



**Letting it Flow:
The Challenges of Protecting Colorado's Rivers**

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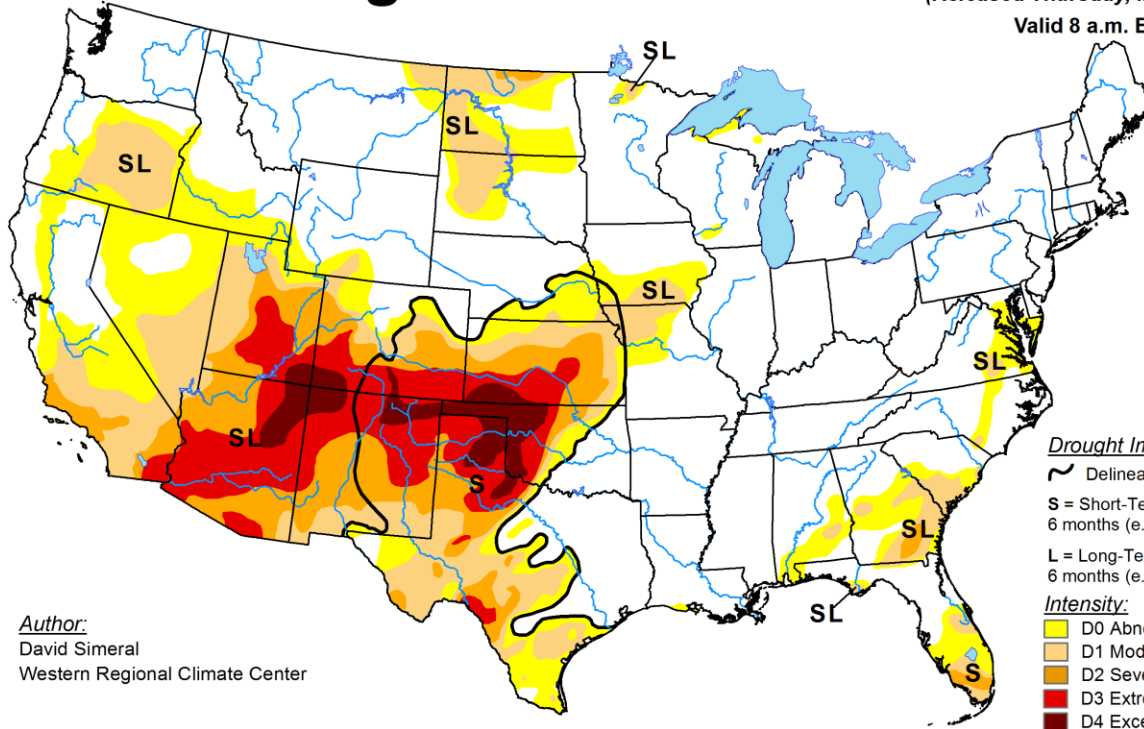


U.S. Drought Monitor

May 1, 2018

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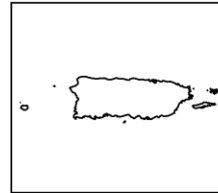
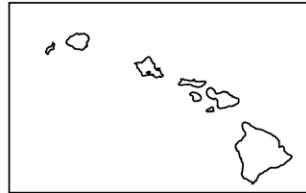
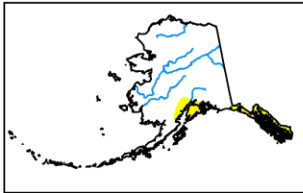
Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

