



# Overview of Groundwater in California:

## California Water Plan Update 2013, Groundwater Management, and CASGEM

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January 23, 2013

for the Inyo-Mono Integrated Regional Water Management Program





# Division of Integrated Regional Water Management



## Northern Region

- Red Bluff
- Kelly Staton

## North Central Region

- West Sacramento
- Chris Bonds

## South Central Region

- Fresno
- Dane Mathis

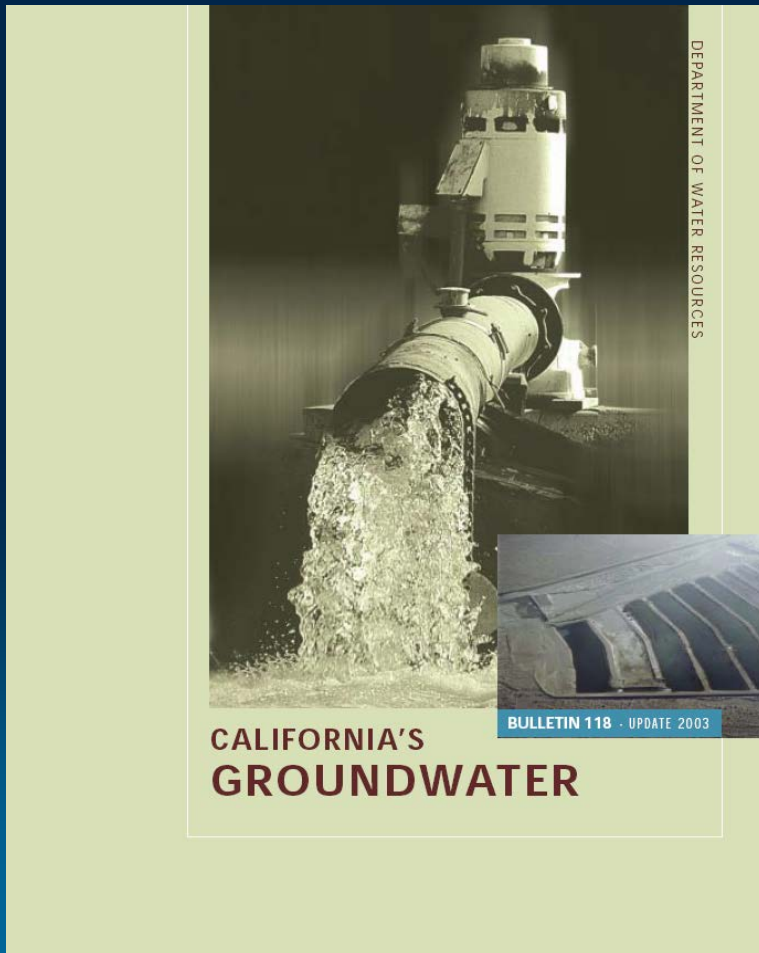
## Southern Region

- Glendale
- Tim Ross

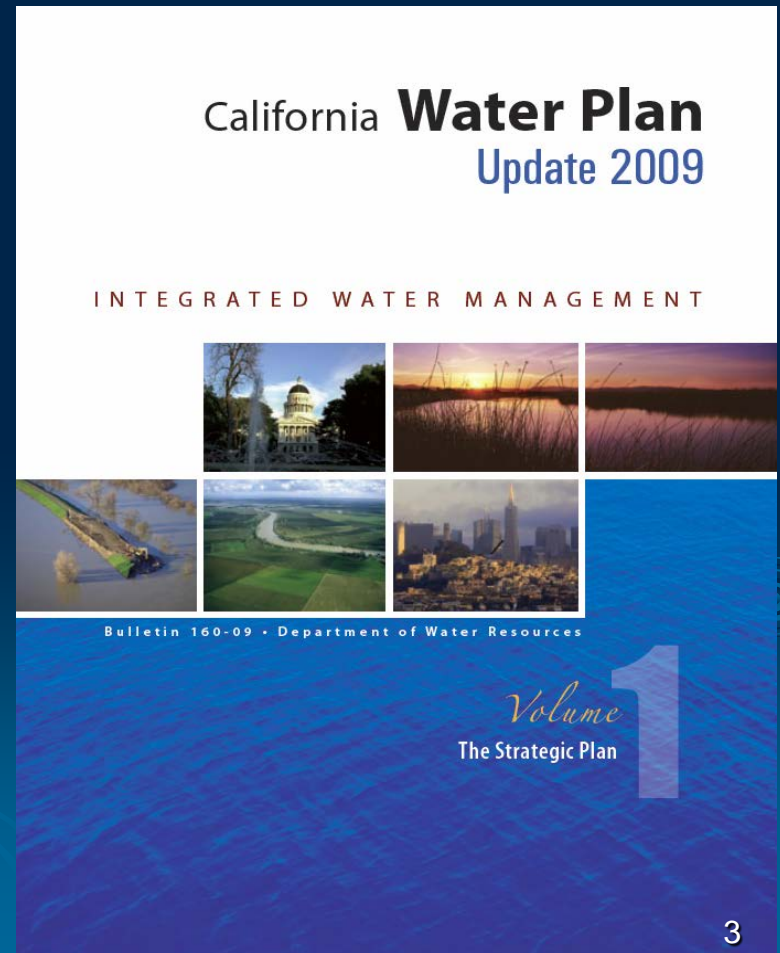


# California's Water Plan

[www.water.ca.gov/groundwater](http://www.water.ca.gov/groundwater)  
Bulletin 118 (2003)



[www.waterplan.water.ca.gov](http://www.waterplan.water.ca.gov)  
Bulletin 160 (2009)





# DWR's Groundwater Information Center

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

www.water.ca.gov/groundwater/index.cfm#

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CA.GOV DEPARTMENT OF WATER RESOURCES

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California Cooperative Snow Surveys Water Supply Contracts Water Use Efficiency All Supply/Use Topics...

## Groundwater Information Center

**GROUNDWATER INFORMATION CENTER**

- Groundwater Information Center Home
- Groundwater Management
- Groundwater Elevation Monitoring (CASGEM)
- Bulletin 118 Home
- Contacts for General Groundwater Information
- Well Standards
  - GHEW Standards Project - **NEW!**
- Well Completion Reports
  - Contacts
- Site Map


**OTHER LINKS**

- DWR Publications
- WDL
- CDEC
- CIMIS
- IWRIS
- Drought
- Funding

### INFORMATION ABOUT GROUNDWATER IN CALIFORNIA

Groundwater Basics Management Bulletin 118 Data Wells & More

#### Groundwater Basics



Meeting California's water needs presents new challenges and highlights the importance of educating the public about groundwater resources. Actions to increase the overall water supply will require more understanding and protection of groundwater, especially from contamination and overuse. Monitoring and evaluation must be continued so that future groundwater issues are not overlooked or misunderstood. Proper stewardship of California's groundwater is important to avoid quality degradation and land subsidence. Groundwater issues vary statewide, making it most suitable to local management.

This 'Groundwater Basics' section is intended for the general public, non-technical readers, teachers and students for an easy understanding of the basics of groundwater. For additional general groundwater information, see Chapter 6 of DWR's [Bulletin 118 California's Groundwater Update 2003](#).

*The following topics are discussed in this Groundwater Basics section.*

- [Hydrologic Cycle](#) - illustrates and describes how groundwater relates to the continuous process by which water is circulated throughout the Earth and its atmosphere.
- [Relationship between Groundwater and Surface Water](#) - illustrates and describes the general relationship between the interaction of groundwater and surface water.
- [Commonly Used Groundwater Terms](#) - refers to a list of commonly used groundwater terms and provides links to additional terms related to groundwater.
- [Water Fact Sheets and Related Links](#) - provides links to various DWR and other agencies published fact sheets, bulletins, booklets, reports and studies with respect to groundwater in a general or regional context.
- [Contacts for general Groundwater Information in California](#) - provides DWR contacts for groundwater information in California.

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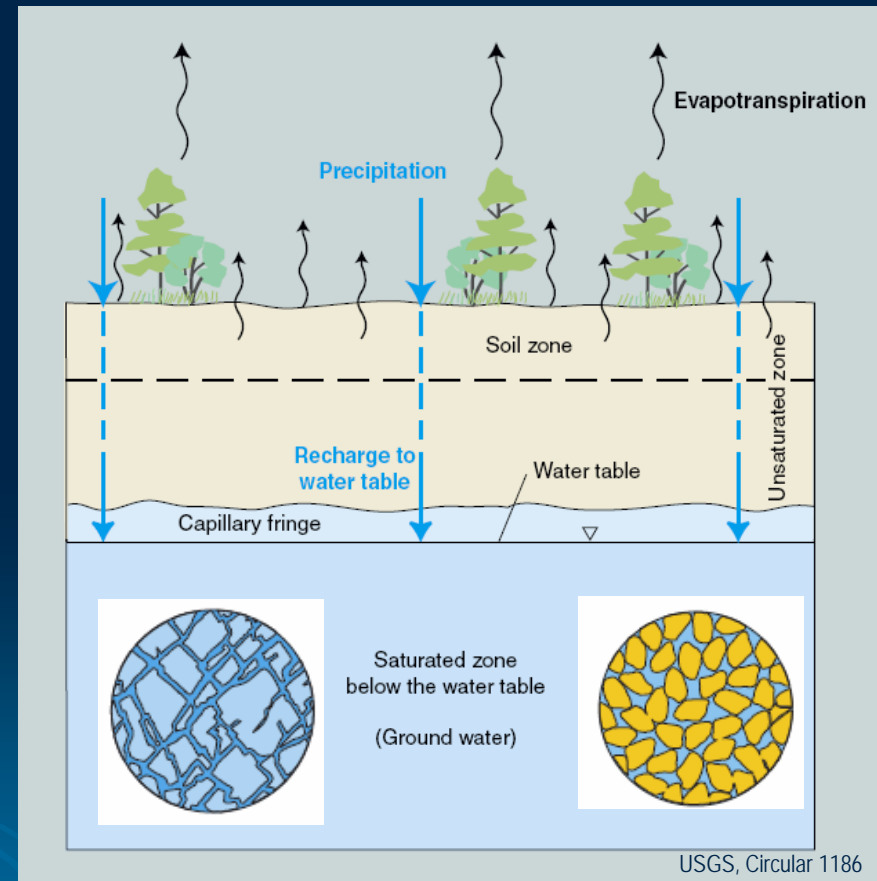
# General Groundwater Concept

