Not a Drop to Spare

Sustainable Water Management for the South Coast

OCTOBER 2016

The current drought has widened the gap between the amount of water we use and the amount supplied by nature, and has challenged communities across California to find alternative sources of water supply while also using less. But the drought has also created opportunities to reduce wasteful uses of water, develop more sustainable, local and reliable sources of supply, and better manage the finite water resources we do have. With climate change becoming more of a reality with each passing year, it's likely that droughts will become more frequent and more severe in the future. Therefore, it is imperative that we act now to implement strategies that put us on the path toward a more sustainable and drought-resilient water future.

Santa Barbara Channelkeeper is eager to help water districts on the South Coast of Santa Barbara County transition to more sustainable water supply portfolios, so we commissioned a study by a group of Masters students at the University of California Santa Barbara's Bren School of Environmental Science and Management to analyze the financial, energy and environmental costs of the various water supply sources currently used on the South Coast as well as several new supply and demand reduction options that could be developed in the future.

The Bren study, entitled *Not a Drop to Spare, Sustainable Water Management for the South Coast of Santa Barbara County*, demonstrated that there is significant untapped potential on the South Coast to reduce demand and increase supply by improving water use efficiency, capturing rainwater, and recycling and reusing water, while at the same time cutting energy use and greenhouse gas emissions, saving money, reducing pollution, and increasing our preparedness for future droughts.

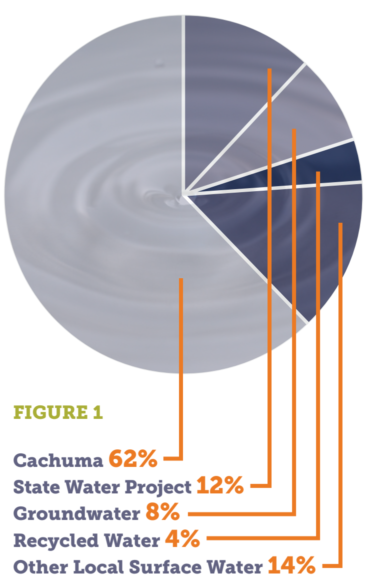


FIGURE 1

South Coast water sources, as percentages of total average annual production (2004-2014). "Recycled water" refers to centralized non-potable tertiary treated water.

Current Supply

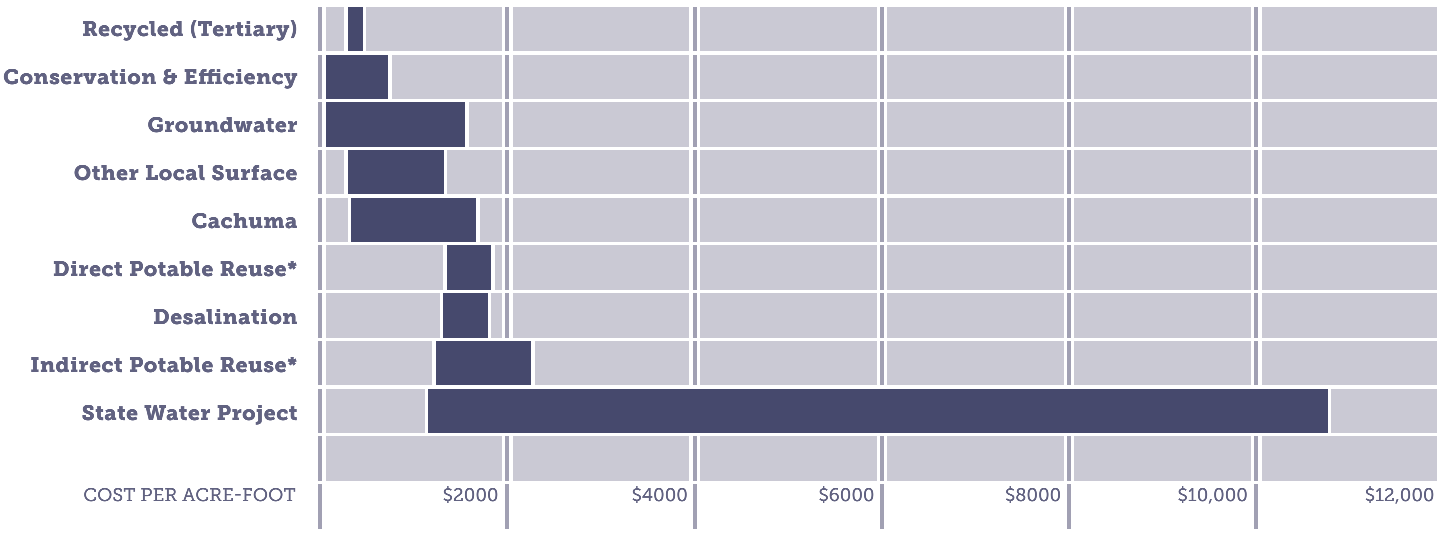
Aggregate water demand on the South Coast has ranged from approximately 31,000-41,000 acre-feet per year (AFY) over the past ten years (1 AF = 325,851 gallons). More than half of that demand is from the residential sector. South Coast water supplies are managed by five water districts: Goleta Water District, La Cumbre Mutual Water Company, City of Santa Barbara, Montecito Water District, and Carpinteria Valley Water District. Together they serve a population of about 214,000.

