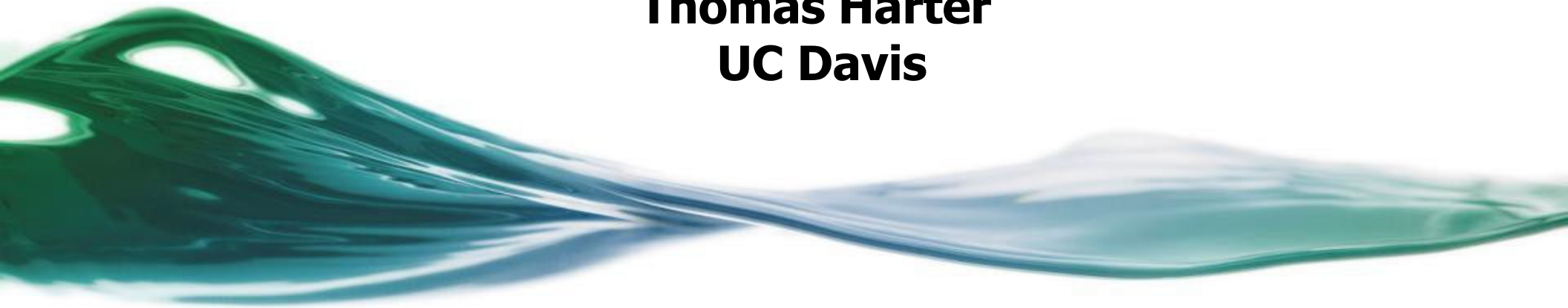
Modified by Ben Faber from:

Implementing the Sustainable Groundwater Management Act (SGMA)

Thomas Harter
UC Davis



Groundwater Resources Association of California

WATER EDUCATION FOUNDATION

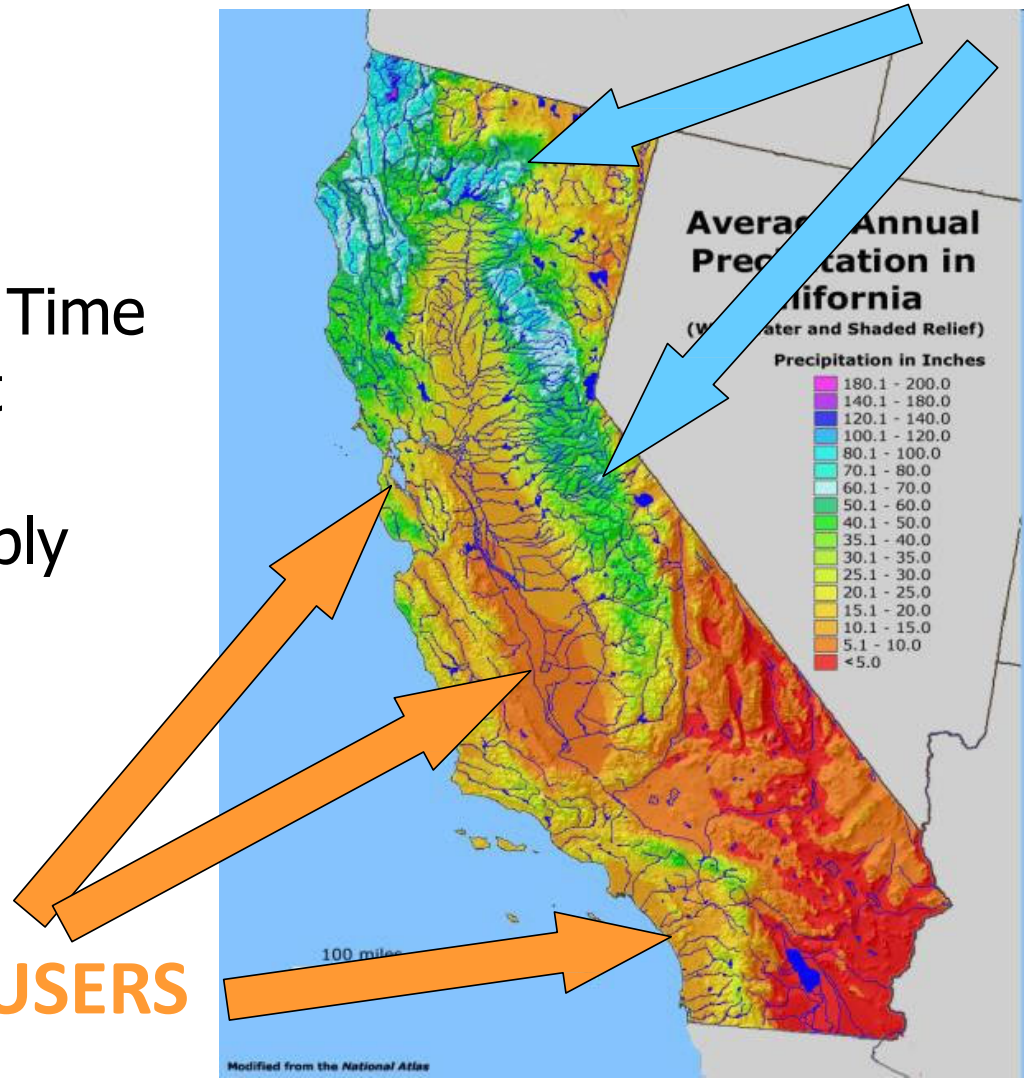
UCDAVIS CENTER FOR WATERSHED SCIENCES

University of California Agriculture and Natural Resources

Department of LAND, AIR AND WATER RESOURCES
University of California, Davis
Climate Change • Sustainable Agriculture
Environmental Quality • Landscape Processes

RAIN

Space and Time Disconnect between Water Supply and Water Use



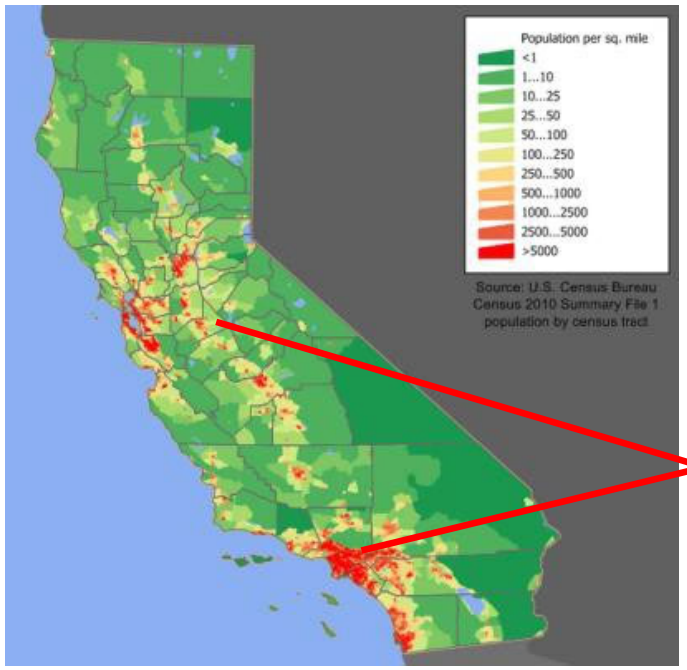
WATER USERS

California's Water Users

Irrigated Agriculture
9.5 million acres
(4 million ha)

applied water use:
27 – 35 MAF
(35 – 45 km^3)

CDFA, 2003



Population
38 million people

water use:
8 MAF (10 km^3)

Environment
&
protected streams,
wetlands:
45 MAF (55 km^3)

MAF = million acre-feet

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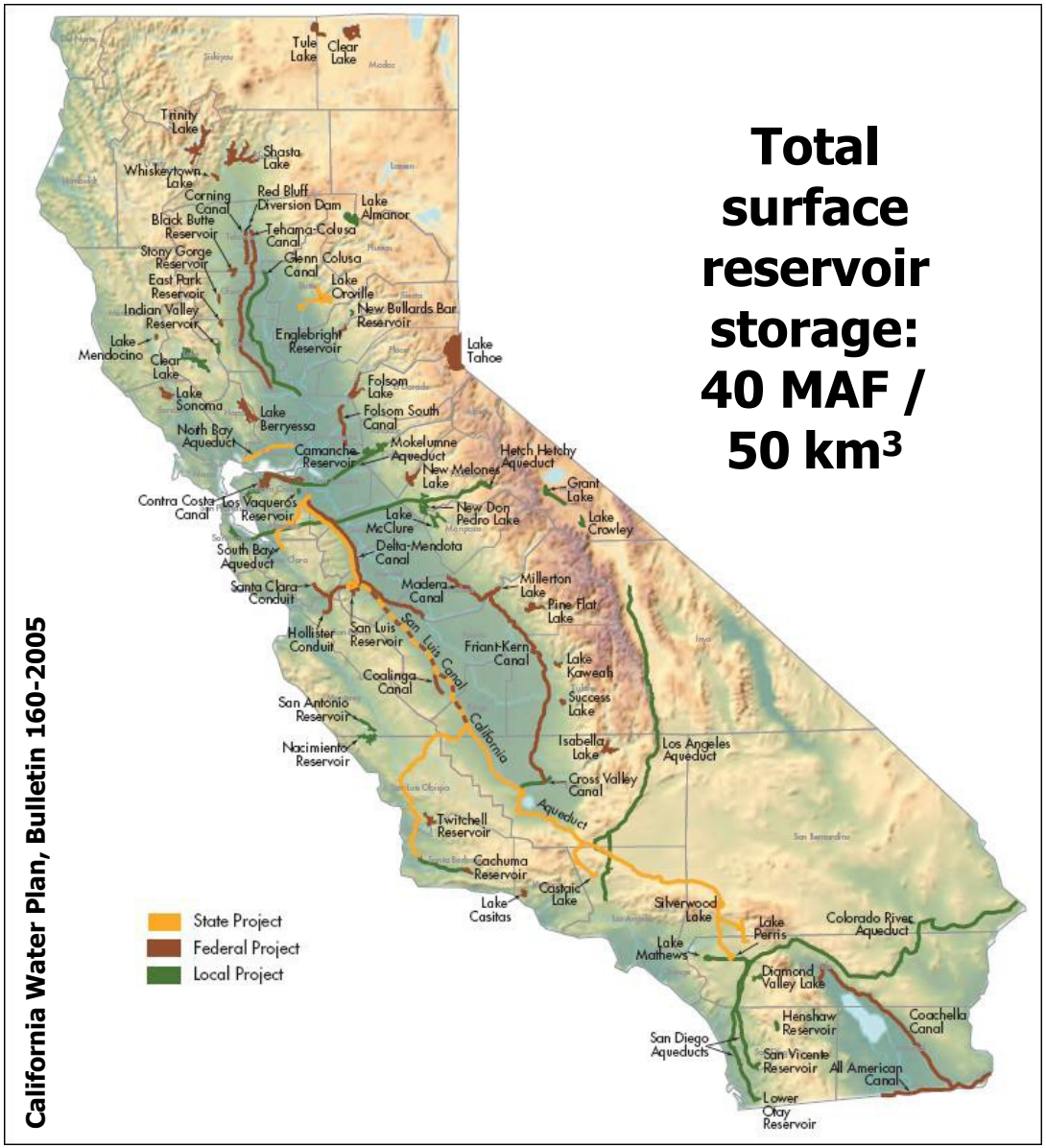
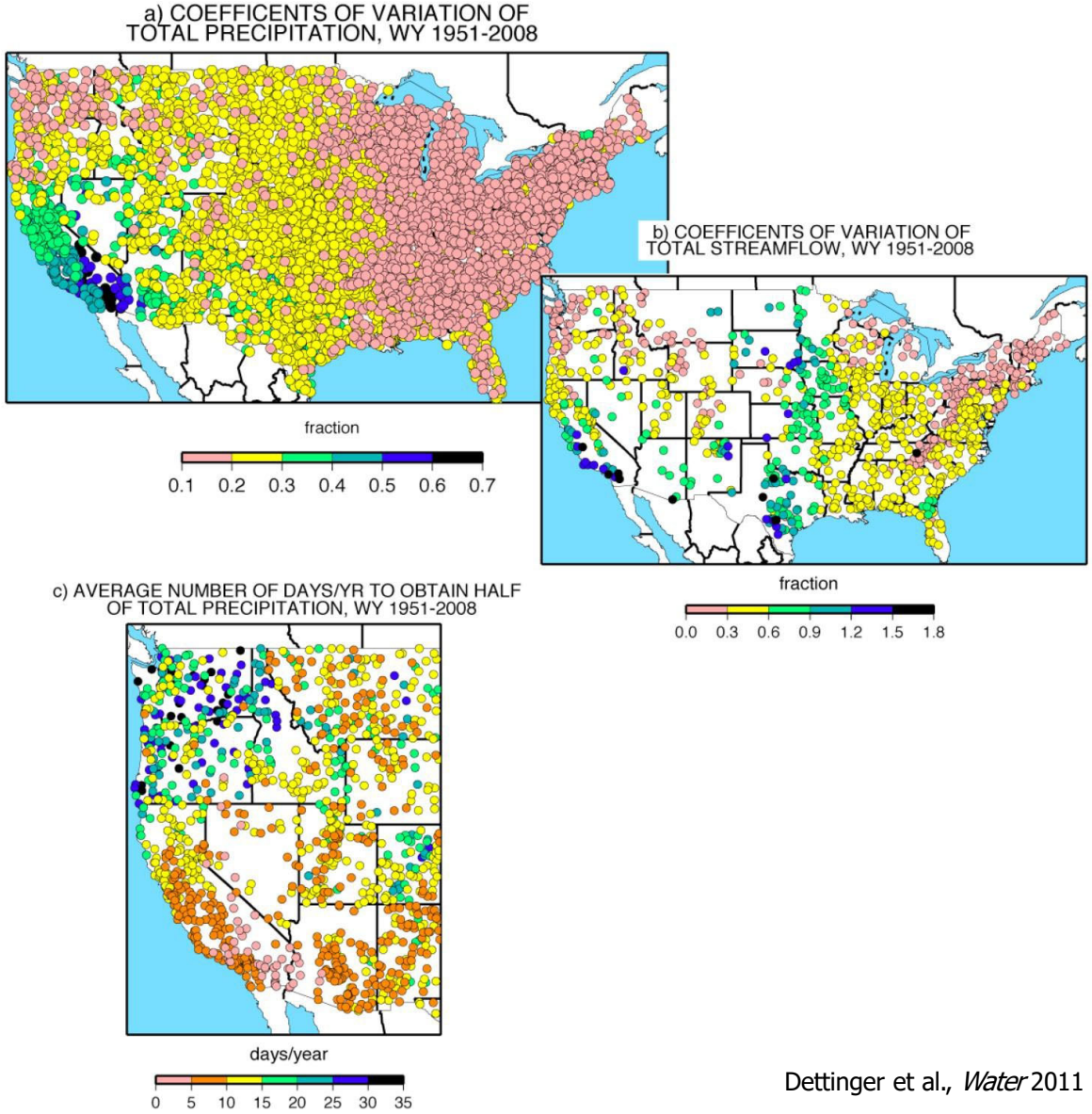
California Water Infra-structure

