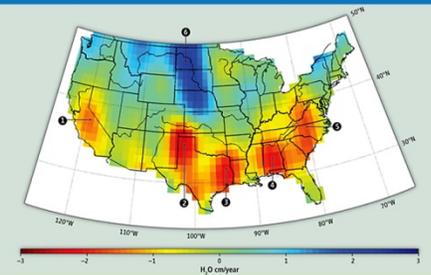


# Southern California's Water Future

## Issues, Challenges and Potential Solutions

March 6, 2014  
SCAG Joint Policy Meeting



# Southern California's Water Future

## MODERATOR

- **Richard Atwater**, Executive Director  
Southern California Water Committee

## PANELISTS

- **William Croyle**, Drought Manager  
California Department of Water Resources
- **Brandon Goshi**, Manager of Water Policy and Strategy  
Metropolitan Water District of Southern California
- **David W. Pedersen**, General Manager  
Las Virgenes Municipal Water District
- **Mark Grey, Ph.D.**, Director of Environmental Affairs  
Building Industry Association of Southern California
- **James Famiglietti, Ph.D.**, Director  
Center for Hydrologic Modeling, University of California, Irvine

## Question 1

What is the current state of the science regarding extent of the water shortage in the short and long-term?

- **William Croyle**

Drought Manager

California Department of Water Resources

## Snow Water Equivalents (inches)

Provided by the California Cooperative Snow Surveys

Data For: 04-Mar-2014

% Apr 1 Avg. / % Normal for this Date



Change Date: 04-Mar-2014

Refresh Data

NORTH	
Data For: 04-Mar-2014	
Number of Stations Reporting	28
Average snow water equivalent	5.7"
Percent of April 1 Average	20%
Percent of normal for this date	22%

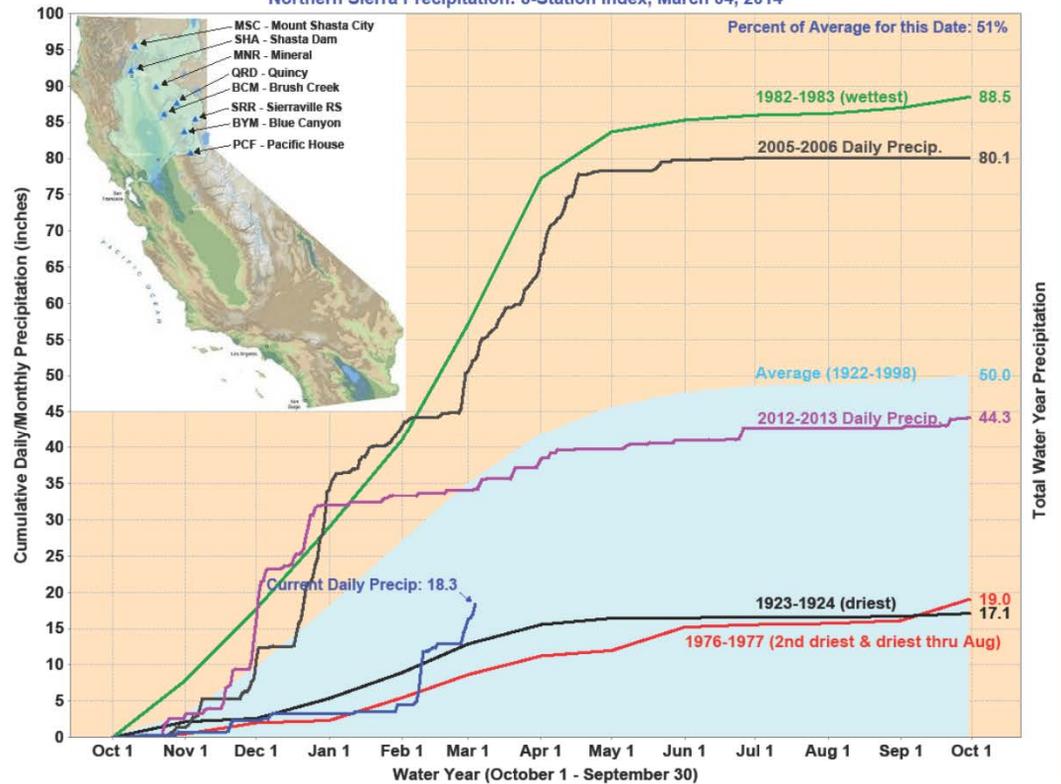
CENTRAL	
Data For: 04-Mar-2014	
Number of Stations Reporting	41
Average snow water equivalent	10.3"
Percent of April 1 Average	35%
Percent of normal for this date	39%

SOUTH	
Data For: 04-Mar-2014	
Number of Stations Reporting	31
Average snow water equivalent	8.3"
Percent of April 1 Average	32%
Percent of normal for this date	36%

STATEWIDE SUMMARY	
Data For: 04-Mar-2014	
Number of Stations Reporting	100
Average snow water equivalent	8.4"
Percent of April 1 Average	30%
Percent of normal for this date	33%



Northern Sierra Precipitation: 8-Station Index, March 04, 2014



- Third dry year
- Statewide unimpaired river runoff: 26% of average
- Most major reservoirs below historical average
- Initial SWP allocation 5% (Nov)
- Projected spring allocation 0%

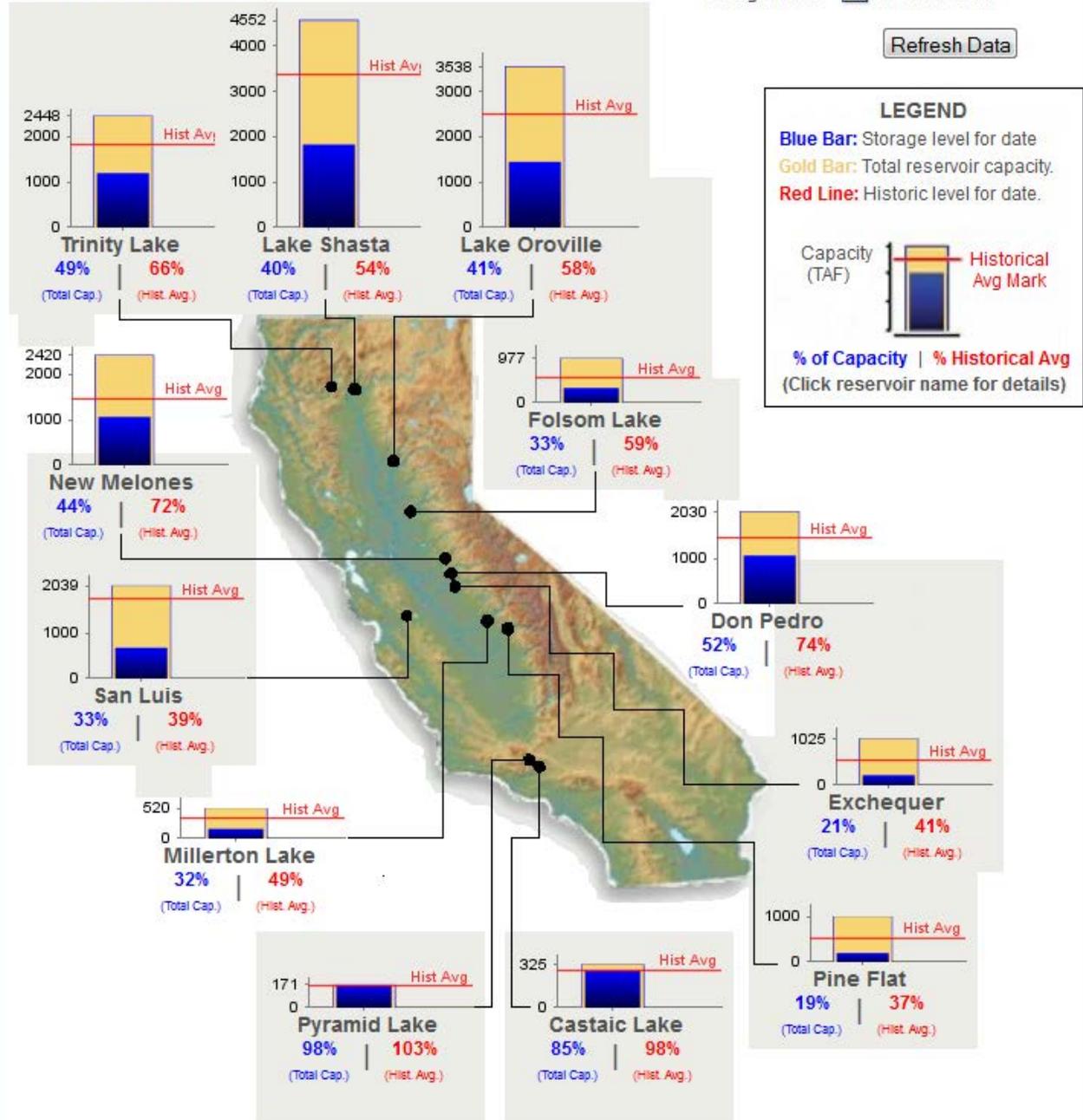
# Major Reservoir Conditions

## CONDITIONS FOR MAJOR RESERVOIRS: 03-MAR-2014

Data as of Midnight: 03-Mar-2014

Change Date:

[Refresh Data](#)



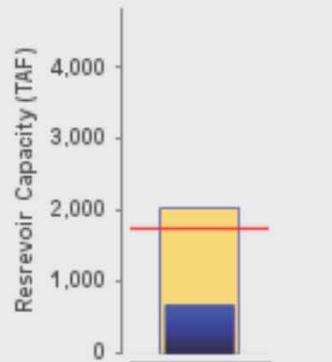


# Reservoir Conditions - San Luis



## San Luis Conditions

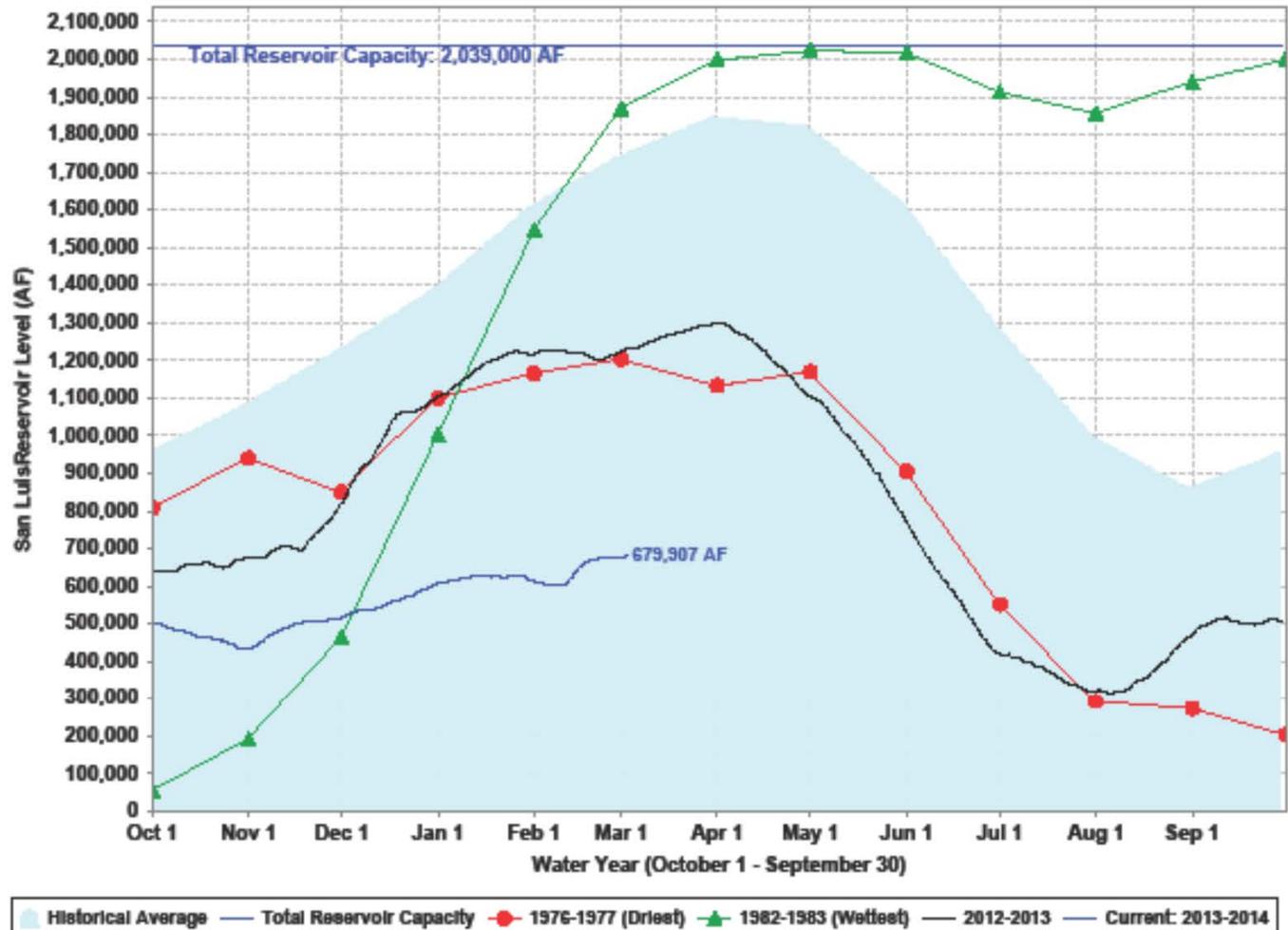
(as of Midnight - March 3, 2014)