Lake Cachuma has historically served as the primary water source for the South Coast, with other surface water (Jameson Lake and Gibraltar Reservoir), groundwater, recycled water, and imported water from the State Water Project providing the rest (see Figure 1). However, due to a prolonged period of below average rainfall, the districts have turned to more imported water, increased groundwater production and, in Santa Barbara, desalination, to make up for the diminished supply from Lake Cachuma.

Some of these water sources have higher costs than others, both financial and environmental. Desalination and imported water, for example, have substantially higher financial and environmental costs than other current and potential South Coast water supply sources (see Figures 2 & 3).

FIGURE 2

Full System Costs for South Coast Water Sources



Relative comparisons of each water source's marginal full system costs ($/AF). Full system costs comprise annual variable and fixed cost ranges and are based on average water production over the years for which cost data are available. *There are no current plans to implement these sources.

Potential Future Supplies

The South Coast has a variety of options to address water supply shortages driven by drought – options that are cost-effective, technically feasible, drought-resistant, and environmentally friendly.

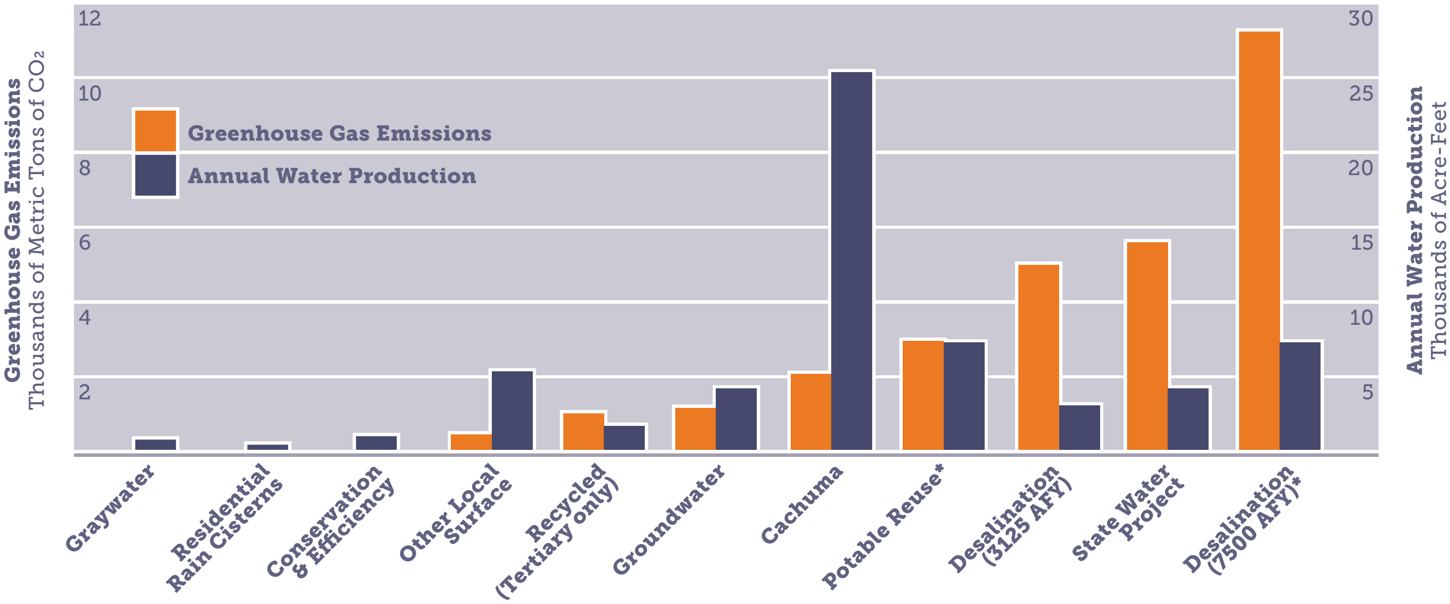
Recycled Water: Wastewater effluent can undergo advanced treatment to produce recycled water suitable for non-potable uses (i.e. irrigation or toilet flushing) or for potable use (drinking water). Direct potable reuse (DPR) involves introducing the highly treated wastewater directly into a potable water distribution system. Indirect potable reuse (IPR) involves injecting the treated wastewater into an environmental buffer (i.e. a groundwater aquifer) before introduction into the potable system. IPR is being implemented successfully in Orange County, Los Angeles and San Diego, and regulations are currently under development in California to allow for DPR, likely in about 5-10 years.

