

Managing Groundwater to Reduce Vulnerability to Drought



Adjudicated Basins Special Act Districts

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THE SUSTAINABLE
GROUNDWATER
MANAGEMENT ACT



2014 Sustainable Groundwater Management Act

Specified areas with a groundwater basin:
Must form a groundwater sustainability agency (GSA)
Who **must** adopt plans to manage groundwater

“without causing undesirable results”

-Chronic lowering of groundwater levels

-Significant and unreasonable:

Reduction in storage

Saltwater intrusion

Degraded water quality

Subsidence

Reduced flows in surface streams

SGMA exempts prior adjudicated groundwater basins
and

Under SGMA, special act districts have the option to
be the GSA within their service area boundary

What is a Groundwater Adjudication?

IN THEORY

A court evaluates claims of all water users taking water from the defined groundwater basin

Quantifies the available supply

Assigns water rights and apportions the water among the claimants

Imposes a management and appoints a Watermaster to manage the basin

Adjudicated groundwater basins



What is a Special Act District?

Created through a legislative act

Generally has enhanced authority to
manage a groundwater basin

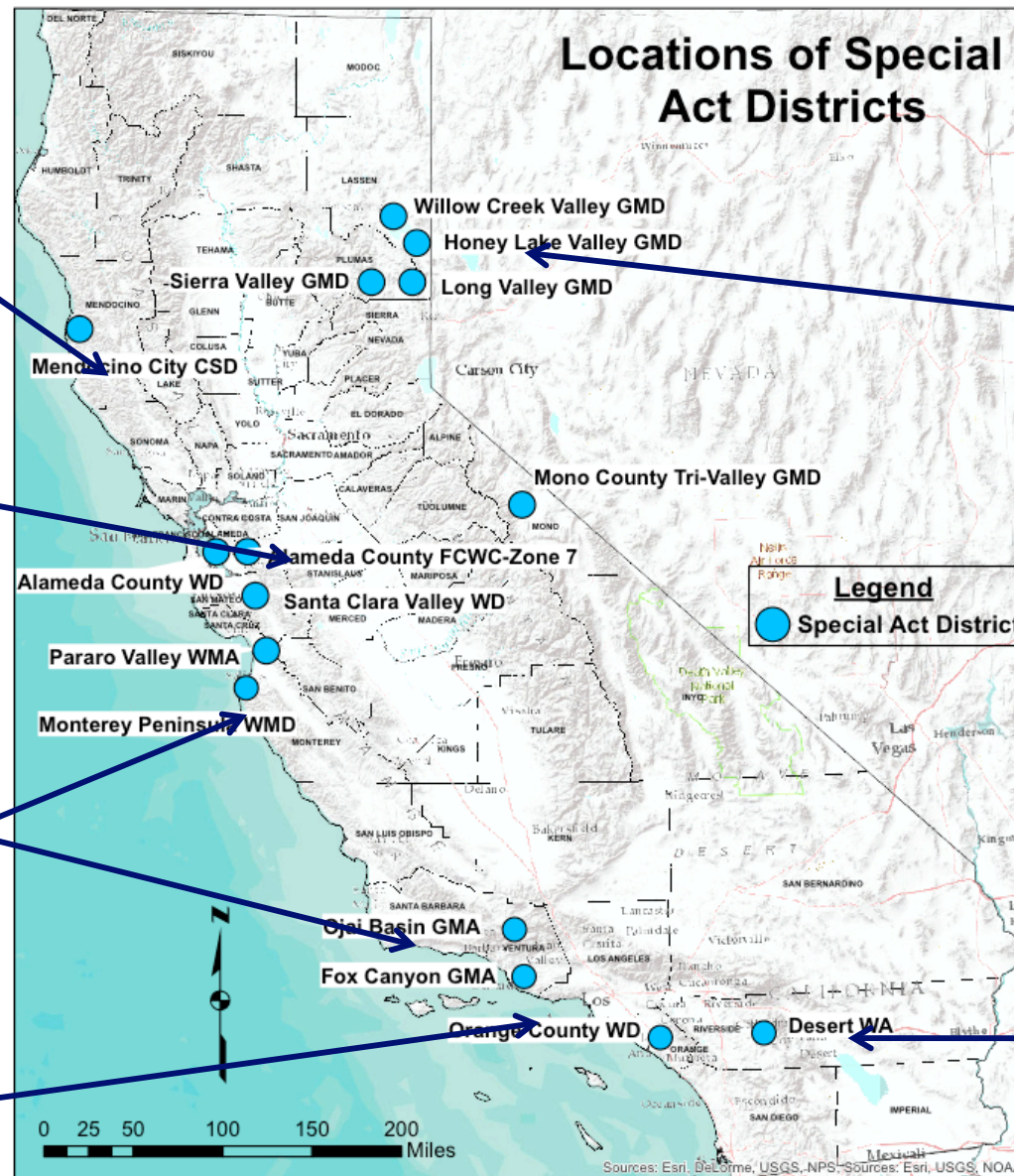
Under SGMA, it has the option to be the
GSA within its service area boundary

North Coast

Bay Area

Central Coast

Orange County



Sierra Foothills

Desert

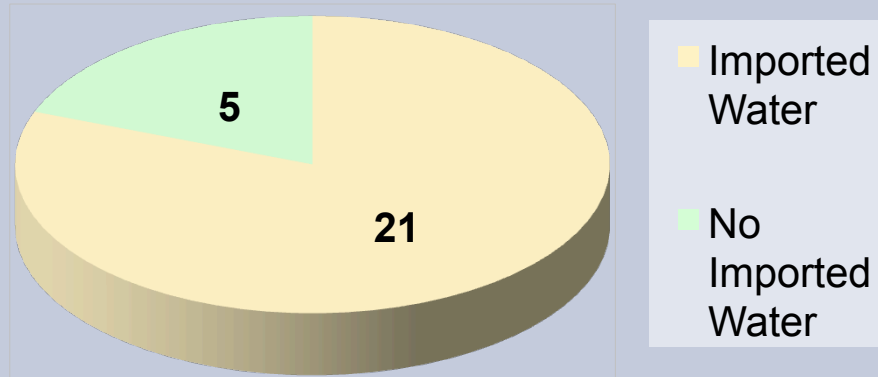


OF NOTE

I.