Current Level: 679,907 AF

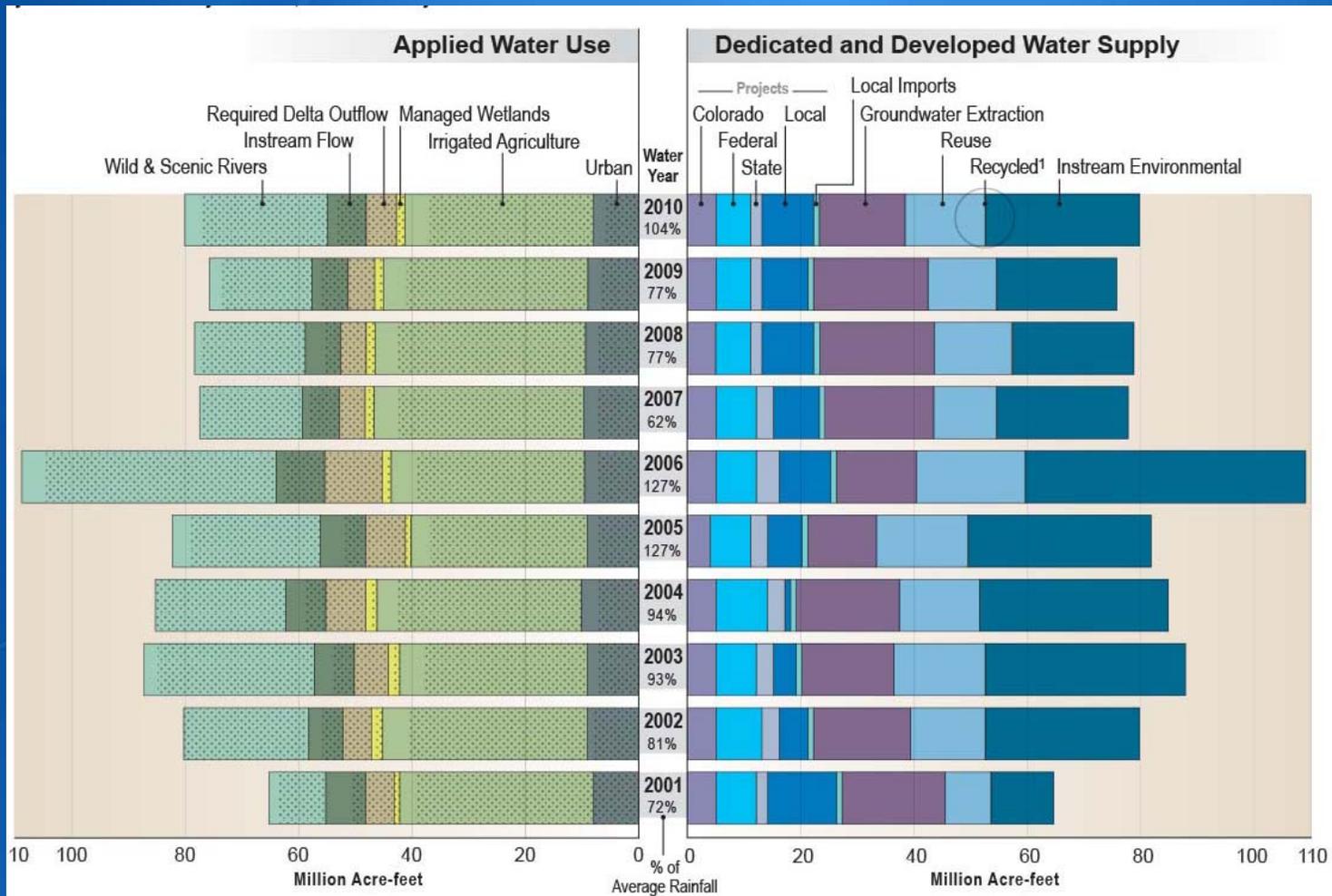
33% (Total Capacity) | 39% (Historical Avg.)

San Luis Levels: Various Past Water Years and Current Water Year, Ending At Midnight March 3, 2014

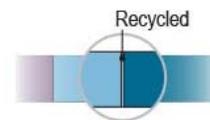


# California's Water Resources

## Variable and Extreme



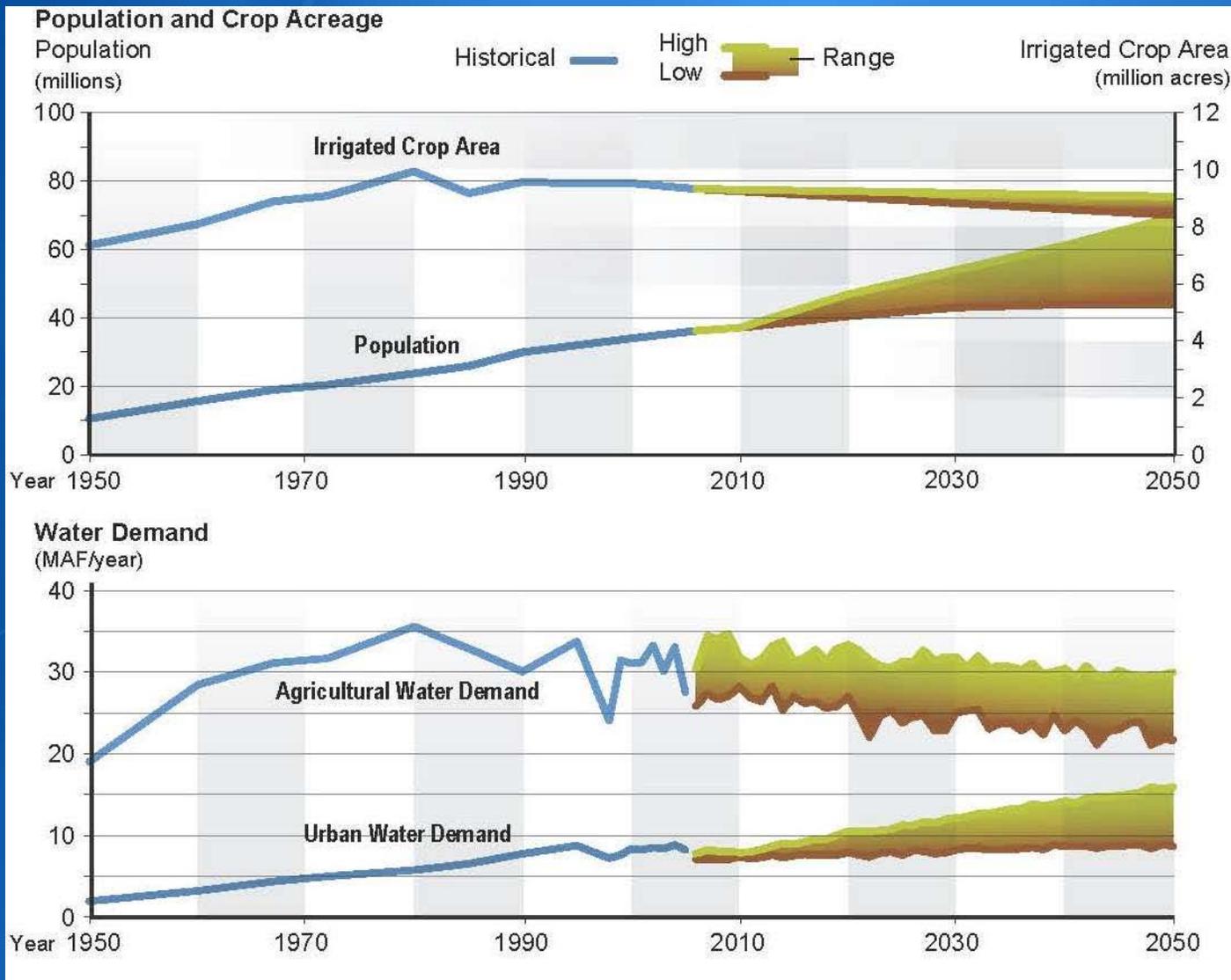
Stippling in bars indicates depleted (irrecoverable) water use (water consumed through evapotranspiration, flowing to salt sinks like saline aquifers, or otherwise not available as a source of supply)



<sup>1</sup> Detail of bar graph: For water years 2001-2010, recycled municipal water varied from 0.2 to 0.5 MAF of the water supply.

# Changing Water Demands

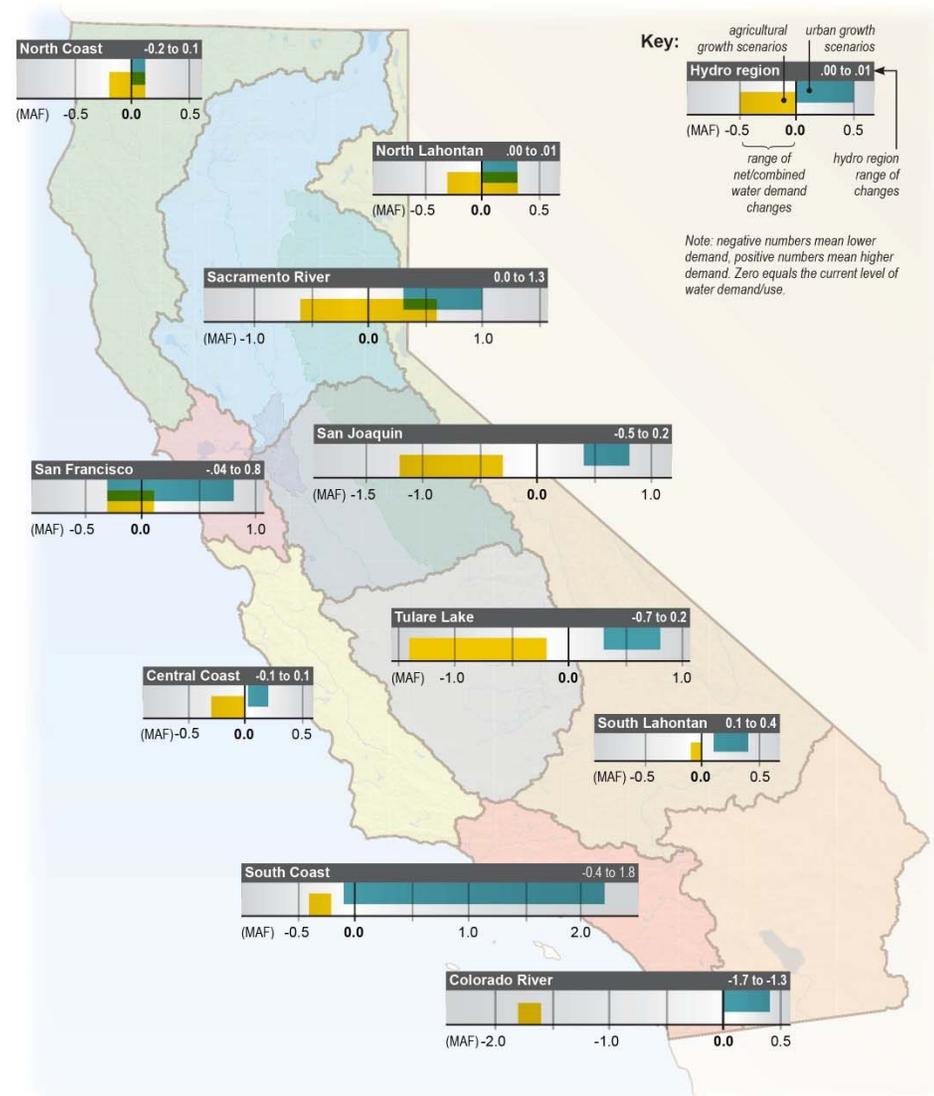
## A Range of Possible Futures



# Changing Water Demands

## A Range of Possible Futures

**Figure 5-22 Change in Regional Agricultural and Urban Water Demands for 117 Scenarios from 2006-2050 (million acre-feet per year)**



## Question 1

What is the current state of the science regarding extent of the water shortage in the short and long-term?