GROUNDWATER is the water that completely fills the void space in rocks or sediment

CLIMATE (precipitation) controls the availability of water in an area

GEOLOGY (rock type and structure) controls the capacity to store groundwater

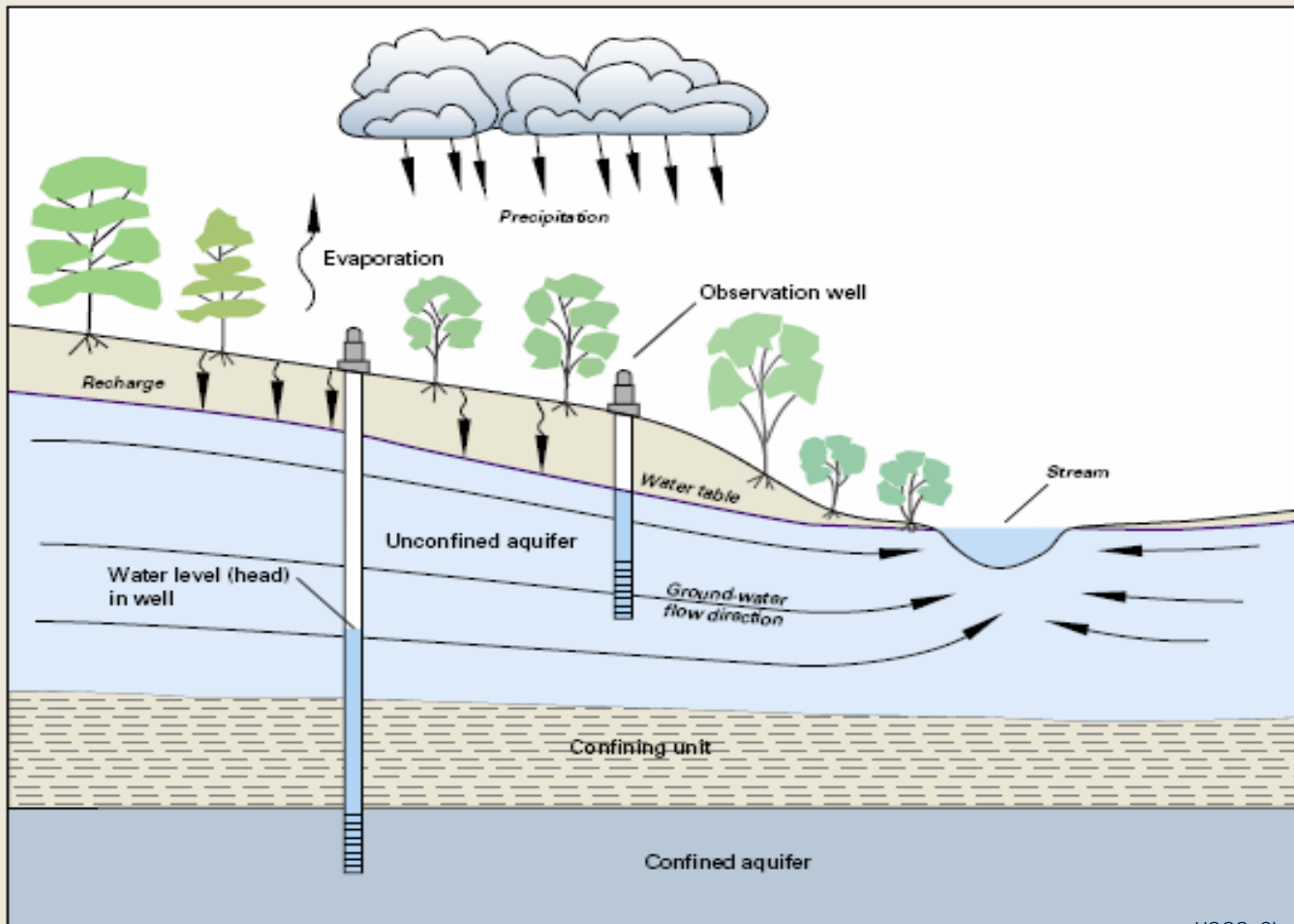
- POROSITY is the ability of a material to contain water
- PERMEABILITY is the ability of water to move through a material



