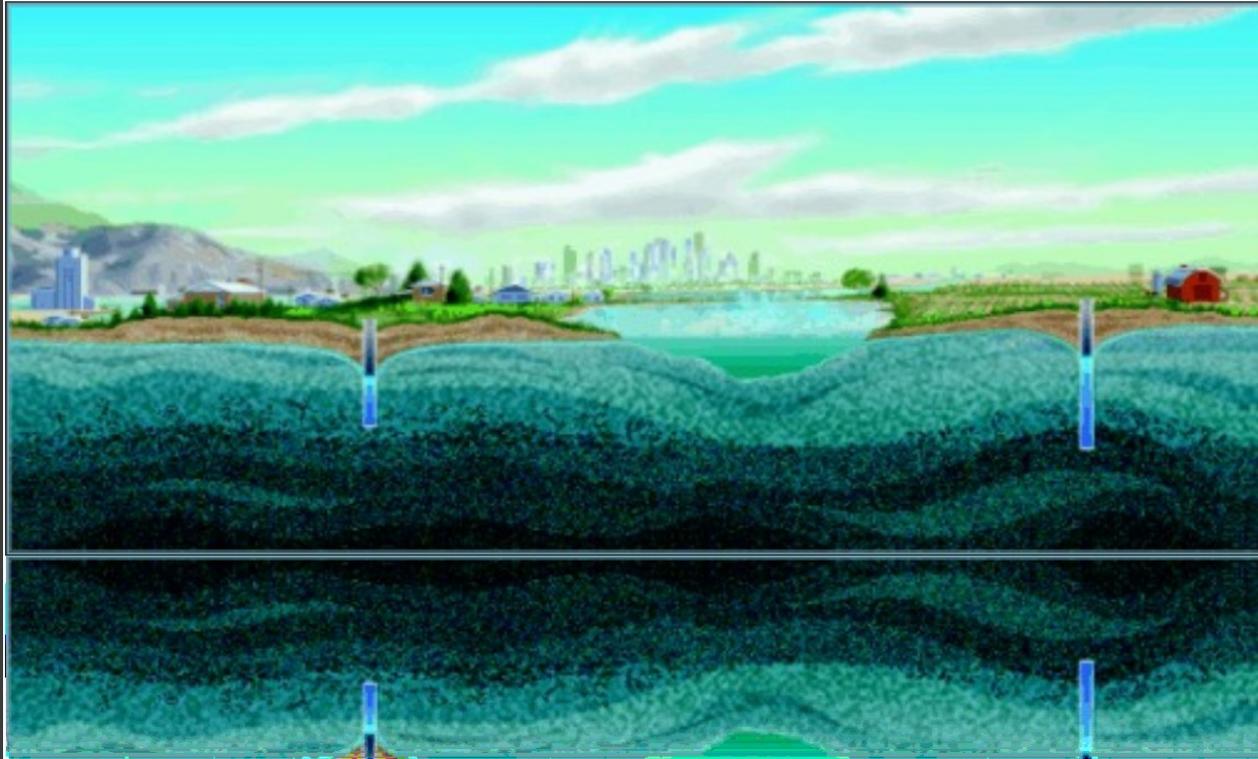


# California Groundwater The Impact of Drought



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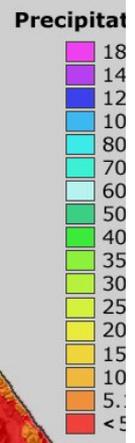
# OUTLINE

- Groundwater Overview
- Drought Response
- Future



# Precipitation

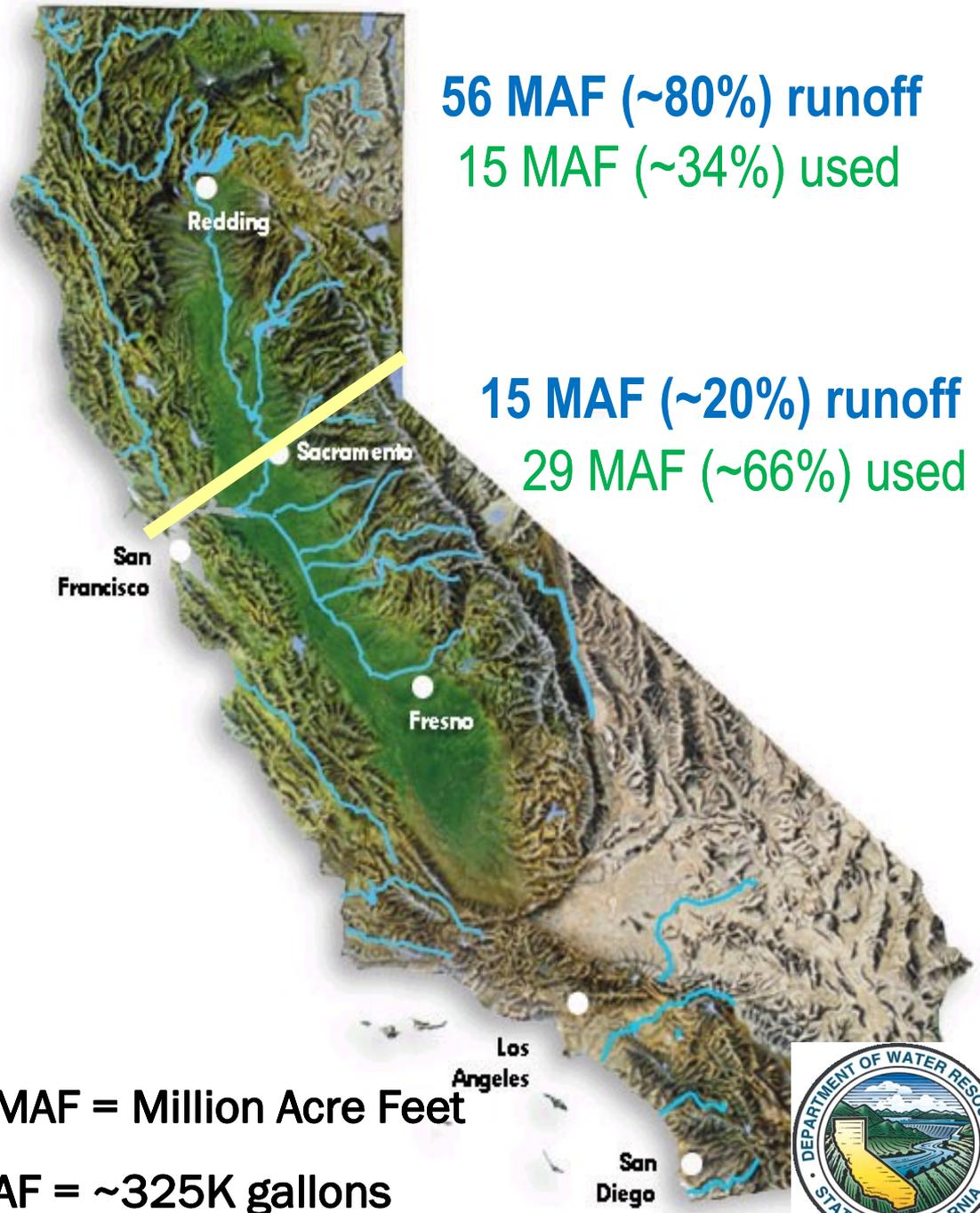
Average Annual Precipitation California (With Shaded)