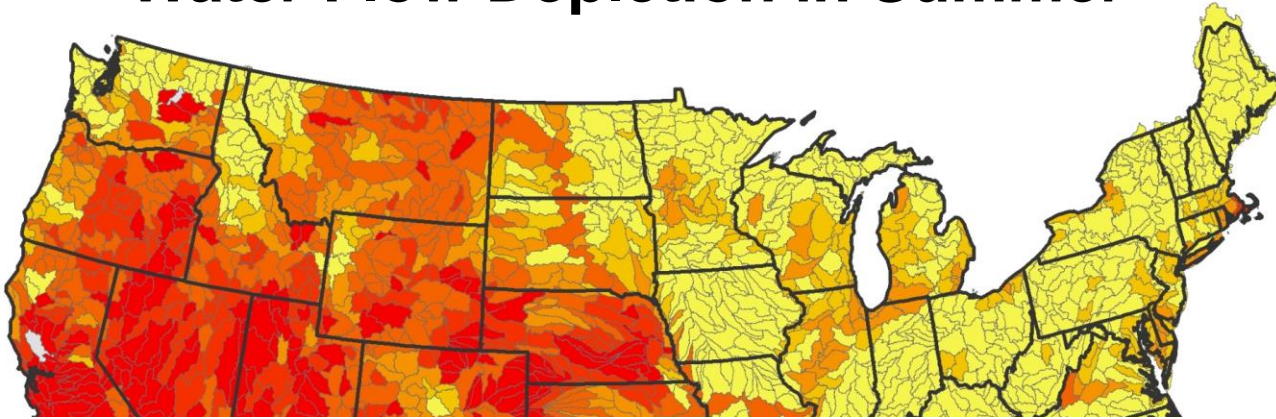
- Yellow: D0 Abnormally Dry
- Light Orange: D1 Moderate Drought
- Orange: D2 Severe Drought
- Red: D3 Extreme Drought
- Dark Red: D4 Exceptional Drought