USGS, Circular 1186



# Unconfined vs. Confined Aquifers





# This is groundwater from an UNCONFINED aquifer





# This is groundwater from a CONFINED aquifer



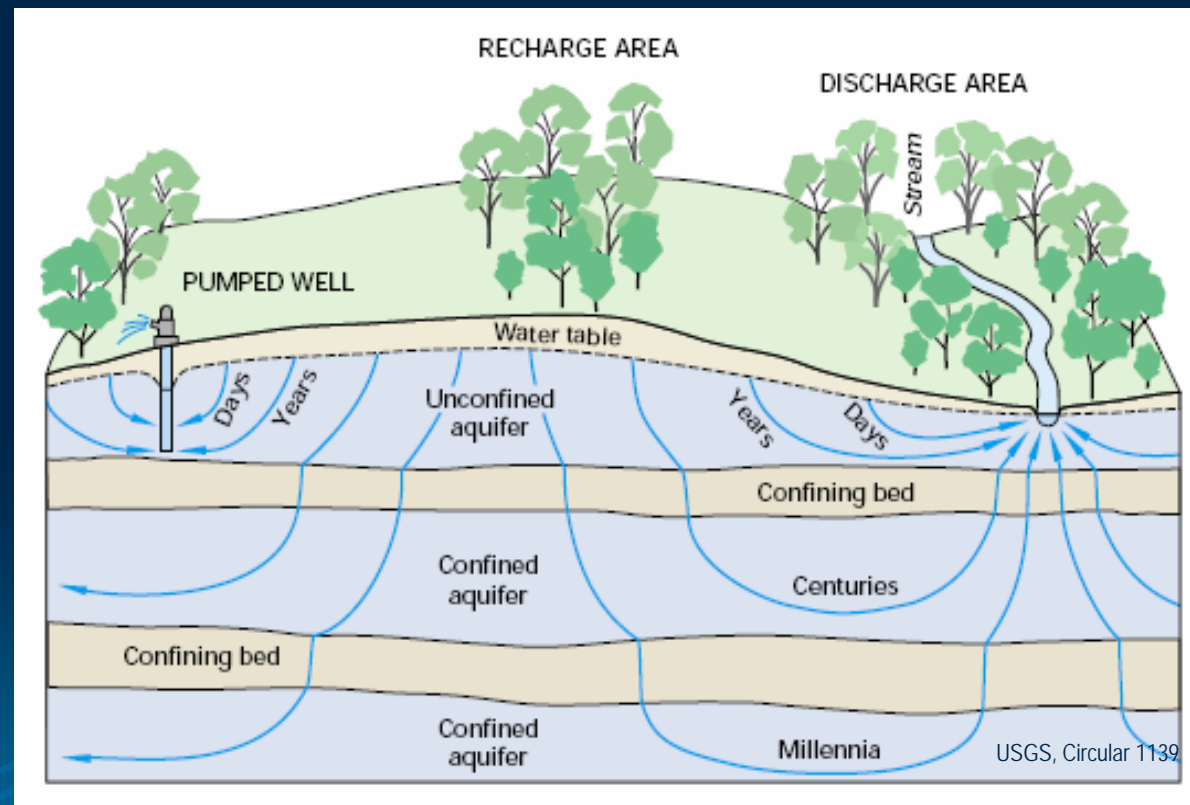




# Groundwater Flow Paths

Groundwater flow paths vary greatly in LENGTH, DEPTH and travel TIME

Groundwater pumped from wells can be DAYS old or THOUSANDS of years old





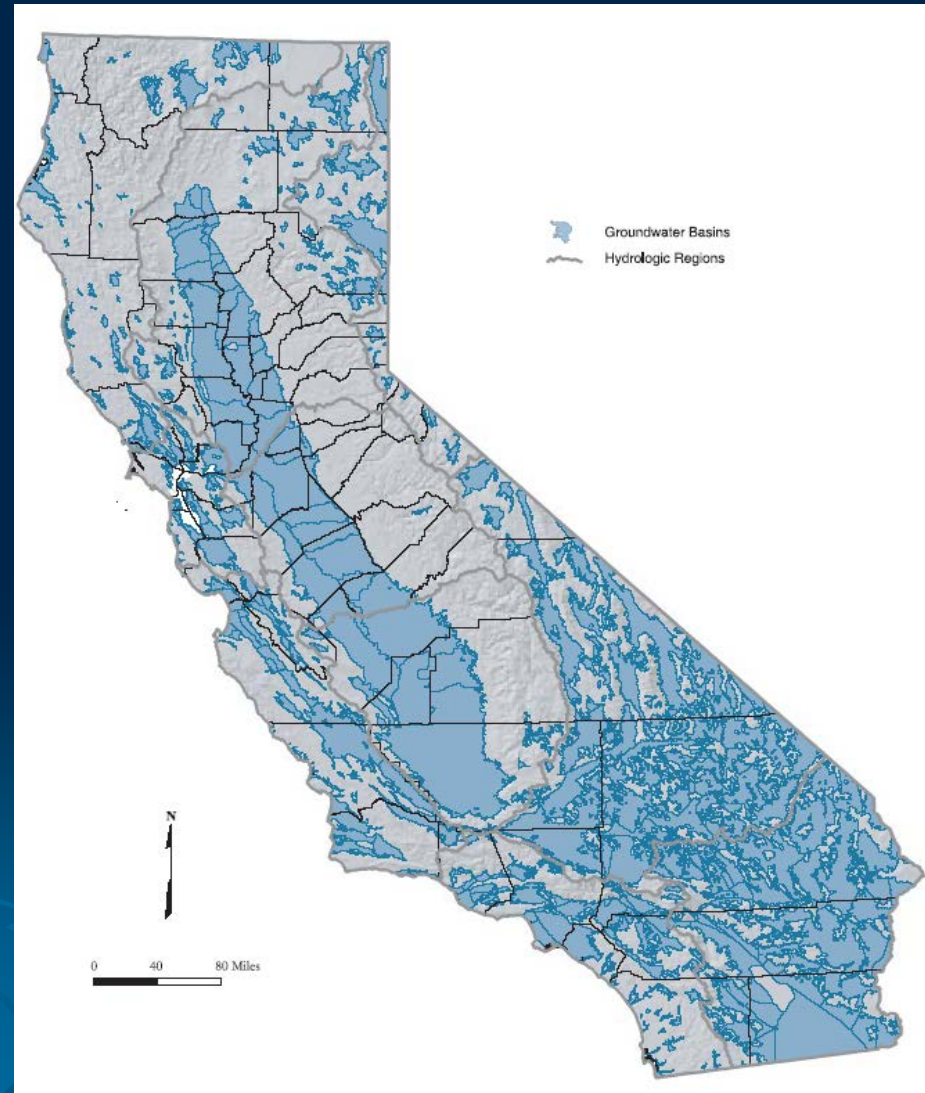
# California's Groundwater

Groundwater basins are identified in *Bulletin 118 – Update 2003*

- 515 alluvial basins and subbasins delineated

In California, groundwater provides:

- About 30% of water supply in normal years
- More than 40% in dry years



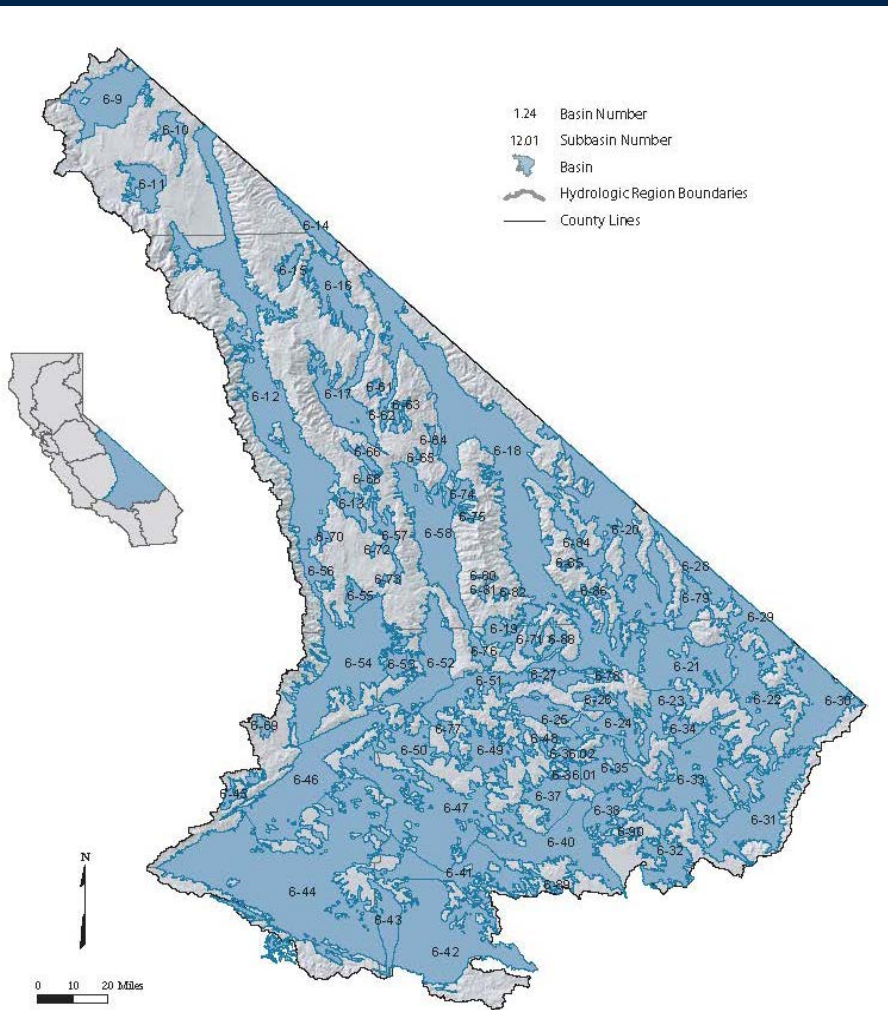


# South Lahontan Hydrologic Region

All of Inyo, most of Mono and San Bernardino, and part of Kern and LA Counties

76 groundwater basins or subbasins

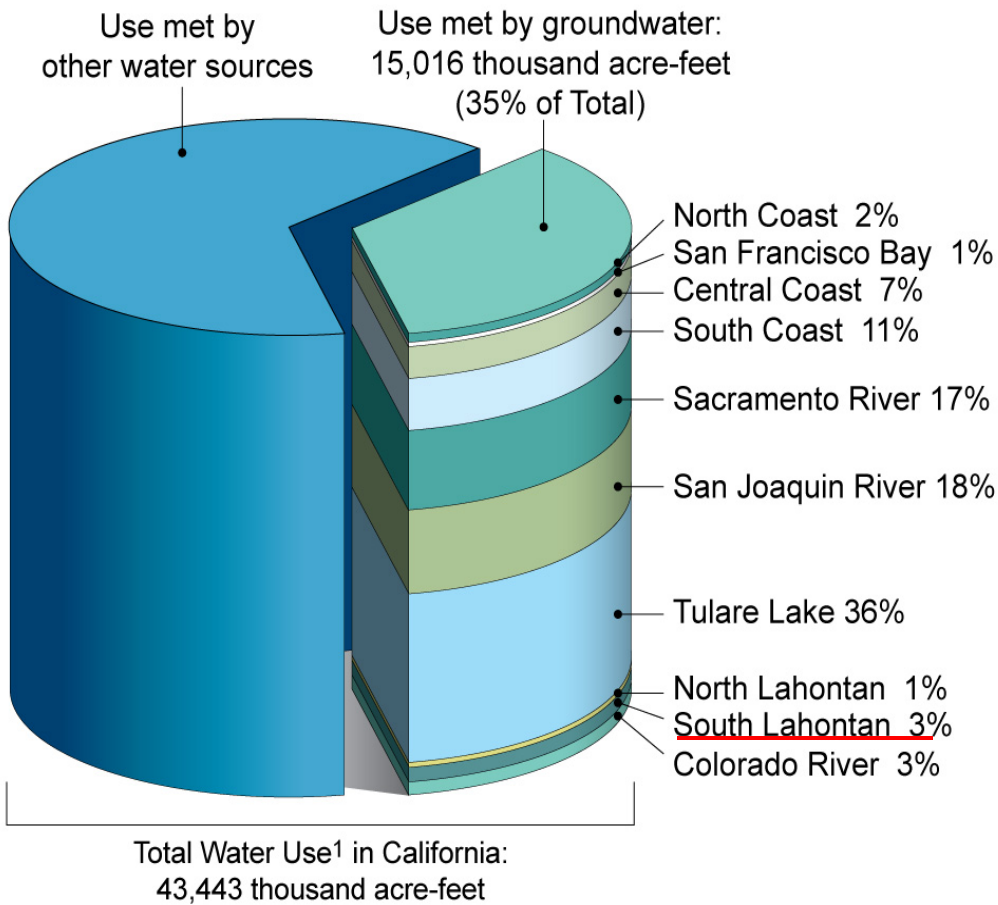
GW basins cover 14,800 sq. miles or 55% of the hydrologic region