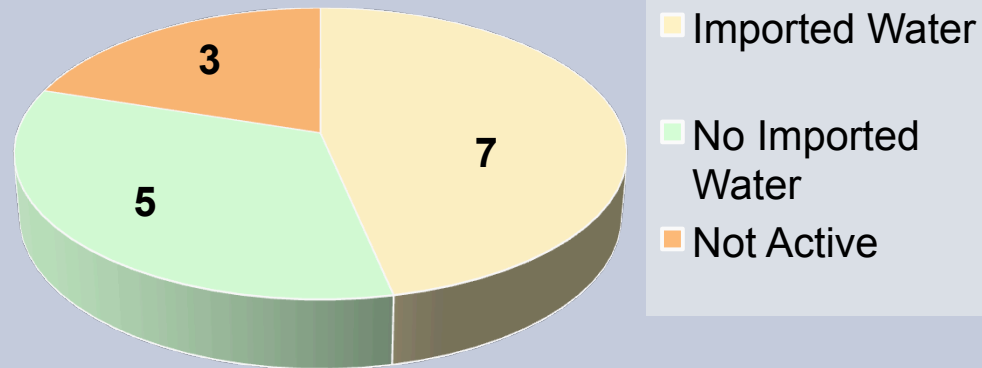
Heavy reliance on imported water

Adjudicated Basins



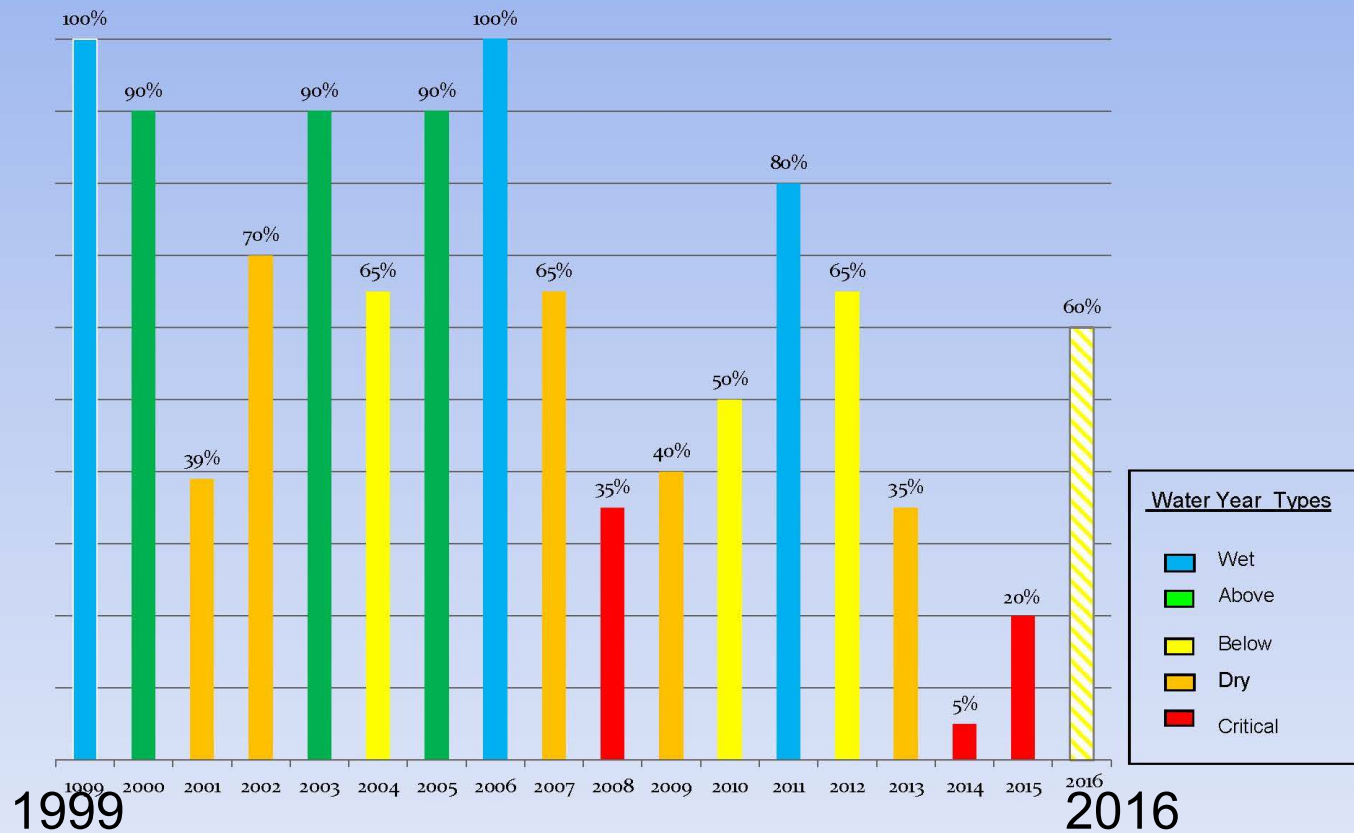
	Adjudicated Basin
<u>Imports</u>	<p><i>All 19 Los Angeles, Inland Empire Foothill and SOCAL Desert Basins</i></p> <p><i>2 Central Coast Basins</i> Goleta, Santa Maria</p>
<u>No Imports</u>	<p>Lytle Creek</p> <p><i>4 Coastal Basins</i> Santa Margarita River Watershed, Seaside Scott River Stream System, Santa Paula</p>

Special Act Districts



Special Act Districts	
<u>Imports</u>	<p>4 Major Urban Basins Alameda Zone 7, Alameda CWD, Orange CWD, Santa Clara VWD</p> <p>3 Smaller Basins Desert WA, Ojai GMA, Sierra Valley GMD</p>
<u>No Imports</u>	<p>4 Coastal Basins Monterey PWMD, Mendocino CCSD, Pajaro Valley WMA, Fox Canyon GMA</p> <p>4 Rural Inland Basins Tri-Valley GMD, Long Valley GMD, Willow Creek GMA, Honey Lake GMD</p>

SWP Allocation in Recent Years



II.

Limited Approaches to Reduce Withdrawals

Adjudicated Basin	Regulate Withdrawals
West Coast	Some limits but extractions more than double the proposed limit
Mojave	Modest decrease each year based on past withdrawals
Santa Maria	Minimal – Overlyers only cut back in a severe water shortage

Special District	Regulate Withdrawals
OCWD	Limited. Uses a replenishment fee proportional to pumping
FCMGA	Charges a modest extraction fee based on crop type
Zone 7	Sells imported water to retailers who have a fixed annual quota that if exceeded requires a recharge fee

III.