Recycled water is a highly reliable, local, drought-proof source of water supply that also reduces the costs and environmental and public health impacts associated with discharging treated wastewater into the ocean. Treating wastewater to potable standards uses the same Reverse Osmosis (RO) technology as is used to desalinate seawater, but at a significantly lower cost, requiring far less energy and greenhouse gas emissions.

There are five wastewater treatment plants on the South Coast that discharge more than 13 million gallons per day (14,640 AFY) of treated sewage into the Santa Barbara Channel. While Goleta and Santa Barbara currently produce small volumes of recycled water for non-potable uses (2,125 AFY combined), much more wastewater could be recycled and put to productive uses, thereby offsetting demand from other sources. According to the *Long Term Water Supply Alternatives Report* (RMC Water and Environment, 2015), there is existing capacity and demand for an additional 2,108 AFY of non-potable recycled water in the region. If the South Coast were to maxi-

FIGURE 3

Annual Greenhouse Gas Emissions & Water Production Volume



Total annual greenhouse gas emissions of extraction and treatment, and water production volume. Orange columns correspond to annual greenhouse gas emissions (thousands of metric tons CO2). Blue columns correspond to average annual water production (AFY) from 2004 to 2014. Calculations are limited to the extraction and treatment processes of each water source, and do not include full life cycle processes. *There are no current plans to implement either of these options.

mize the amount of potable water that could be produced from treated wastewater, we could meet one-third of total demand in the region (more than 12,000 AFY).

Graywater - wastewater from washing machines and showers - can be reused onsite without treatment for non-potable purposes. Single- and multi-family households on the South Coast could produce 1,120-3,361 AFY of water from graywater systems.

Stormwater is an enormous untapped source of water that could be captured and used to significantly increase water supplies. Capturing stormwater also has the added benefits of reducing flood risks and improving water quality by minimizing urban runoff pollution. Stormwater can be captured and reused directly for irrigation (using rain barrels or cisterns) or redirected to open spaces and allowed to infiltrate into the ground to recharge groundwater supplies. Capturing 10-50% of the 7,000 AF of stormwater that runs off the South Coast and into the ocean each year and using it to recharge groundwater would provide 700-3,500 AFY of additional water for non-potable use. Installing rain cisterns on 25-75% of single-family residences could capture and provide an additional 200-600 AFY of stormwater for watering plants and landscaping.