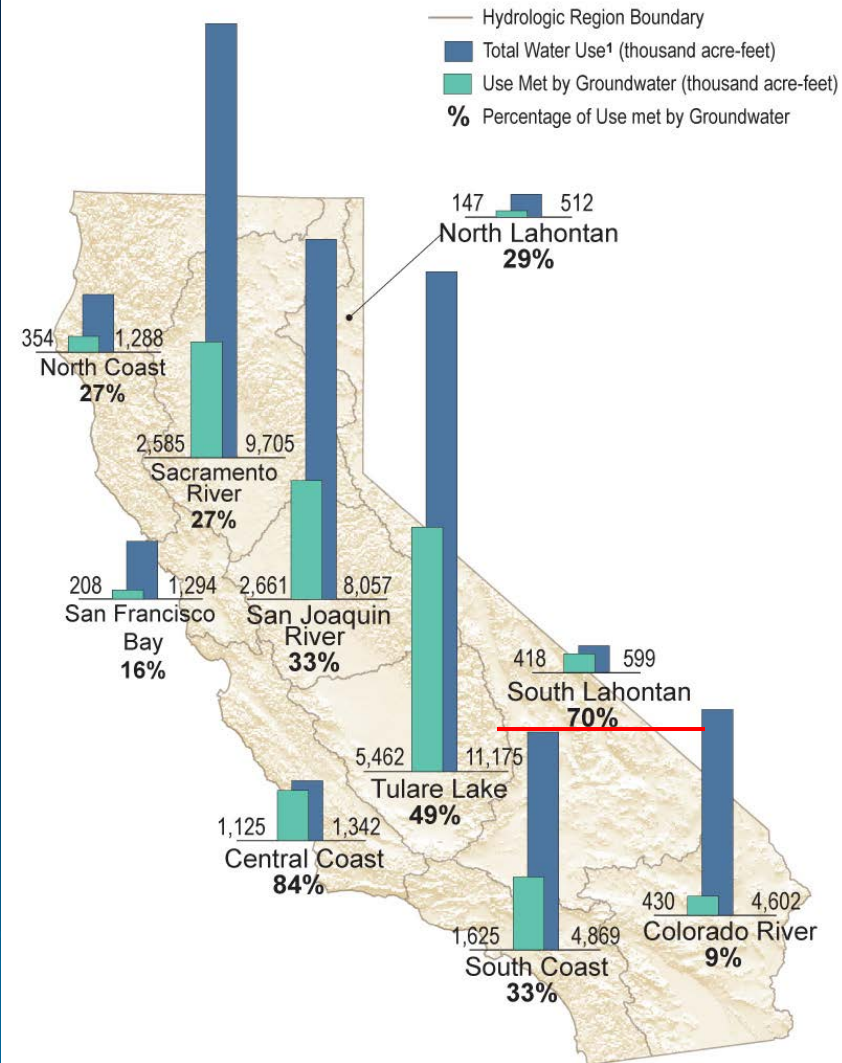
South Lahontan Hydrologic Region



# Water Use Met by Groundwater in California: Statewide and by Hydrologic Region



1. Total Water Use is defined as the sum of water uses for agricultural, urban, and managed wetlands.



1. Total Water Use is defined as the sum of water uses for agricultural, urban, and managed wetlands.

# California Water Plan Update 2013



# The California Water Plan – Est. 1957

- First published in 1957
- Updated 9 times; last one in 2009
- DWR required by law (Water Code) to update the Water Plan every 5 years; next one in 2013
- Growing interest by Legislature and stakeholders
- Not a mandate and No appropriation



## California Water Plan Update 2013

*California Water Plan Update 2013* (Update 2013) is currently being developed by staff from the Department of Water Resources (DWR) and other agencies through rigorous public involvement and State and federal agency coordination processes. It will build on the contents of the previous update — the five-volume *California Water Plan Update 2009*, which provided a strategic plan, a suite of resource management strategies, reports on California's hydrologic regions, and reference and technical guides — and will introduce a number of key additions and enhancements in response to stakeholder recommendations and evolving decision-maker information needs.

*Integrated water management is a collection of policies, practices, and tools applied to water resources planning and management to achieve multiple objectives and enhanced outcomes.*

### Water Plan Framework for Integrated Water Management and Sustainability



**Investing in Innovation and Infrastructure**



# CWP 2009 Resource Management Strategies

## Reduce Water Demand

- Agricultural Water Use Efficiency
- Urban Water Use Efficiency

## Improve Operational Efficiency & Transfers

- Conveyance – Delta
- Conveyance – Regional/Local
- System Reoperation
- Water Transfers

## Increase Water Supply

- Conjunctive Management & Groundwater Storage
- Desalination – Brackish & Seawater
- Precipitation Enhancement
- Recycled Municipal Water
- Surface Storage – CALFED
- Surface Storage – Regional/Local

## Improve Flood Management

- Flood Risk Management

## Improve Water Quality

- Drinking Water Treatment and Distribution
- Groundwater/Aquifer Remediation
- Matching Quality to Use
- Pollution Prevention
- Salt & Salinity Management
- Urban Runoff Management
- Sediment Management \*new for 2013

## Practice Resource Stewardship

- Agricultural Lands Stewardship
- Economic Incentives
- Ecosystem Restoration
- Forest Management
- Land Use Planning & Management
- Recharge Areas Protection
- Water-Dependent Recreation
- Watershed Management
- Outreach & Education \*new for 2013
- Management of Cultural Water Resources & Practices \*new for 2013



# Ways to Provide Input – Multiple Forums

## Update 2013 Collaboration Venues







# Water Plan Update 2013

## Groundwater Content Enhancement

Objective



Expand information about statewide and regional groundwater conditions

to

better inform groundwater management actions

through

compilation and summarization of data and analysis

# California Water Plan Update 2013: Groundwater Content Enhancement Deliverables

Task 1: Compile Groundwater Information

- GWMP, CASGEM, IRWMP, UWMP, AGWMP, Water Transfer, Modeling Reports

Task 2: Summarize Groundwater Information

Task 3: Identify Groundwater Data Gaps

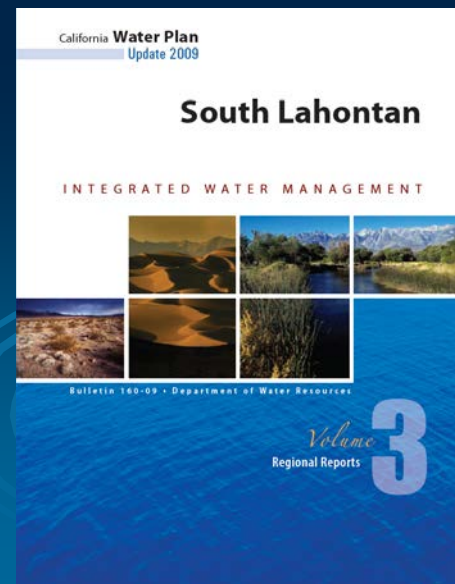
Task 4: Groundwater Change in Storage

Task 5: Groundwater Case Studies

Task 6: Conjunctive Management Opportunities

Task 7: Groundwater Banking and Flood Management

Task 8: Groundwater Sustainability Indicators



# Groundwater Management



# Groundwater Management Legislation

## California Water Code Sections 10750 et seq.

- 1992: AB 3030 – Groundwater Management Plans (GWMP)
- 2000: AB 303 – Local Groundwater Assistance Grants
- 2002: SB 1938 – Required specific elements in GWMPs to be eligible for grant funds
- 2009: SBx7 6 (CASGEM) – Statewide seasonal and long-term groundwater elevation monitoring
- 2011: AB 359 – Requires groundwater recharge mapping



# DWR's Role in Groundwater Management

- DWR works in cooperation with local agencies and stakeholders to increase water supply reliability through the planned, coordinated use of water resources
- DWR provides technical assistance and offers financial assistance for meeting facilitation
- DWR DOES NOT:
  - Regulate groundwater quality
  - Regulate groundwater use



## Mandatory or Voluntary?

“Nothing in this part [of the water code] requires a local agency overlying a groundwater basin to adopt or implement a groundwater management plan...”

10750.4



## Impact on Water Rights

“Nothing in this part [of the water code], or in any groundwater management plan adopted pursuant to this part, affects...[water rights]” 10753.1

# GWMPs: SB 1938 Required Components

(CWC § 10753.7.1 - 10753.7.6)