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

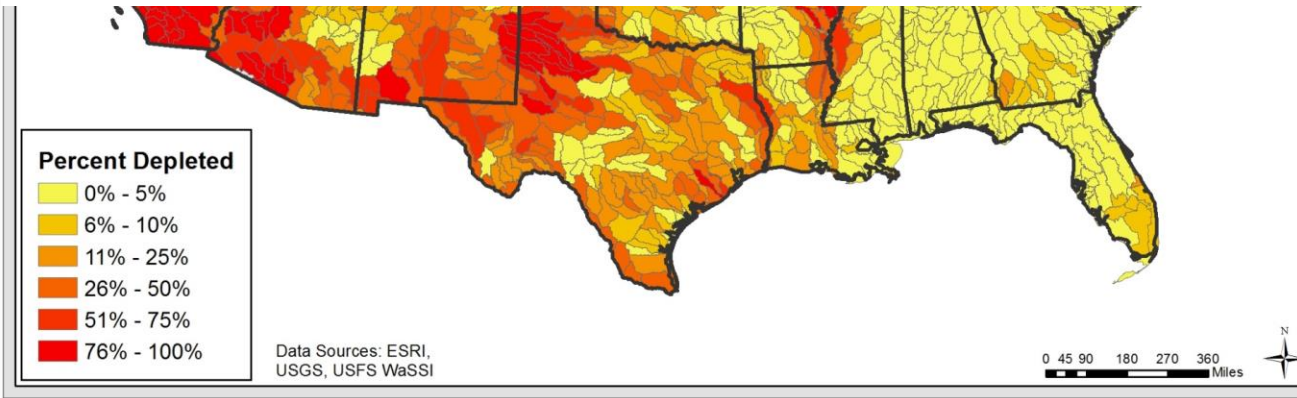


<http://droughtmonitor.unl.edu/>

Water Flow Depletion in Summer



**Half of Western rivers have lost half of their summer water
One quarter have lost more than 75%**



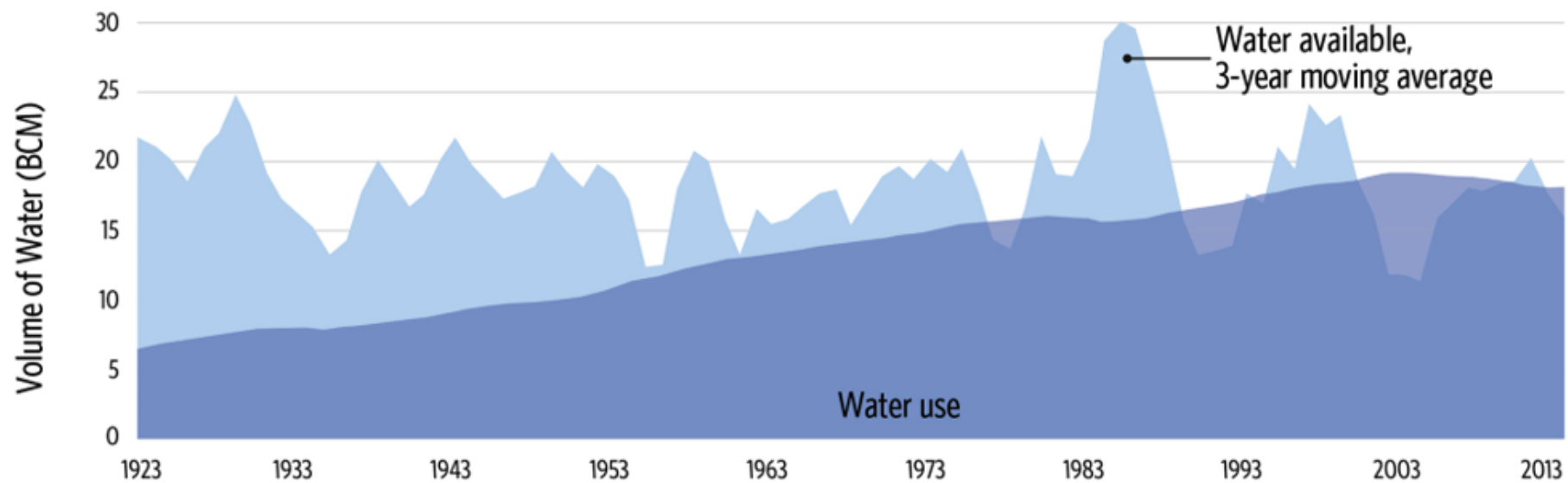
Source: "Protection and restoration of freshwater ecosystems, Richter et al 2016. Chapter 7 in *Water Policy and Planning in a Variable and Changing Climate*, CRC Press