100 miles

ified from the National Atlas

SOURCE: <http://education.usgs.gov/california/re>



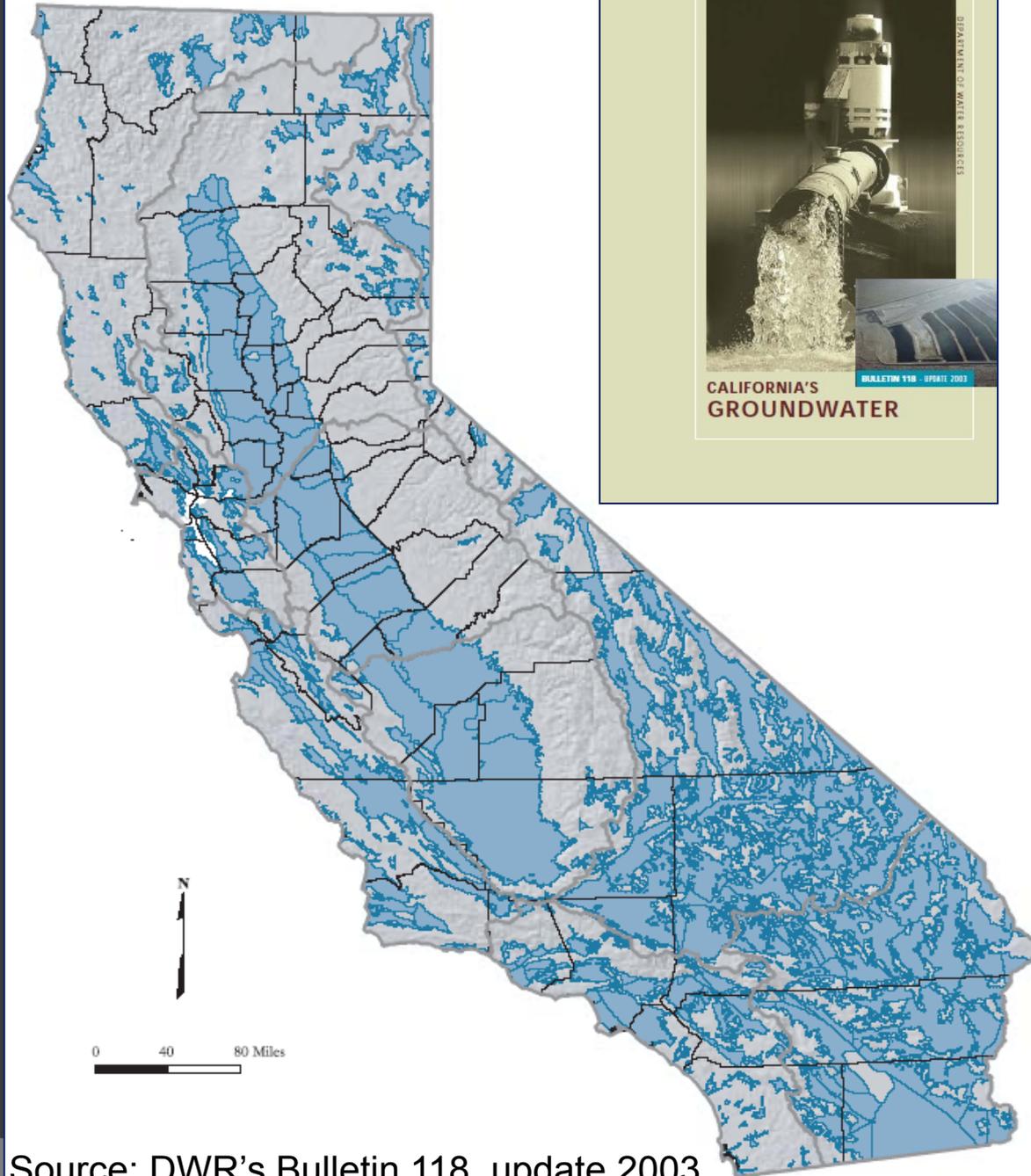
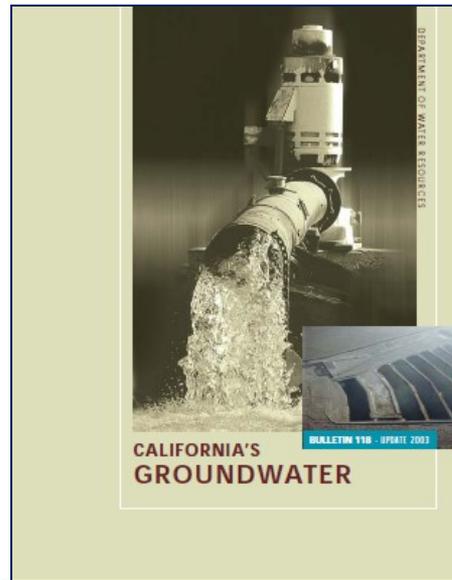
MAF = Million Acre Feet

AF = ~325K gallons



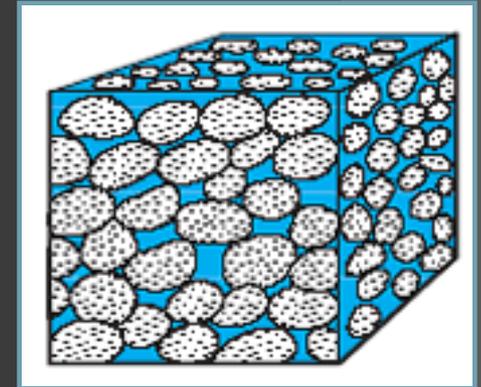
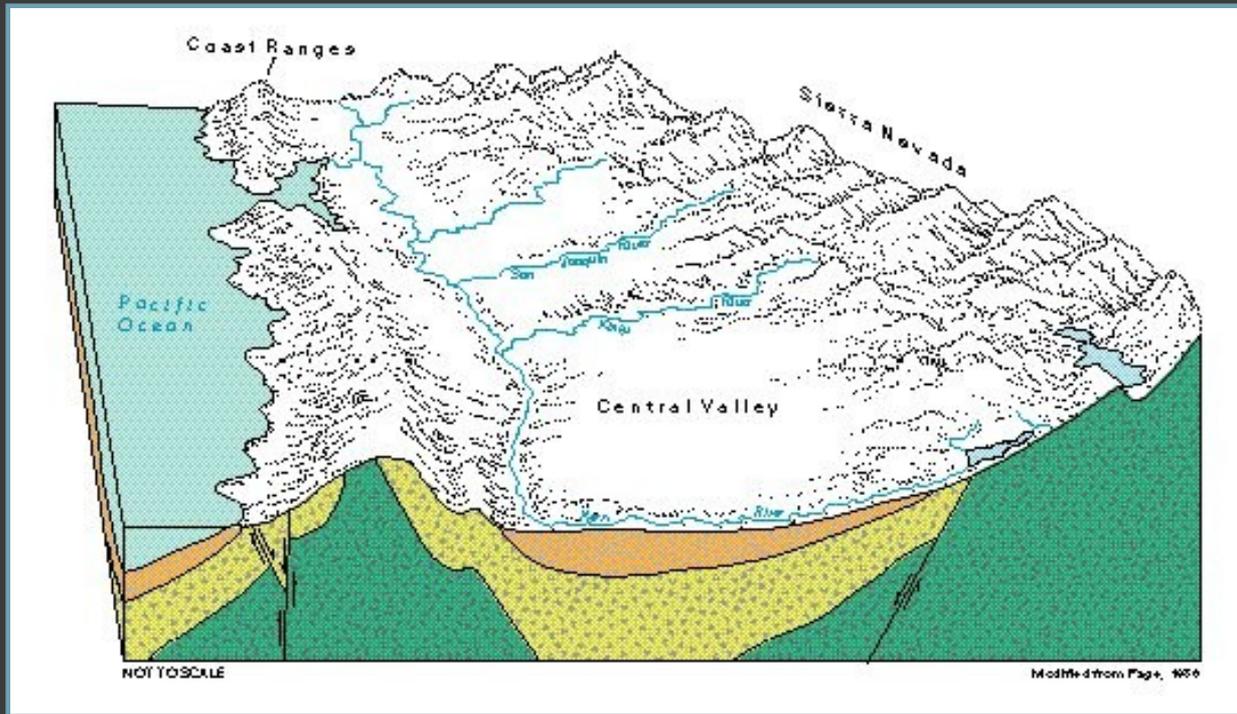
# California's Groundwater Basins

- ▣ 515 alluvial basins/subbasins
- ▣ ~ 30 to 45 % of state's water supply
- ▣ Basins, precipitation, population, and demands are not evenly distributed



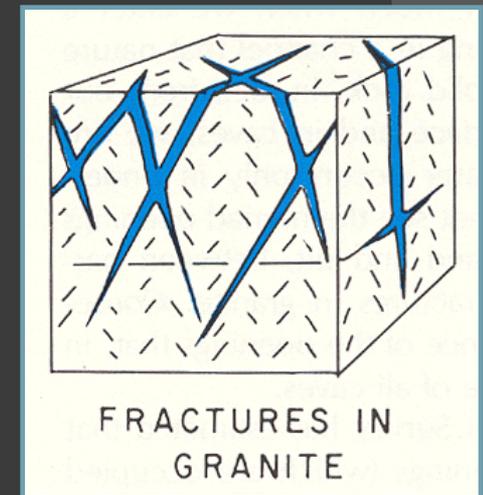
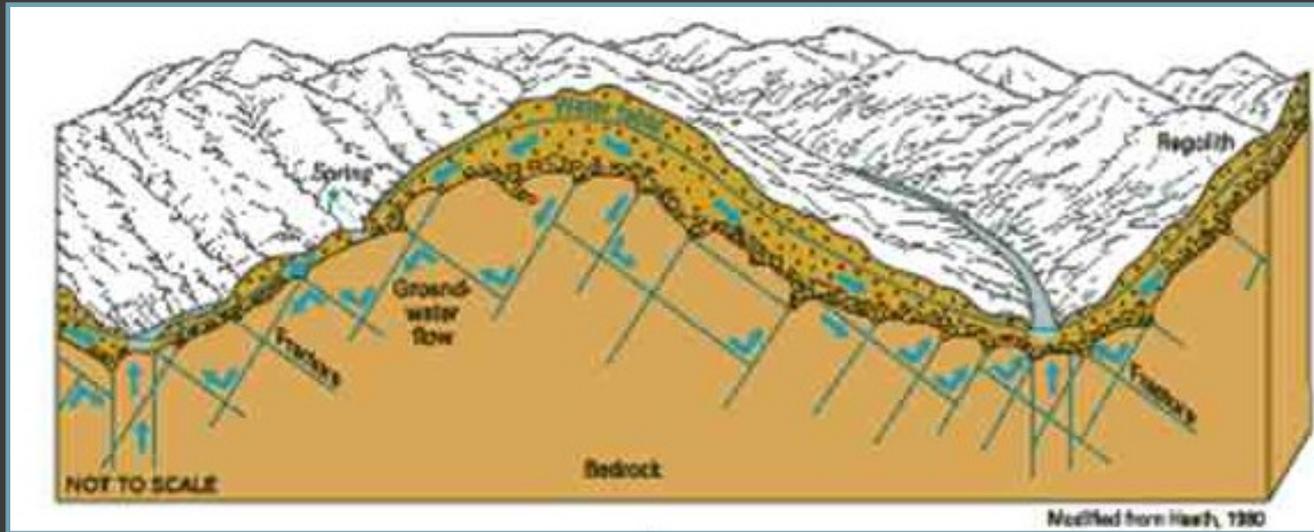
Source: DWR's Bulletin 118, update 2003