- **Brandon Goshi**

Manager of Water Policy and Strategy  
Metropolitan Water District

# Metropolitan Water District of Southern California



Regional Water Wholesaler to 6 counties

- 5,200 square miles

26 Member Agencies

~18 million residents

Regional economy: ~\$1 trillion

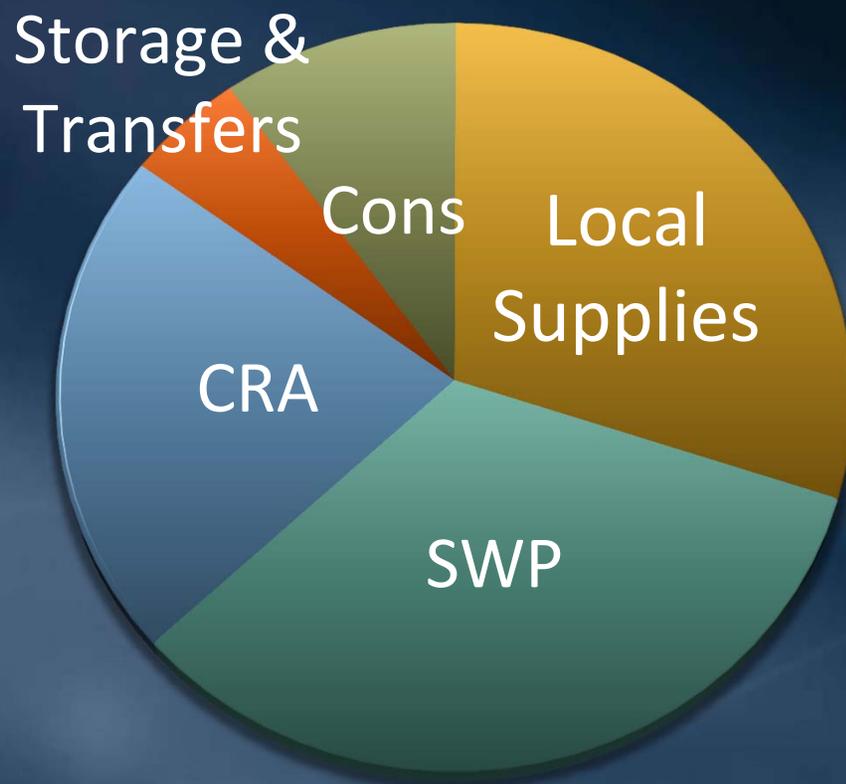
Estimated Retail Demand:

- 4 million acre-feet
- Provide about ½ of retail demands

# Sources of Water for Southern California

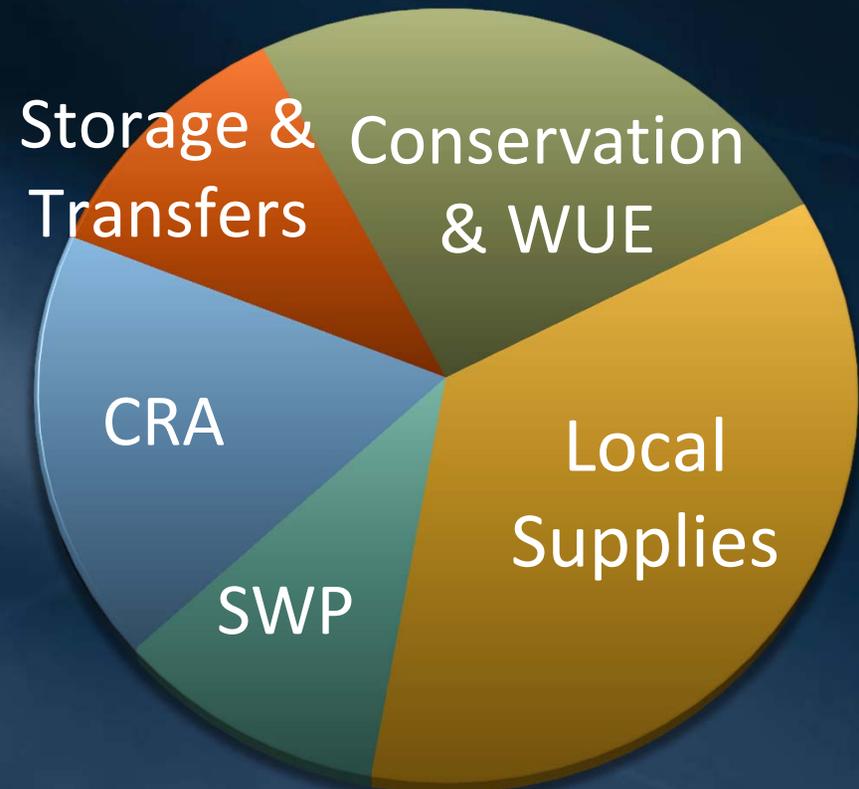


# Diversification of Water Portfolio



**Early 1990's**

*Heavy dependence on imported supply and SWP Diversions*



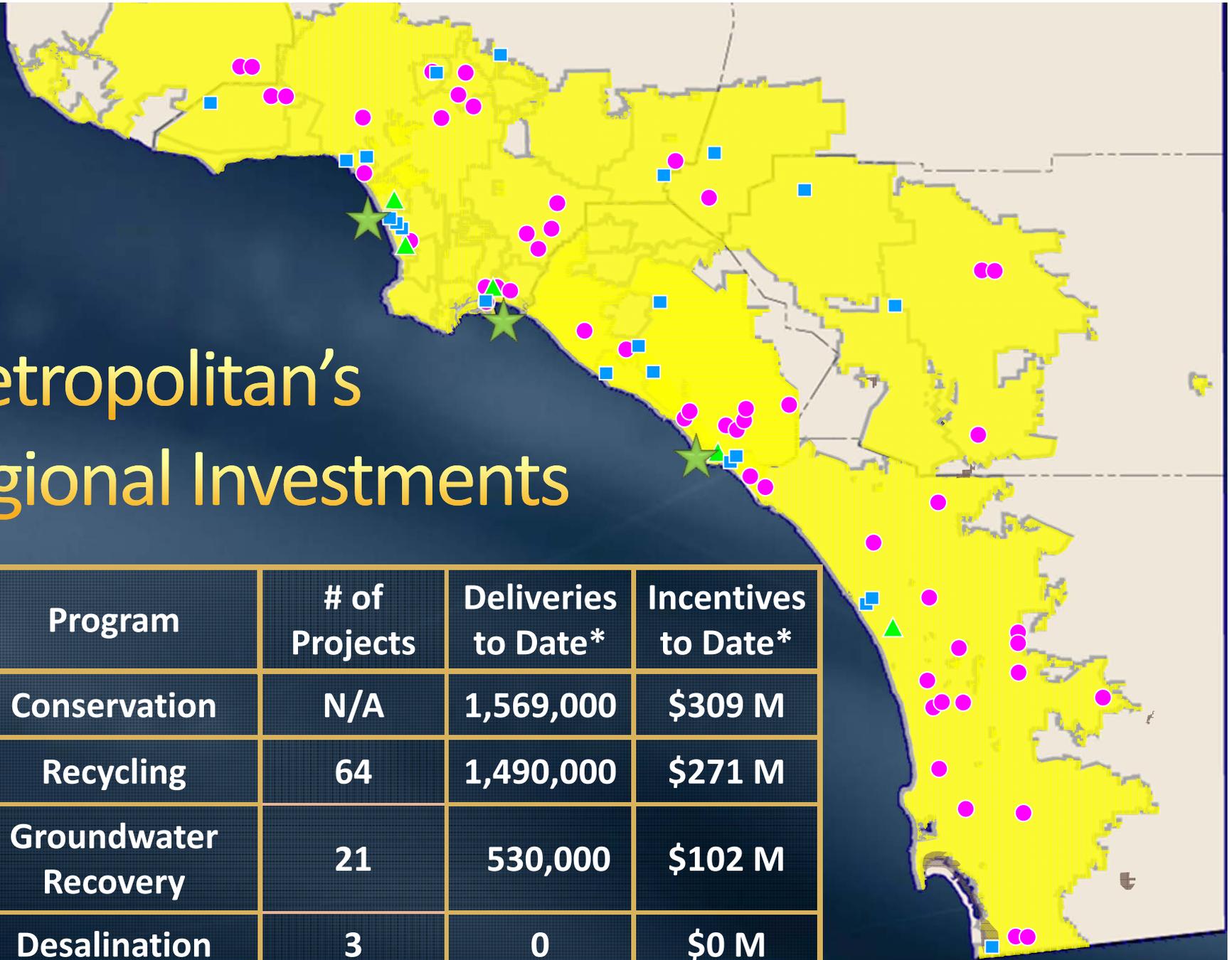
**2010 IRP Strategy**

*Emphasis on Conservation, Local Supplies, and Storage & Transfers*

# Metropolitan's Regional Investments

	Program	# of Projects	Deliveries to Date*	Incentives to Date*
■	Conservation	N/A	1,569,000	\$309 M
●	Recycling	64	1,490,000	\$271 M
■	Groundwater Recovery	21	530,000	\$102 M
★	Desalination	3	0	\$0 M

\*Through FY 2010/11



# Metropolitan's Storage Capacity



# Recent Key Events

- February snow survey was only 12% of normal snowpack to date
- DWR reduced the SWP Table A Allocation to zero percent (January 31)
- March snow survey was 22% of normal snowpack to date (did not include last storm)
- SWRCB granted a joint DWR/USBR petition
  - Reduces Delta Outflow requirements to minimum
  - Provides flexibility in Delta Cross Channel operations

# 2014 Supply and Demand Balance

Based on Currently Allocated Supplies and Demands

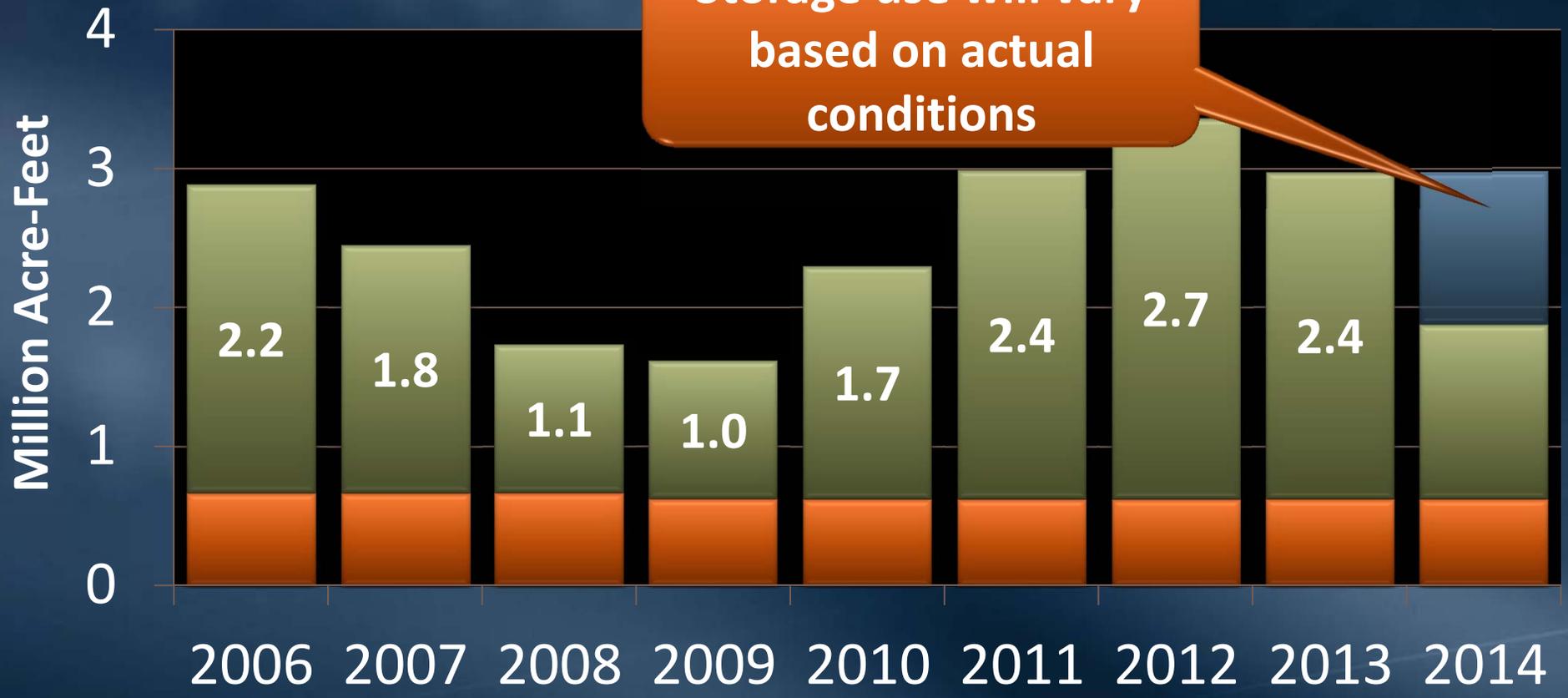
Supply/Demand Balance	Acre-Feet
SWP Supply	600,000
CRA Supply	1,200,000
<b>Total Supply</b>	<b>1,800,000</b>
<b>Total Demand</b>	<b>2,000,000</b>
<b>In-Region Storage Requirement</b>	<b>200,000</b>