Phoenix, Arizona

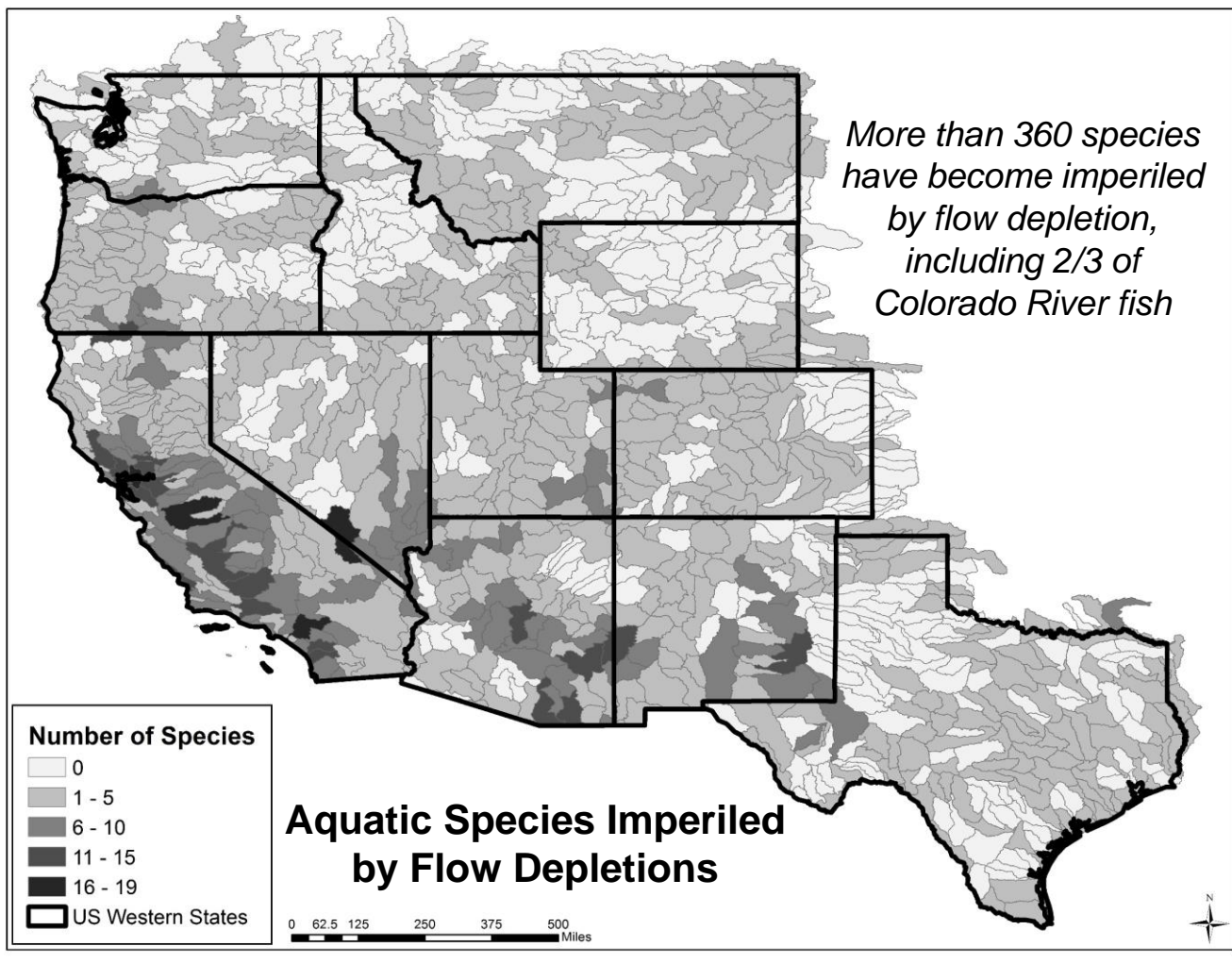


Water availability and use in the Colorado River Basin of the United States



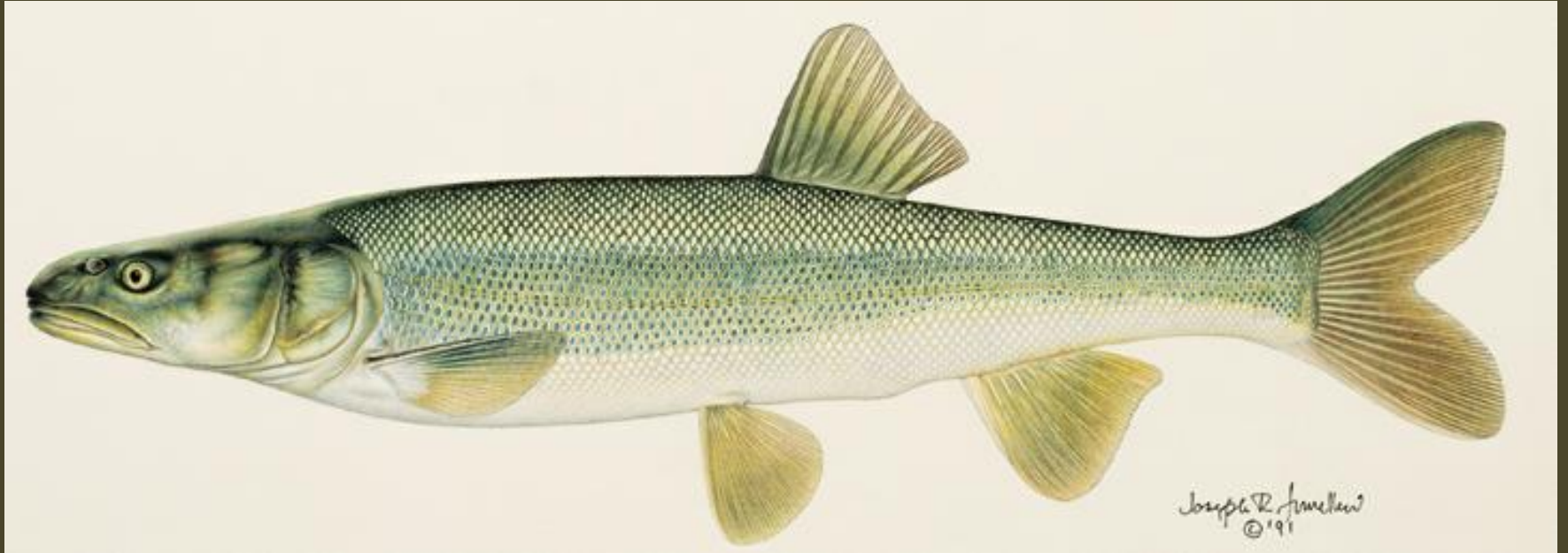


Hoover Dam & Lake Mead



Source: "Protection and restoration of freshwater ecosystems, Richter et al 2016. Chapter 7 in *Water Policy and Planning in a Variable and Changing Climate*, CRC Press