Efficiency: There is also great potential to reduce demand by increasing our water use efficiency. While the South Coast has made good progress in replacing older plumbing fixtures and appliances with newer and more efficient technologies, more water could be saved through further efficiency improvements. Converting turf lawns on single-family properties to lower water demand landscapes could save the South Coast 800-2,400 AFY, and rebates for high-efficiency washing machines for single- and multi-family households could save an additional 1,250 AFY. Further savings could be achieved by upgrading older plumbing fixtures and other appliances in the residential and commercial sectors.

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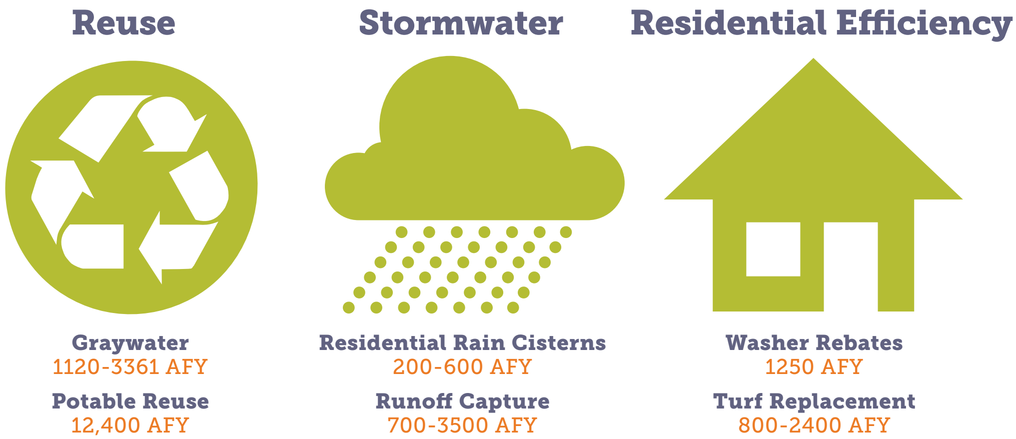

FIGURE 4

Recycled water, stormwater capture, and just two residential efficiency measures could collectively produce 16,470-23,511 AFY of additional water supplies for the South Coast – **more than half of the region's total demand.**

Desalination is another new water supply source that South Coast water districts are examining, and that Santa Barbara is already pursuing. However, while desalination may seem like a promising solution, it has several major drawbacks. Desalinating seawater uses more energy per gallon of water than any other source, increasing greenhouse gas emissions and undermining the region's efforts to mitigate climate change and clean up our air and water, while also making it extremely expensive. It also causes significant harm to the marine environment through both the intake of marine life with seawater and the discharge of the concentrated brine waste and other chemical byproducts back into the ocean.

Santa Barbara's desalination plant presents a cautionary tale of the dangers of desalination. The plant was originally built in response to the last drought in the late 1980s-early 1990s (at a cost of $34 million) but was never actually used because as soon as construction was complete, the drought ended and the water was too expensive to justify its operation, so the plant was mothballed. Now Santa Barbara is recommissioning the plant to produce 3,125 AFY of water at a cost of $55 million, however it is outfitted with an outdated "open ocean" seawater intake that will kill billions of marine organisms and threaten the productivity of marine ecosystems in the Santa Barbara Channel. Such an intake would not be permitted today under new desalination regulations recently implemented in California to protect marine life, but Santa Barbara's desalination plant is grandfathered out of complying with those regulations.

Given its high financial and environmental costs, Channelkeeper's position is that desalination should only be pursued as a last resort after the more cost-effective and environmentally beneficial options outlined above have been fully implemented. Then, if desalination is still necessary to meet any remaining shortfall in supply – which it likely will not – then the best available technology – subsurface intakes and brine diffusers - should be employed to minimize the harm to marine life.

Conclusion

The shortage of water caused by the current drought has created challenges for water managers on the South Coast and across California, but it has also provided opportunities to develop new water supply and demand reduction alternatives that are more sustainable. There is significant potential to expand the use of recycled water, capture and reuse stormwater, and improve our water use efficiency on the South Coast. These are cost-effective drought response measures that can eliminate the need for desalination, reduce reliance on imported water, cut energy use and greenhouse gas emissions, reduce pollution, and improve our resilience to future droughts. Pursuing these options would put the South Coast on the path toward a more sustainable water future.

Acknowledgements

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