# MWD Storage Reserves

End of Year Balances\*

■ Emergency Storage      ■ Dry-Year Storage

Storage use will vary based on actual conditions

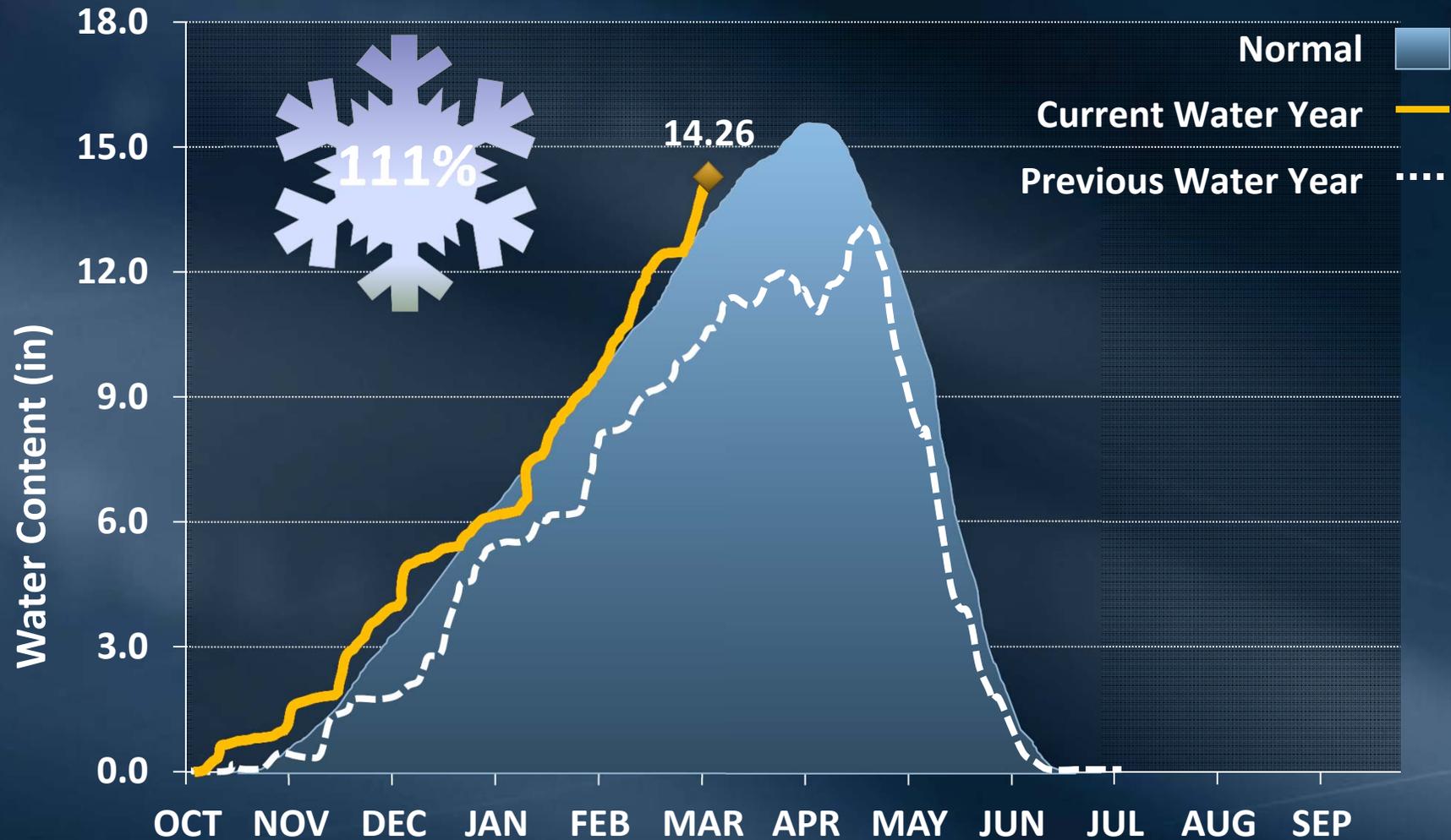


\*Estimated actual storage balances, may be subject to change.

# Colorado River Hydrologic Conditions

Upper Colorado Basin Snowpack

As of 2/28/14



## Question 1

What is the current state of the science regarding extent of the water shortage in the short and long-term?

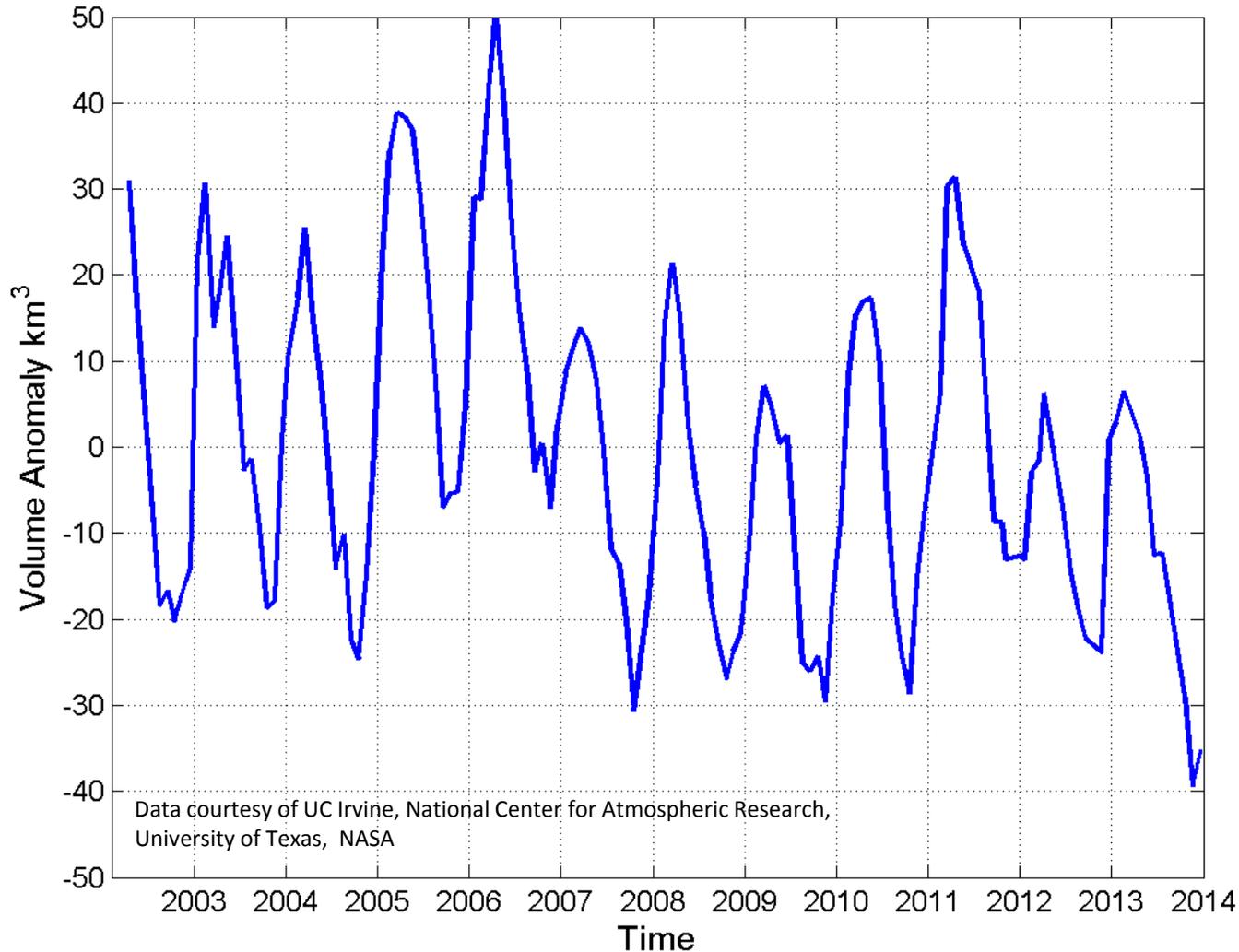
- **James Famiglietti, Ph.D.**

Director

Center for Hydrologic Modeling

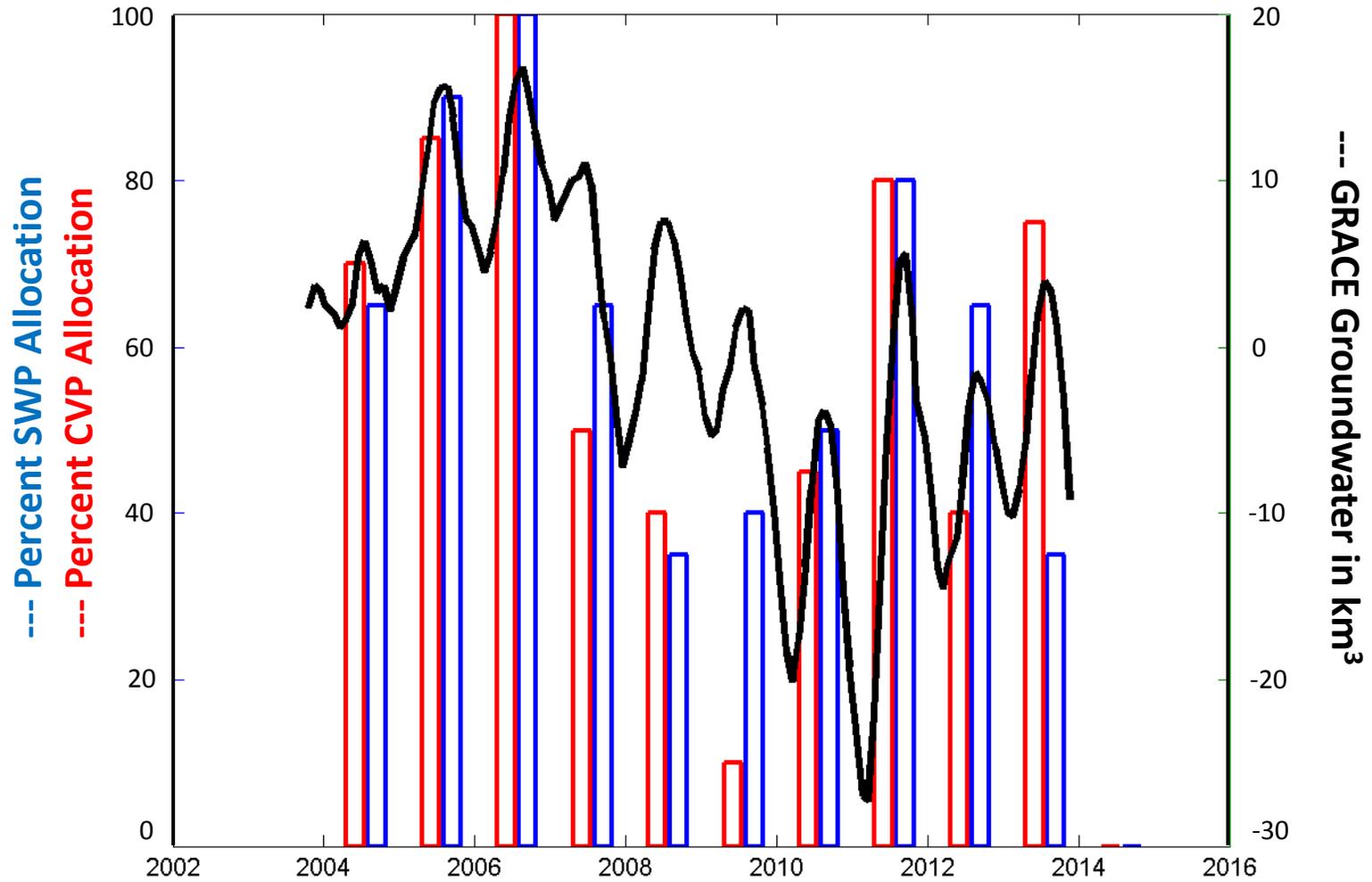
University of California, Irvine

## Total Water Storage Changes in the Sacramento-San Joaquin River Basins from the NASA GRACE Satellite Mission for March 2002- December 2013



- Monthly changes in all of the snow, river and reservoir storage, soil water and groundwater combined.
- Currently the area is 25 cubic kilometers below its normal low for this time of year (based on the average low for the time period shown)

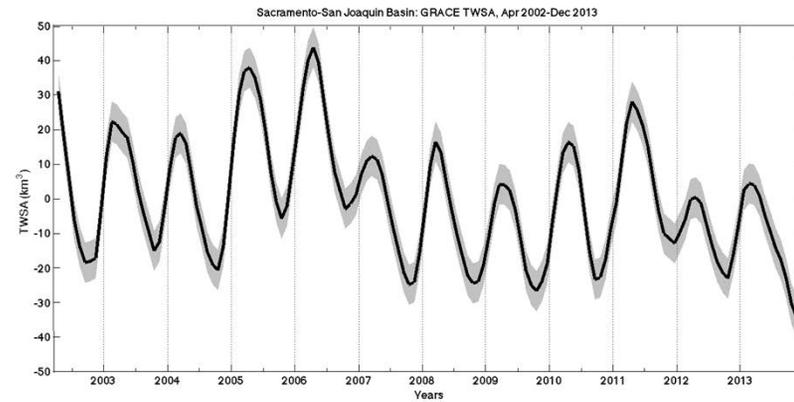
# Central Valley groundwater depletion and surface water allocations are closely connected



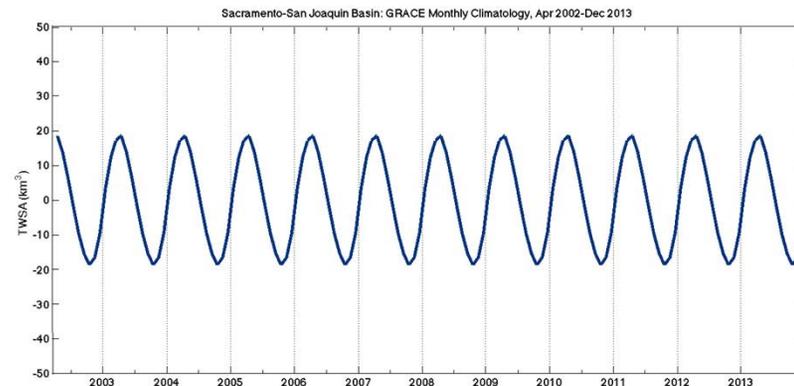
# An example of water cycle change from GRACE

## *Increasing extremes in California*

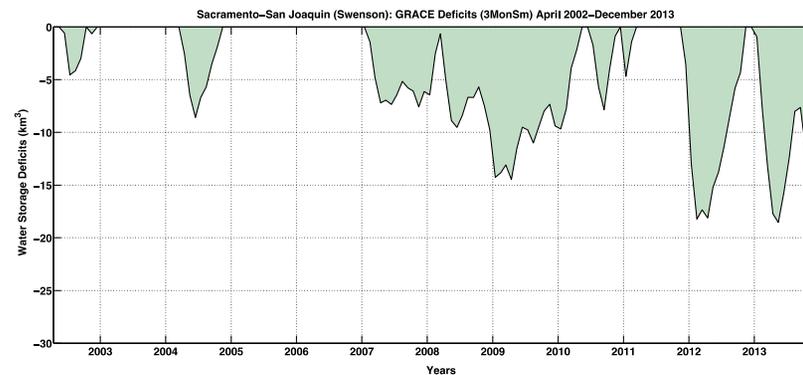
Monthly changes in total water storage



Average changes in total water storage



Negative deviations from average water storage conditions



## Question 2

What immediate actions can be taken to address drought conditions and limit impacts?