Colorado Pikeminnow







21st Century Reality

In water-scarce regions of the world, there is no more 'surplus' water

We must now *aggressively shrink* the water footprints of cities and farms to bring them into balance with sustainable water supplies and restore river ecosystems

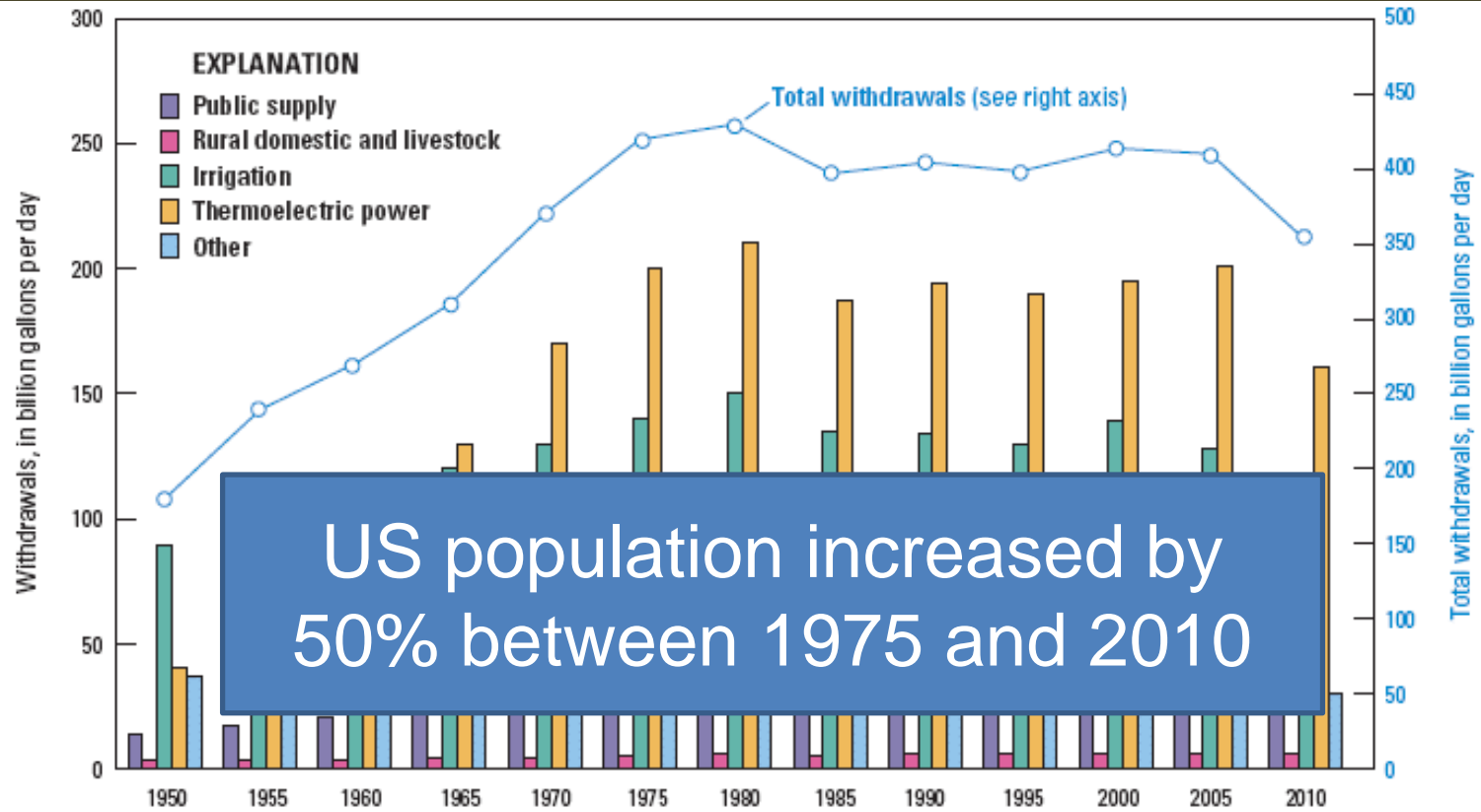


Figure 14. Trends in total water withdrawals by water-use category, 1950–2010.