# Alluvial Aquifers



- Unconsolidated material
- Underlies valley floors & coastal plains

# Fractured Rock Aquifers



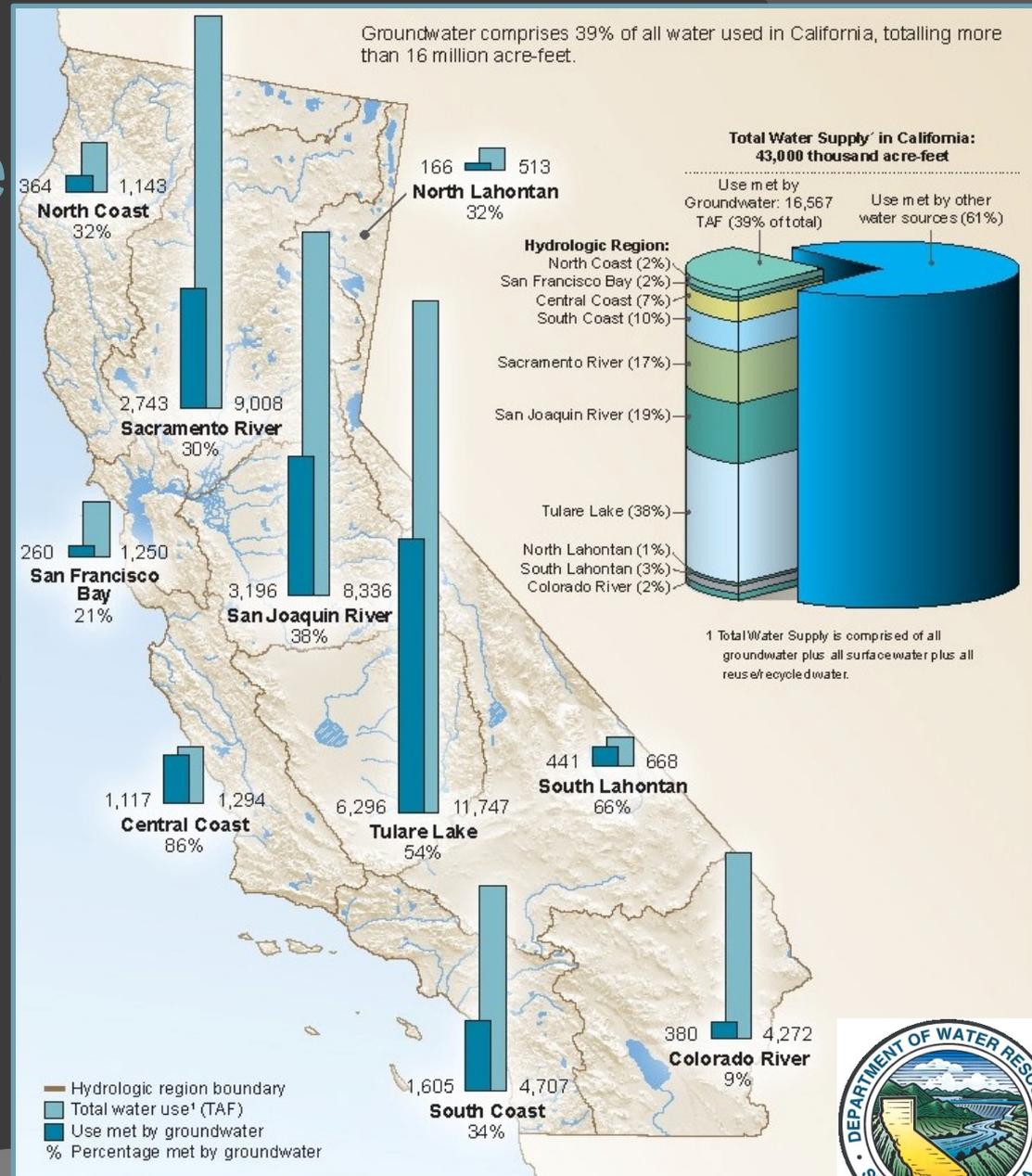
- Consolidated “hard” rock
- Underlies mountainous & highland areas

# Statewide Groundwater Use

Regions with highest use:  
(relative to statewide total)

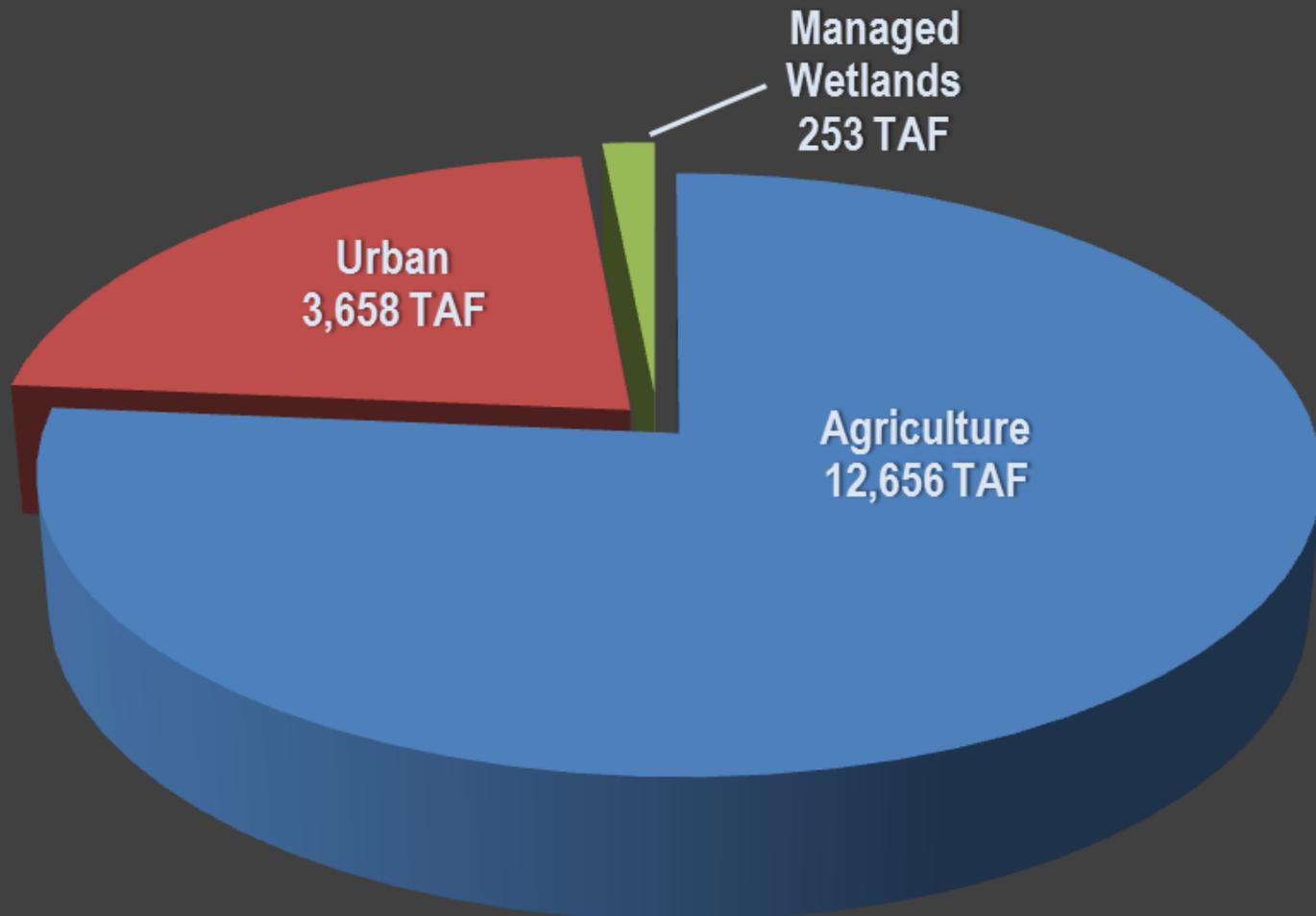
- Tulare Lake 38%
- San Joaquin River 19%
- Sacramento River 17%
- South Coast 10%