Accumulated overdraft is rarely addressed

West Coast Basin

ACCUMULATED OVERDRAFT

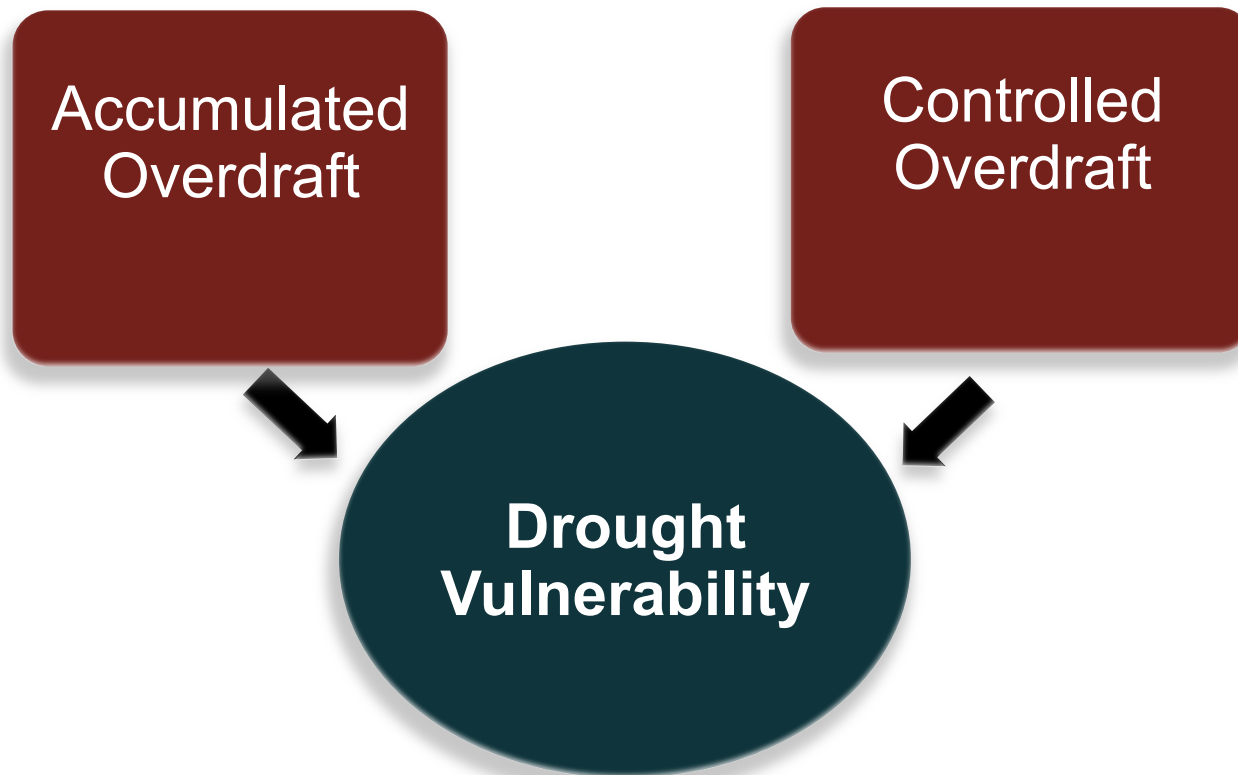
Withdrawals that result in
declining storage over time

ULARA/Beaumont/Chino

CONTROLLED OVERDRAFT

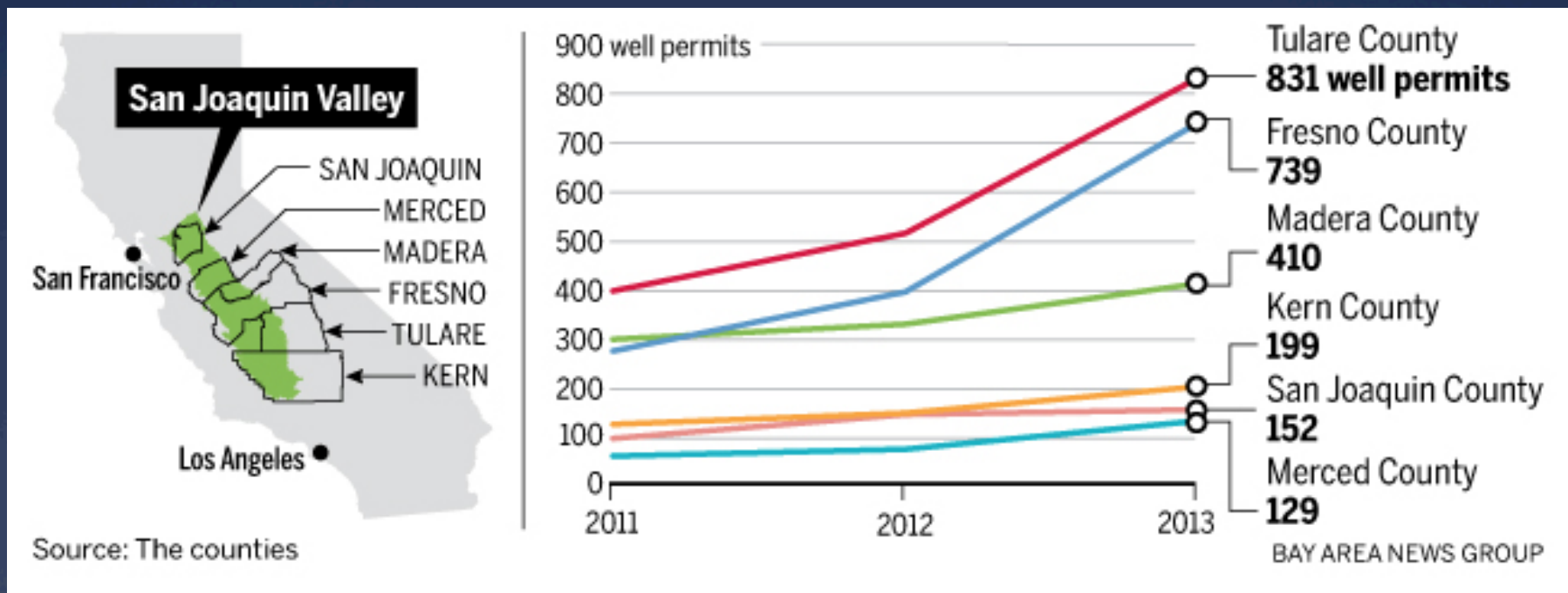
Intentionally withdrawing more than the
safe yield – sometimes to create storage
space for imported water

What Groundwater Management Strategies Affect Drought Vulnerability?