- **William Croyle**

Drought Manager

California Department of Water Resources

# State of California Actions

- EO B-21-13: Streamline water transfers - May 2013
- California Water Plan Update 2013 - draft Oct 2013
- State Drought Task Force - Dec 2013
- Governor's Drought Proclamation - Jan 2014
- Water Action Plan - Jan 2014
- SB 103 & SB 104 Drought Relief Bills - March 2014



# Drought Legislation Summary

- **\$549 million** - Local and regional projects.
- **\$30 million** - Improve water use efficiency, save energy and reduce GHG emissions.
- **\$14 million** - Groundwater management and assistance to disadvantaged communities.
- **\$10 million** - Irrigation and water pumping systems that reduce water & energy use.
- **\$15 million** - Address emergency water shortages due to drought.
- **\$13 million** - Expand water use efficiency and conservation activities and to reduce fuel loads.
- **\$25 million** - Food assistance to those impacted by the drought.
- **\$21 million** - Housing related assistance for individuals impacted by the drought.

*NOTE: Funding sources include voter-approved GO bonds, General Fund , and Greenhouse Gas Emissions Fund*

# Short Term Actions

- Conservation
- Review / Activate Water Contingency Plans
- Local / Regional Information and Assistance
- Expedite System Improvements

# Long Term Actions

- Interties
- Diverse Water Portfolios
- Integrated Water Management Actions
- Capital Outlay and Maintenance Funding

# Moving From Plans to Action



## Question 2

What immediate actions can be taken to address drought conditions and limit impacts?

- **David W. Pedersen**  
General Manager  
Las Virgenes Municipal Water District

## Question 2

What immediate actions can be taken to address drought conditions and limit impacts?

- **Mark Grey, Ph.D.**

Director of Environmental Affairs

Building Industry Association of Southern California  
(BIASC)

# ***Latest Generation of Phase 1 MS4 Permits in southern California***

<b>Location</b>	<b>Regional Board</b>	<b>Date Adopted</b>
<b>North Orange County</b>	<b>Santa Ana</b>	<b>6/3/2009</b>
<b>South Orange County</b>	<b>San Diego</b>	<b>12/16/2009</b>
<b>Western Riverside County</b>	<b>Santa Ana</b>	<b>1/29/2010</b>
<b>San Bernardino County</b>	<b>Santa Ana</b>	<b>1/29/2010</b>
<b>Ventura County</b>	<b>Los Angeles</b>	<b>7/8/2010</b>
<b>Southern Riverside County</b>	<b>San Diego</b>	<b>10/13/2010</b>
<b>Los Angeles County</b>	<b>Los Angeles</b>	<b>11/8/2012</b>
<b>San Diego Regional</b>	<b>San Diego</b>	<b>5/9/2013</b>
<b>North Orange County</b>	<b>Santa Ana</b>	<b>2014?</b>

All permits require on-site retention of the 85<sup>th</sup> percentile, 24-hour storm event;  
Most permits provide an “off-ramp” for infeasibility of on-site retention practices

## ***Stormwater LID Best Practices Categories Required for on-site use at development projects***

<b>Infiltration</b>	<b>Harvest and Use</b>	<b>Evaporative</b>	<b>Biofilter/Biotreat</b>	
\$-\$\$	\$\$\$	\$\$\$\$	\$\$	
Grading	Rain Barrels	Green Roof	Bioretention	
Swale	Cisterns	Brown Roof	Biofiltration	
Trench	Tanks	Blue Roof	Planter Box	
Basin		Canopy Intercept	Constr. Wetland	
Drywell	<u>Uses:</u>	Soil Amendment	Vegetated Swale	
Gallery	Irrigation Toilet Flushing Vehicle Washing Evaporative Cooling Industrial Process Dilution Water Other Non-Potable	Runoff Dispersion	Vegetated Strip	
French Drain			Proprietary Device	
Permeables: --Asphalt --Concrete --Pavers				Biotreatment may use underdrains or overdrains

# ***Case Study Analysis of On-site Retention LID BMPs Installation and 20-year O&M Per Gallon Managed***

<b>LID BMPs Evaluated</b>	<b>Office Complex</b>	<b>Residential Single Family</b>	<b>Small Urban Infill</b>	<b>Retail Big Box</b>	<b>Large Urban Mixed Use</b>
	<b>Cost Per Gallon of Runoff</b>				
<b>Infiltration Basin</b>	<b>\$4</b>	<b>\$2</b>	<b>---</b>	<b>\$1</b>	<b>---</b>
<b>Infiltration Paver</b>	<b>\$6</b>	<b>\$3</b>	<b>\$18</b>	<b>\$3</b>	<b>\$9</b>
<b>Cistern: outdoor</b>	<b>\$12</b>	<b>\$7</b>	<b>---</b>	<b>\$5</b>	<b>---</b>
<b>Cistern: outdoor &amp; indoor</b>	<b>\$15</b>	<b>---</b>	<b>\$49</b>	<b>---</b>	<b>\$11</b>
<b>Green Roof</b>	<b>\$103</b>	<b>\$38</b>	<b>\$126</b>	<b>\$61</b>	<b>\$84</b>
<b>Biofiltration</b>	<b>\$6</b>	<b>\$4</b>	<b>\$21</b>	<b>\$2</b>	<b>\$9</b>

**Installation and 20-year O&M Cost hierarchy normalized per gallon:**

**Infiltration < Infiltration Pavers ≤ Biofiltration < Harvest and Use Cisterns < Green Roof**

# Retrofits and New Technologies to Promote Conservation and Local Storage



**Subterranean Storage**



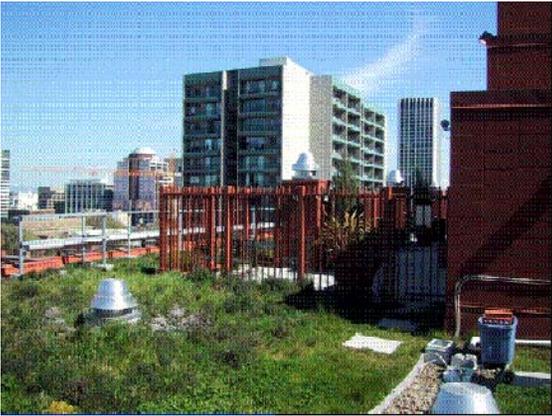
**Rainwater Harvesting**



**Landscape Integration**



**Complete Streets**



**Urban Green Surfaces**

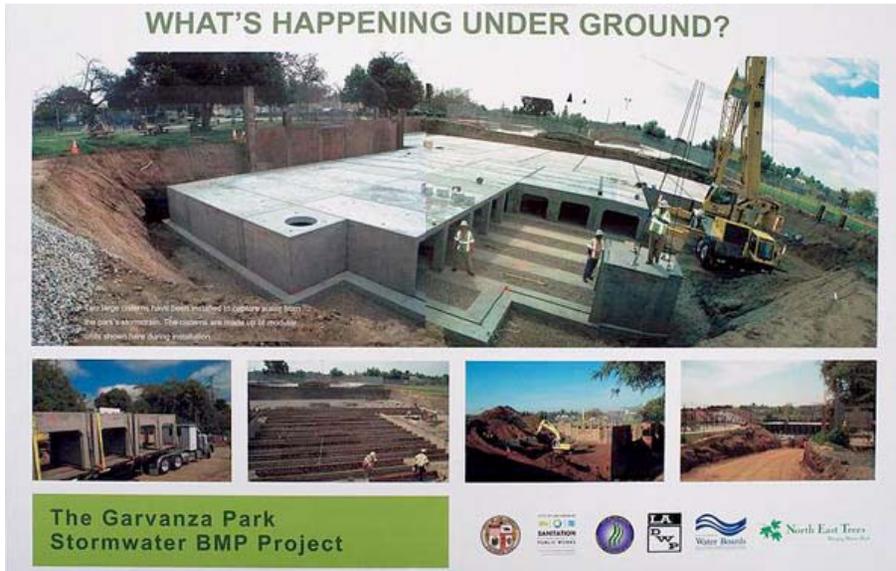
# *Urban LID Biofiltration Retrofits*



**Infrastructure retrofits in urban areas with LID-type control systems will require using treat and release filtration systems**

# ***More on Retrofits and Best Practices Applied to Water Quality Compliance***

## **Regional/Off-project Scale**



- ***Green street adjacent or surrounding project***
- ***Green streets near project within catchment***
- ***Facility retrofits adjacent/near project***
  - ***Parking Areas***
  - ***Parks***
- ***Streets/Retrofits outside catchment of project***
- ***Regional infiltration within/outside project watershed***

**CASQA 2012 BMP of the Year: Garvanza Park**

**Slide Source: City of Los Angeles**

**Contractor: Griffith Company**

## Question 3

What longer-term strategies should be considered to ensure a stable water supply and what financing mechanisms need to be put into place in order to implement these strategies?

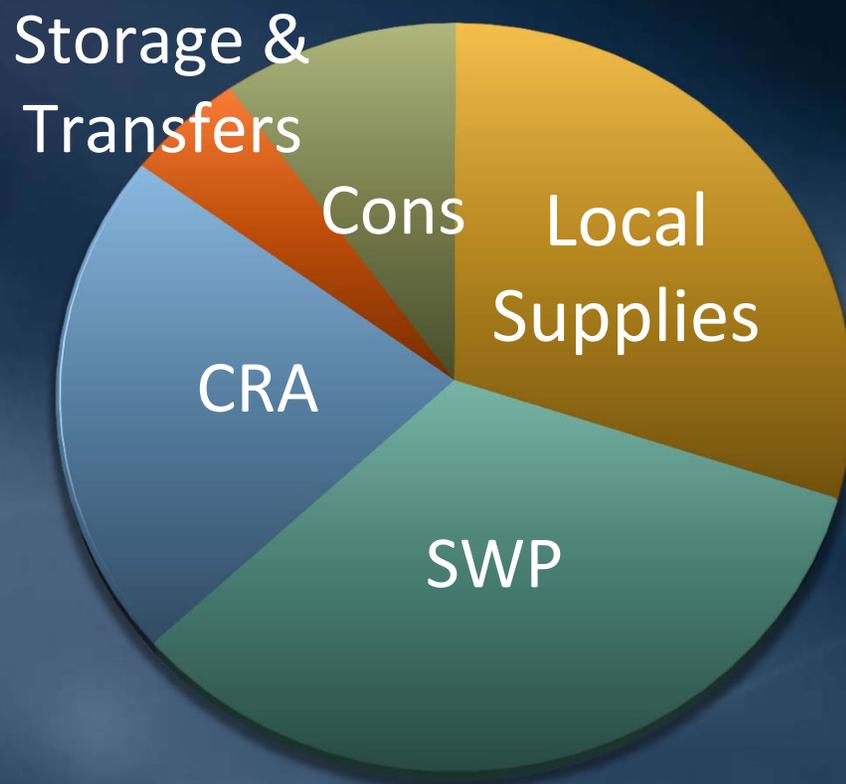
- **Brandon Goshi**

Manager of Water Policy and Strategy  
Metropolitan Water District

# Integrated Resources Plan Supply Reliability Goal

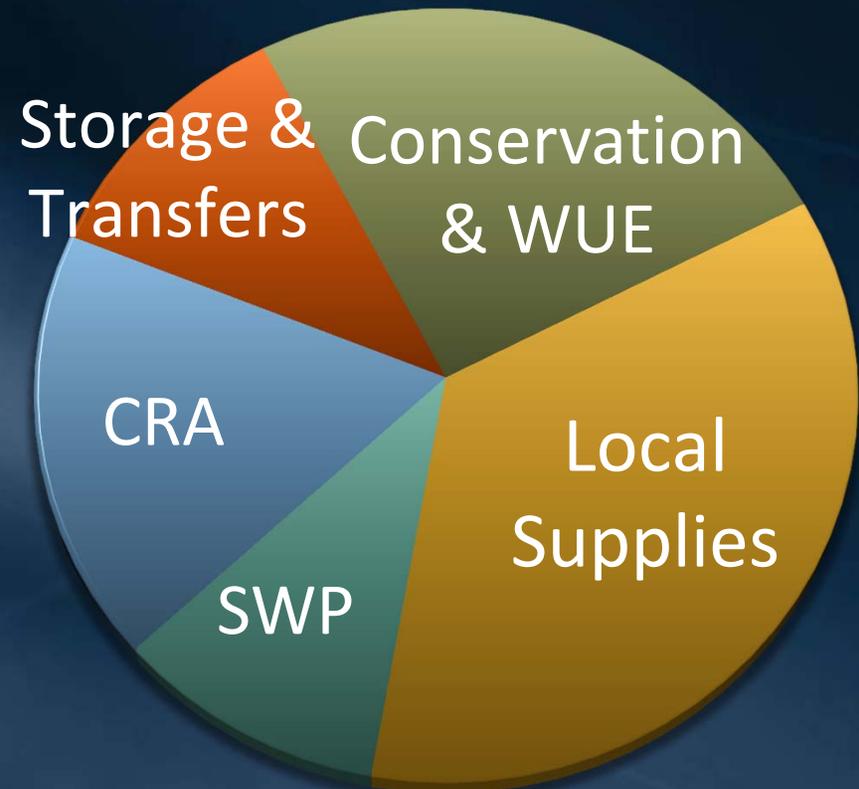
*“Through the implementation of the  
IRP, Metropolitan and its member  
agencies will have the full capability to  
meet full-service demands at the retail  
level under all foreseeable hydrologic  
conditions”*