Bridging the Spatial and Temporal Disconnect between SUPPLY and USE

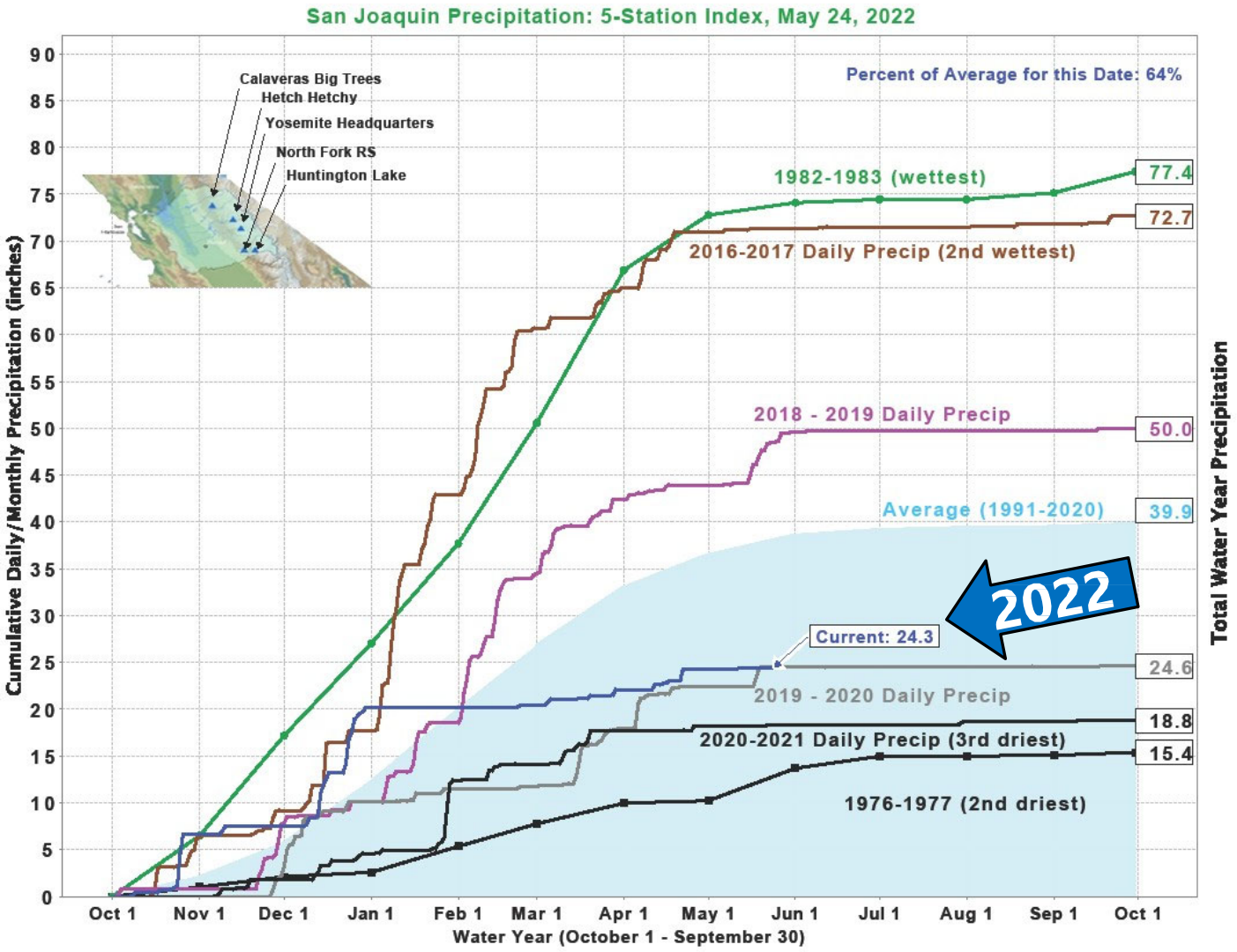


Total surface reservoir storage: 40 MAF / 50 km³

California has the most variable annual precipitation and runoff totals



Dettinger et al., *Water* 2011



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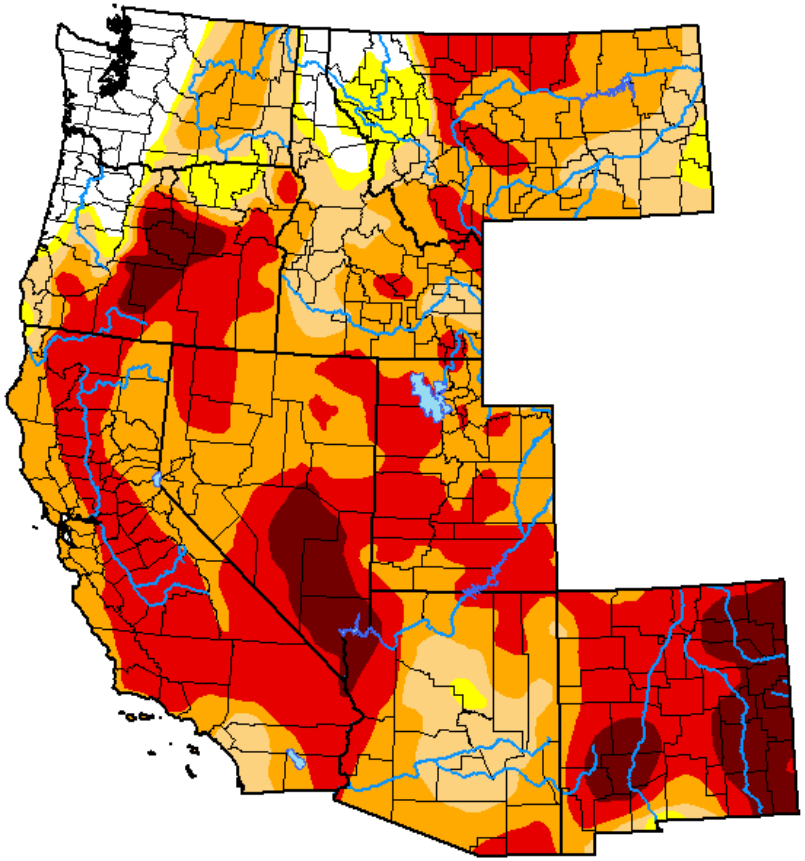
https://cdec.water.ca.gov/water_cond.html

U.S. Drought Monitor
West

May 17, 2022
(Released Thursday, May. 19, 2022)
Valid 8 a.m. EDT



Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:

Richard Heim
NCEI/NOAA

droughtmonitor.unl.edu

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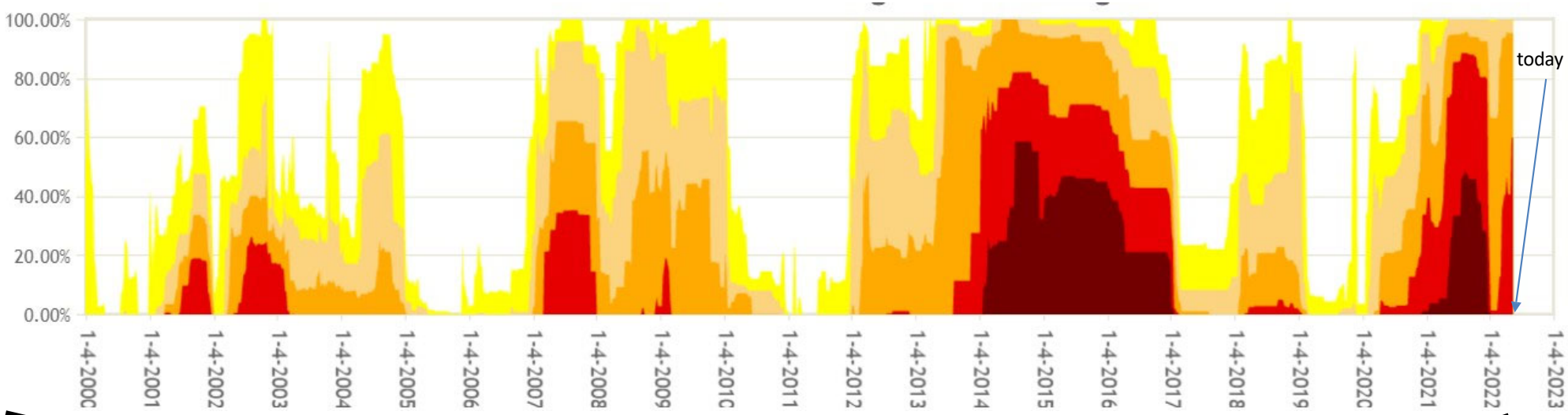
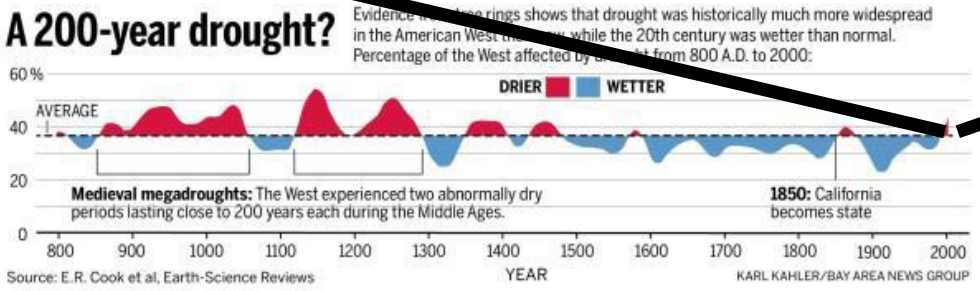
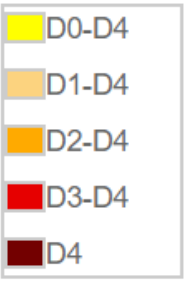
21st Century California: Drought as a Regular Phenomenon