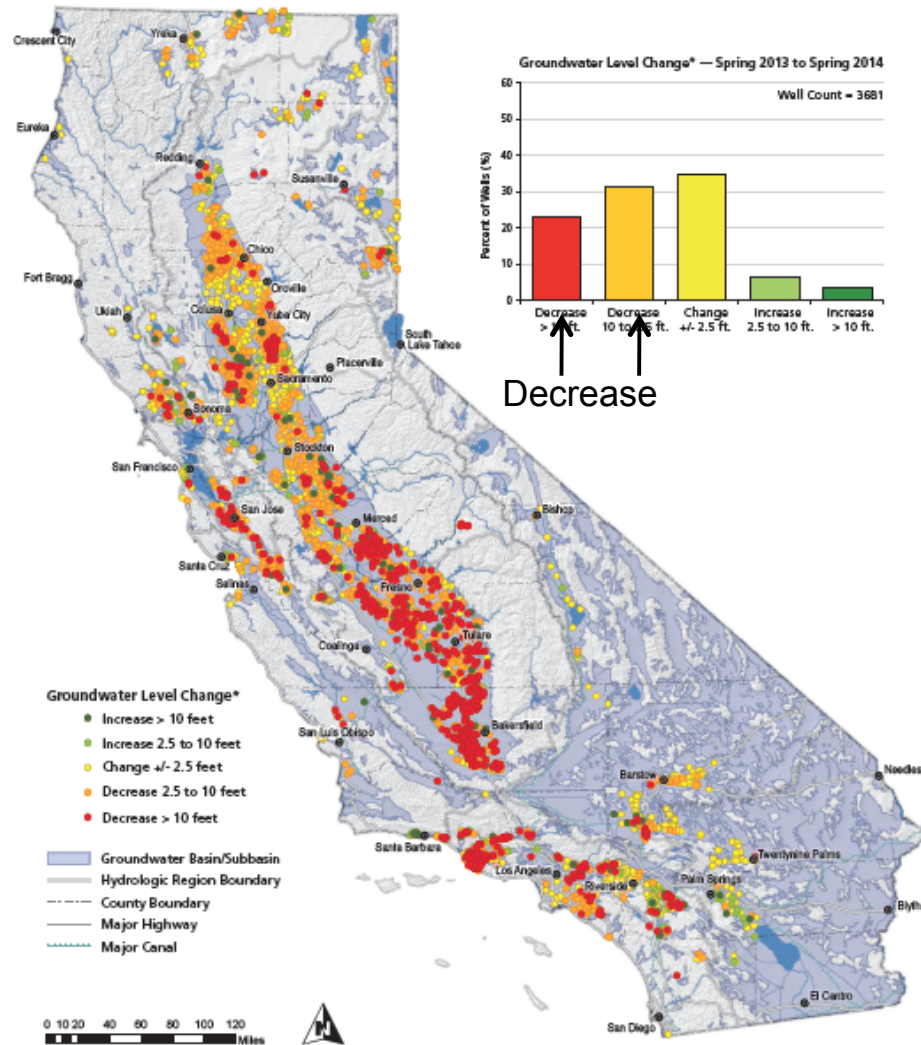
During drought groundwater pumping is increased to address reduced surface supplies

Well permits 2011-2013



mercurynews.com/drought/ci_25447586/california--drought--san--joaquin--valley--sinking--farmers--race