(2005 to 2010 Average Annual Data)



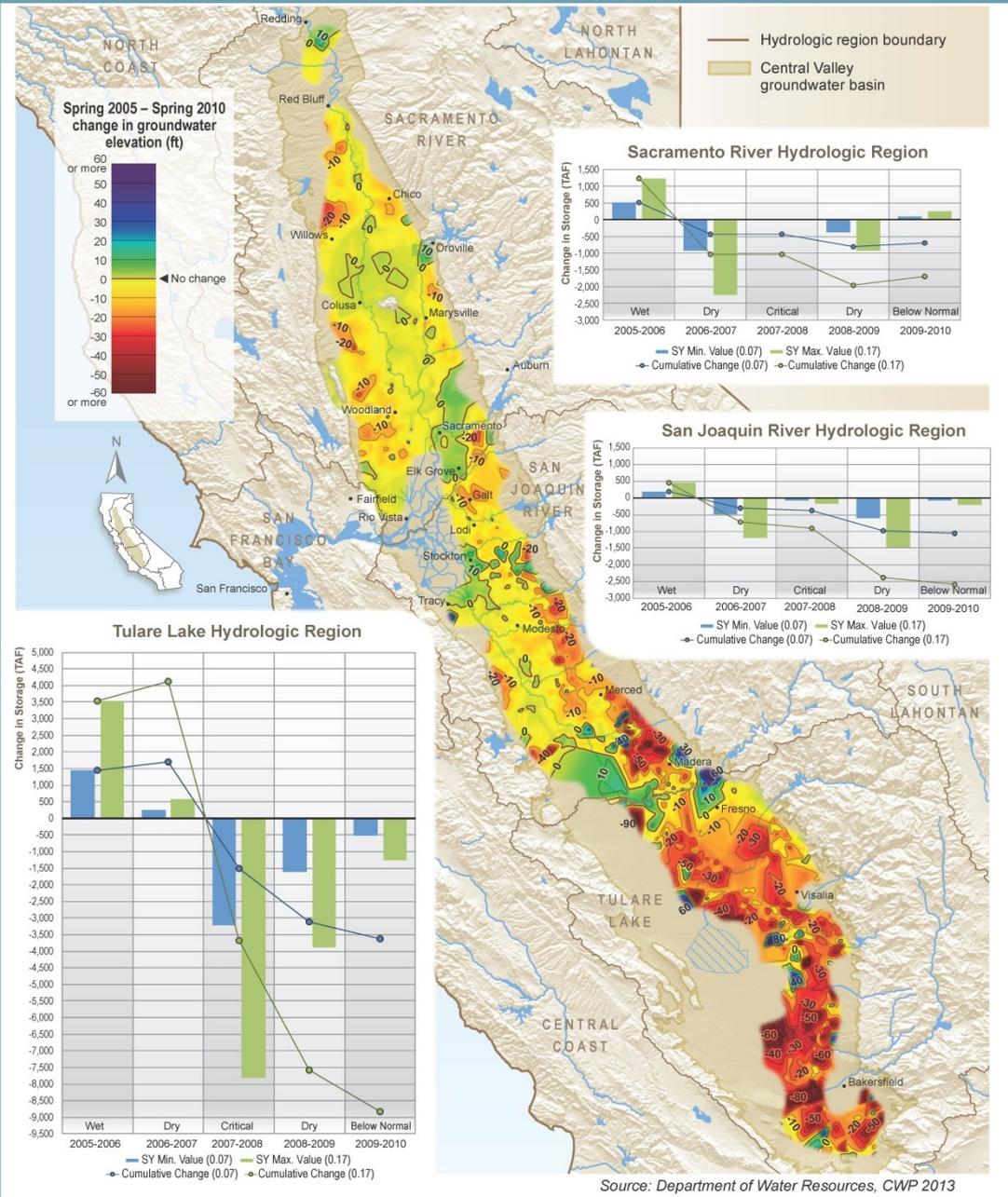
# Statewide Groundwater Use

*2005-2010 Average Annual: 16,567 (TAF)*



Source: California Water Plan Update 2013





Spring 2005-Spring 2010  
Change in Groundwater  
Storage

Sacramento River HR

+

San Joaquin River HR

+

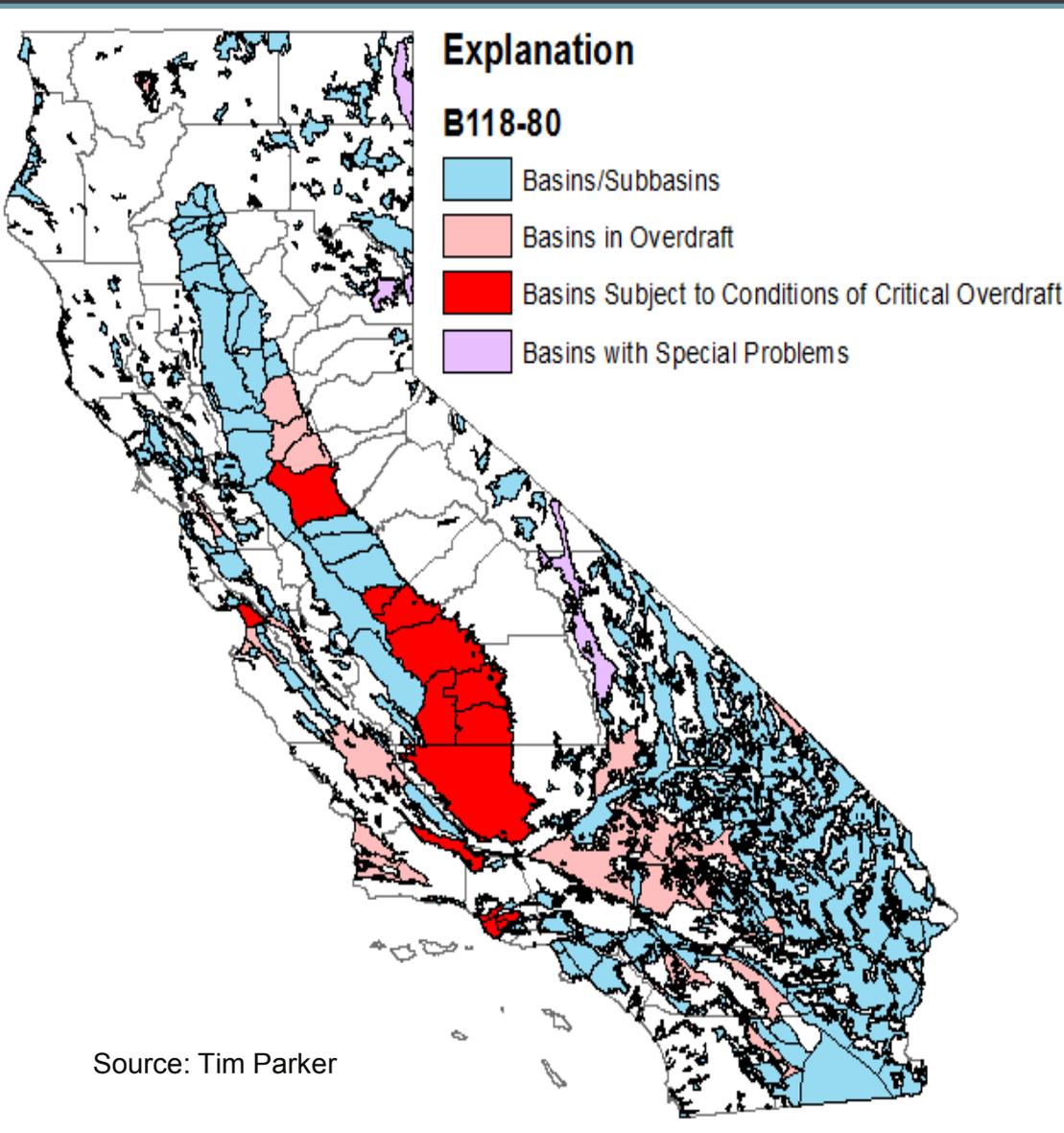
Tulare Lake HR

= approx. -5 to -13

Million Acre feet (MAF)



# Overdraft in 1980



- 31 basins with evidence of overdraft
- 11 basins subject to critical overdraft
- 4 basins with special problems

30 years later - many of these basins show signs of continued overdraft and impacts have not yet been adequately addressed

Source: Tim Parker



# 2014 Drought



January 18, 2013



January 18, 2014



# 2014 Drought

- ◎ Oct. 2011-Mar. 2014
  - Driest 30-month period on record since 1895 (National Climatic Data Center)
- ◎ Water Year 2014
  - Third driest on record (average precipitation)
  - Critical (Sacramento and San Joaquin Valley WY Index)



May 1, 2014 Snow Survey  
18% of Average



# 2014 Drought



Office of Governor  
**Edmund G. Brown Jr.**



FOR IMMEDIATE RELEASE:

Friday, January 17, 2014

Contact: Governor's Press Office

(916) 445-4571

## **Governor Brown Declares Drought State of Emergency**

**Calls for Conservation Statewide, Directs State to Manage Water for Drought**

11. The Department of Water Resources will evaluate changing groundwater levels, land subsidence, and agricultural land following as the drought persists and will provide a public update by April 30 that identifies groundwater basins with water shortages and details gaps in groundwater monitoring.