# Diversification of Water Portfolio



**Early 1990's**

*Heavy dependence on imported supply and SWP Diversions*



**2010 IRP Strategy**

*Emphasis on Conservation, Local Supplies, and Storage & Transfers*

# Three Component IRP Strategy

## Blueprint for Adapting to Change

**Component 1:**  
Core Resource  
Strategy

Reliability Under  
Planned Conditions  
(eg. Historical weather)

**Component 2:**  
Supply Buffer

Adapt to Shorter-  
Term Uncertainty  
(Outside of planned  
conditions)

**Component 3:**  
Foundational  
Actions

Preparation for Long-  
Term Change  
(Climate Change, Supply  
Loss, Demands)

# Component 1: Core Resources Strategy

Reliability Under Planned Conditions

Water Use  
Efficiency

- **20% by 2020 Retail Compliance**

Local  
Resources

- **Incentives and Partnerships**

SWP

- **Delta Improvements**

CRA

- **Dry-Year Supply Programs**

# Addressing Shorter-Term Risk with a Supply Buffer

**Component 1:**  
Core Resource  
Strategy

Reliability Under  
Planned Conditions  
(eg. Historical weather)

**Component 2:**  
Supply Buffer

**Adapt to Shorter-  
Term Uncertainty**  
(Outside of planned  
conditions)

**Component 3:**  
Foundational  
Actions

Preparation for Long-  
Term Change  
(Climate Change, Supply  
Loss, Demands)

# Having a Supply Buffer Manages Shorter-Term Uncertainty



200 TAF additional water conservation and recycling

Consider additional local resources e.g. groundwater recovery, desalination



# Preparing for Long Term Uncertainty with Foundational Actions

**Component 1:**  
Core Resource  
Strategy

Reliability Under  
Planned Conditions  
(eg. Historical weather)

**Component 2:**  
Supply Buffer

Adapt to Shorter-  
Term Uncertainty  
(Outside of planned  
conditions)

**Component 3:**  
Foundational  
Actions

Preparation for Long-  
Term Change  
(Climate Change, Supply  
Loss, Demands)

# What are Foundational Actions?

- Actions that provide an adaptive approach to managing longer-term uncertainties
  - Projects can be implemented more quickly when needed
  - Implementation is tied to triggers
- Low regret planning and mitigation actions
- Actions that present minimal cost-risk

# Foundational Actions



Recycled Water



Stormwater



Desalination

## Processes

Integration

Public Perception

Legislation

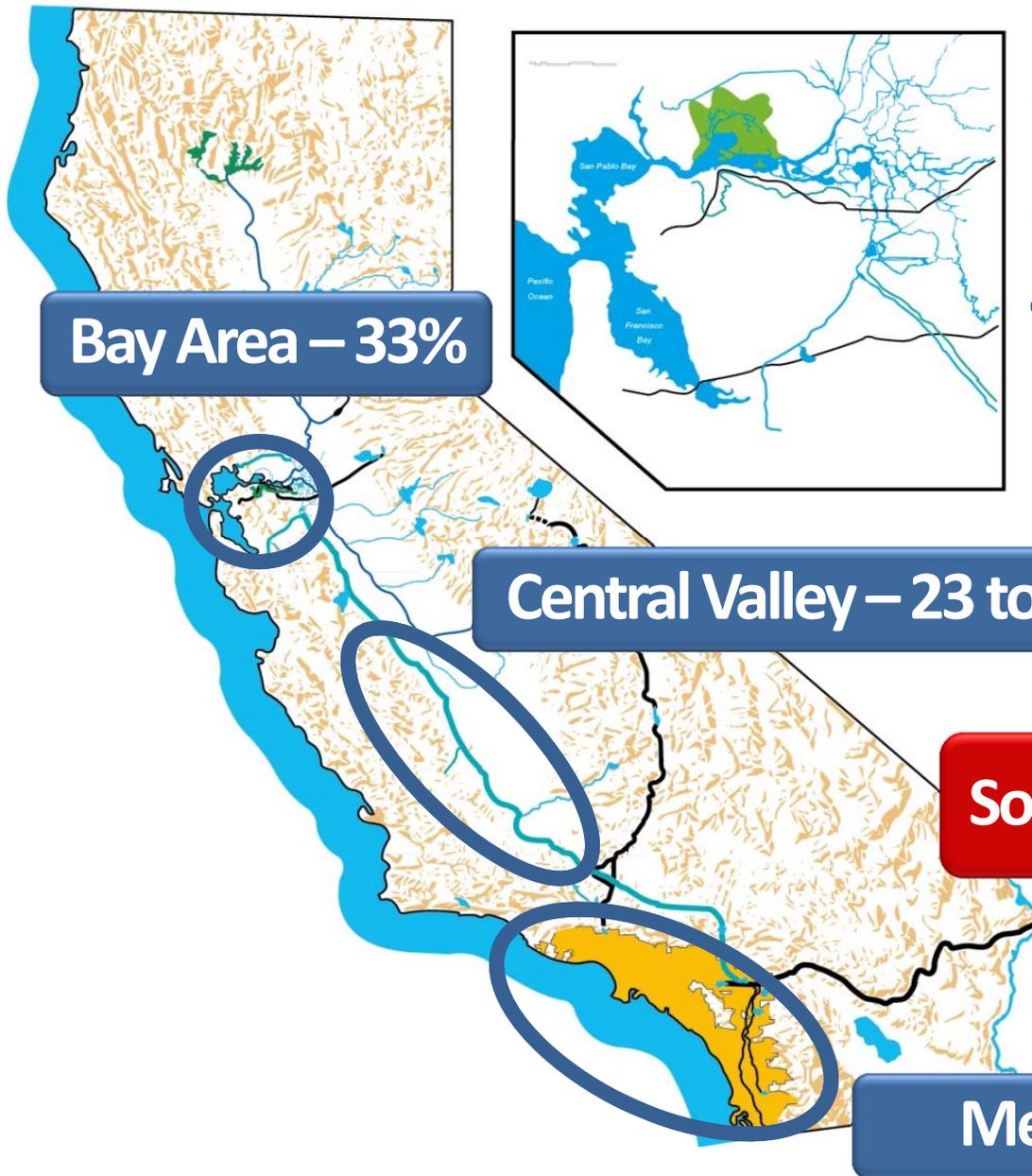
Procedural

Funding

Operational

# Bay Delta Conservation Plan (BDCP)

# California relies on water that flows through the Delta



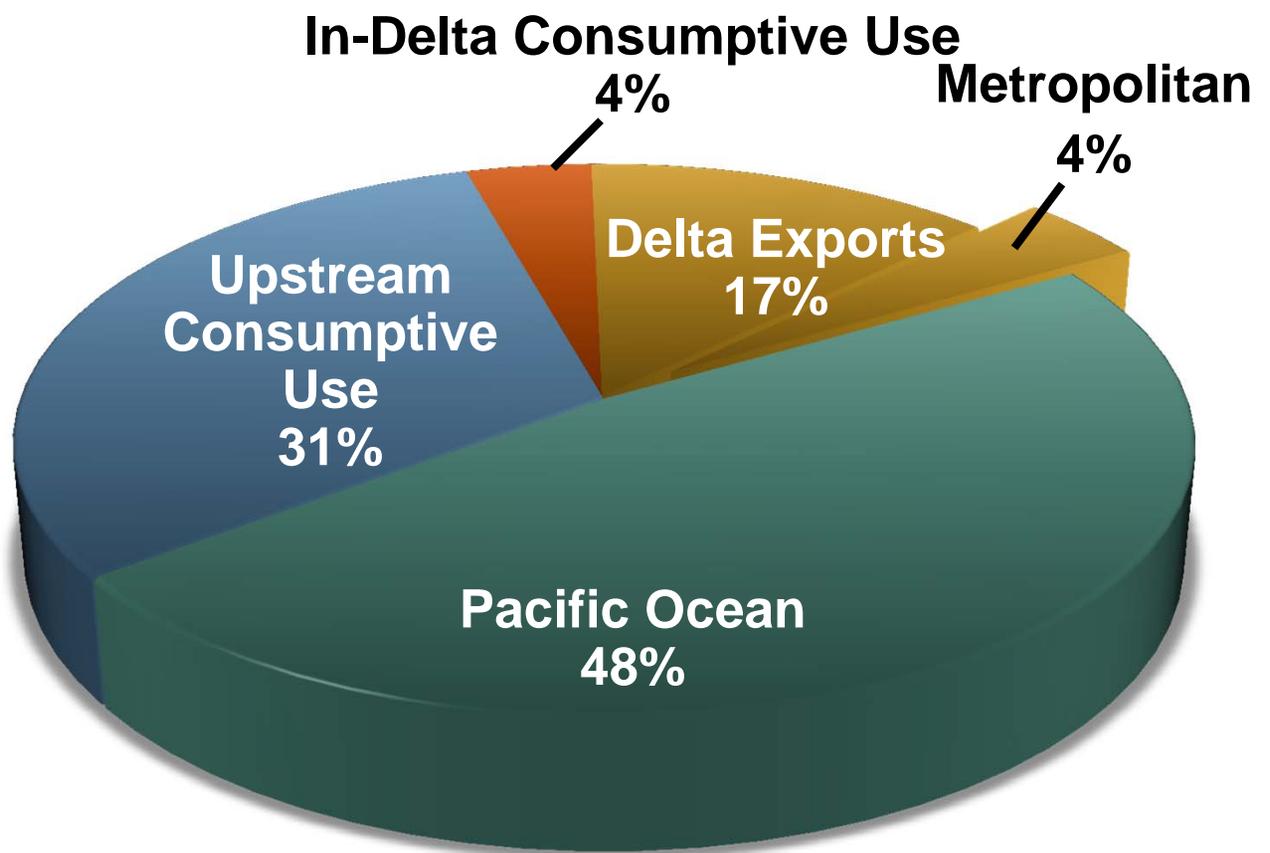
# Water Flowing from the Delta Watershed

**Upstream Consumptive Use**

- Residential
- Commercial
- Agriculture
- Industrial
- Institutional

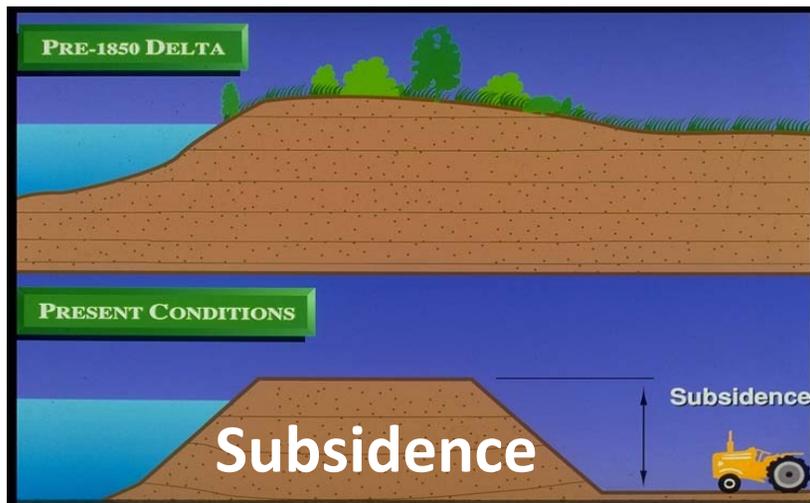
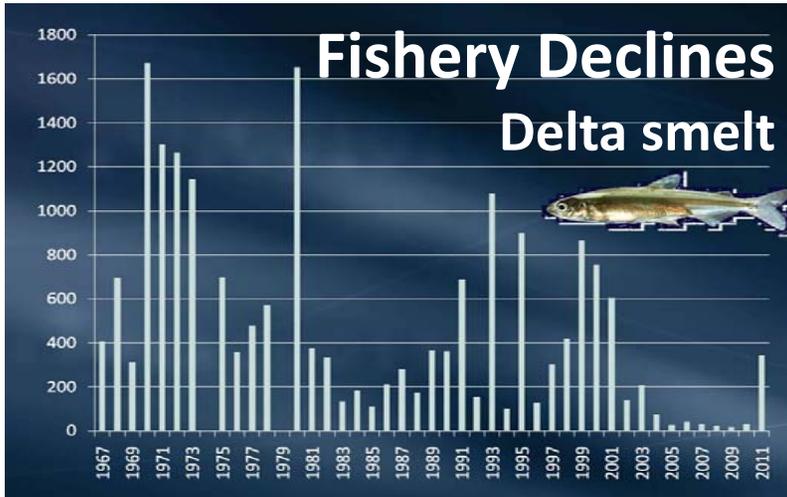
**Delta Exports**