## **1. Basin Management Objectives**

Monitoring/Management Groundwater Levels

Monitoring Groundwater Quality

Inelastic Subsidence

SW/GW Interaction & Affects to Groundwater Levels & Quality

## **2. Agency Cooperation**

### **3. Map**

Groundwater basin area

Area of local agency

Boundaries of other local agencies

## **4. Recharge Areas (1/1/2013)**

## **5. Monitoring Protocols**

Changes in groundwater levels

Changes in groundwater quality

Subsidence

SW/GW Interaction & Affects to Groundwater Levels & Quality

## **6. Compliance with 1-5 for GWMPs Located Outside B118-03 Basins**







# GWMPs: Additional Components

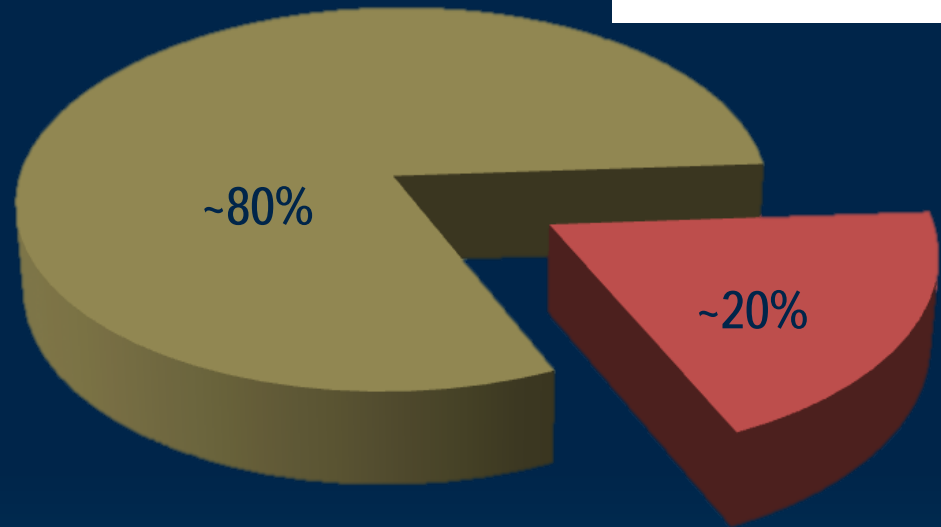
<b>Voluntary GWMP Components (CA WC §10753.8)</b>
<b>1. Control Saline Intrusion</b>
<b>2. Identify &amp; Manage Wellhead Protection &amp; Recharge Areas</b>
<b>3. Regulate Migration of Groundwater Contamination</b>
<b>4. Administer Well Abandonment &amp; Destruction Programs</b>
<b>5. Mitigate Conditions of Overdraft</b>
<b>6. Groundwater Extraction &amp; Replenishment</b>
<b>7. Monitoring of Groundwater Levels and Storage</b>
<b>8. Facilitate Conjunctive Use Operations</b>
<b>9. Identify Well Construction Policies</b>
<b>10. Construction and Operation by the Local Agency of Groundwater Projects</b>
<b>11. Develop Relationships with State &amp; Federal Regulatory Agencies</b>
<b>12. Coordinate with Land Use Planning to Minimize Risks to GW Supply</b>

<b>Suggested GWMP Components (B118-03, Appendix C)</b>
<b>1. GWMP Guidance: Establish Advisory Committee to Guide GWMP</b>
<b>2. Management Area: Describe Physical Setting, Aquifer Characteristics, Historical Data, Known Issues, Historical Water Supply &amp; Demands</b>
<b>3. BMOs, Goals, &amp; Actions</b>
<b>4. Monitoring Plan Description</b>
<b>5. IRWM Planning Coordination</b>
<b>6. GWMP Implementation: Status Reports of Basin Conditions &amp; Mgmt Actions</b>
<b>7. GWMP Evaluation &amp; Assessment</b>



# Integrated Regional Water Management Plans and Groundwater Management

- IRWMPs Reliant on GMPs to Manage Groundwater
- IRWMPs Managing Groundwater



Of the 31 Active IRWM Plans:

- ~ 80% are reliant on local Groundwater Management Plans to manage groundwater
- ~ 20% take an active role in managing groundwater

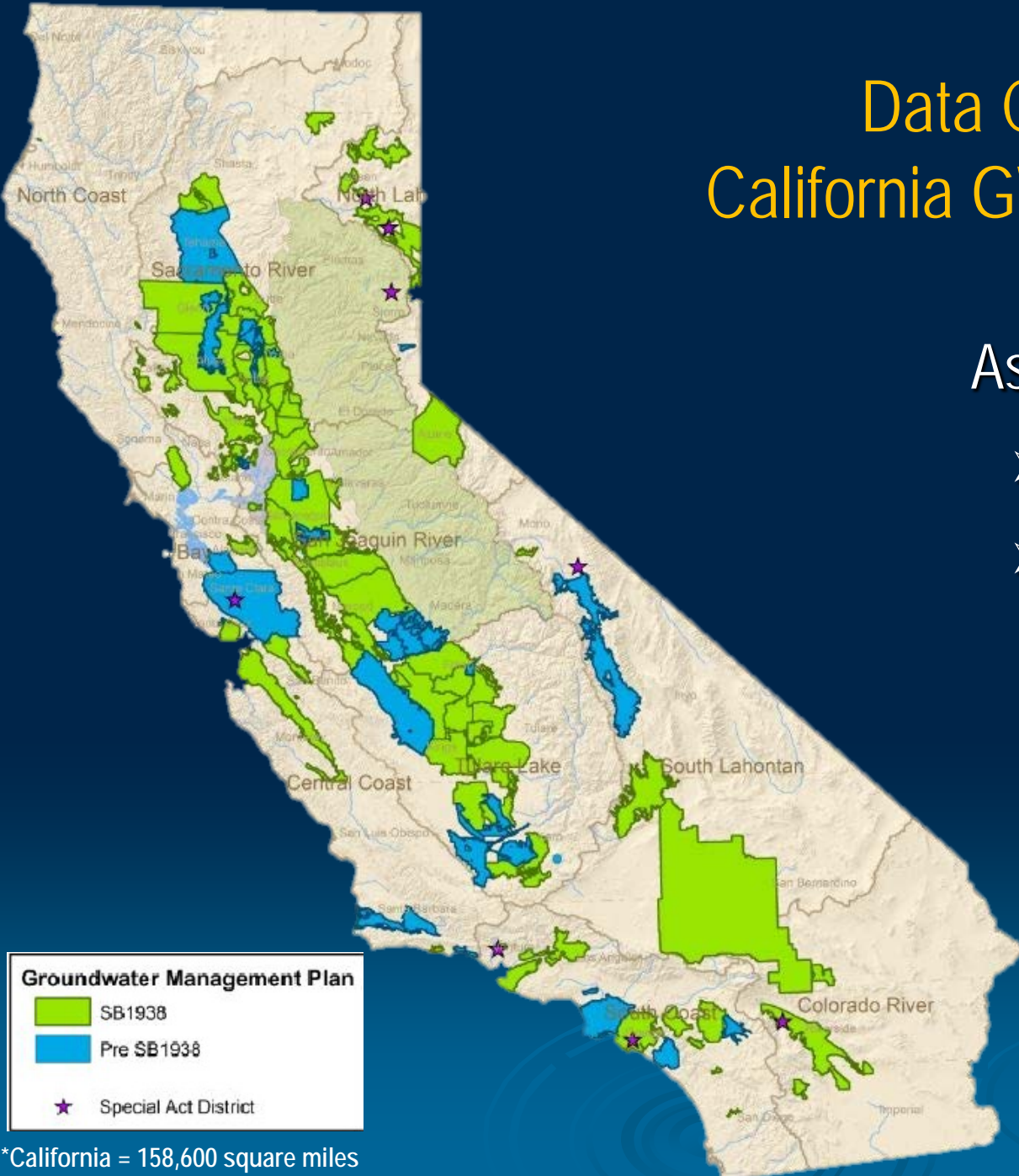


48 IRWM Regions  
31 Active IRWM Plans  
17 in Development

# Data Collection: California GWMP Coverage

As of August 2012:

- 118 Plans
- Plan coverage (All)
  - 31,200 square miles
  - 20% of California\*
  - 82 (or 70%) of the plans are post SB 1938 (2002)