# Drought Response – Groundwater

- ◎ Basins with Potential Water Shortages
  - Well Deepening Activity
  - Groundwater Reliance
  - Groundwater Levels
  - Key Hydrographs
  
- ◎ Gaps in Groundwater Monitoring
  - CASGEM Basin Prioritization
  - Groundwater Level Monitoring Networks
  - Groundwater Management Plans



State of California  
The Resources Agency  
Department of Water Resources

**Public Update for Drought Response  
Groundwater Basins with Potential Water Shortages and  
Gaps in Groundwater Monitoring**



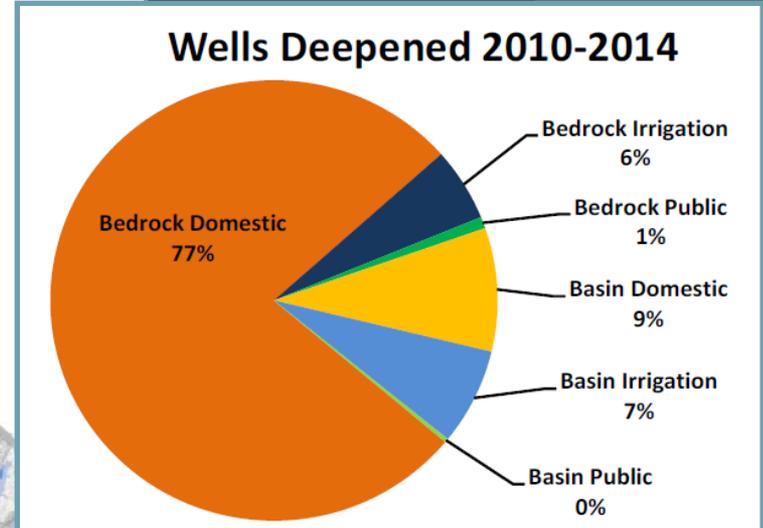
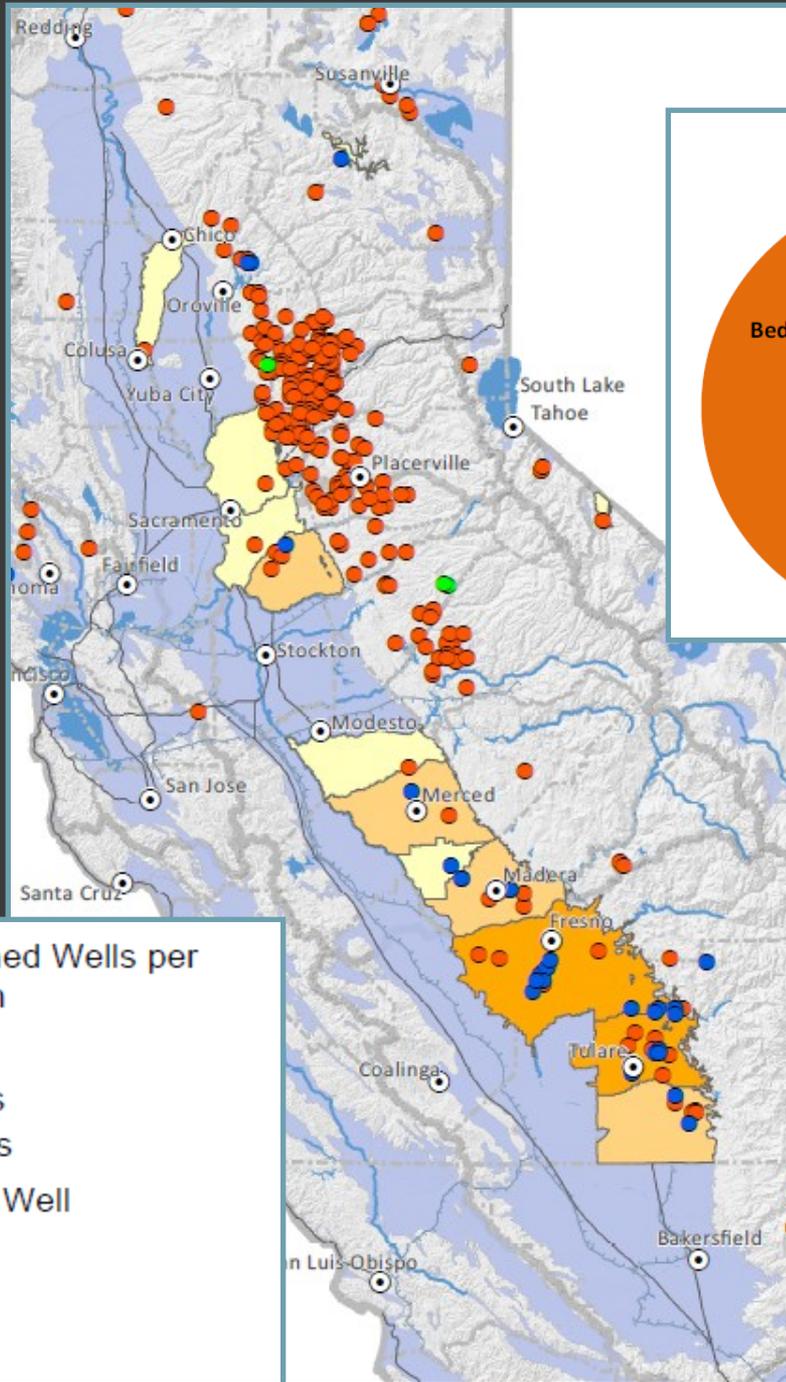
[www.water.ca.gov/waterconditions](http://www.water.ca.gov/waterconditions)