- Central Valley Project
- State Water Project

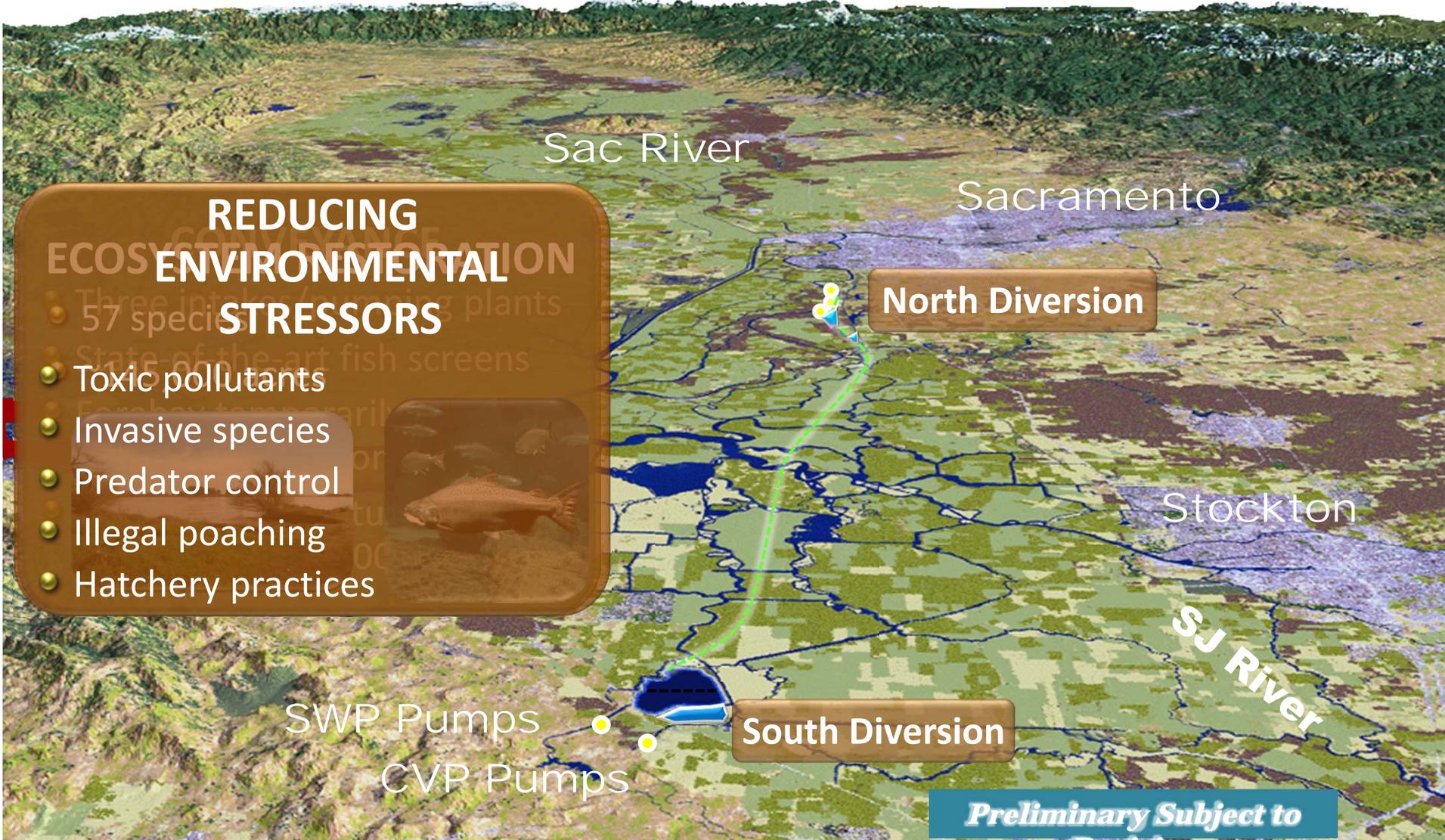


Source: Delta Vision Report -Estimated total annual runoff 32.85 maf (2007)

# Key Delta Risks



# Bay-Delta Conservation Plan



## REDUCING ENVIRONMENTAL STRESSORS

- Toxic pollutants
- Invasive species
- Predator control
- Illegal poaching
- Hatchery practices



Preliminary Subject to

# BDCP Project Costs

Improvements	Capital	O&M (Total 50 Years)	Funding Source
Conveyance	\$14.5 billion	\$1.5 billion	Water Contractors
Eco-Restoration & Other Stressors	\$5.2 billion	\$3.3 billion	Fed/State/Water Contractors/Other
<b>TOTAL Capital/O&amp;M</b>	<b>\$19.7 billion</b>	<b>\$4.8 billion</b>	
<b>TOTAL BDCP</b>	<b>\$24.5 billion</b>		

- Users pay for new conveyance facility & mitigation
- Beneficiaries pay for habitat conservation & statewide benefits
- \$5 - 6/month per household for Southern Californians

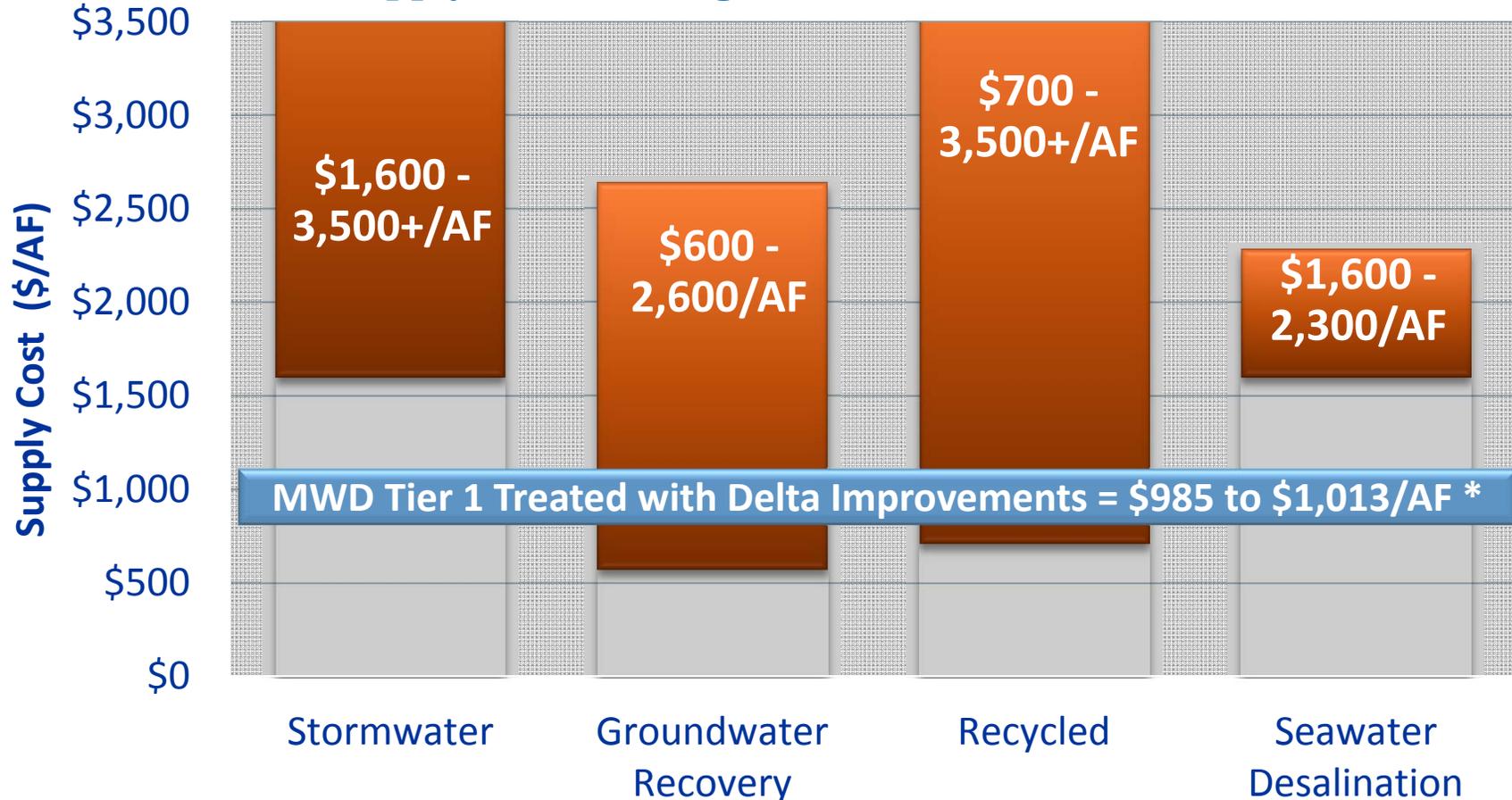
*Metropolitan's share is approximately 25 percent  
 Estimated costs from BDCP Administrative Draft Chapter 8 (May 2013) in undiscounted 2012 dollars. 52*

# Water Investment Projects

Project	Cost	Population Served	Per capita cost
SFPUC's Hetch Hetchy Project	\$4,600,000,000	2,600,000	\$1,769
SWP Coastal Aqueduct and CCWA Project	\$575,000,000	430,000	\$1,337
CCWD Los Vaqueros Project	\$570,000,000	550,000	\$1,036
BDCP Conveyance Tunnels <i>(BDCP Admin Draft May 2012)</i>	14,500,000,000	25,000,000	\$580
SDCWA Emergency Storage Project	\$1,500,000,000	2,800,000	\$536
EBMUD Freeport Project	\$517,000,000	1,300,000	\$398

# Cost Comparison of Water Portfolio Projects

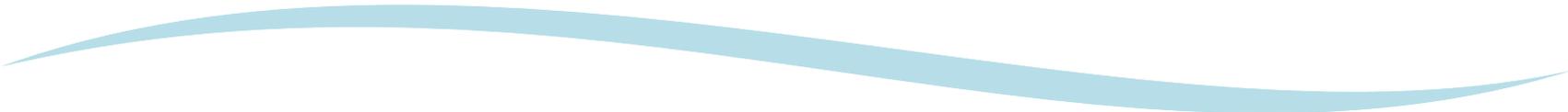
**Metropolitan is committed to meeting future additional water supply needs through local resources and conservation**



**\* MWD Treated Water Rate with Delta Improvements (in 2013 dollars)**

**-- Existing (\$847/AF treated rate) + Delta Improvements (\$138 - \$166/AF melded rate) = \$985 - \$1,013/AF**  
**Local project cost ranges are based on recent reports from member agencies**

## Statewide Economic Report—Costs/Benefits of BDCP



- \$5 billion in overall net benefits
- 177,000 construction and habitat restoration jobs created
- \$84 billion in statewide business activity over 50-year life
- Avoidance of water shortages that could cost over 1 million jobs

## Question 3

What longer-term strategies should be considered to ensure a stable water supply and what financing mechanisms need to be put into place in order to implement these strategies?

- **Mark Grey, Ph.D.**

Director of Environmental Affairs

Building Industry Association of Southern California  
(BIASC)

## Question 3

What longer-term strategies should be considered to ensure a stable water supply and what financing mechanisms need to be put into place in order to implement these strategies?