Fraction of California Area with Drought Index 0 - 4







https://droughtmonitor.unl.edu/Data/Timeseries.aspx

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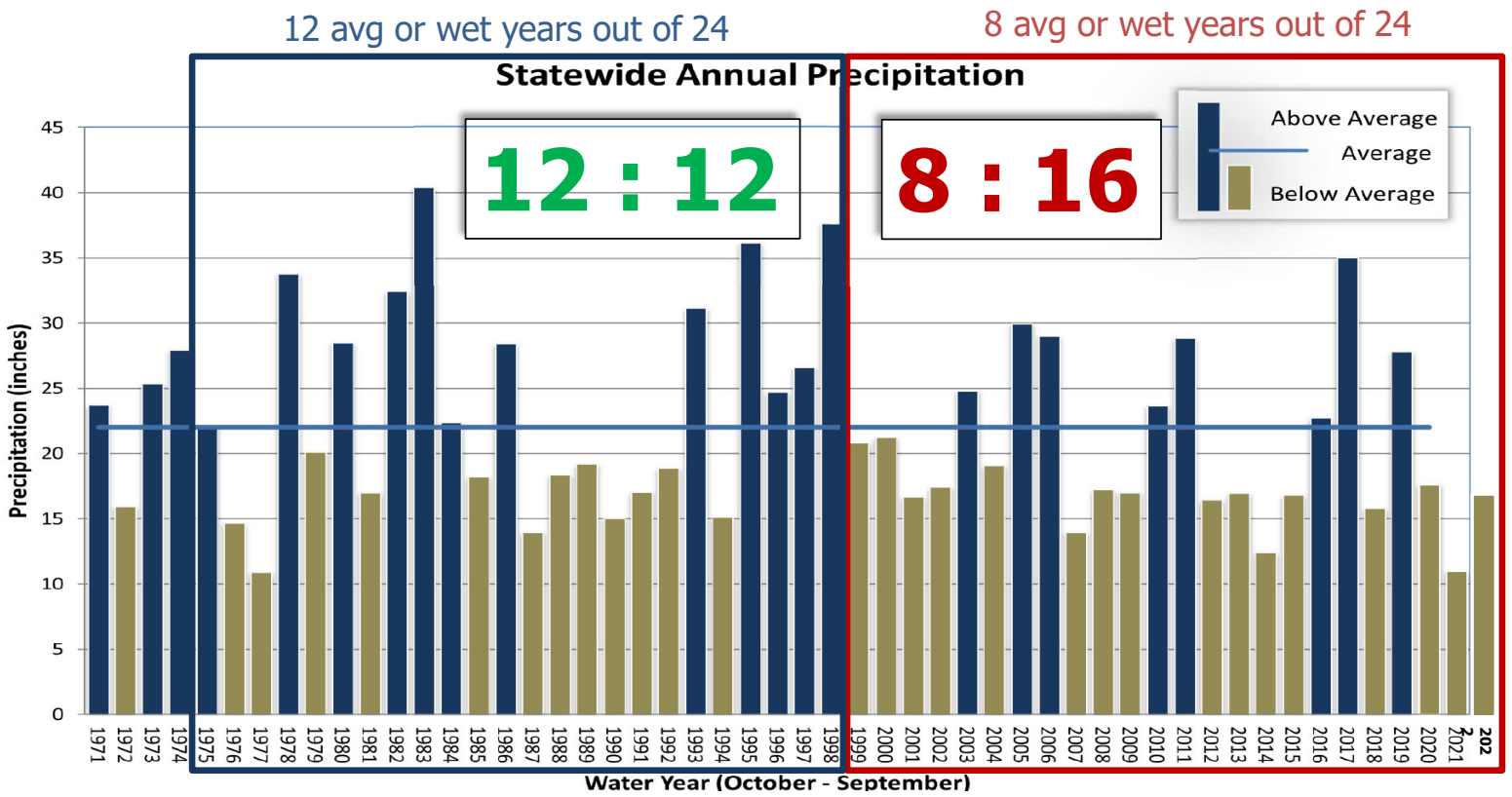
An Unofficial "Groundwater Drought Score"



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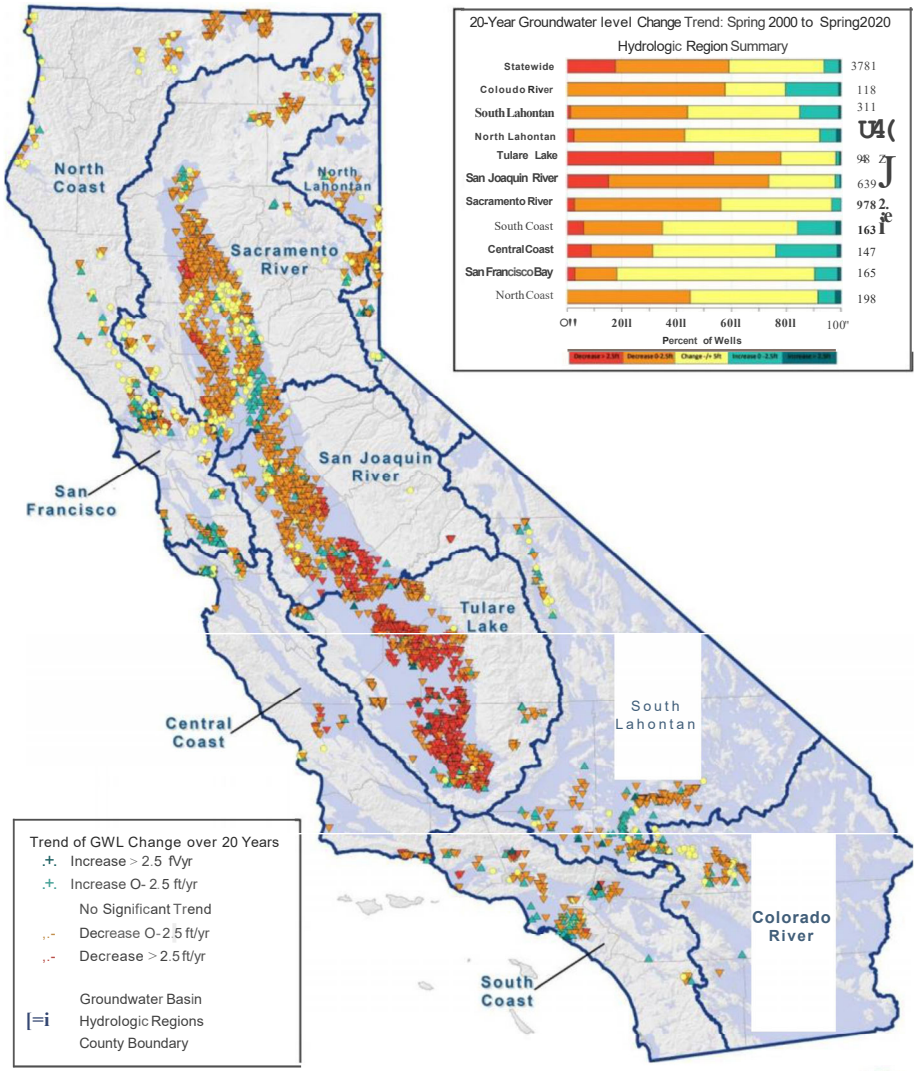
Harter and Brewster, California Water Blog, April 9, 2018; Precipitation Chart: California DWR 2021

https://californiawaterblog.com/2018/04/08/groundwater-recovery-in-california-still-behind-the-curve/

20-Year Groundwater* Level Trend - Spring 2000 to Spring 2020



•Groundwater level trend map for 20-year period between springs 2000 and 2020. Groundwater level trend determined from water level measurements in wells. Map and chart based on available data from the DWR Enterprise Water Management Database as of 09/22/2020. Map Updated: 09/22/2020.

Sustainable Groundwater Management Act of 2014 (SGMA)

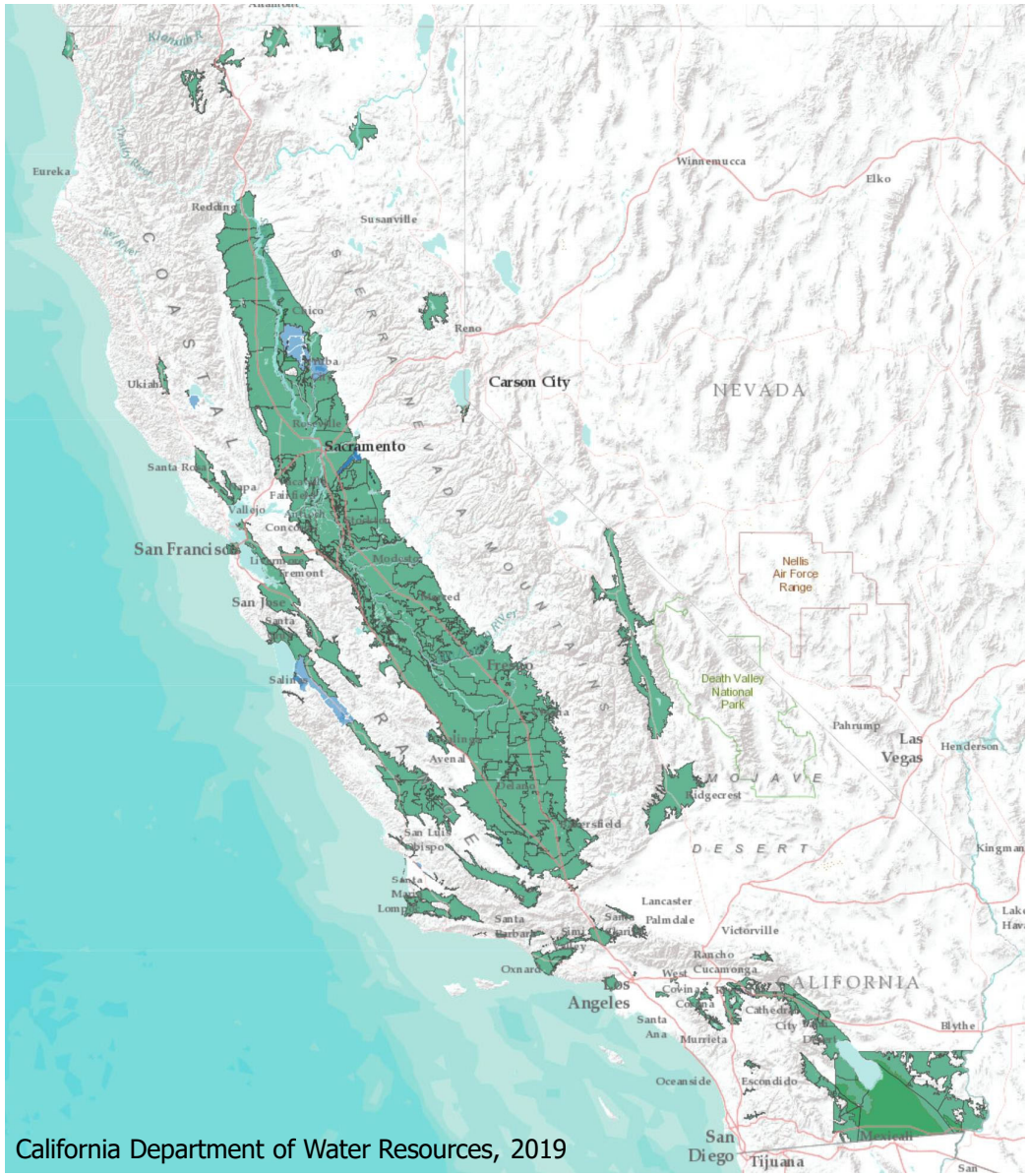
SUSTAINABILITY

Groundwater Sustainability Plans (GSPs) required for **medium** and **high** priority basins by 2020/2022