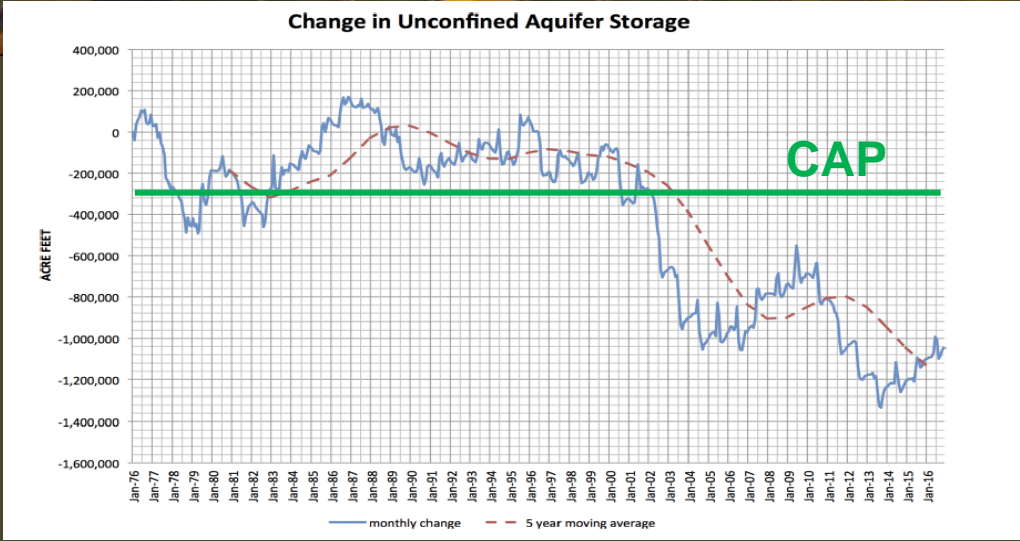
Source: USGS 2012

Three Steps Out of Water Scarcity

Step 1:

Establish caps on consumptive water use

San Luis Valley, Colorado



Source: Davis Engineering, 2016. Change in Unconfined Aquifer Storage
Rio Grande Water Conservation District

San Luis Valley

4,500 active high-capacity wells

Sub-district 1:

- 174,000 total acres
- 10,000 acres fallowed by 2016
- Goal: 40,000 acres fallowed by 2021

Sub-district 1

San Juan Mountains

• Saguache

• North Star Farm

Saguache Creek

Sangre de Cristo Mountains

Great Sand Dunes National Park

• Center

• Del Norte

• Monte Vista

Rio Grande River

• Alamosa

• Manassa

• Antonito

COLORADO

Area of detail

Target is to rotationally fallow ~20% of farmland each year

High Country News

FOR PEOPLE WHO CARE ABOUT THE WEST

After years of drought and overuse, the San Luis Valley aquifer refills

How an over-taxed basin is getting its water use under control.