**April 30, 2014**

Edmund Brown Jr.  
Governor  
State of California

John Laird  
Secretary for Resources  
The Resources Agency

Mark W. Cowin  
Director  
Department of Water  
Resources



**Number of Deepened Wells per Groundwater Basin**

- 1 Well
- 2- 10 Wells
- 11-15 Wells

**Type of Deepened Well**

- Domestic
- Irrigation
- Public

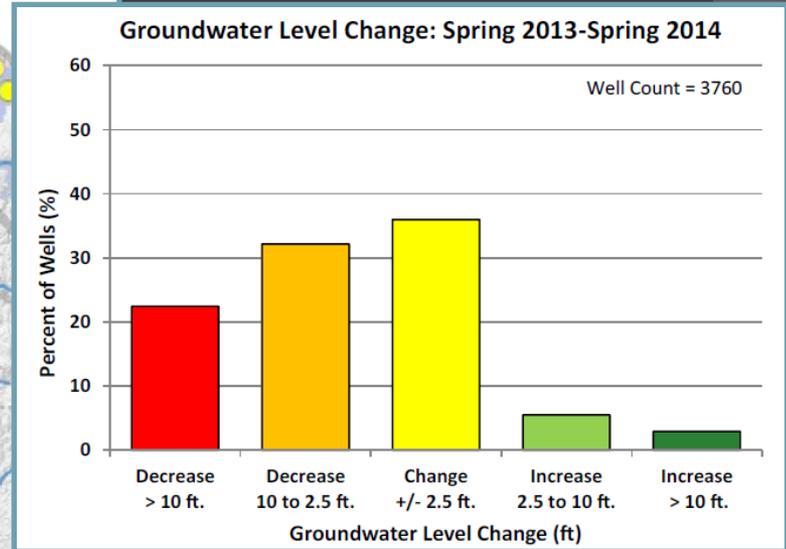
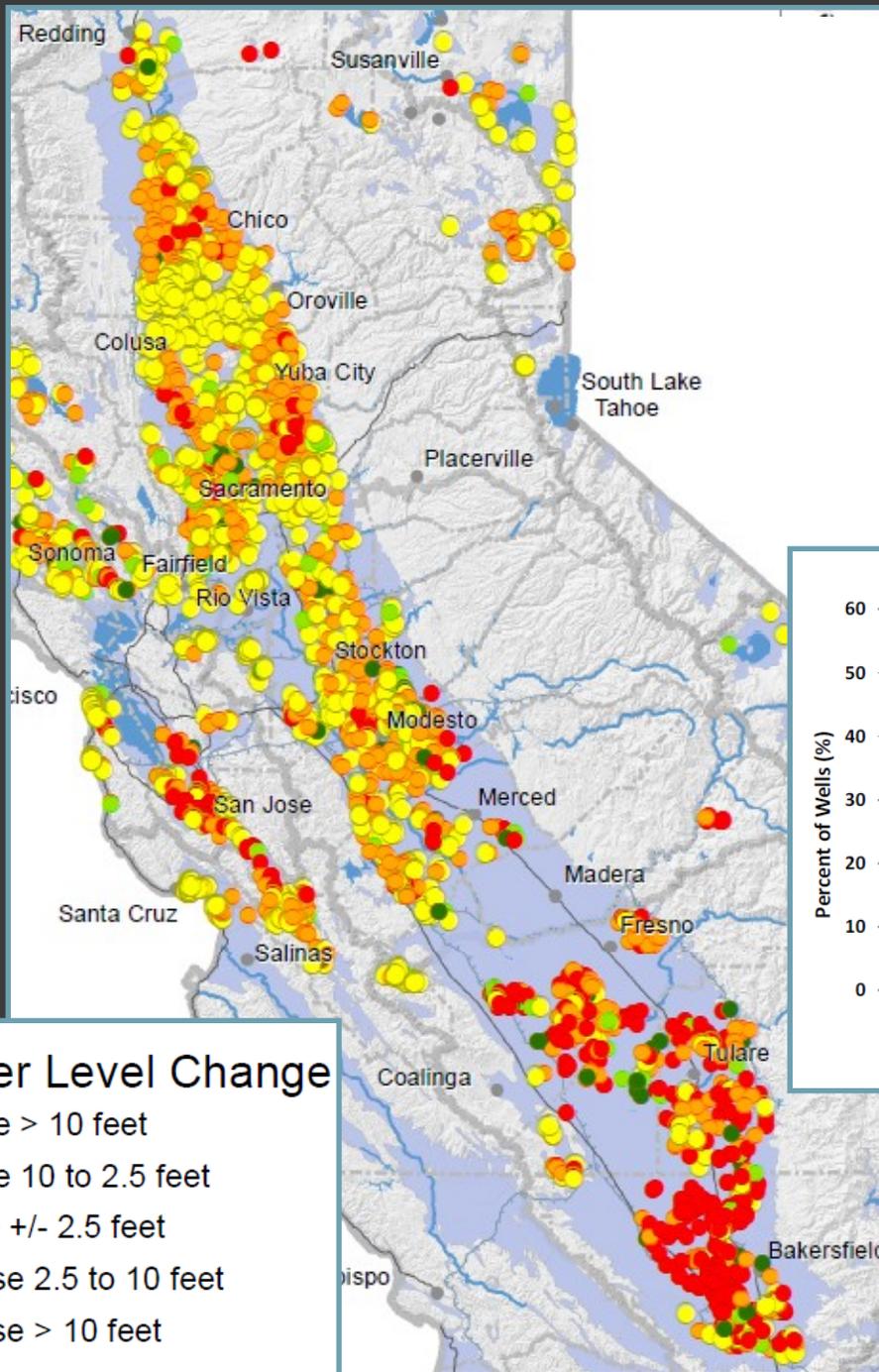
# Well Deepening Activity

## 2010 – 2014



# Groundwater Level Change

Spring 2013 to Spring 2014



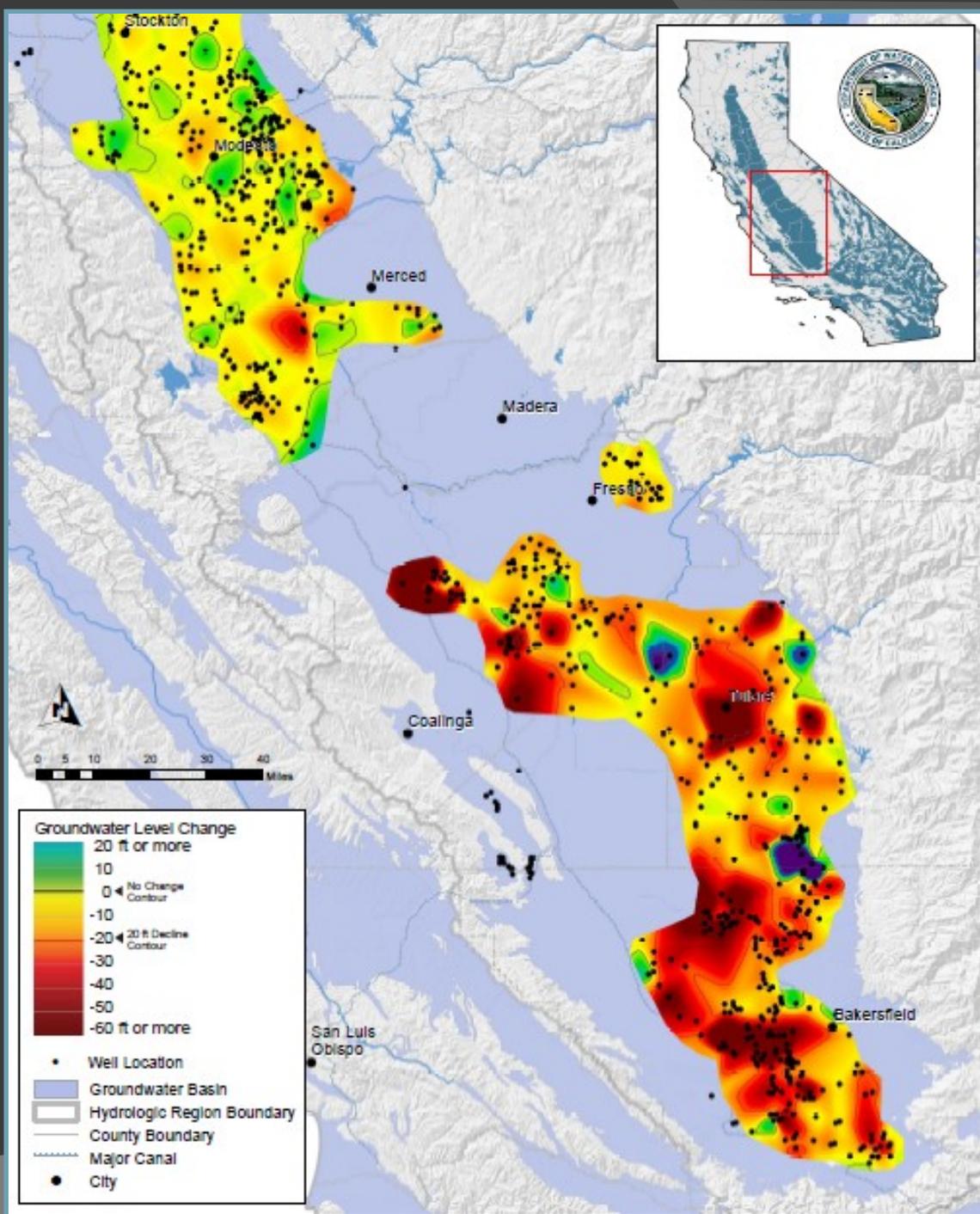
## Groundwater Level Change

- Increase > 10 feet
- Increase 10 to 2.5 feet
- Change +/- 2.5 feet
- Decrease 2.5 to 10 feet
- Decrease > 10 feet