LOCAL CONTROL

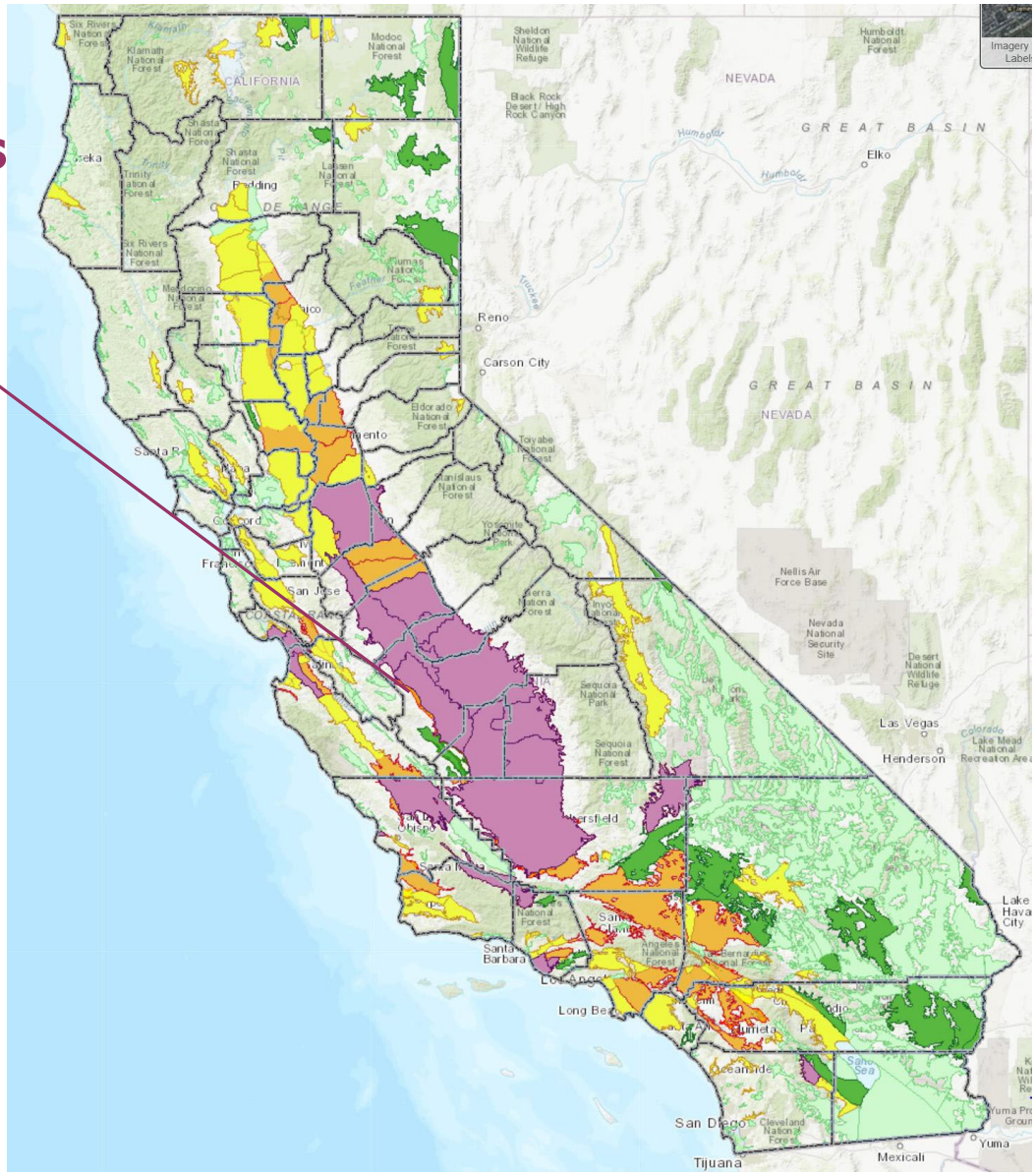
California Groundwater Sustainability Agencies (GSAs)

~ 250 agencies
~ 150 plans



California Department of Water Resources, 2019

Critically Overdrafted Basins

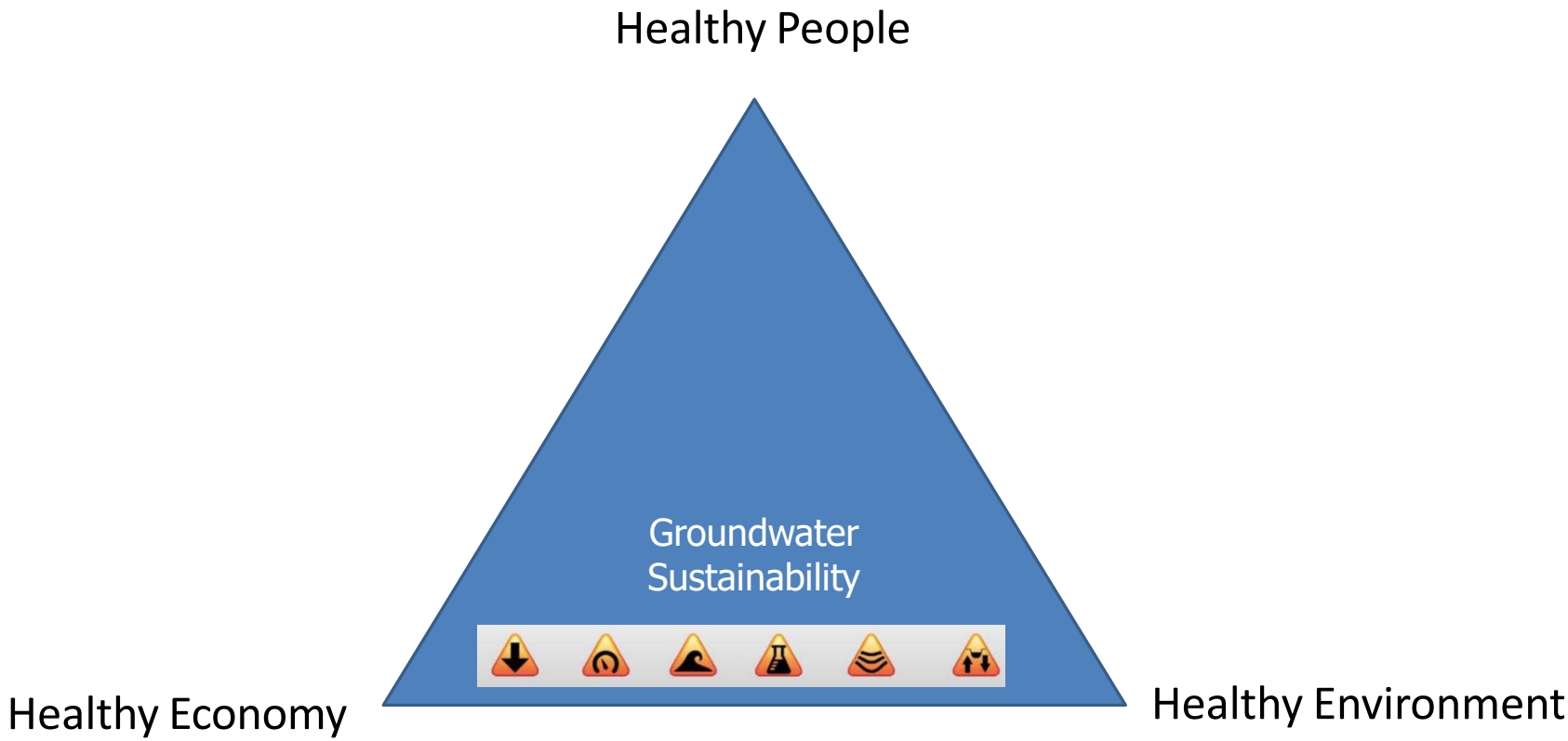



Crescent City
Yreka
Eureka
Redding
Chico
Ukiah
Yuba City
Sacramento
Napa
Stockton
San Francisco
Modesto
San Jose
Merced
Bishop
Fresno
Monterey
Visalia
Bakersfield
Santa Maria
Barstow
Needles
Lancaster
Santa Barbara
Los Angeles
San Bernadino
Long Beach
Palm Springs
San Diego
El Centro
The California Farm Bureau Federation developed this resource for farmers and landowners to help you understand why SGMA is important and how you can be involved.
SGMA requires formation of local agencies to develop new plans, called Groundwater Sustainability Plans or GSPs, to address and prevent problems in groundwater basins in most areas of the state. Signed into law in September 2014, SGMA focuses on protecting California's groundwater for generations to come.
The California map shows important due dates for Groundwater Sustainability Plans (GSPs)
Basins with GSP due in 2020
Basins with GSP due in 2022
Adjudicated areas
County lines
How can I get involved?
How will it affect me?
Why do we have SGMA?

Who can be a GSA?