**Groundwater Management Plan**

- SB1938
- Pre SB1938
- Special Act District

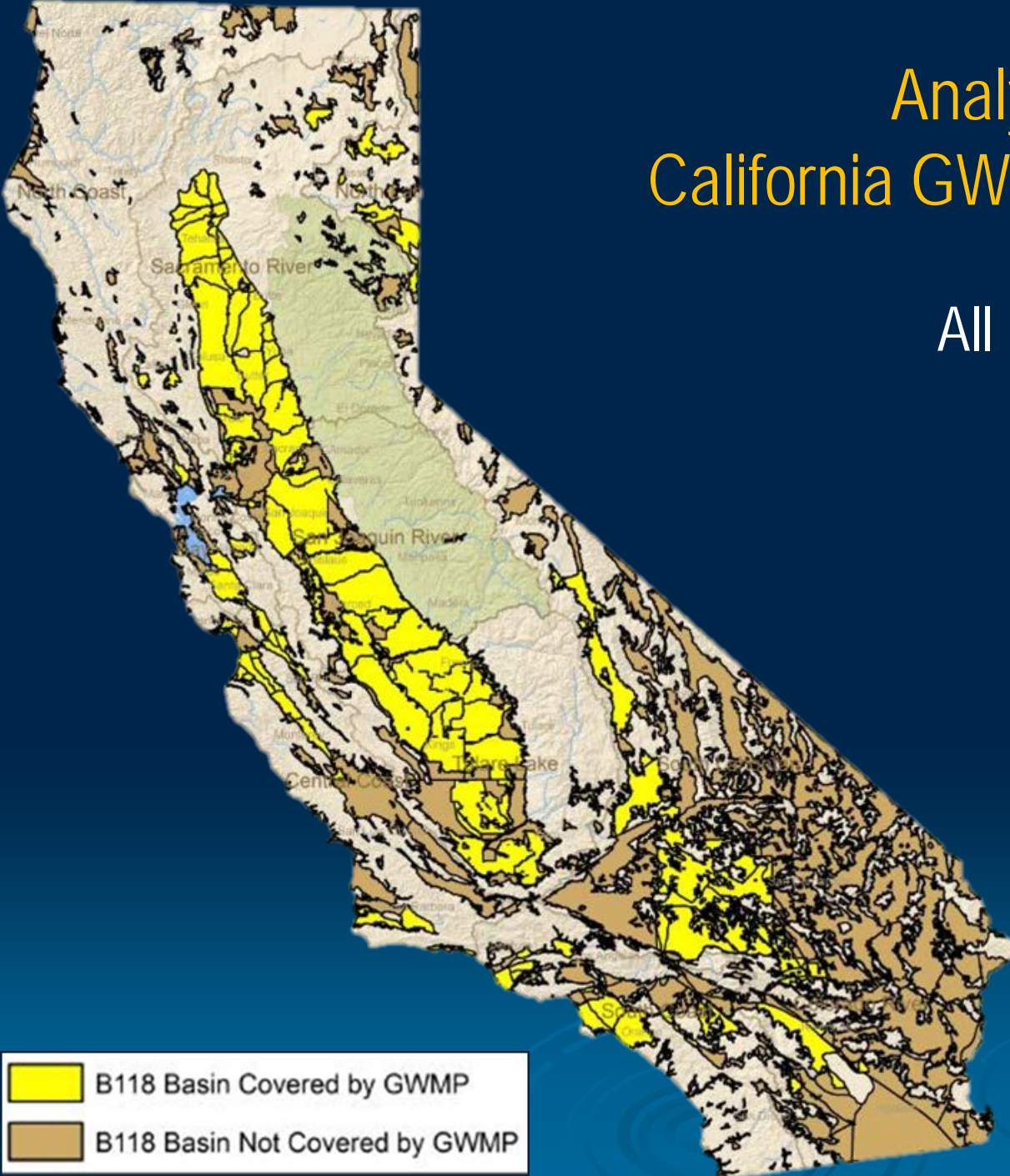
\*California = 158,600 square miles



# Analysis: California GWMP Coverage

## All GWMPs and GW Basins

- Groundwater Basins
  - 61,900 square miles
- GWMP Coverage
  - 118 Plans
- Area Coverage
  - 25,900 square miles
  - 42% of GW Basin area



# Data Collection: California Adjudication Coverage

As of August 2012:

- 23 Adjudicated Basins Statewide
- Plan coverage (All)
  - 6,900 square miles
  - 4% of California\*
- GW Basins
  - 4,600 square miles

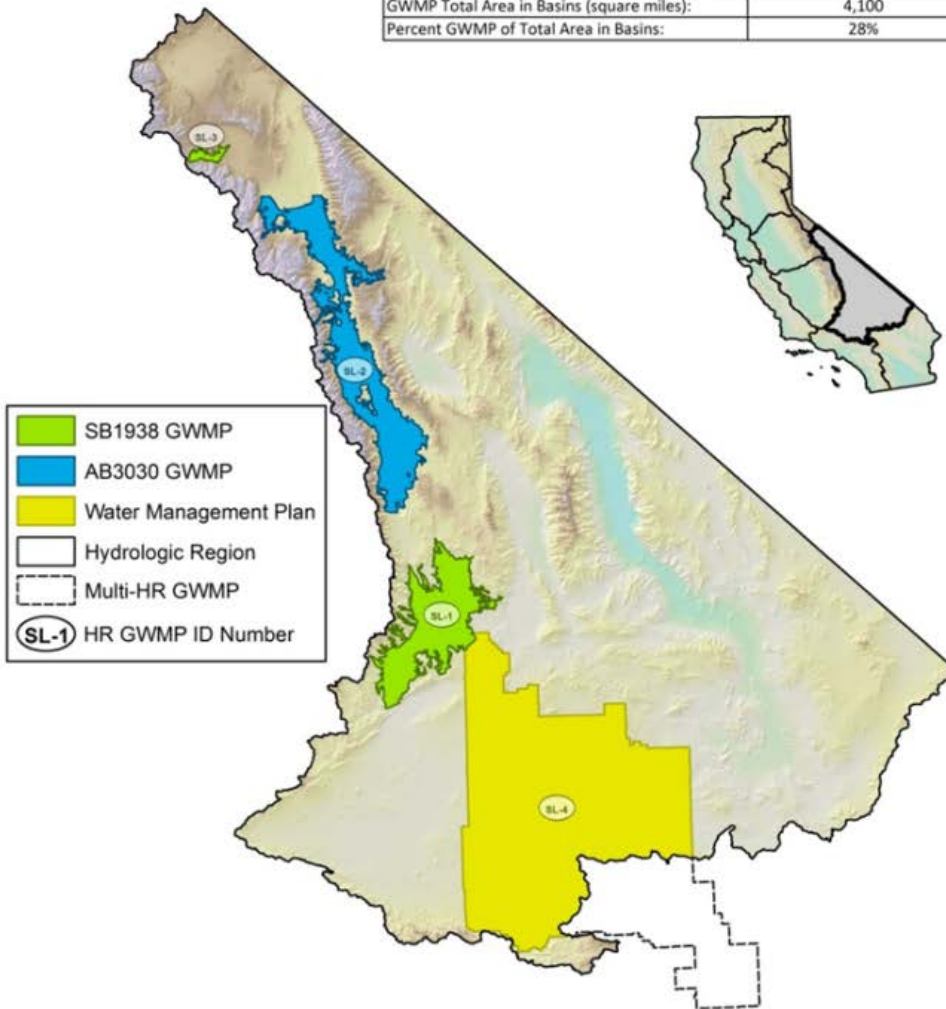


\*California = 158,600 square miles



# South Lahontan (SL) Hydrologic Region Groundwater Management Plan Coverage

South Lahontan Hydrologic Region Area Coverage Results	
Hydrologic Region Total Area (square miles):	26,700
GWMP Total Area in HR (square miles):	5,200
Percent GWMP of Total Area in HR:	19%
B118 Basins Total Area in HR (square miles):	14,800
GWMP Total Area in Basins (square miles):	4,100
Percent GWMP of Total Area in Basins:	28%



DRAFT – Subject to Revision

Map Label	Agency Name	GWMP Title	Date	County
SL-1	Indian Wells Valley Water District	Indian Wells Valley Cooperative Groundwater Management Group	2006	Kern, Inyo, San Bernardino
SL-2	Inyo County and City of Los Angeles	Green Book for the Long Term Groundwater Management Plan for the Owens Valley and Inyo County	1990	Inyo
SL-3	Mammoth Community Water District	Groundwater Management Plan for the Mammoth Basin Watershed	2005	Mono
SL-4 (CR-4)	Mojave Water Agency	2004 Regional Water Management Plan	2004	Kern, Los Angeles, San Bernardino

## Groundwater Adjudications in the South Lahontan Hydrologic Region

Court Judgment	Basin Number	County	Judgment Date
Tehachapi Basin	6-45	Kern	1971
Mojave Basin Area	6-37, 6-40, 6-41, 6-42, 6-43, 6-47, 6-89	San Bernardino	1996

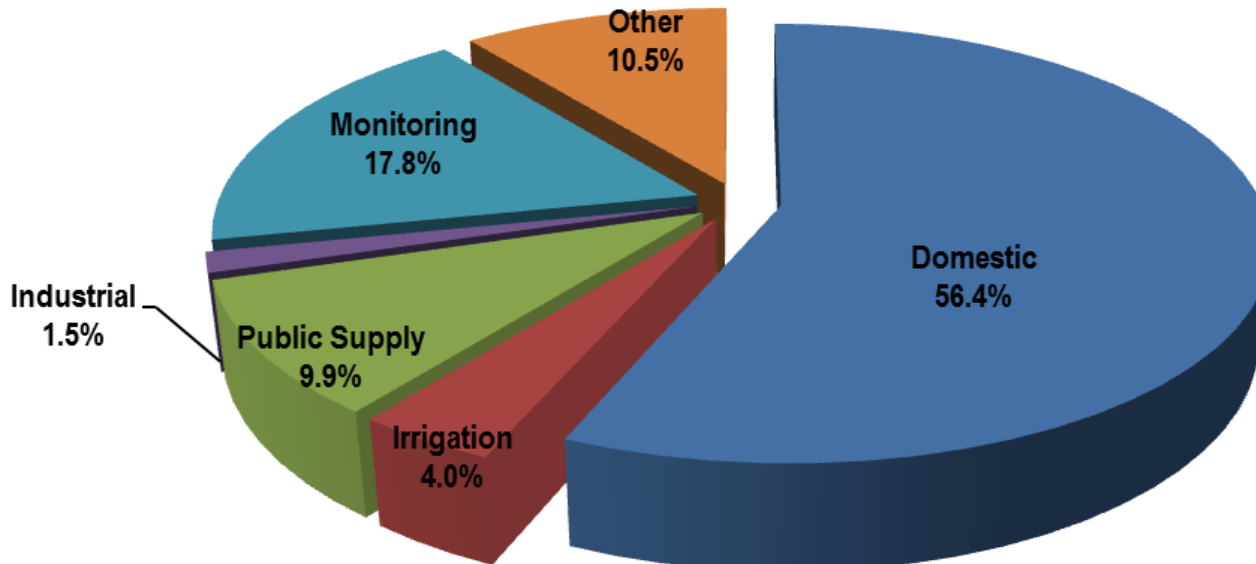
## Groundwater Ordinances that Apply to the Counties in the South Lahontan Hydrologic Region

County	Groundwater Contamination	Well Abandonment and Destruction	Overdraft	Well Construction Policies	Recharge	Permits For Water Transfers
Kern	-	-	-	X	-	X
Los Angeles	-	-	-	-	X	-
Mono	-	X	X	X	-	X
San Bernardino	X	X	X	X	-	-
Total:	1	2	2	3	1	2