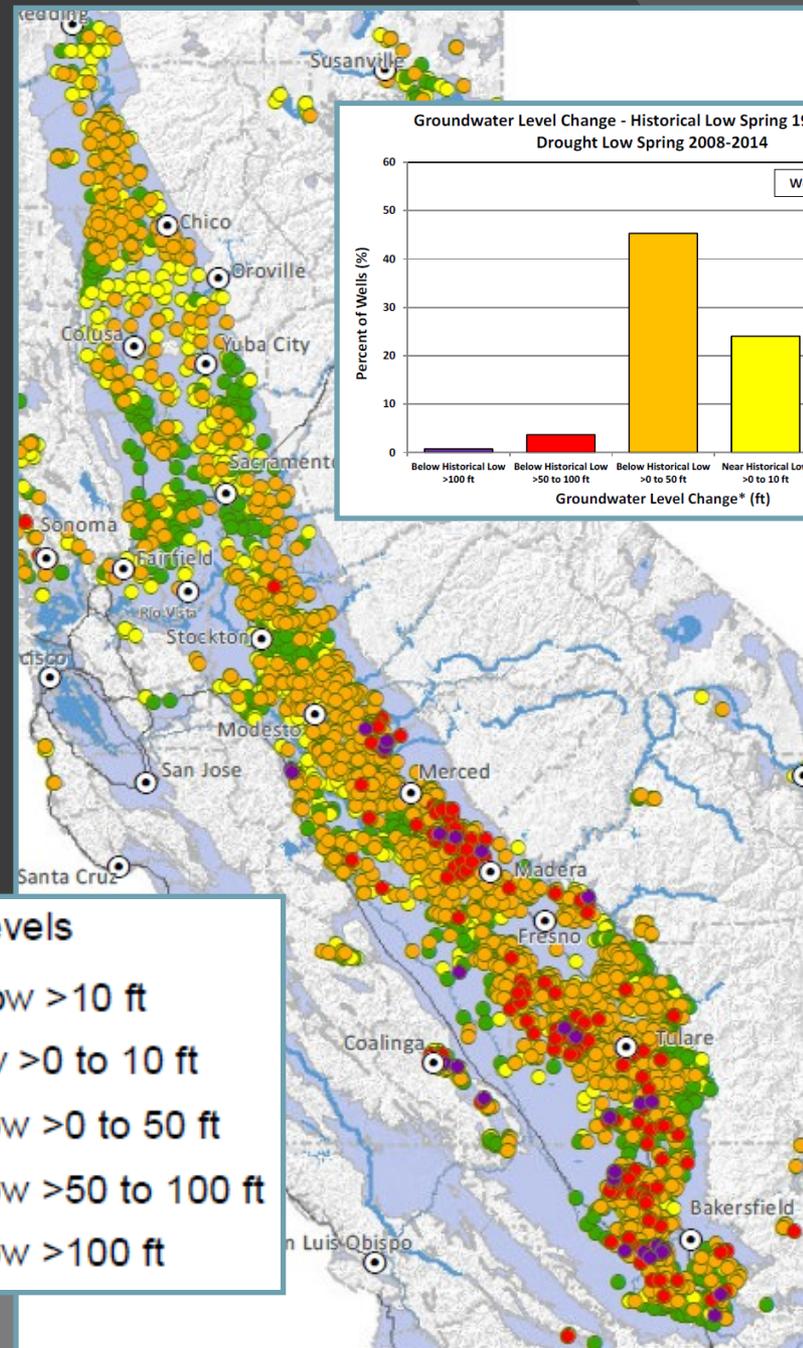
# Groundwater Level Change

Southern Central Valley  
Spring 2013 to Spring 2014



# Groundwater Level Change

Historical Low Spring 1900-1998  
to Drought Low Spring 2008-2014



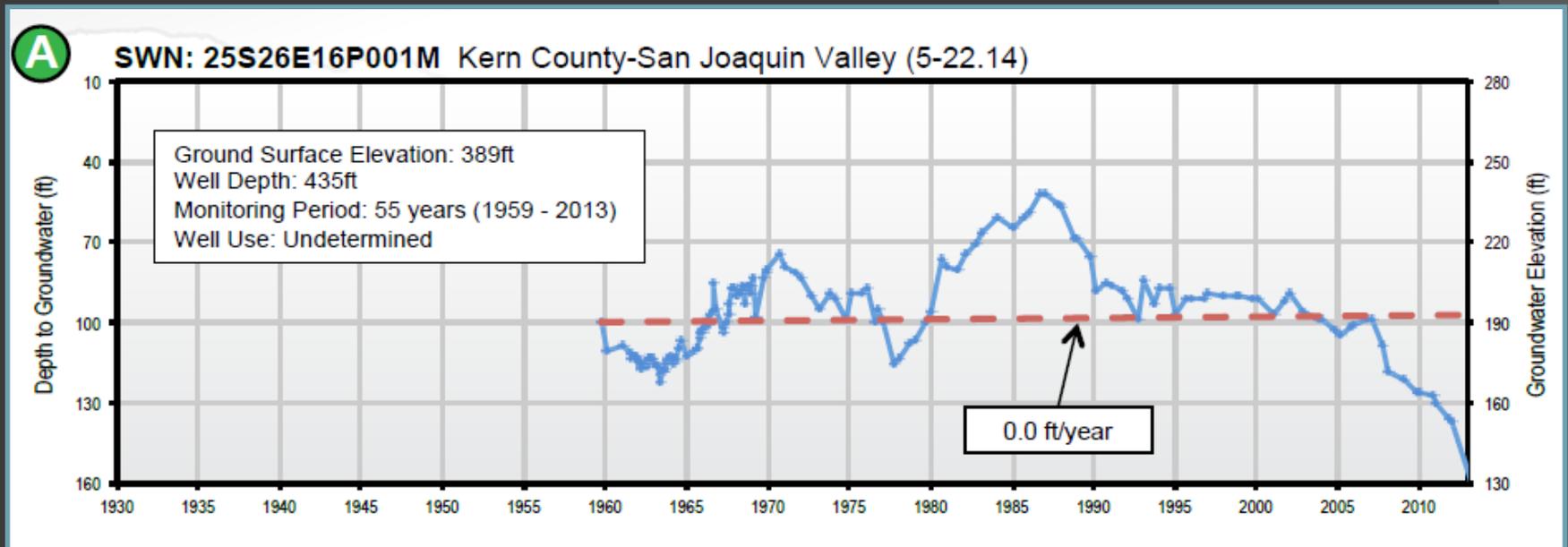
## Change in Groundwater Levels

- Above Historical Low >10 ft
- Near Historical Low >0 to 10 ft
- Below Historical Low >0 to 50 ft
- Below Historical Low >50 to 100 ft
- Below Historical Low >100 ft



# Hydrographs

## Tulare Lake Hydrologic Region



# 2014 Drought – Public Update

- ⦿ Groundwater levels have decreased since 2010.
  - All-time historical lows in San Joaquin Valley, and the SF Bay, South Lahontan, and South Coast HRs.
- ⦿ Well Deepening Activity
  - Nevada, Placer, and El Dorado counties
  - Kaweah and Kings subbasins.
- ⦿ 36 alluvial basins have a high degree of groundwater use and reliance.
- ⦿ CASGEM monitoring data gaps in Sacramento, San Joaquin River, Tulare Lake, Central Coast, and South Lahontan HRs.



# 2014 Drought – Round 2



Office of Governor  
**Edmund G. Brown Jr.**



FOR IMMEDIATE RELEASE:

Friday, April 25, 2014

Contact: Governor's Press Office

(916) 445-4571

## **Governor Brown Issues Executive Order to Redouble State Drought Actions**

LOS ANGELES – With California's driest months ahead, Governor Edmund G. Brown Jr. today issued an executive order to strengthen the state's ability to manage water and habitat effectively in drought conditions and called on all Californians to redouble their efforts to conserve water.

11. The Department of Water Resources will conduct intensive outreach and provide technical assistance to local agencies in order to increase groundwater monitoring in areas where the drought has significant impacts, and develop updated contour maps where new data becomes available in order to more accurately capture changing groundwater levels. The Department will provide a public update by November 30 that identifies groundwater basins with water shortages, details remaining gaps in groundwater monitoring, and updates its monitoring of land subsidence and agricultural land fallowing.



# 2014 Drought – Round 2

FIGURE 8: Change in Groundwater Elevation, Southern Central Valley – Spring 2013 to Spring 2014