- Exempt:
  - Adjudicated basins (mostly in southern CA)
  - Functional equivalent of a GSA, adjudicated basin
- Any local public agency
  - Cities
  - Counties
  - Water / irrigation / special acts districts
  - Other public agencies with responsibility for:
    - water supply,
    - water management, or
    - land use
  - NEW special acts districts (created by legislature, then CEQA, LAFCO, public vote)

Developing a Groundwater Sustainability Plan is …
… an Optimization Problem



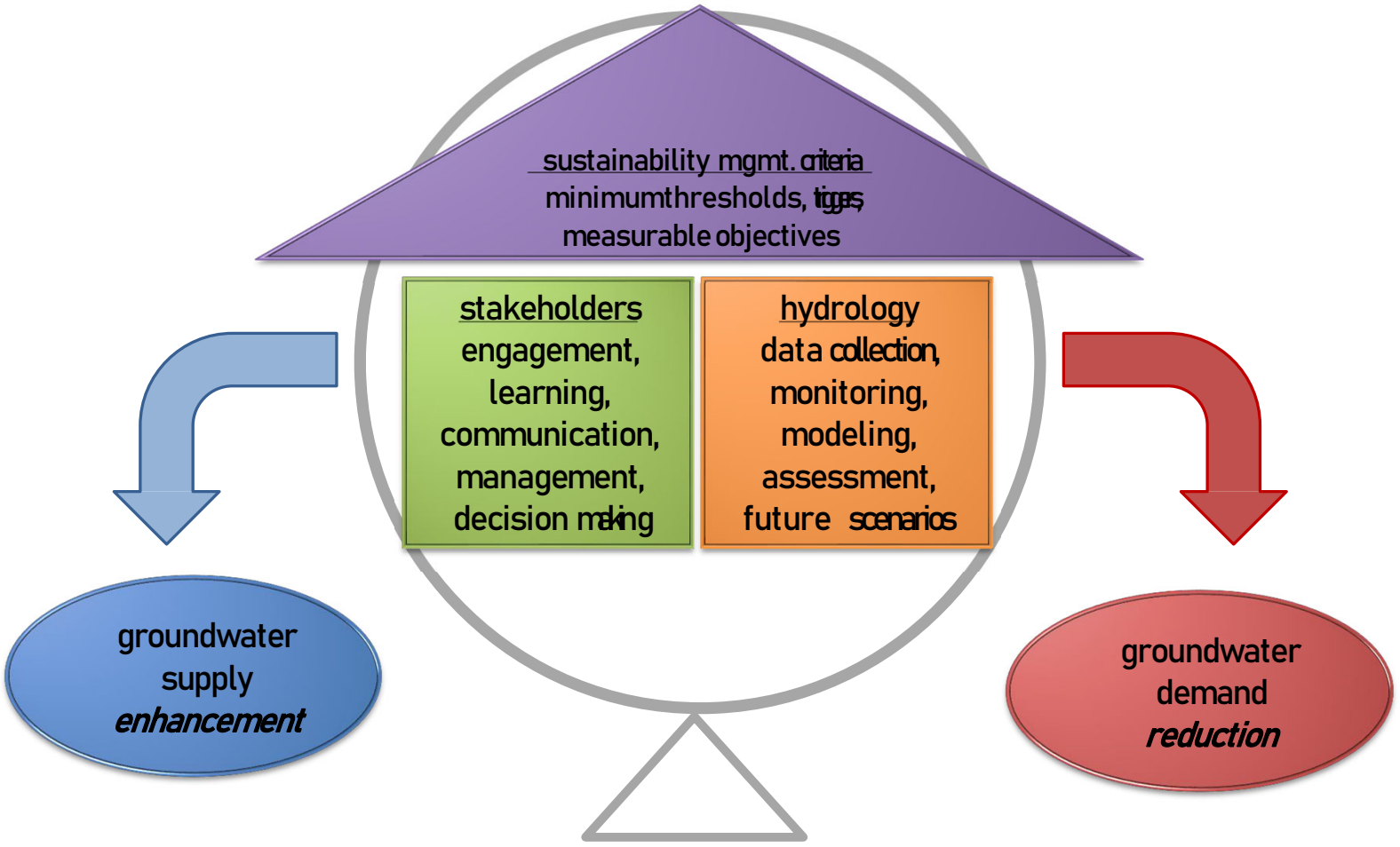
Adopted from: Marylou Shockley, CSU Monterey Bay

Overview of GSP Structure

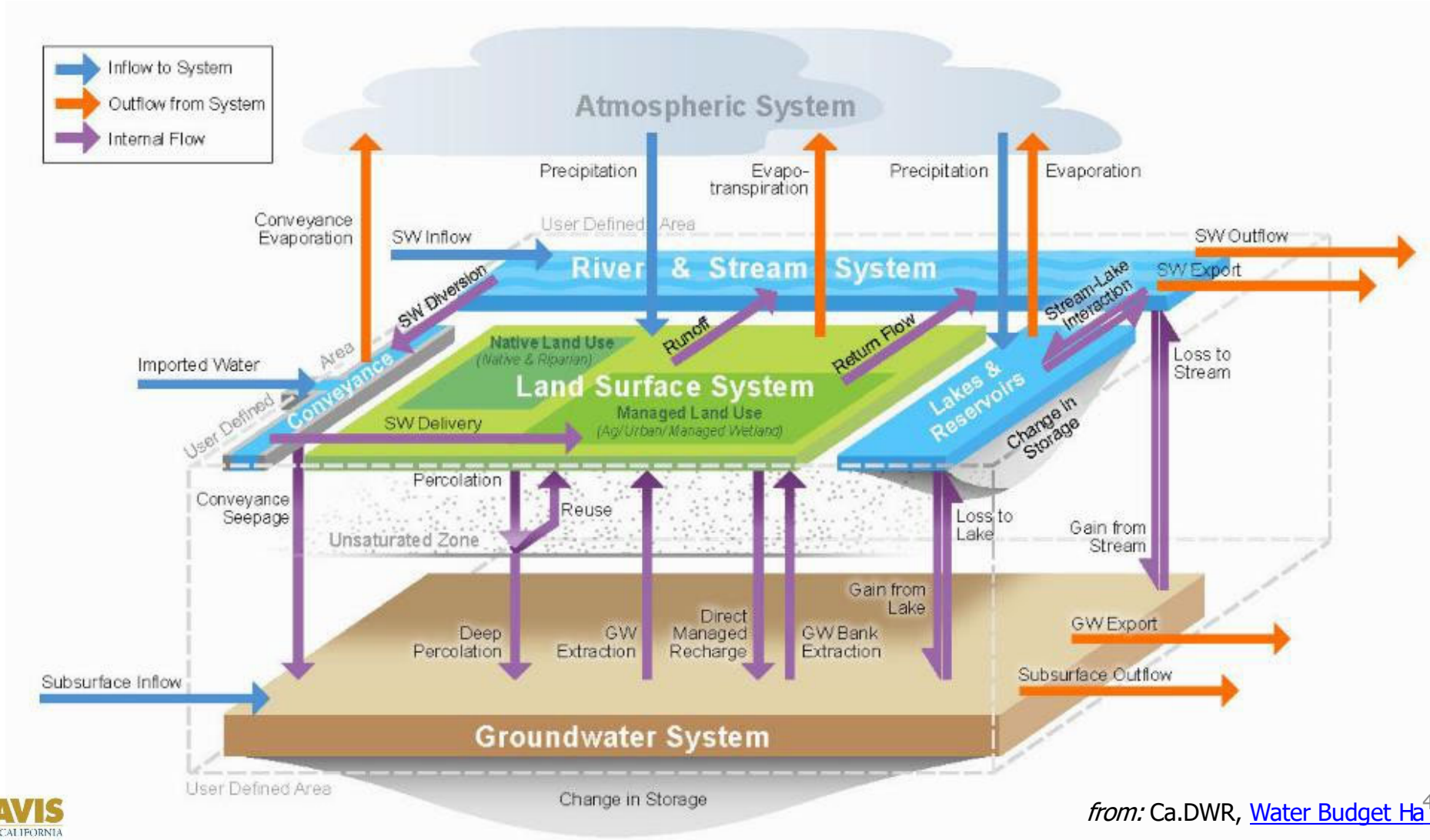
A GSP has five chapters:

1. Introduction
2. Plan Area and Basin Setting
3. Sustainable Management Criteria
4. Projects and Management Actions
5. Plan Implementation

The Key Elements of Groundwater Sustainability Plans

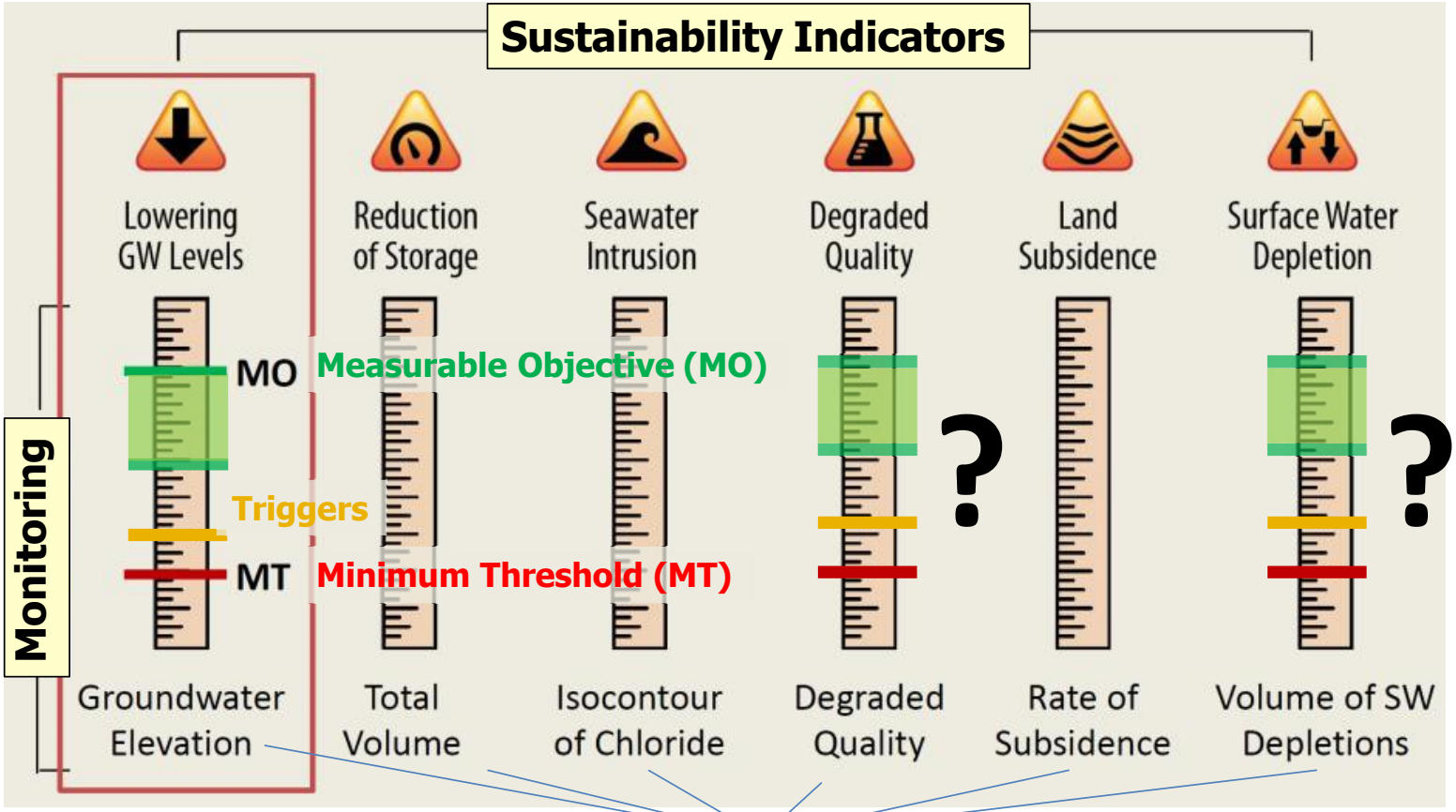


Robust Water Budgets / Integrated Hydrologic Models



from: Ca.DWR, Water Budget Handbook

GSP: Monitoring and Managing Sustainability



[generalized examples of what to monitor]

modified from Ca DWR 2016

GSP: Monitoring and Managing Sustainability

Groundwater Sustainability Agencies have *discretionary* authority to:

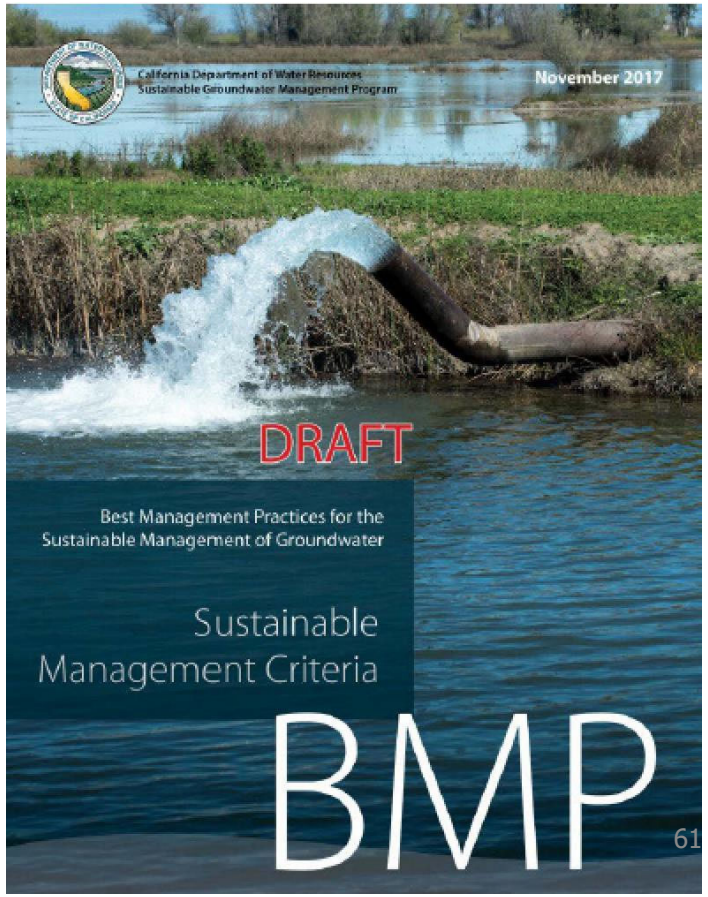
- Conduct studies
- Register & monitor wells
- Set well spacing requirements
- Require extraction reporting
- Regulate extractions
- Implement capital projects
- Assess fees to cover costs

Some exemptions for smaller private well owners

COURTESY - Marcus Trotta, Sonoma County Water Agency, 2015

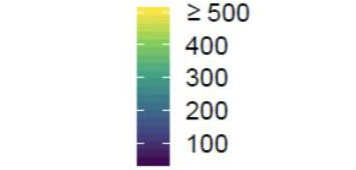
SGMA Activities that Inform Sustainable Management Criteria

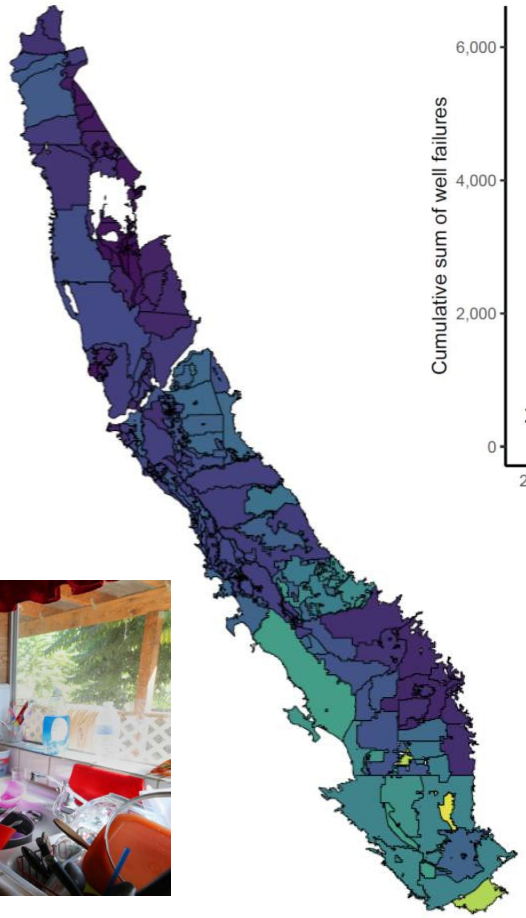
- Understand the basin setting:
  - Hydrogeologic conceptual model
  - Current and historical conditions
  - Estimated water budget
  - Potential management areas
- Inventory existing monitoring programs and evaluate and build potential representative monitoring points
- Engage interested parties (i.e. beneficial uses and users of groundwater)

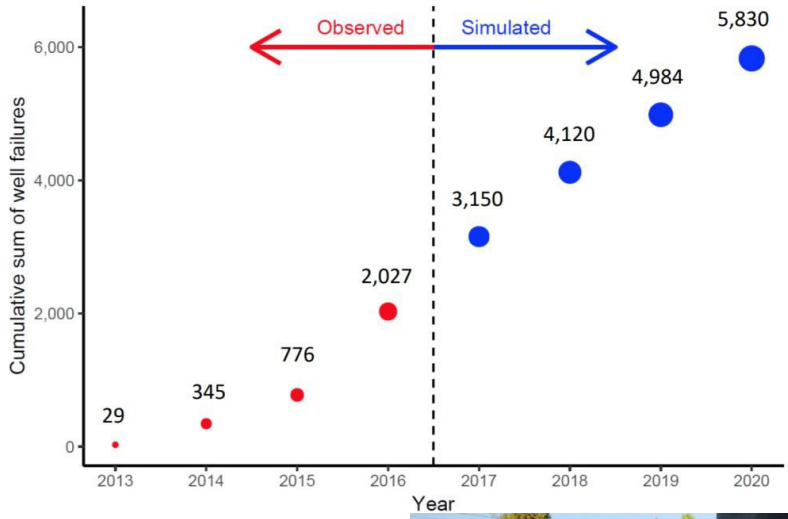


Minimum Thresholds must consider risk for drinking water well outages

Example: Central Valley








Jim Wilson/ The New York Times

[Rich Pauloo, 2019]
[Community Water Center, Drinking Water Tool, 2020]

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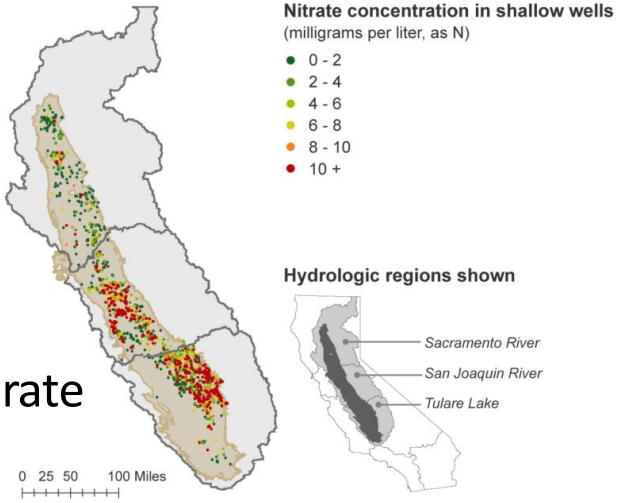
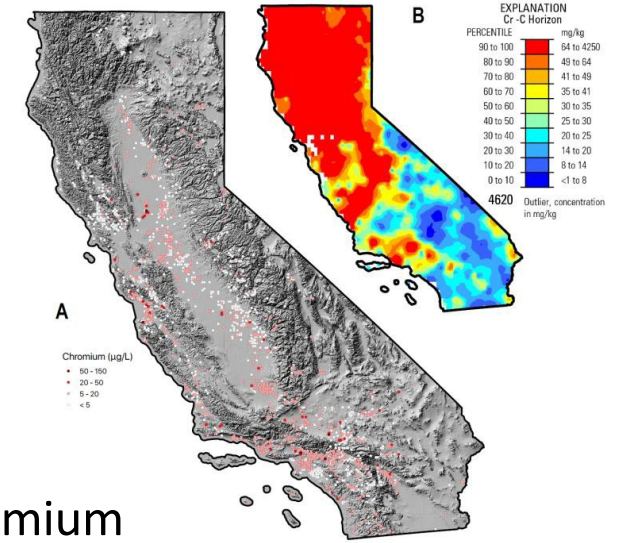
Nonpoint Source, Natural, and Legacy Contamination



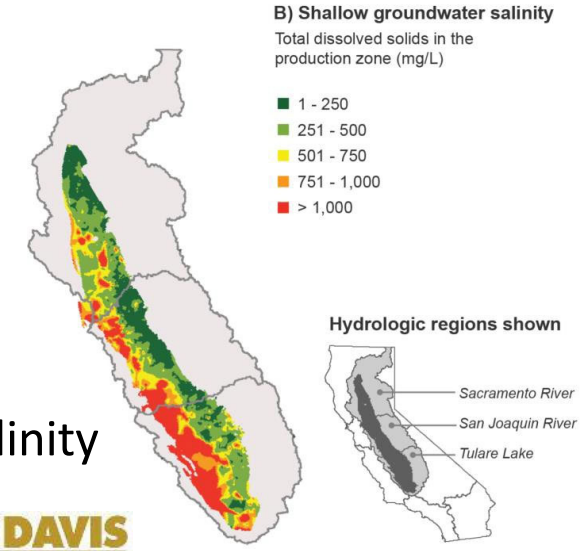
Nitrate

References:

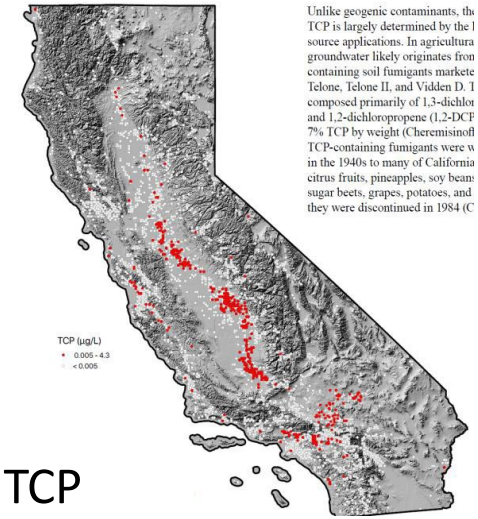
Pub Policy Inst Calif, 2019
Env Defense Fund, 2019
Ransom et al., SciTotEnv 2017
CV-SALTS, Ca Water Boards, 2019
GAMA, Ca Water Boards, 2019