Figure 5: Change In Groundwater Levels In Wells - Spring 2013 to Spring 2014



Changes in
Groundwater Levels
2013-2014

During Drought
Groundwater
levels frequently
decline

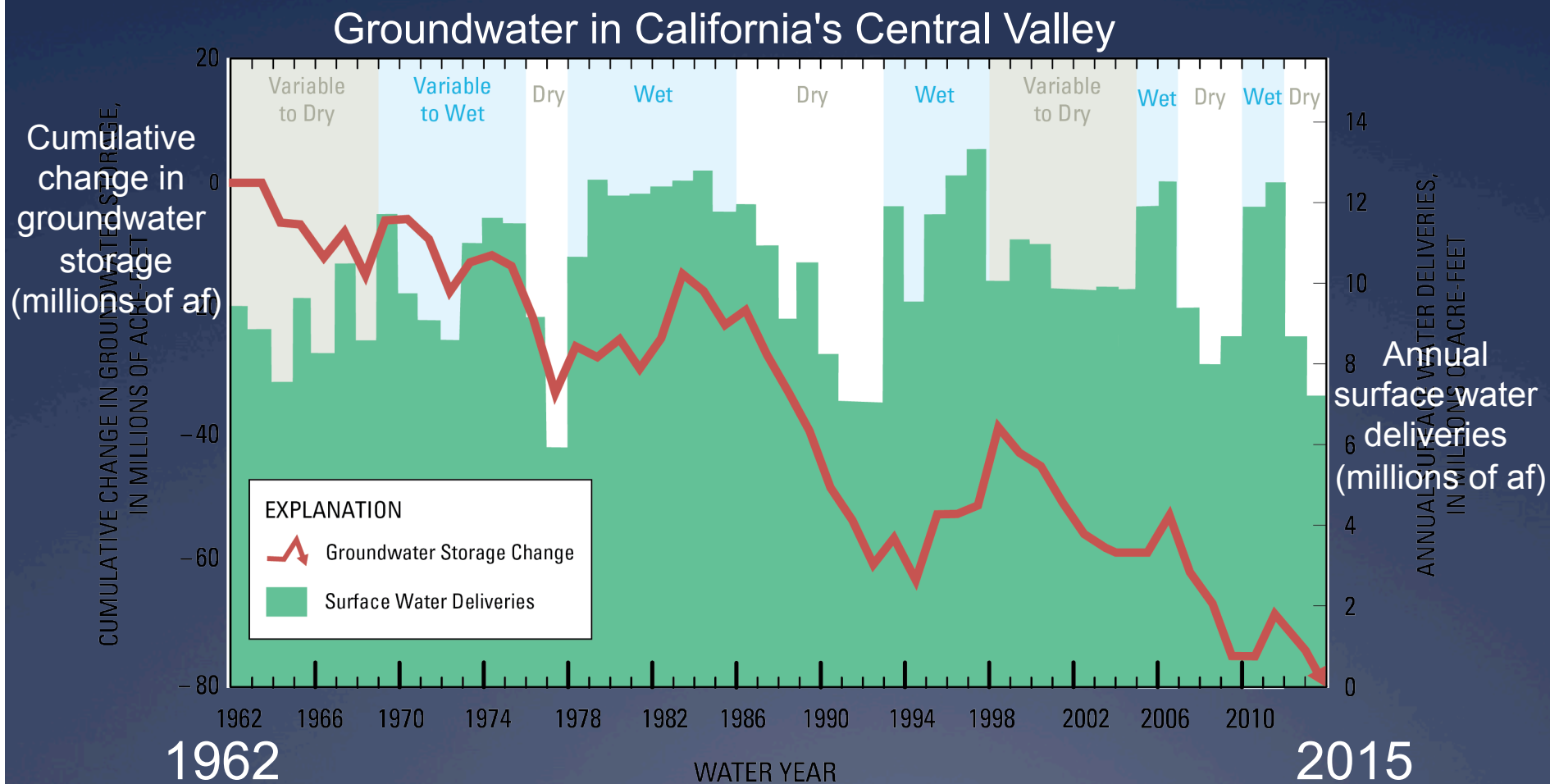


Water in the aquifers continues to be the most effective strategic weapon against drought.

Overdrafting the aquifers during droughts is effective in the short-term, **as long as they are recharged when surface-water supply becomes available.**

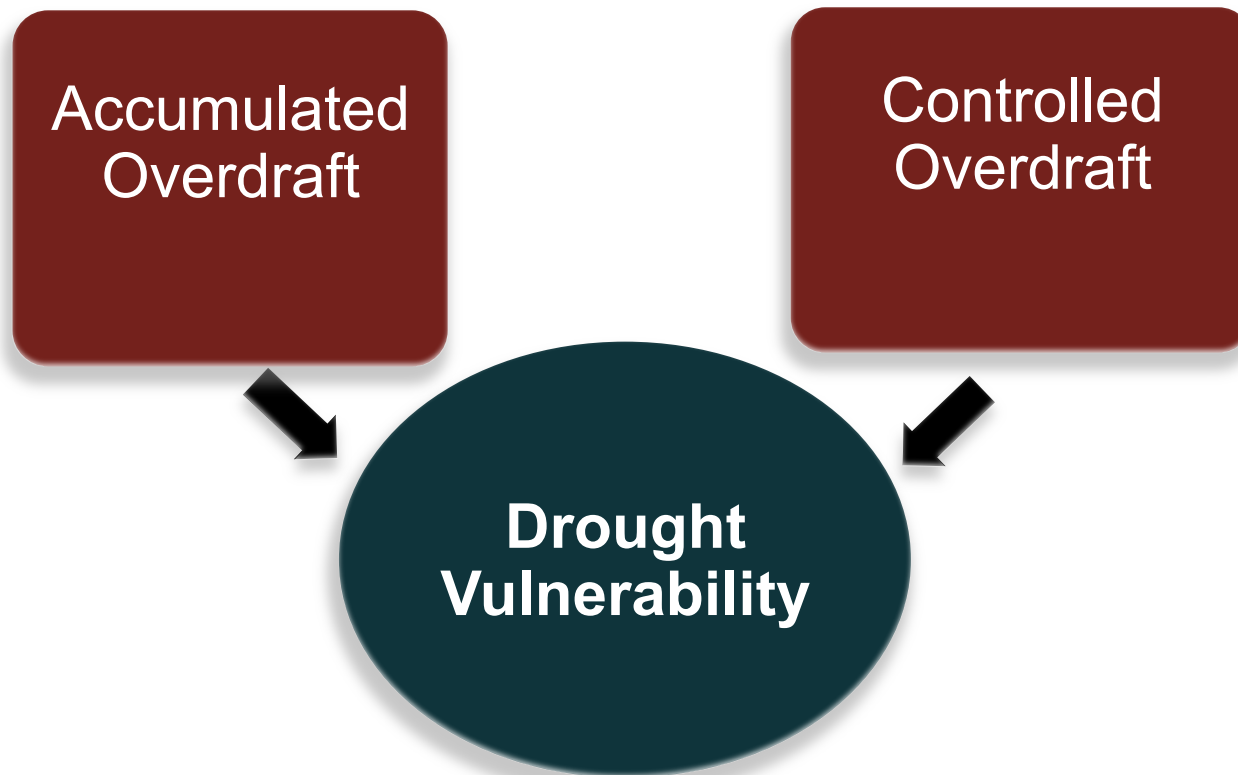
ACE – Lessons Learned From the
California Drought (1987-1992)

Over time replenishment has been less than withdrawals in many areas of California, resulting in long-term groundwater level declines