# Number of Well Logs by Use and by County - For the South Lahontan Hydrologic Region: 1977-2010

Total Number of Well Logs by Well Use

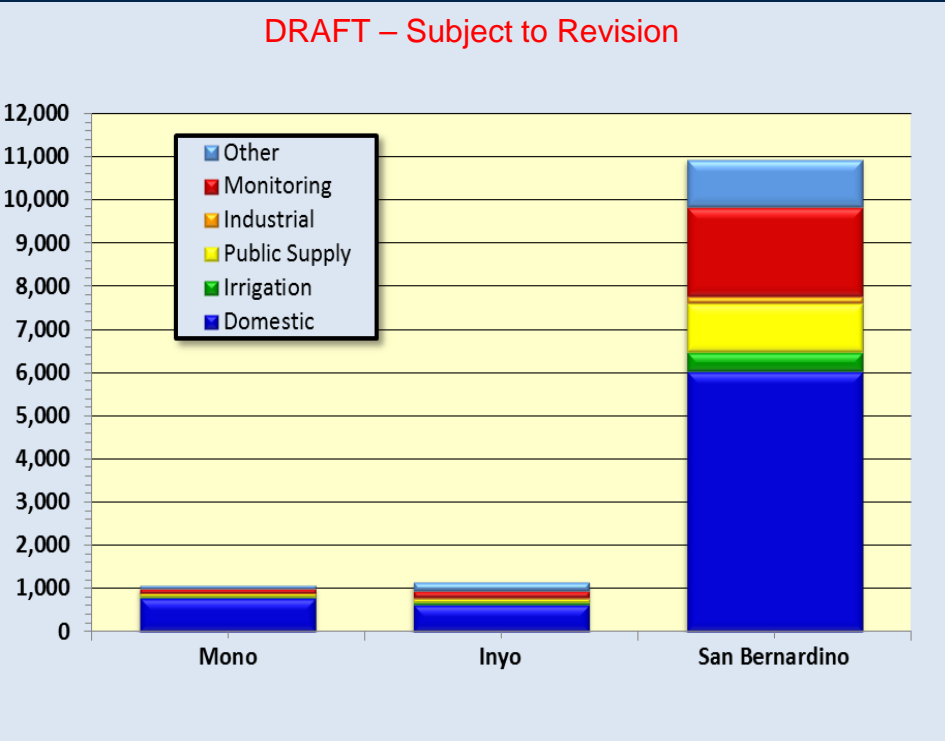
County	Domestic	Irrigation	Public Supply	Industrial	Monitoring	Other	Total Well Records
Mono	765	34	81	3	91	73	1,047
Inyo	603	55	76	32	170	195	1,131
San Bernardino	6,026	432	1,135	161	2,068	1,112	10,934
<b>Total Well Records</b>	<b>7,394</b>	<b>521</b>	<b>1,292</b>	<b>196</b>	<b>2,329</b>	<b>1,380</b>	<b>13,112</b>



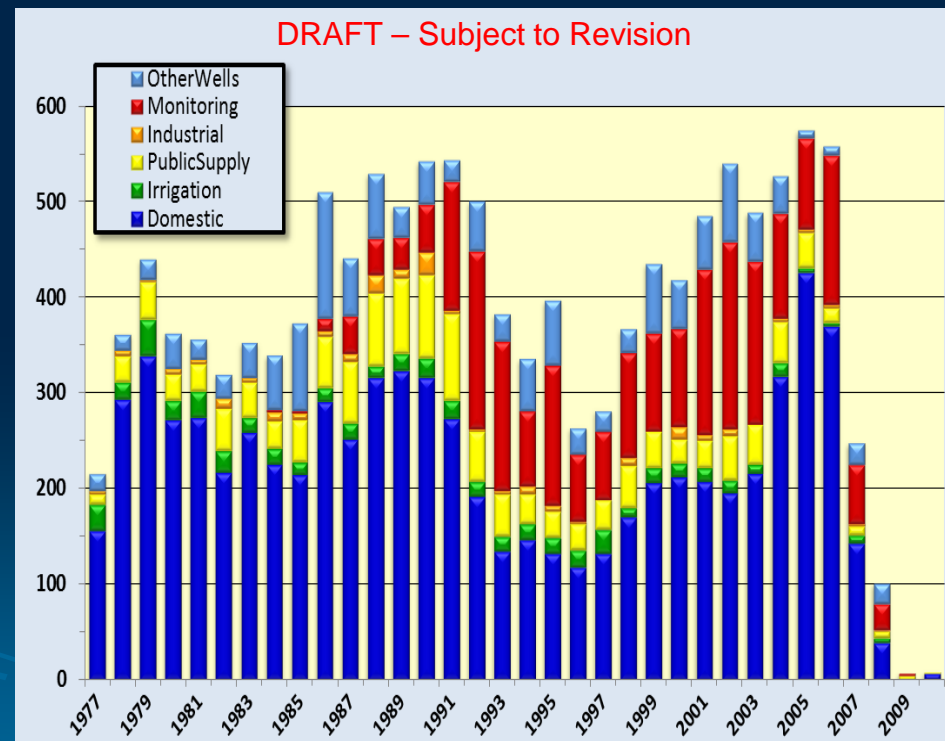


# Groundwater Well Infrastructure and Distribution in South Lahontan Hydrologic Region

Wells Drilled in the SL HR by County, 1977-2010

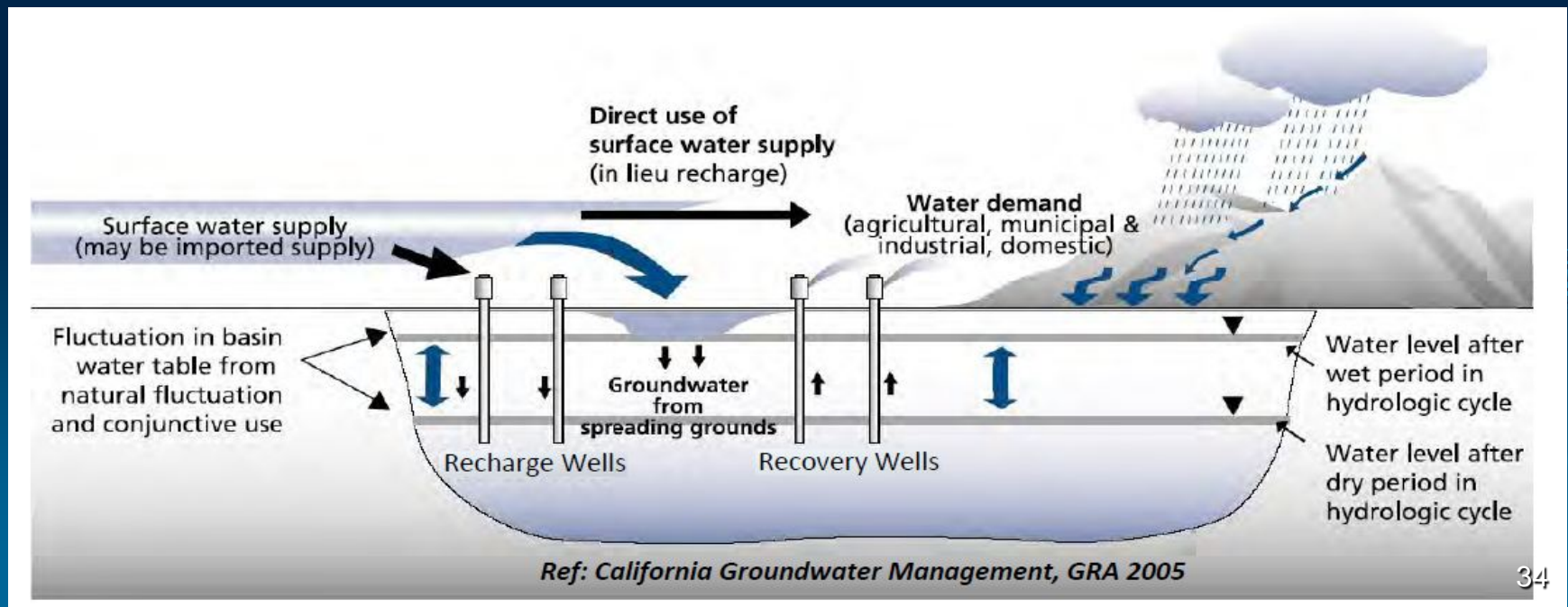


Number of Wells Drilled by Well Type per Year in SL HR, 1977-2010



# Conjunctive Management and Groundwater Storage

**Conjunctive Management:** The coordinated and planned use and management of both surface water and groundwater resources to maximize the availability and reliability of water supplies.





# Inventory of Conjunctive Management Programs in California

Hydrologic Region	# Active Conjunctive Management Programs
North Coast	0
San Francisco Bay	4
Central Coast	5
South Coast	32
Sacramento River	3
San Joaquin River	5
Tulare Lake	37
North Lahontan	0
South Lahontan	2
Colorado River	1
<b>TOTAL PROGRAMS</b>	<b>89</b>



Note: List may not be complete

# CASGEM



# California Statewide Groundwater Elevation Monitoring Program (CASGEM)

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

California Statewide Groundwater Elevation Monitoring (CASGEM)

Home | Newsroom | Flood & Safety | Planning | State Water Project | Funding | Environment | Supply & Use | Data

California Cooperative Snow Surveys | Water Supply Contracts | Water Use Efficiency | All Supply/Use Topics...