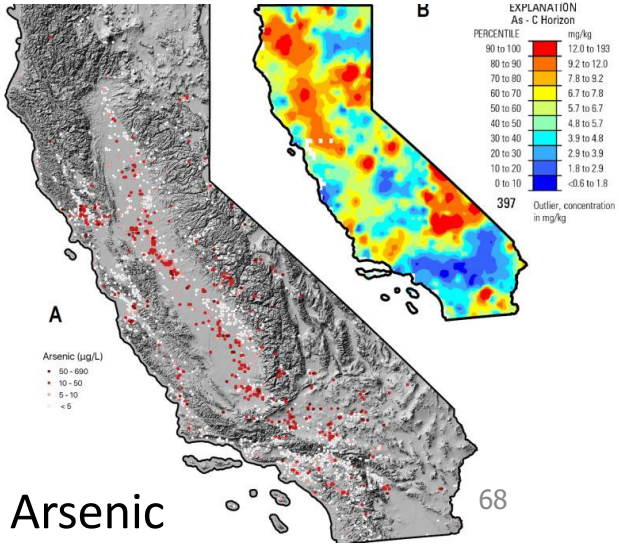
Chromium



Salinity



TCP



Arsenic

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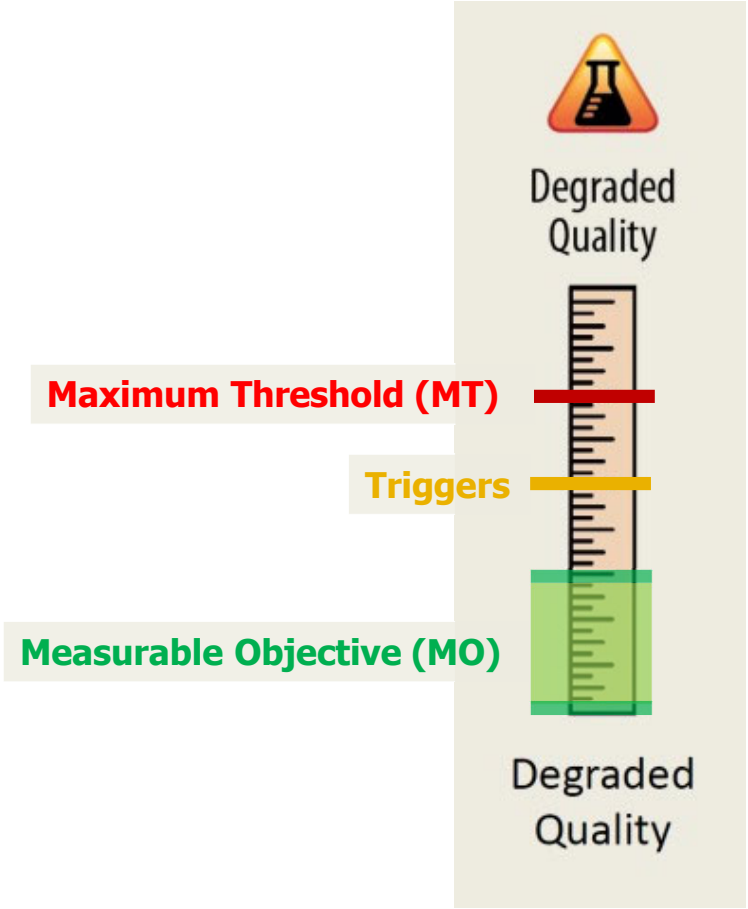
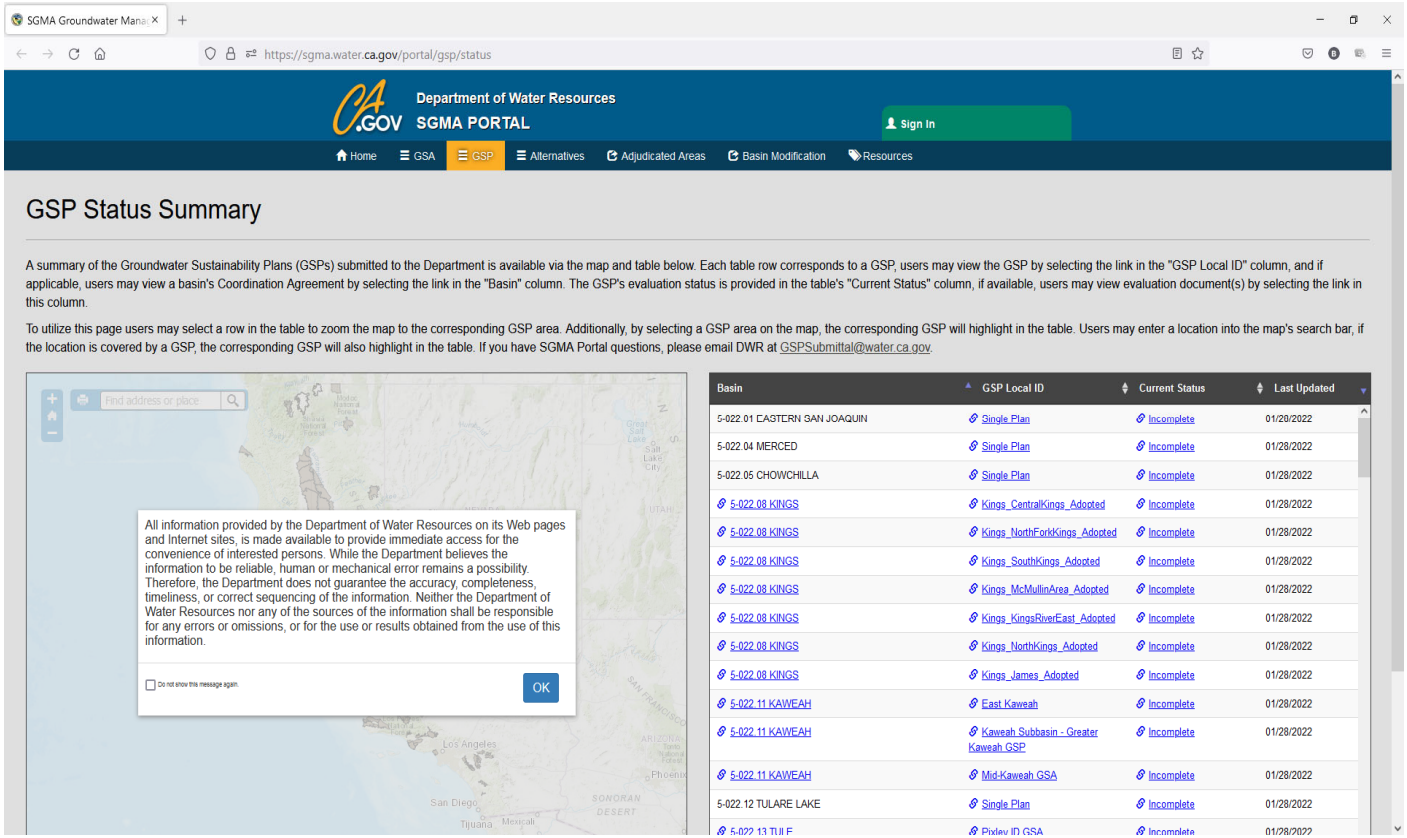
For Selected Constituents: Define Water Quality SMC

- Who will measure
- What to measure
- Where to measure
- When to measure
- What metric to use



All the Groundwater Sustainability Agency (GSA), Groundwater Sustainability Plans (GSP) are located at DWR website: https://sgma.water.ca.gov/portal/gsp/status

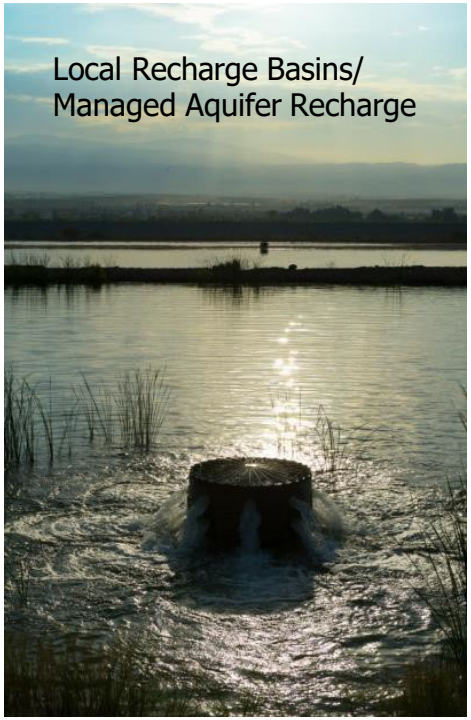


Existing Groundwater Quality Monitoring Programs and Networks

- Public water supply wells
  - Monitored regularly for key water constituents
- State small public water supply wells
  - Monitored regularly, but less frequent than PWS wells for some water constituents
- Domestic wells
  - Only sporadic monitoring, if any
- Agricultural/irrigation wells
  - Only sporadic monitoring, if any
- Monitoring wells
  - At contamination sites to guide/assess remediation

How will SGMA affect you?

- SGMA will affect your groundwater pumping
- SGMA establishes new responsibilities to share groundwater
- SGMA will change how we use land and water
- SGMA does not change water rights



Coachella Valley (Colorado River water)

SGMA plans will reflect local conditions and can include local solutions. Once approved by the state, the local plan represents a commitment to future actions.

Typical Plans for some S. CA GSPs include proposals such as:

- Well head meters
- Installation of CIMIS stations
- Rebate programs for irrigation improvements
- Fallowing
- Crop conversion
- Increased groundwater storage
- Subsidized reclaimed water

Potential to Reverse Depletion: Menu of PMAs

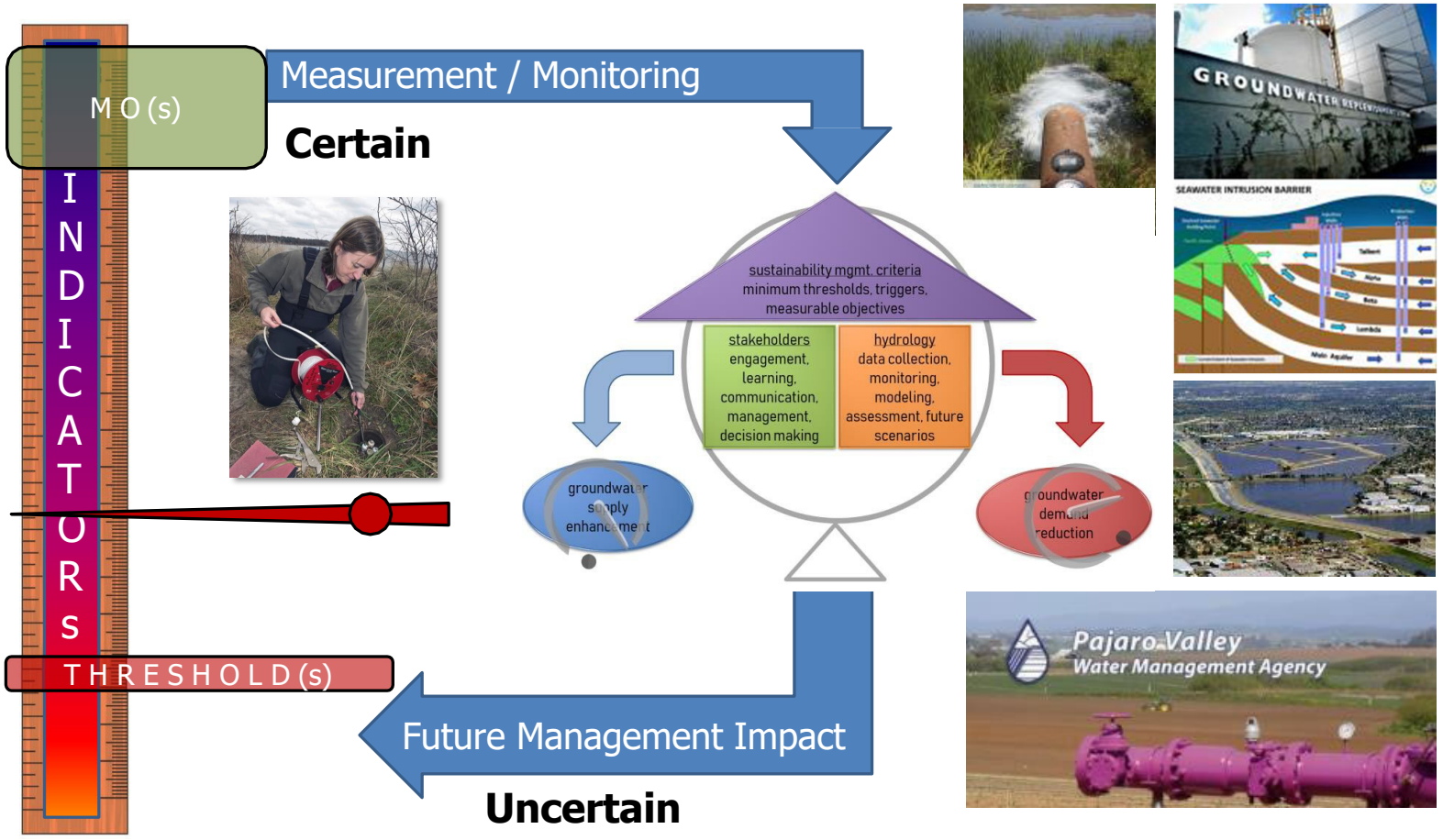
(Project and Management Actions)