Claudia Faunt, Hydrologist, USGS California Water Science Center

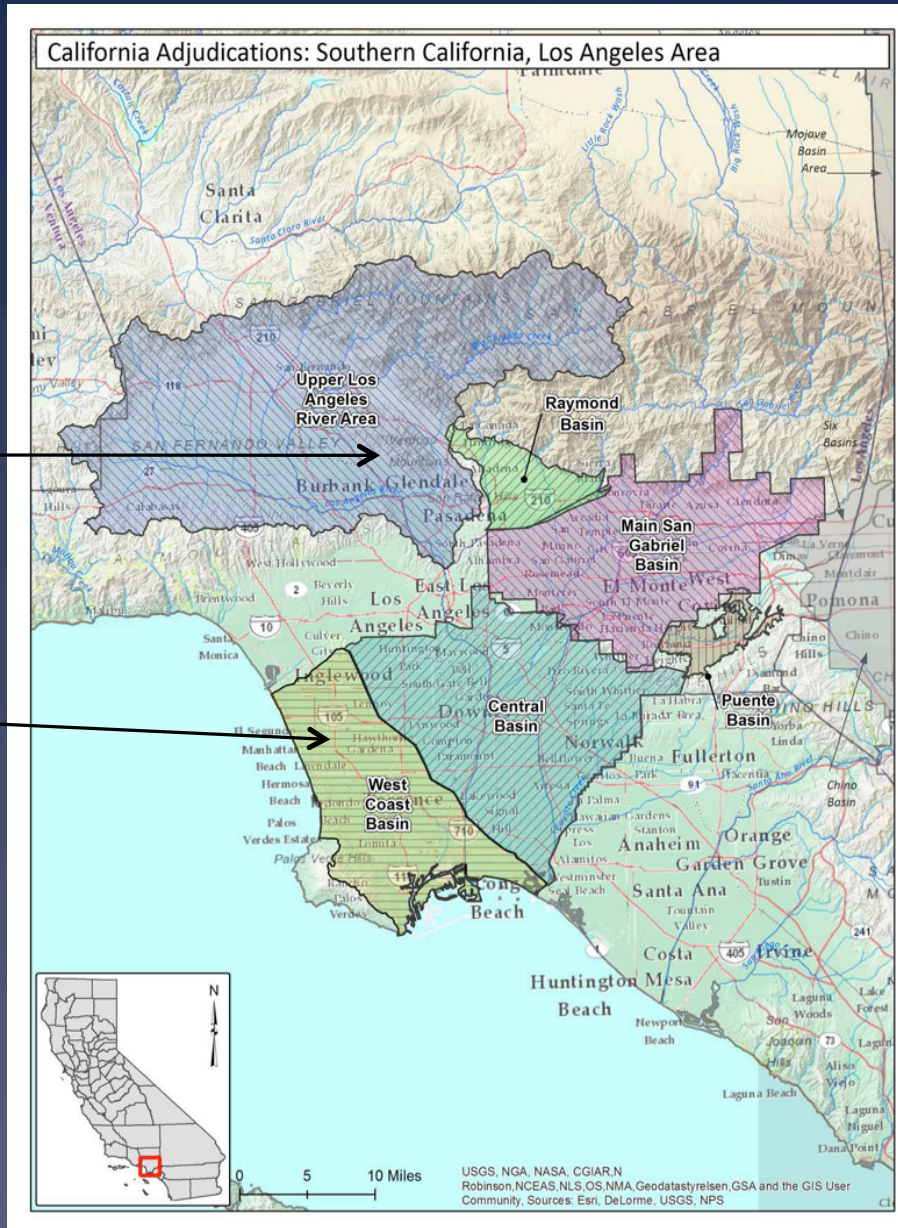
What Groundwater Management Strategies Affect Drought Vulnerability?



Case Studies

Upper
Los Angeles
River Area
Adjudicated
Judgment
1979

West Coast Basin Adjudicated Judgments 1961,66



West Coast Basin

Total Accumulated Overdraft

**Through 1957 = ~832,000AF (seawater replaced 50–75 % of gw)
2012 = ~650,600 AF**

Injection wells at the coast, using imported and recycled water, create a hydraulic barrier between the ocean and the aquifer

Imported water is the largest supply component since mid-1950s
2013–2014 = 172,953 AF

Decrease in groundwater levels on average over entire basin in
2014 = ~ 2 feet

Upper Los Angeles River Area (ULARA)

Net Groundwater, Net Imports, and Recycled Water (AF)

	2010-2011	2011-2012
Net Groundwater	35,880	35,279
Net Imports	253,052	273,523
Recycled Water	13,023	15,055

Controlled Overdraft

Court Definitions

Overdraft

“...when the total annual extractions of ground water from a basin exceed its safe yield, and when *any temporary surplus* has been removed.”

Temporary surplus

the amount that, when withdrawn can create storage space for recapture in wet years, but with no adverse effects on the basin's long-term supply

This permitted extractions over the “safe yield,”
to provide storage for artificial water.

Basin recharge is not keeping up with judgment's pumping rights

Causes include:

- Pumping in excess of long-term recharge;
- Reduced natural recharge;
- Groundwater leaving the basin;
- Reductions in artificial recharge

Challenges continue to be:

- A long-term decline in actual volume of stored groundwater**
- An accumulation of a large quantity of *stored water credits* with an insufficient volume of “real” groundwater in storage**