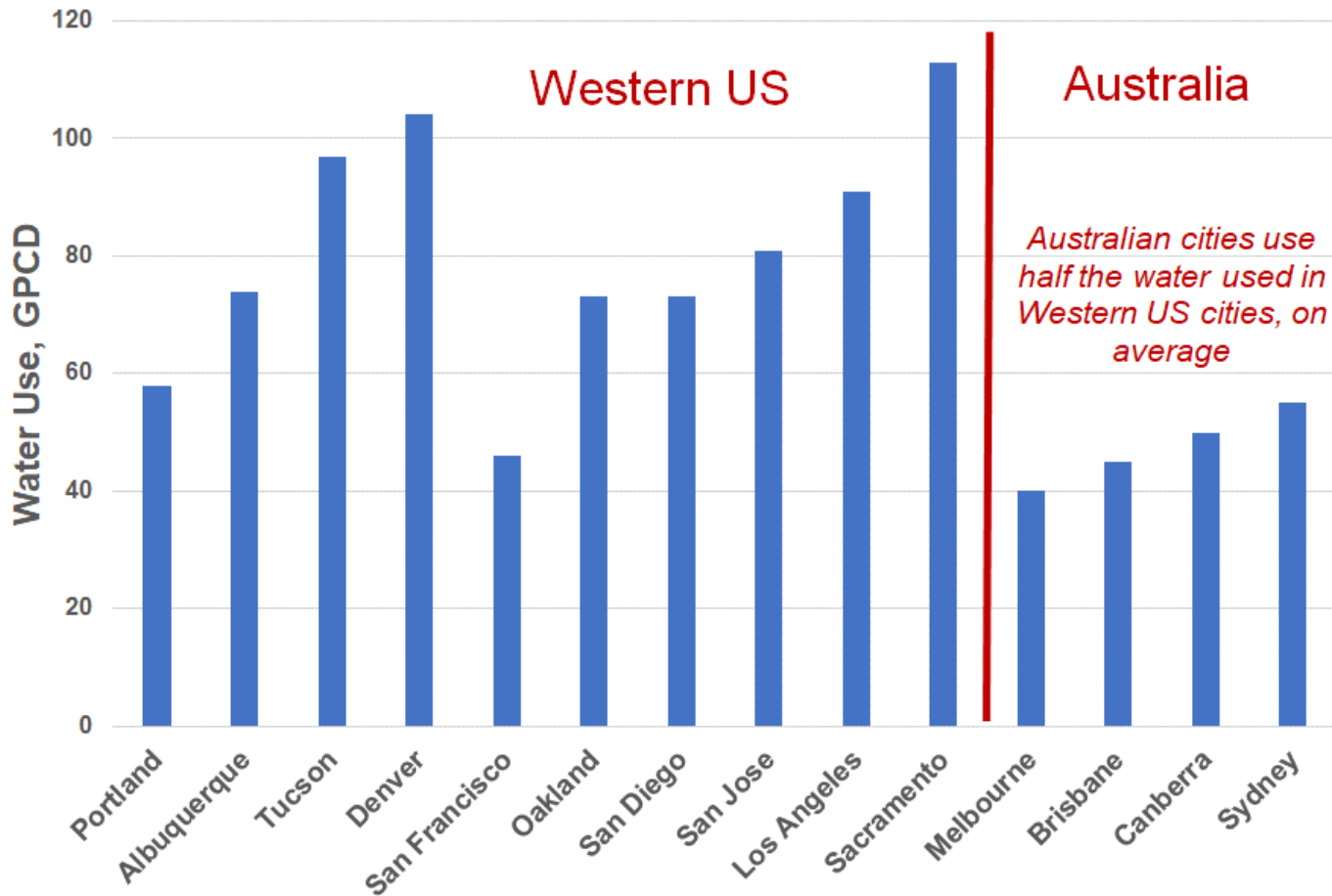
Paige Blankenbuehler | May 26, 2016

Change in Unconfined Aquifer Storage



Step 2:
Freeze urban water footprints

Per-Capita Water Use



Source: "Residential Water Conservation in Australia and California,"
Ryan Cahill and Jay Lund, 2013 Journal of Water Resources Planning & Management