Scenario information		
Scenario Type	Scenario ID	Scenario description
Enhanced Recharge	MAR	Divert surface water to over-irrigate fields and enhance groundwater recharge during the wet season (Dec-Mar) . Allow diversions from tributaries to continue as long as water is available (on a monthly volume basis).
	ILR	Divert surface water to irrigate fields during the growing season (Apr-Jun or Jul) in lieu of pumping groundwater. Allow diversions from tributaries to continue as long as water is available (on a monthly volume basis).
	MAR_ILR	Combination of MAR and ILR scenarios.
	Expanded MAR_ILR, 0.019	MAR and ILR on all old MAR and ILR fields and all other fields with Surface Water access. Assumed max infiltration rate of 0.019 m/day. CDFW instream flow recommendations restrict water available for MAR.
Crop change	80% Irrigation	Assumes unspecified irrigated crop change, reducing all irrigated acreage water demand by 20%.
	90% Irrigation	Assumes unspecified irrigated crop change, reducing all irrigated acreage water demand by 10%.
Irrigation Efficiency	Improve irrigation efficiency by 0.1	Effective irrigation efficiency of wheel line and center pivot on alfalfa and pasture improves by 0.1 (10%).
	Reduce irrigation efficiency by 0.1	Effective irrigation efficiency of wheel line and center pivot on alfalfa and pasture worsens by 0.1 (10%).
Irrigation schedule change	Alfalfa irrigation schedule - July 10 end date	Alfalfa irrigation ceases on July 10th of every growing season. (Basecase is Aug 31st)
	Alfalfa irrigation schedule - Aug 01 end date	Alfalfa irrigation ceases on Aug 1st of every growing season. (Basecase is Aug 31st)
	Alfalfa irrigation schedule - Aug 15 e	
	Aug 15 end date, *dry years onl*	se is Aug 31st)
Attribution - adjudicated area impacts	Natural Vegetation Outside Adjudicat (NVOA)	ping is turned off, revert to natural vegetation with a k_c value of 1.0. dicated zone. Increase ET extinction depth (in MODFLOW .ETS package) to
	Natural Vegetation, on Groundwater-source fields, Outside Adjudicated a GWM-OA)	roundwater and surface water" irrigation source. Assumes that these fields, or more of their area overlapping with the adjudicated zone are "inside" the utside the DIscharge Zone.
	Natural Vegetation Inside Adjudicat (NVIA)	ing is turned off, revert to natural vegetation with a k_c value of 1.0. 4.5 m in native vegetation areas outside the DIscharge Zone.
	Natural Vegetation, on Groundwater- or Mixed-source fields, Inside Adjudicated area (NV-GWM-IA)	Turns off pumping for wells serving fields **inside** the adjudicated zone, which have a "groundwater" or "mixed groundwater and surface water" irrigation source. Assumes that these fields, where pumping is turned off, revert to natural vegetation with a k_c value of 1.0. Assumes that all fields with 5% or more of their area overlapping with the adjudicated zone are "inside" the adjudicated zone. Increase ET extinction depth (in MODFLOW .ETS package) to 4.5 m in native vegetation areas outside the DIscharge Zone.
	Natural Vegetation (NV)	Turns off pumping for wells serving **all irrigated fields** in the SVIHM model. Assumes that these fields, where pumping is turned off, revert to natural vegetation with a k_c value of 1.0. Assumes that all fields with 5% or more of their area overlapping with the adjudicated zone are "inside" the adjudicated zone. Increase ET extinction depth (in MODFLOW .ETS package) to 4.5 m in native vegetation areas outside the DIscharge Zone.
	Natural Vegetation on all Groundwater- or Mixed-source fields (NV-GWM)	Turns off pumping for wells serving **all irrigated fields** which have a "groundwater" or "mixed groundwater and surface water" irrigation source. Assumes that these fields, where pumping is turned off, revert to natural vegetation with a k_c value of 1.0. Assumes that all fields with 5% or more of their area overlapping with the adjudicated zone are "inside" the adjudicated zone. Increase ET extinction depth (in MODFLOW .ETS package) to 4.5 m in native vegetation areas outside the DIscharge Zone.
Reservoir	Reservoir, 30 cfs release, Shackleford	Simulates a 9 TAF reservoir on the Shackleford Creek tributary by withholding wet-season flow and releasing it during the dry season according to set operations rules.
	Reservoir, 30 cfs release, Etna	Simulates a 9 TAF reservoir on the Etna Creek tributary by withholding wet-season flow and releasing it during the dry season according to set operations rules.
	Reservoir, 30 cfs release, French	Simulates a 9 TAF reservoir on the French Creek tributary by withholding wet-season flow and releasing it during the dry season according to set operations rules.
	Reservoir, 30 cfs release, S. Fork	Simulates a 9 TAF reservoir on the South Fork tributary by withholding wet-season flow and releasing it during the dry season according to set operations rules.
100% reliable reservoir	100% reliability 30 cfs release	Simulates a 29 TAF reservoir on the Etna Creek tributary by withholding wet-season flow and releasing it during the dry season according to set operations rules.
	100% reliability 60 cfs release	Simulates a 29 TAF reservoir on the Etna Creek tributary by withholding wet-season flow and releasing it during the dry season according to set operations rules.

Performance Measures Implementation Plan

4x 5-Year Review Cycles

20 Years to Sustainability



The Road to Sustainability

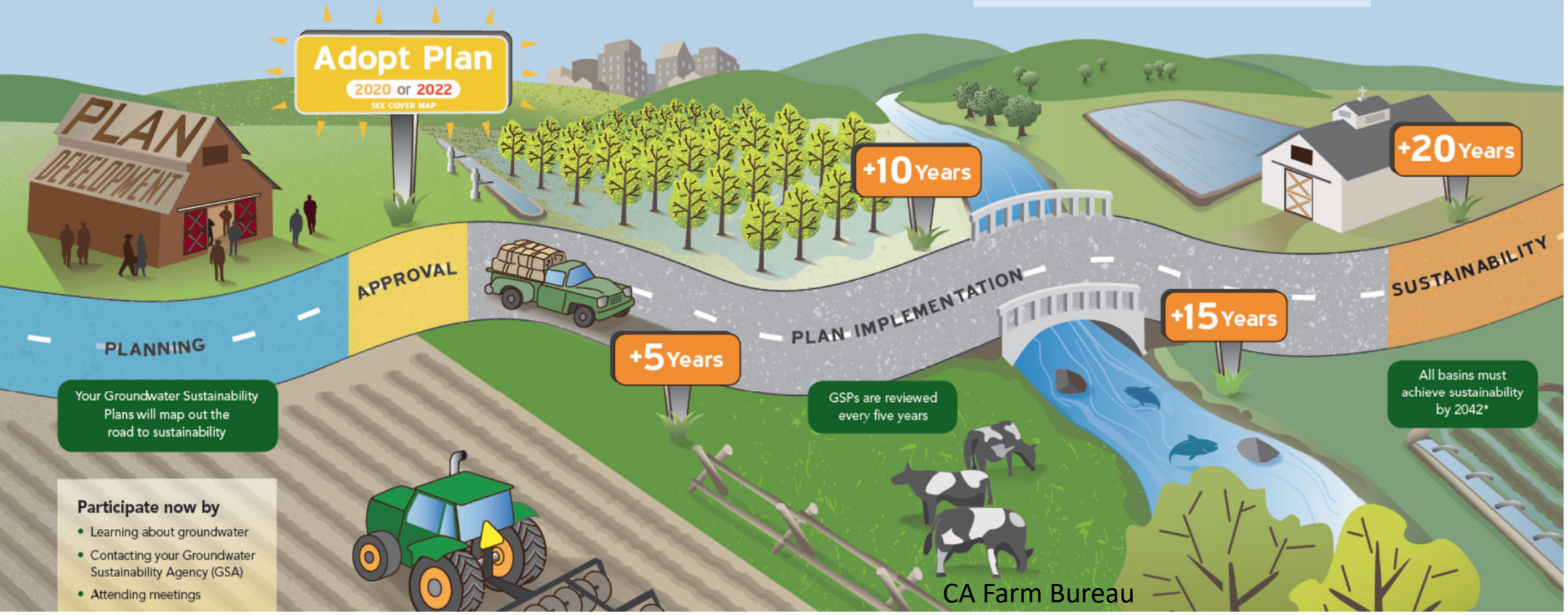
SGMA plans will reflect local conditions and can include local solutions. Once approved by the state, your local plan represents a commitment to future actions.

Let's be clear:

- SGMA will affect your groundwater pumping
- SGMA establishes new responsibilities to share groundwater
- SGMA will change how we use land and water
- SGMA does not change water rights

Learn and Engage!

Participate now to represent your interest. SGMA stresses local group formation, local plans and local management.



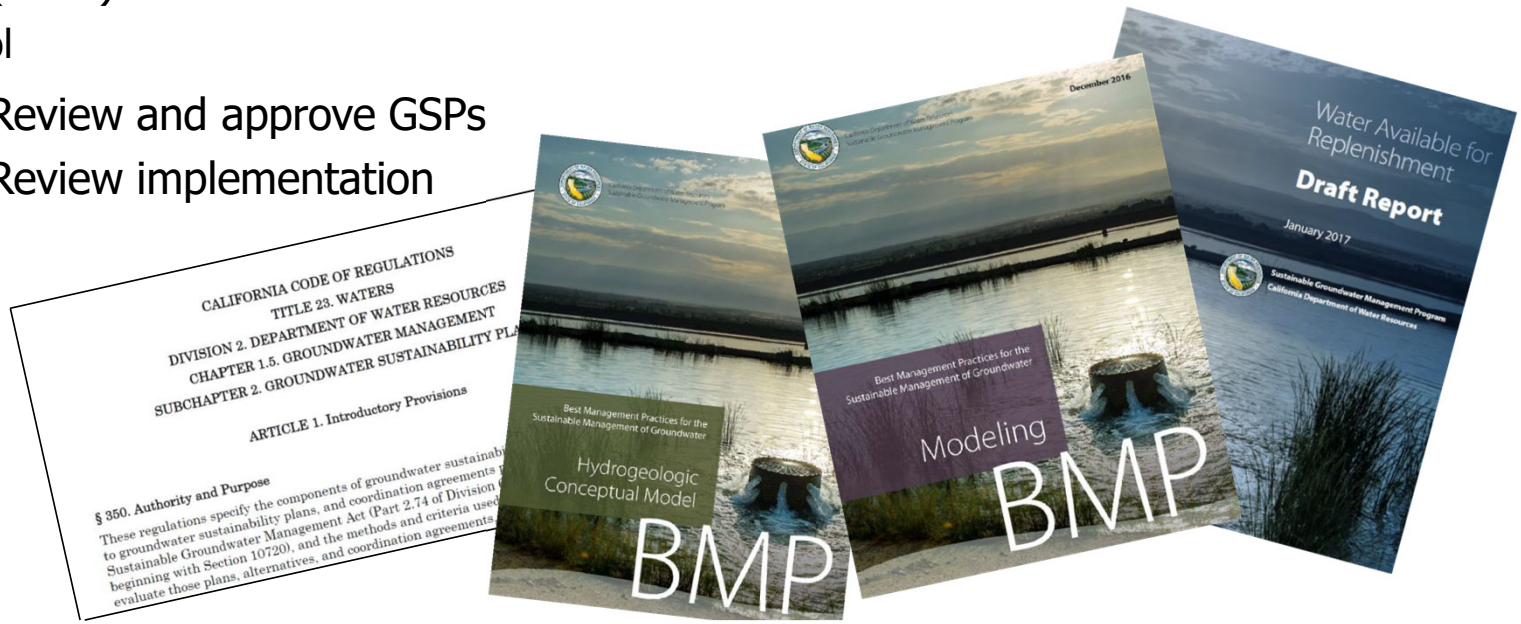
Participate now by

- Learning about groundwater
- Contacting your Groundwater Sustainability Agency (GSA)
- Attending meetings

CA Farm Bureau

Role of the State: **Carrot**

- Department of Water Resources has a key role:
  - Technical assistance and funding (Prop 1: $100 million for SGMA) (ongoing)
  - Regulation
    - Groundwater basin boundary adjustments (2016)
    - Minimum regulations and guidelines for appropriate GSP (2016)
  - Control
    - Review and approve GSPs
    - Review implementation



"Toward Sustainable Groundwater in Agriculture, 2016"
Video Library:
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