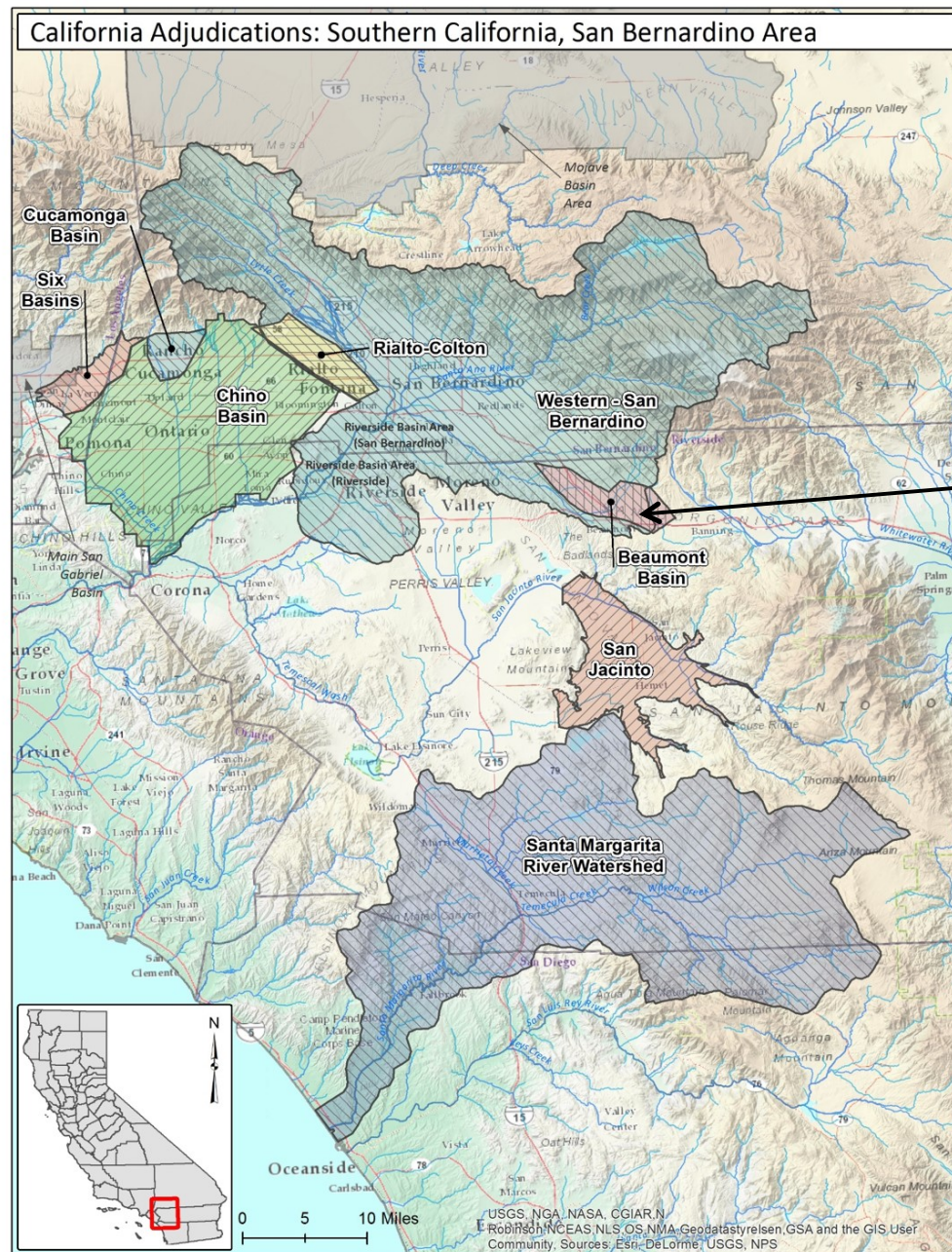
WY 2012-2013

Groundwater in storage decreased by ~12,157 AF

Cumulative storage decreased by ~ 193,640 AF

Created ~461,753 AF of storage space-Watermaster states this can be used for storage of native or imported water during wet years

Inland Empire Groundwater Basins



Beaumont
Basin
Adjudicated
Judgment
2004

WATER RIGHTS

Overlyers - received all the “safe yield”

Appropriators - could remove the “temporary surplus” for 10 years (160,000 AF, pumped at the rate of 16,000 AFY from 2004 -2014).

And

Water not used by overlyers went to appropriators

Water not used by appropriators went into storage accounts for use after 2013

REASON FOR CONTROLLED OVERDRAFT

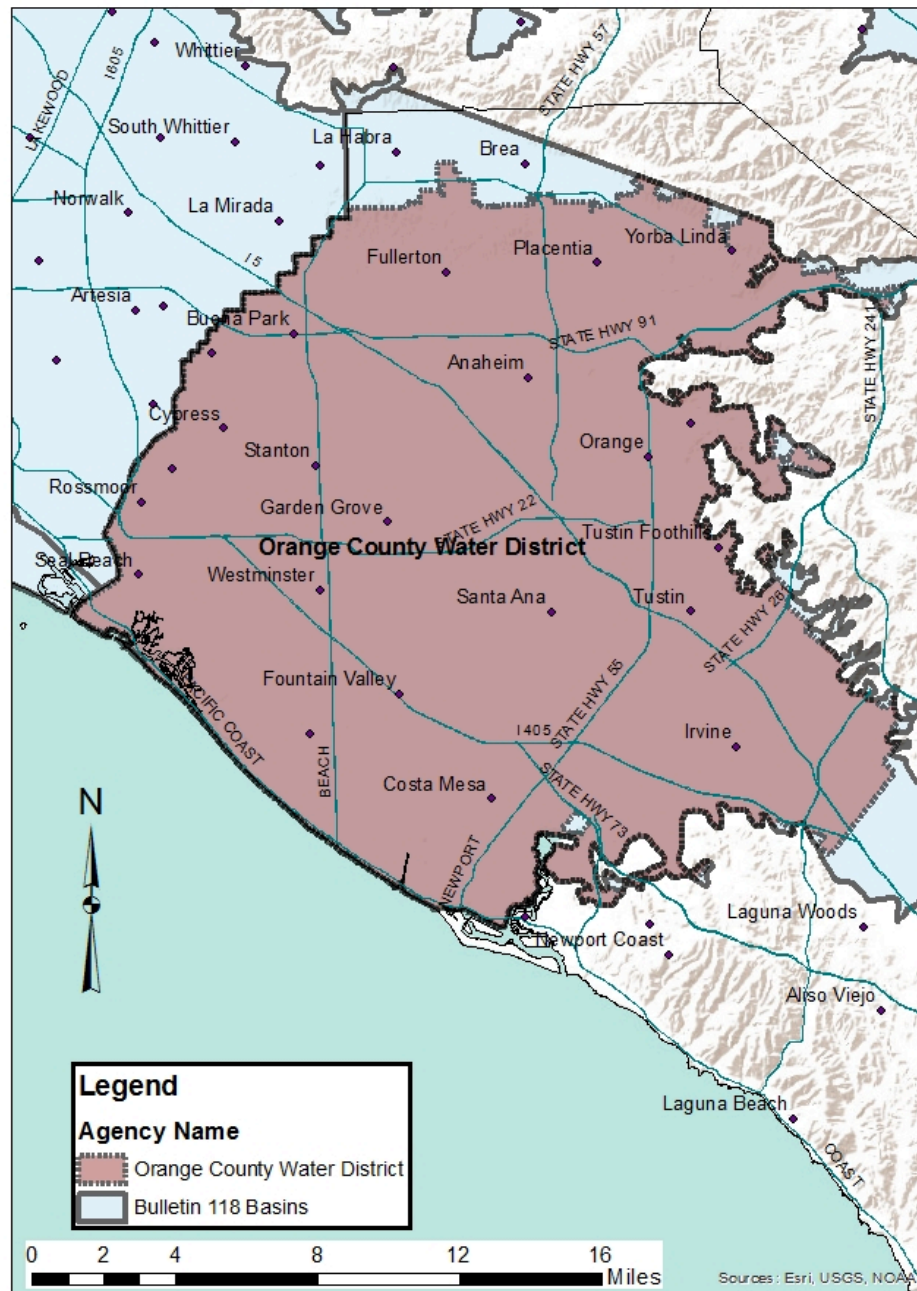
To meet appropriators demands until delivery of imported water
AND create a storage reservoir

