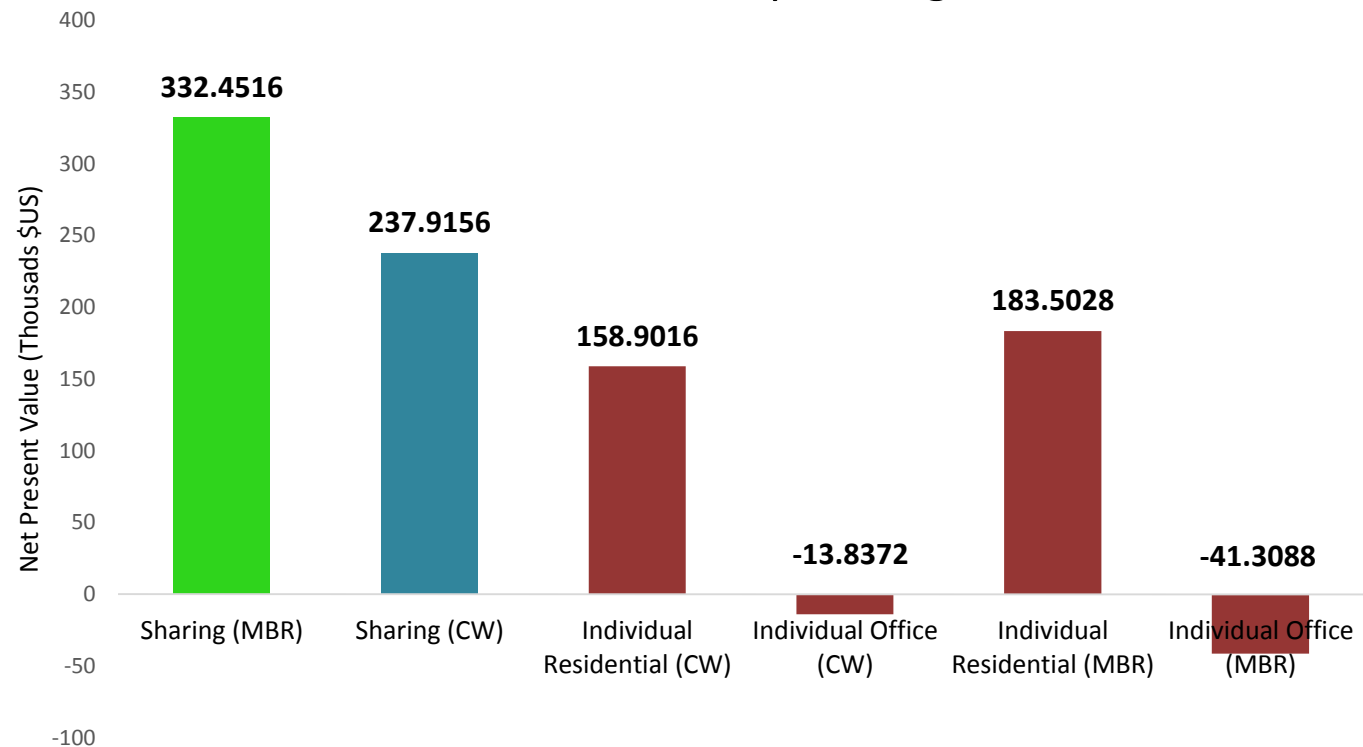
Data Source: *The Guardian* 2013

Overcoming Grey Water Cost

Combined Systems

- Larger capacity systems accommodate multiple buildings
- Highest Water Savings potential
- Divided cost between participants

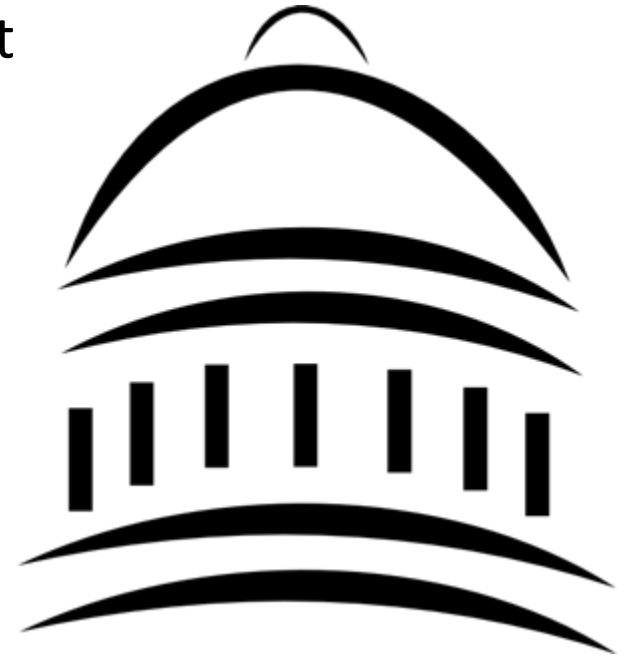
NPV Over a 15 Year Operating Period



Data Source: *Sustainability* 2013; doi:10.3390/su5072887

Primary Regulation Updates

1. Redefine kitchen and dishwasher effluent as difficult to handle grey water.
2. Allow commercial and multi-family homes
3. Eliminate the mandate for a redundant irrigation system just for grey water distribution