- **David W. Pedersen**  
General Manager  
Las Virgenes Municipal Water District

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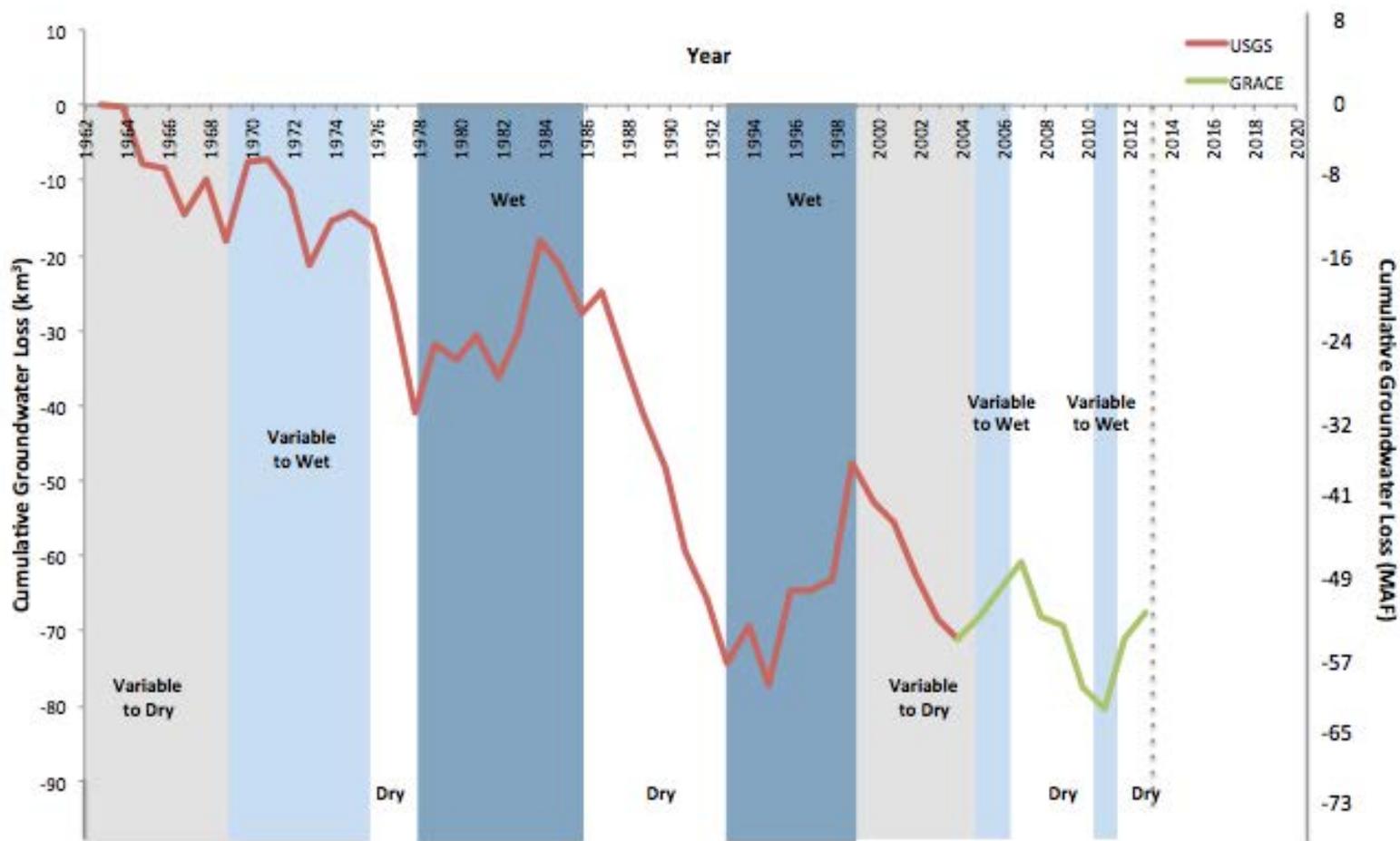
- **James Famiglietti, Ph.D.**

Director

Center for Hydrologic Modeling

University of California, Irvine

## Cumulative Groundwater Depletion in California's Central Valley from USGS and GRACE



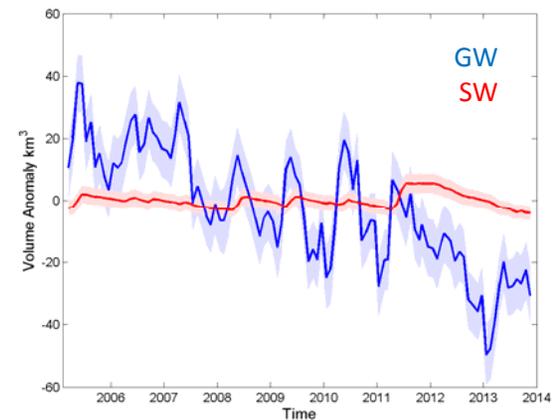
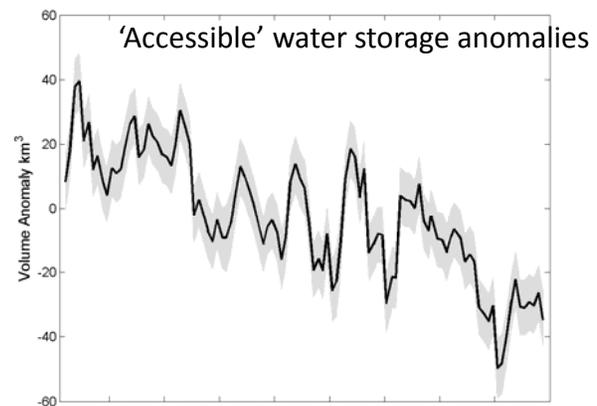
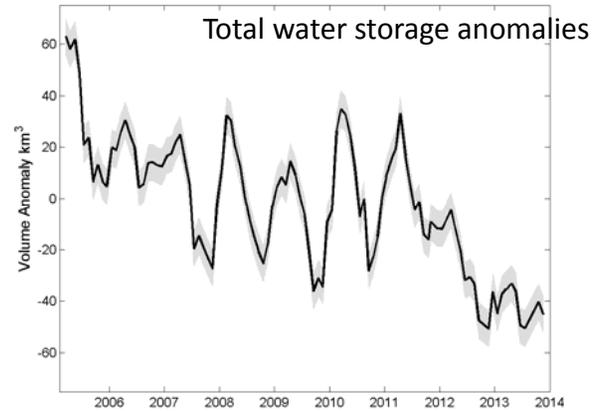
UCCHM, 2014

# Estimating groundwater storage changes with GRACE

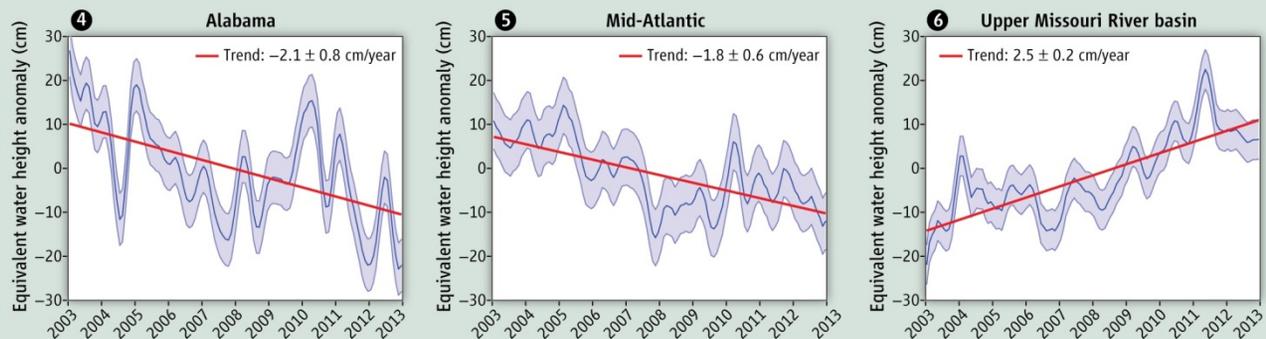
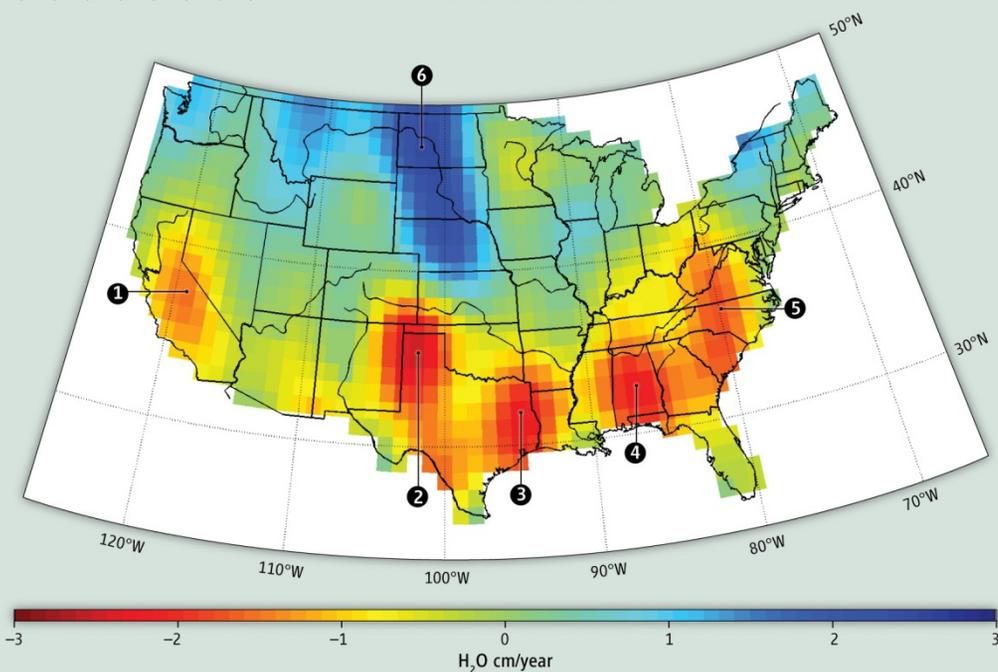
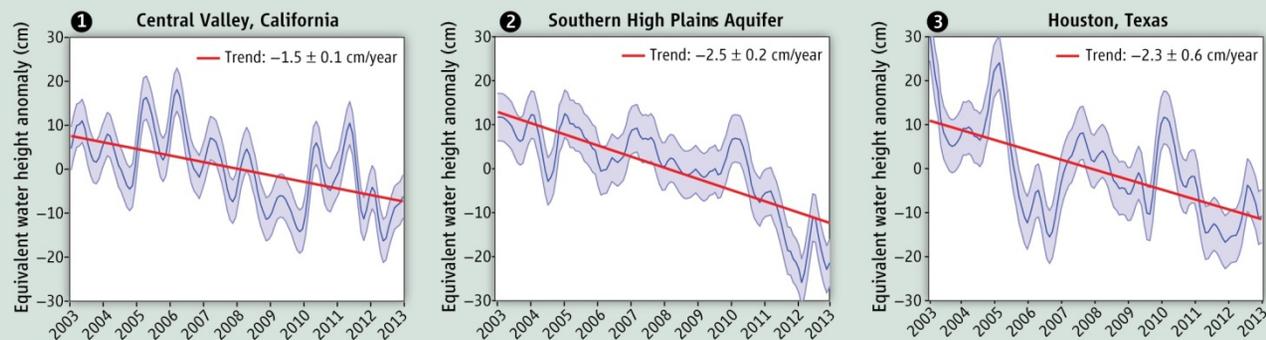
## Colorado River Basin



Castle et al., 2014, in prep



## Trends in Freshwater Storage from GRACE, 2003-2012



A golden retriever dog is sitting on a grey carpet, looking towards the left. A person in a grey suit jacket is kneeling next to the dog, with their hand resting on its back. The dog is wearing a red collar. To the left of the dog is a blackboard with a pledge written in colorful chalk. The text on the blackboard reads: "I PLEDGE TO SAVE water BY not taking a bath 'til next SUMMER". The words "I PLEDGE TO" are in purple, "SAVE water BY" are in blue, "not taking a bath" are in light blue, "'til next" are in pink, and "SUMMER" is in green. The background is a blue wall with some faint graffiti.

I PLEDGE TO  
SAVE water BY  
not taking  
a bath  
'til next  
SUMMER

## Question 4

How can a regional planning agency like SCAG be part of the solution as we work with local agencies to develop land-use and transportation plans to create more sustainable communities?

- **William Croyle**

Drought Manager

California Department of Water Resources

# Governor's Water Action Plan

## A Diverse Water Portfolio --- 10 Priority Actions

1. Make conservation a California way of life
2. Increase regional self-reliance and integrated water management across all levels of government
3. Achieve the co-equal goals for the Delta
4. Protect and restore important ecosystems
5. Manage and prepare for dry periods
6. Expand water storage capacity and improve groundwater management
7. Provide safe water for all communities
8. Increase flood protection
9. Increase operational and regulatory efficiency
10. Identify sustainable and integrated financing opportunities



# What You Can Do:

- Know your water portfolio
- Know your water costs
- Assess your risks
- Sustainable funding
- Engage in Regional IRWM Actions
- Ownership at the user level
- 20% by 2020 – Go Early!
- Wave your flag
- Reward Conservation and Innovation

## Question 4

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- **Brandon Goshi**

Manager of Water Policy and Strategy  
Metropolitan Water District

## Question 4

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- **David W. Pedersen**

General Manager

Las Virgenes Municipal Water District

## Question 4

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- **Mark Grey, Ph.D.**

Director of Environmental Affairs  
Building Industry Association of  
Southern California (BIASC)

## Question 4

How can a regional planning agency like SCAG be part of the solution as we work with local agencies to develop land-use and transportation plans to create more sustainable communities?

- **James Famiglietti, Ph.D.**

Director

Center for Hydrologic Modeling

University of California, Irvine

# Discussion