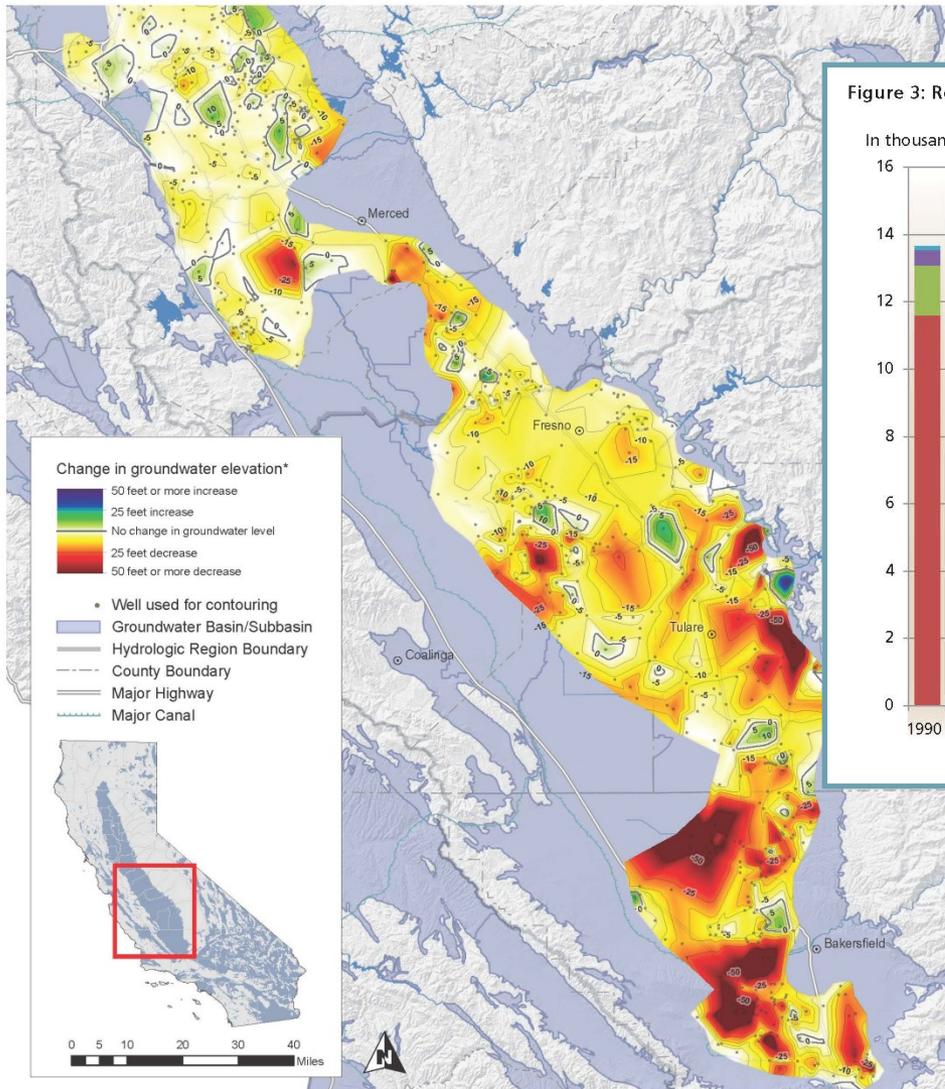
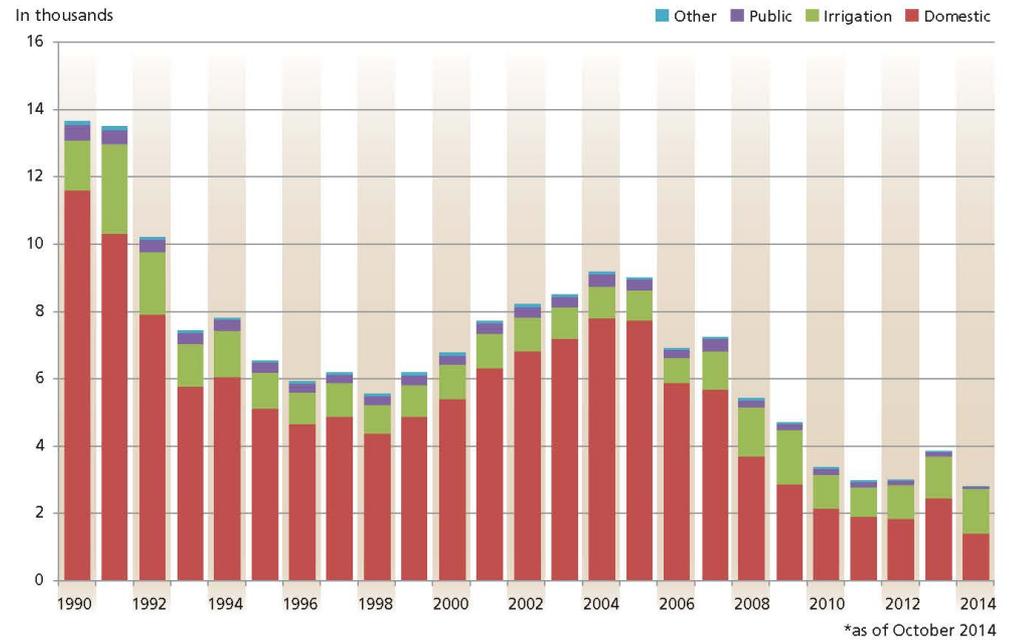
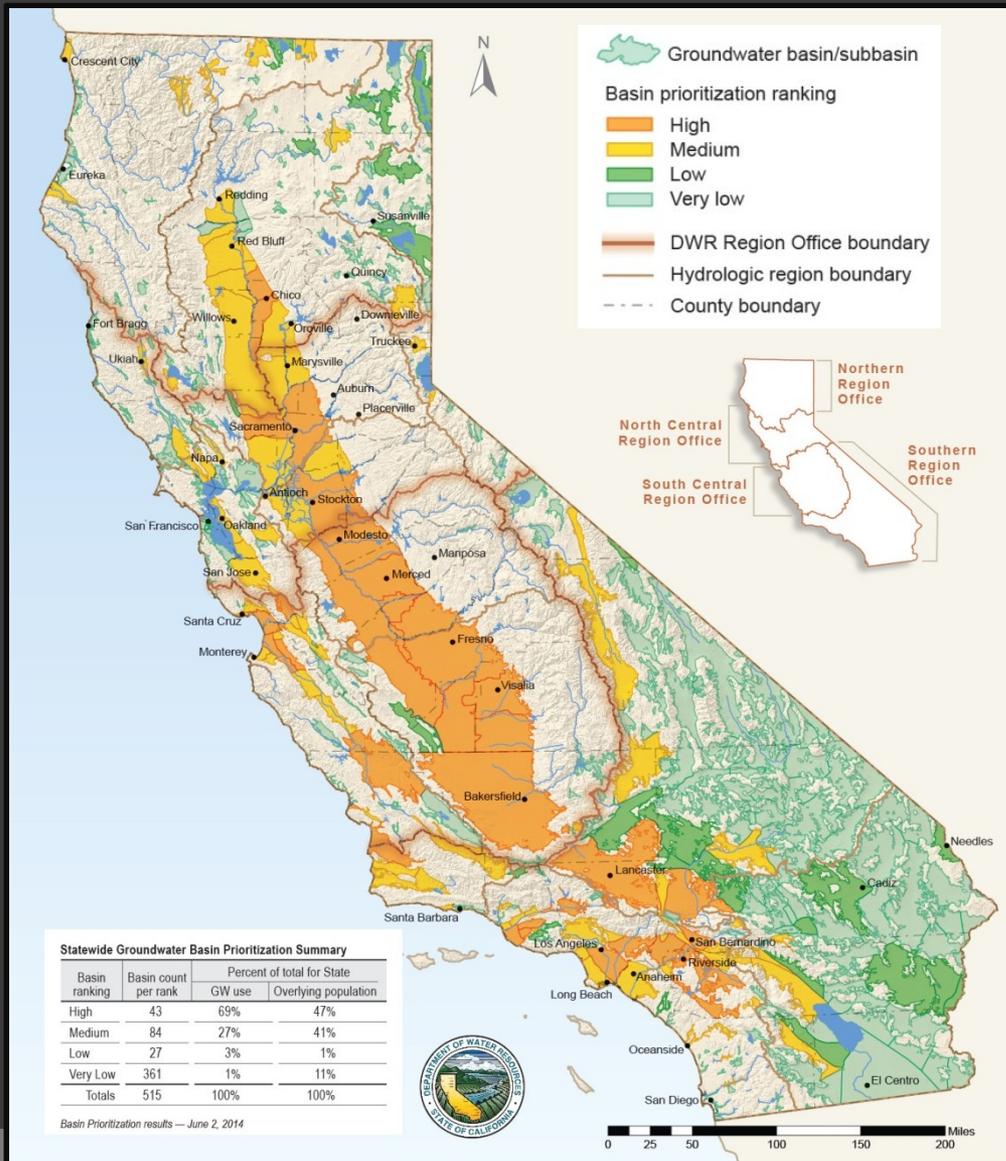


Figure 3: Reported New Water Supply Wells 1990 to 2014\*



\*Groundwater level change determined from water level measurements in wells. Map and chart based on available data from the DWR Water Data Library as of 11/08/2014. Data subject to change without notice.

# CASGEM Basin Prioritization



## Statewide Breakdown

Basin Ranking	Basin Count per Rank	Percent of Total for Hydrologic Region	
		GW Use	Overlying Population
High	43	69%	47%
Medium	84	27%	41%
Low	27	3%	1%
Very Low	361	1%	11%
Totals	515	100%	100%

127 High & Medium Priority basins

- 96% of groundwater use
- 88% of overlying population

<http://www.water.ca.gov/groundwater/casgem/>

# 2014 Historic Groundwater Legislation

AB 1739, SB 1168, and SB 1319

- Supports California Water Action Plan
- 2016
  - Regulations for:
    - Basin boundaries
    - GSPs and Alternatives
- 2017
  - BMPs
  - Locals – GSAs (H&M)
- 2020
  - Critical overdraft basins managed under GSPs
- 2022
  - All H&M basins under GSP
- ~2040
  - Achieve sustainability



# On Deck for 2014 and 2015

- ◎ Continue Drought Response
  - Outreach and technical assistance
  - Update groundwater report – November 25<sup>th</sup>
- ◎ Implement California Water Action Plan
  - Collection and sharing additional groundwater data
  - Increase groundwater recharge and storage
  - Identify tools and resources for local water managers for improved groundwater management
- ◎ Coordinate with other State agencies to develop statewide program for sustainable groundwater management





*Thank you!*

*Mathis, PG, CEG, CHG  
Senior Engineering Geologist  
Division of Integrated Regional Water Management  
Central Region Office*