Policy

Managing the Public: Triple Appeal Principle

The Id



The Ego



The Super Ego



Managing Public Opinion

Water Flowing From Toilet to Tap May Be Hard to Swallow

By JOHN SCHWARTZ MAY 8, 2015

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FOUNTAIN VALLEY, Calif. — Water spilled out of a spigot, sparklingly clear, into a plastic cup. Just 45 minutes earlier, it was effluent, piped over from Orange County’s wastewater treatment plant next door. At a specialized plant, it then went through several stages of purification that left it cleaner than anything that flows out of a home faucet or comes in a brand-name bottle.

“It’s stripped down to the H, 2 and O,” said [Mike Markus](#), the general manager of the county water district. He was not exaggerating. Without the minerals that give most cities’ supply a distinctive flavor, this water tastes of nothing.

As California scrambles for ways to cope with its crippling drought and the [mandatory water restrictions](#) imposed last month by Gov. Jerry



Filtering membranes in an Orange County, Calif., water purification facility. The plant opened in 2008 during the state's last drought. Stuart Palley for The New York Times

Water Recycling is Awe Inspiring for Some – Nauseating to Others

Managing Residential Practices



IMPORTANT INFORMATION Your Property's Water Allocation Is In This Letter

July 2015

Dear Customer,

In the midst of the worst drought in California history and an Executive Order from Governor Brown, the State has mandated a 36% cut in water usage Districtwide, compared to 2013 levels. In response, the District has taken a number of actions, including approving drought allocations.

The new water allocations are effective beginning July 1, 2015. The District identified the 2013 water usage of all its customers and evaluated a variety of allocation approaches before settling on the method that was determined to be most practical and fair. The allocations are measured in hundred cubic feet (HCF). One HCF is equal to 748 gallons. Features of the District allocation are summarized below.

Single-Family Residential Allocations. Each residential customer receives a Base Allotment of 15 HCF of water per two-month billing period (11,220 gallons) with no restrictions. This is to ensure every customer has adequate water for basic household needs. Any remaining water use must be reduced by 45% compared to what that property used in 2013 during the same billing period. The combined Base Allotment and 45% cut in remaining use meets the mandated 36% District-wide cut in use.

Multi-Family Allocations. Multi-family customers receive a Base Allotment of 13 HCF per dwelling unit per two-month billing period. Any remaining water use must be reduced by 45% compared to what that property used in 2013 during the same billing period.

Government, Institutional and Commercial Allocations. The State goal is to minimize outdoor water use. Government and commercial customers, therefore, are allotted their lowest bi-monthly usage during 2013 as a base amount with no cutback. This is assumed to be basic indoor and/or production water needs. All usage above this base is assumed to be outdoor use and will require a 45% cutback compared to the property's 2013 usage.

Irrigation and Recycled. Since all irrigation use is outdoors, irrigation customers must cut 45%. Recycled water customers are exempt from cut backs.

Your Bi-Monthly Allocation. Your property's allocation is listed on the reverse side of this letter. You are billed every other month. Depending on when your meter is read, you may have allocations for a January-February time frame, or a February-March time frame, and so on. Your billing period is listed on your bill in the Account Summary section. This will tell you what day of the month your bill is read, within two-three days.

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It is Critical that You Read Your Water Meter and Actively Manage Your Water Use to Remain Below Your Allocation

Information About Irrigation Regulations, Conservation Tips, Landscaping Ideas, How to Read Your Meter and Registering for a Free Watersmart Checkup may be obtained at www.sfidwater.org

Please like us on Facebook or follow #SFIDwatersavvy on Twitter

❖ Updates and Transparency
Key for Public Cooperation

Rewarding Practices

Water Use in California Down 27% in June, Beating Goal

By ADAM NAGOURNEY JULY 30, 2015



Alek Crnogorac, a City of Sacramento water conservation specialist, adjusting the spray of a resident's backyard sprinkler. Max Whittaker for The New York Times

“California water servers and users have stepped up big time,” said Felicia Marcus, the chairwoman of the State Water Resources Control Board, as she announced the finding. “That is especially significant because June was really hot. The June numbers tell **a story of conscious conservation.**” – New York Times

Contact us for more information



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Questions