STORAGE

CY 2015: 95,629 AF stored in the Basin for future use;

2013-2015: Total basin storage decreased due to expiration of the temporary surplus at the end of FY 2013

Orange County Water District



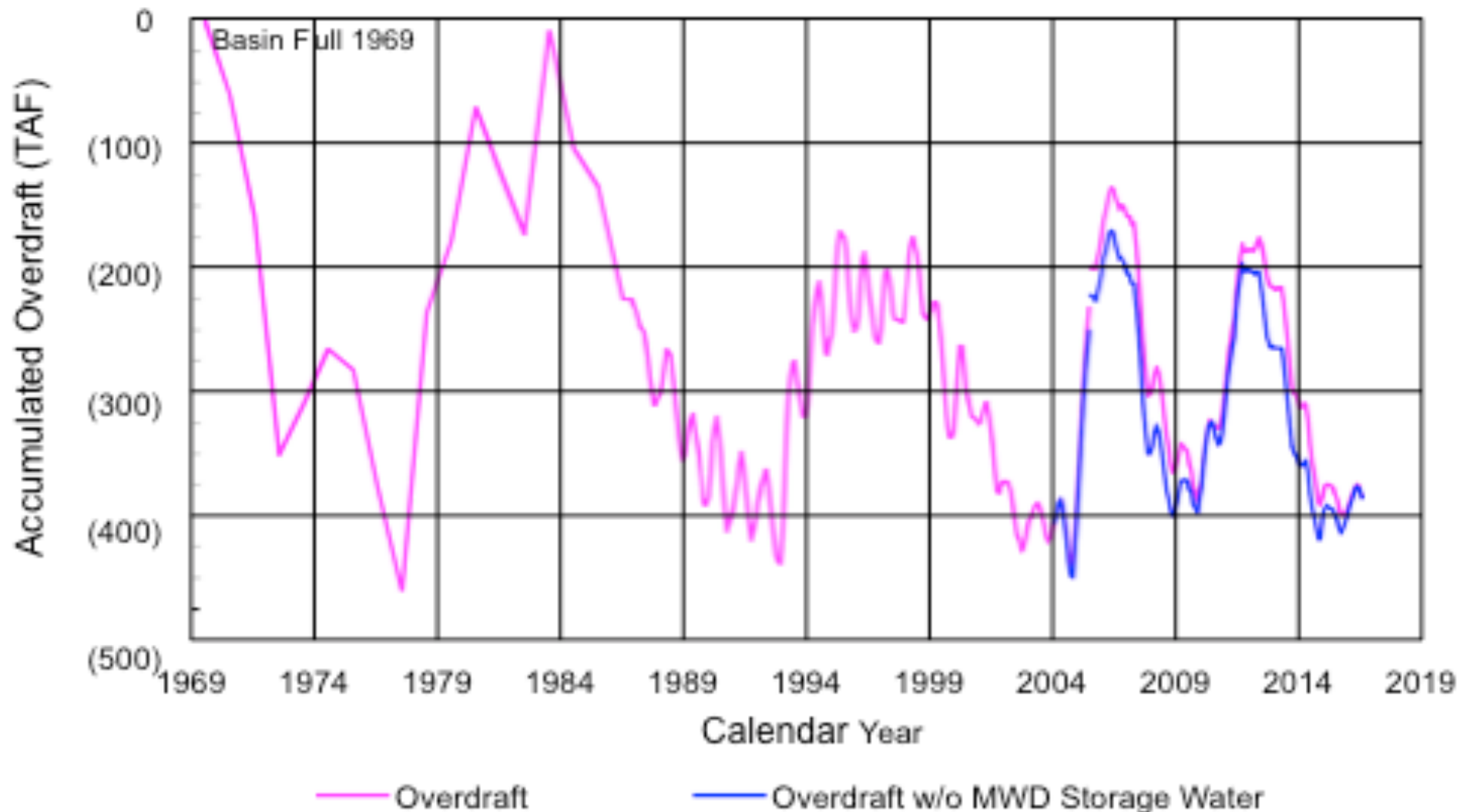
Orange County Water District (A Special Act District)

Accumulated Overdraft

2015 - 397,804

2016 - 376,864

(excludes MWD
storage)



Established an operating range through trial and error and understanding the basin. Levels below 500,000 AF result in sea water intrusion. Two seawater barriers increase drought resilience by enabling greater drawdown of the basin without causing seawater intrusion.

2013, Roy Herndon, Chief Hydrogeologist from Orange County Water District

Available Storage Space

(amount below full basin condition in acre-feet)

Benefits

Constraints

Less than 200,000

- Improve control of seawater intrusion
- Lower cost to pump groundwater
- Maintain stable BPP; potential to increase BPP
- Increase supply of water for pumping in dry years
- Decrease potential for vertical migration of poor quality water

- Increase groundwater flow to Los Angeles County
- Possible impacts of high groundwater levels in local areas
- Decrease opportunity to recharge basin when low-cost recharge water available

200,000 - 350,000

- Minimal to no impacts from high groundwater levels
- Increase available storage capacity when recharge water available
- Decrease groundwater outflow to Los Angeles County

- Reduced amount of water in storage for pumping during drought
- Increase risk of seawater intrusion

350,000 to 500,000

- Minimal to no problems with high groundwater levels
- Increased available storage capacity if large amount of recharge water becomes available
- Further decrease in groundwater outflow to Los Angeles County

- Reduce supply of water in storage available for dry years
- Increase pumping costs
- Increase risk of seawater intrusion
- Some production wells inoperable when groundwater levels below 400,000 acre-feet
- Potential risk of increased land subsidence
- Potential increased risk of vertical migration of poor quality water
- Need to increase purchase of imported water
- Difficult to maintain stable BPP

DROUGHT CHALLENGES

Determining the level of drought protection needed or desired

Recovering, not just stabilizing, an overdrafted aquifer so as to achieve the desired “protective” level

Increased focus on planning for an extreme drought event



Available online at:

[http://www.waterboards.ca.gov/
water_issues/programs/gmp/docs/
resources/swrcb_012816.pdf](http://www.waterboards.ca.gov/water_issues/programs/gmp/docs/resources/swrcb_012816.pdf)

An Evaluation of California's Adjudicated Groundwater Basins

Questions?



Thank You

<http://droughtreserves.ucsc.edu/>