Home → Groundwater Information Center → CASGEM

### GROUNDWATER ELEVATION MONITORING CASGEM

- CASGEM Home
- 2012 CASGEM Status Report to Legislature
- Public Login
- Monitoring Entity Login
- Designated Monitoring Entities
- What's New?
- Sign Up/Subscribe
- Background
- SBX7 6 (Bill Text)
- AB 1152 (Bill Text)
- Monitoring Entities
- Groundwater Elevation Data
- Documents & Outreach
- Public Comments
- FAQs
- Contacts

#### OTHER LINKS

- Groundwater Information Center
- Bulletin 118
- IWRIS
- Funding
- IRWM

#### CASGEM Status Report to the Legislature and the Governor is Now Available

authorized by SBX7 6, enacted in November 2009

DWR has completed the [2012 CASGEM Status Report](#), prepared for the Governor and the Legislature as required by the Water Code (§10920 et seq.). The report outlines the background of the CASGEM Program and describes the first two years of implementation. This report is the first in a series of periodic reports on the CASGEM Program that DWR will provide to the Governor and the Legislature. Subsequent reports will be provided every five years beginning in 2015.

#### CASGEM Online System is Now Available

Current or prospective Monitoring Entities can notify DWR of their intent to become a Monitoring Entity, manage existing Notification information, and submit groundwater elevation data through the [Monitoring Entity Login](#) to the Online System. Public users can view Monitoring Entities, monitored groundwater basins and wells, and groundwater elevation data, through reports, search tools, and GIS viewing by accessing the [Public User Login](#) to the Online System.

#### Overview of CASGEM

On November 4, 2009 the State Legislature amended the Water Code with SBx7-6, which mandates a statewide groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. To achieve that goal, the amendment requires collaboration between local monitoring entities and Department of Water Resources (DWR) to collect groundwater elevation data. Collection and evaluation of such data on a statewide scale is an important fundamental step toward improving management of California's groundwater resources.

In accordance with this amendment to the Water Code, DWR developed the California Statewide Groundwater Elevation Monitoring (CASGEM) program. The intent of the CASGEM program is to establish a permanent, locally-managed program of regular and systematic monitoring in all of California's alluvial groundwater basins. The CASGEM program will rely and build on the many, established local long-term groundwater monitoring and management programs. DWR's role is to coordinate the CASGEM program, to work cooperatively with local entities, and to maintain the collected elevation data in a readily and widely available public database. DWR will also continue its current network of groundwater monitoring as funding allows.

The law anticipates that the monitoring of groundwater elevations required by the enacted legislation will be done by local entities. The law requires local entities to notify DWR in writing by January 1, 2011 if the local agency or party seeks to assume groundwater monitoring functions in accordance with the law.

#### Overview of SBX7 6

In 2009, the Legislature passed SBX7 6, which establishes, for the first time in California, collaboration between local monitoring parties and DWR to collect groundwater elevations statewide and that this information be made available to the public.

SBX7 6 provides that:

- Local parties may assume responsibility for monitoring and reporting groundwater elevations.
- DWR work cooperatively with local Monitoring Entities to achieve monitoring programs that demonstrate seasonal and long-term trends in groundwater elevations.
- DWR accept and review prospective Monitoring Entity submittals, then determine the designated Monitoring Entity, notify the Monitoring Entity and make that information available to the public
- DWR perform groundwater elevation monitoring in basins where no local party has agreed to perform the monitoring functions.
- If local parties (for example, counties) do not volunteer to perform the groundwater monitoring functions, and DWR assumes those functions, then those parties become ineligible for water grants or loans from the state.

For text of the chaptered legislation, please visit the official [California Legislative Information](#) website.

#### MAJOR DEADLINES

On or before January 1, 2011: Parties seeking to assume groundwater elevation monitoring functions must notify DWR (WC section 10920)

On or before January 1, 2012: Monitoring Entities shall begin reporting seasonal groundwater elevation measurements (WC section 10932)



# CASGEM Goals

## Short term

- Encourage local participation throughout the state
- Determine the extent of groundwater elevation monitoring in California's groundwater basins
- Provide assistance to local agencies

## Long term

- Establish a statewide groundwater monitoring network that shows seasonal and long-term trends
- DWR Region Offices work with local agencies to better characterize California's groundwater basins

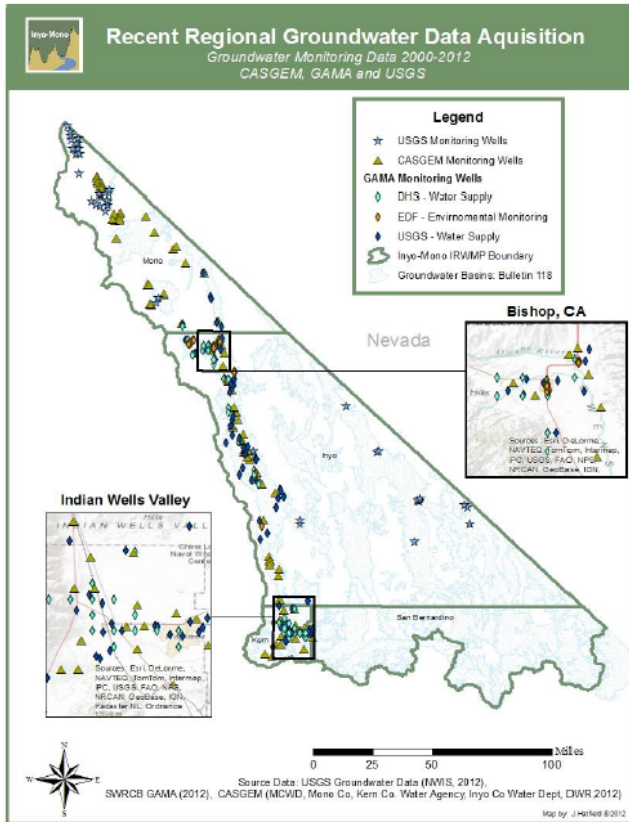
# Number of Monitoring Wells by Agency, DWR Cooperator, and CASGEM Monitoring Entity – SL HR

State and Federal Agencies	Number of Wells
USGS	683
Total State and Federal Wells:	683
DWR Cooperators	Number of Wells
Apple Valley Ranchos Water Company	11
Hesperia County Water District	14
Mojave Water Agency	250
Sheep Creek Mutual Water Company	1
Southern California Water Company	14
Total DWR Cooperator Wells:	290
CASGEM Monitoring Entities	Number of Wells
Indian Wells Valley Cooperative Groundwater Management Group	39
Inyo County	11
Los Angeles Department of Water and Power	33
Mono County	14
Tri-Valley Groundwater Management District	2
Total CASGEM Wells:	99
Grand Total	1,072



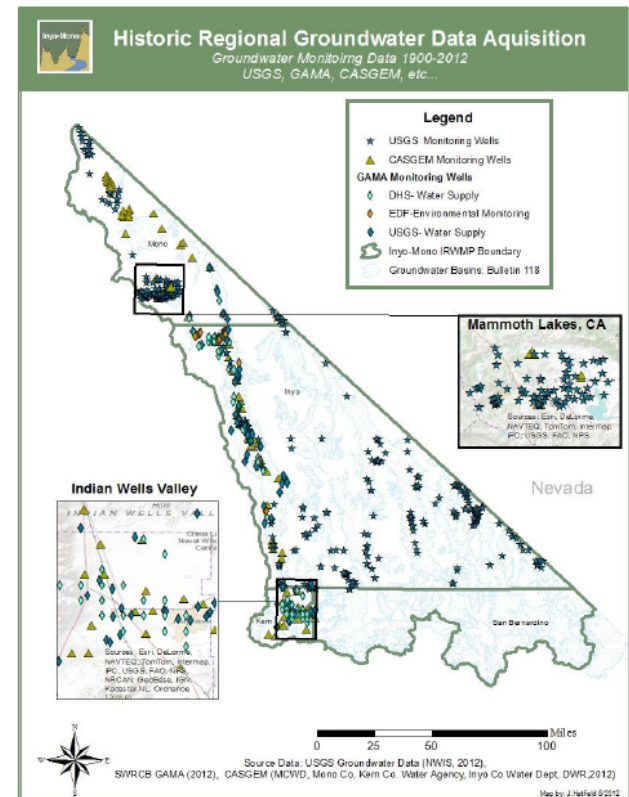
# Recent and Historic Groundwater Data Acquisition

Figure 4-2. Recent Regional Groundwater Data Acquisition: 2000-2012



The above map depicts the monitoring data collected over the past 12 years within the Inyo-Mono IRWM Region. Loss of funding is the primary reason behind the reduction of many of the Groundwater Monitoring efforts.

Figure 4-3. Historical Regional Groundwater Data Acquisition: 1900-2012



The above map illustrates the history of groundwater monitoring and exploration throughout the vast Inyo-Mono Region by a variety of different programs. The majority of many of these wells are no longer in use within the region, particularly those owned and operated by the United States Geological Survey (USGS).





# Sources of Groundwater Information

## DWR's Groundwater Information Center

- <http://www.water.ca.gov/groundwater/index.cfm>

## Groundwater Resources Association of California

- <http://www.grac.org/>

## ACWA Groundwater Framework

- <http://www.acwa.com/>

## Stanford's Water in the West Working Paper

- Uncommon Innovation: Developments in Groundwater Management Planning

## United States Geological Survey

- <http://www.usgs.gov/water/>



# QUESTIONS AND COMMENTS?

## DWR Regional Office Contacts:

### Southern Region Office

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