Sydney, Australia



Los Angeles, California

Photo: LA Times

Outdoor landscaping

Water-efficient toilets



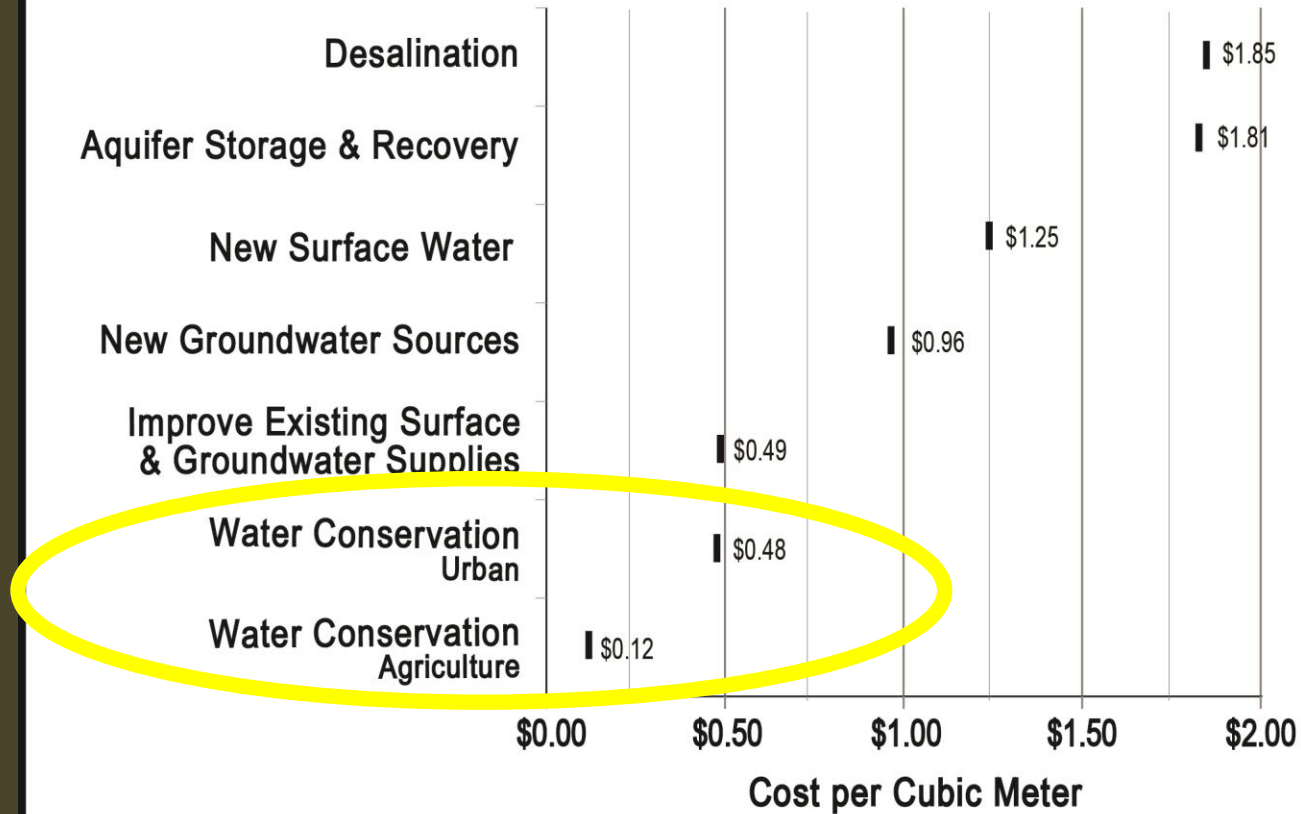
Reductions in Water Usage 2000-2015

Per-Capita Water Use

Denver (Denver County)	- 6%
San Diego (San Diego County)	- 32%
Phoenix (Maricopa County)	-23%
Los Angeles (Los Angeles County)	-33%
Las Vegas (Clark County)	-32%

Source: USGS 2018

SAN ANTONIO - COSTS OF FUTURE WATER SUPPLIES



Source: Richter *et al*, 2013. Tapped out: how can cities secure their water future?
Water Policy 15 (2013) 335–363.

Step 3:

Work with farmers to reduce consumptive use and re-allocate conserved water to rivers



Flood irrigation

Improvements in water application
34-57% savings in consumptive use

Drip irrigation



“Opportunities for Saving and Reallocating Agricultural Water to Alleviate Water Scarcity”
(*Water Policy*, Richter et al, 2017)



Enhanced soil health (including mulch or no-till)
13-54% savings in consumptive use

“Opportunities for Saving and Reallocating Agricultural Water to Alleviate Water Scarcity”
(*Water Policy*, Richter et al, 2017)



Cotton



Sorghum

Saving water by crop shifting
54-87% savings in consumptive use

“Opportunities for Saving and Reallocating
Agricultural Water to Alleviate Water Scarcity”
(*Water Policy*, Richter et al, 2017)





Temporary rotational fallowing with cover crop
95-100% savings in consumptive use

“Opportunities for Saving and Reallocating Agricultural Water to Alleviate Water Scarcity”
(*Water Policy*, Richter et al, 2017)



Brian
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A Guide for
Moving from
Scarcity to
Sustainability

CHASING
WATER

Want more?



THANK YOU