A NEW ERA OF LIMITS: Agriculture and Water

Dave Puglia

Farm Foundation Round Table

January 8th, 2015

Orlando, Florida

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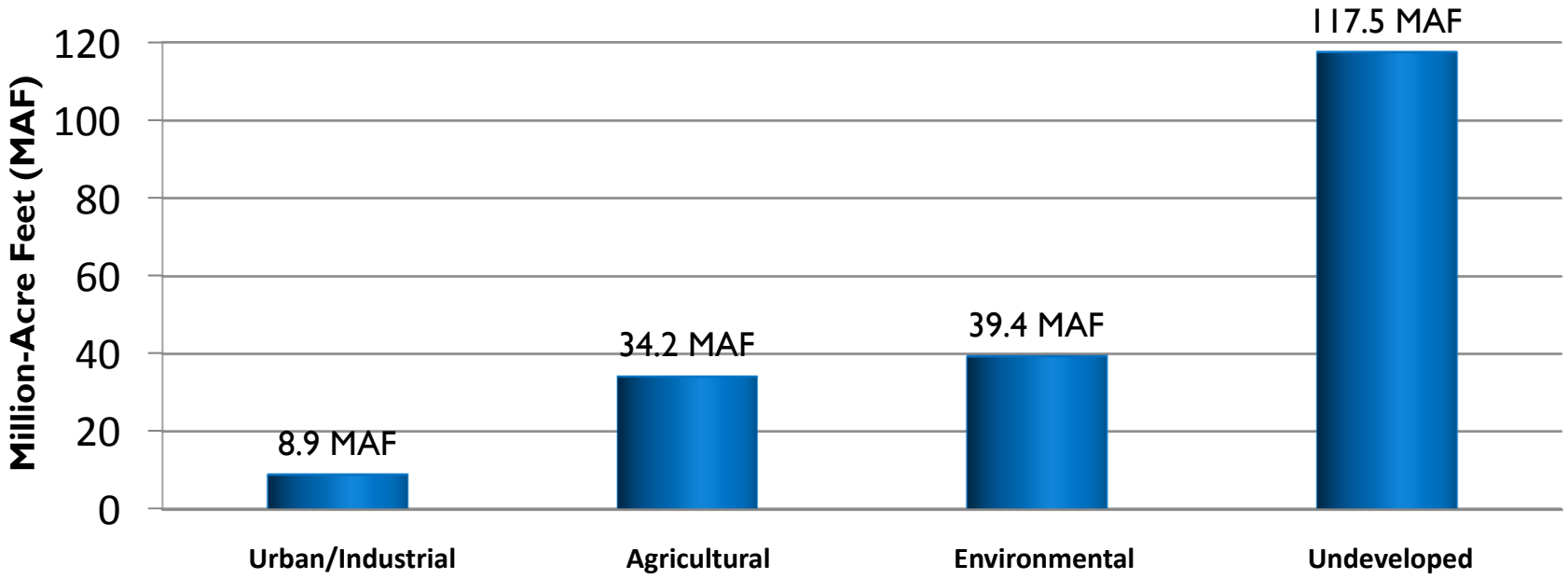
Mother Nature's Blessings

California's Average Annual Water Supply and Use



	Urban/Industrial	Agricultural	Environmental	Undeveloped
Developed (82.5 MAF)	8.9	34.2	39.4	-
CA Water (200.0 MAF)	8.9	34.2	39.4	117.5
Developed (%)	10.8%	41.5%	47.8%	-
CA Water (%)	4.5%	17.1%	19.7%	58.8%

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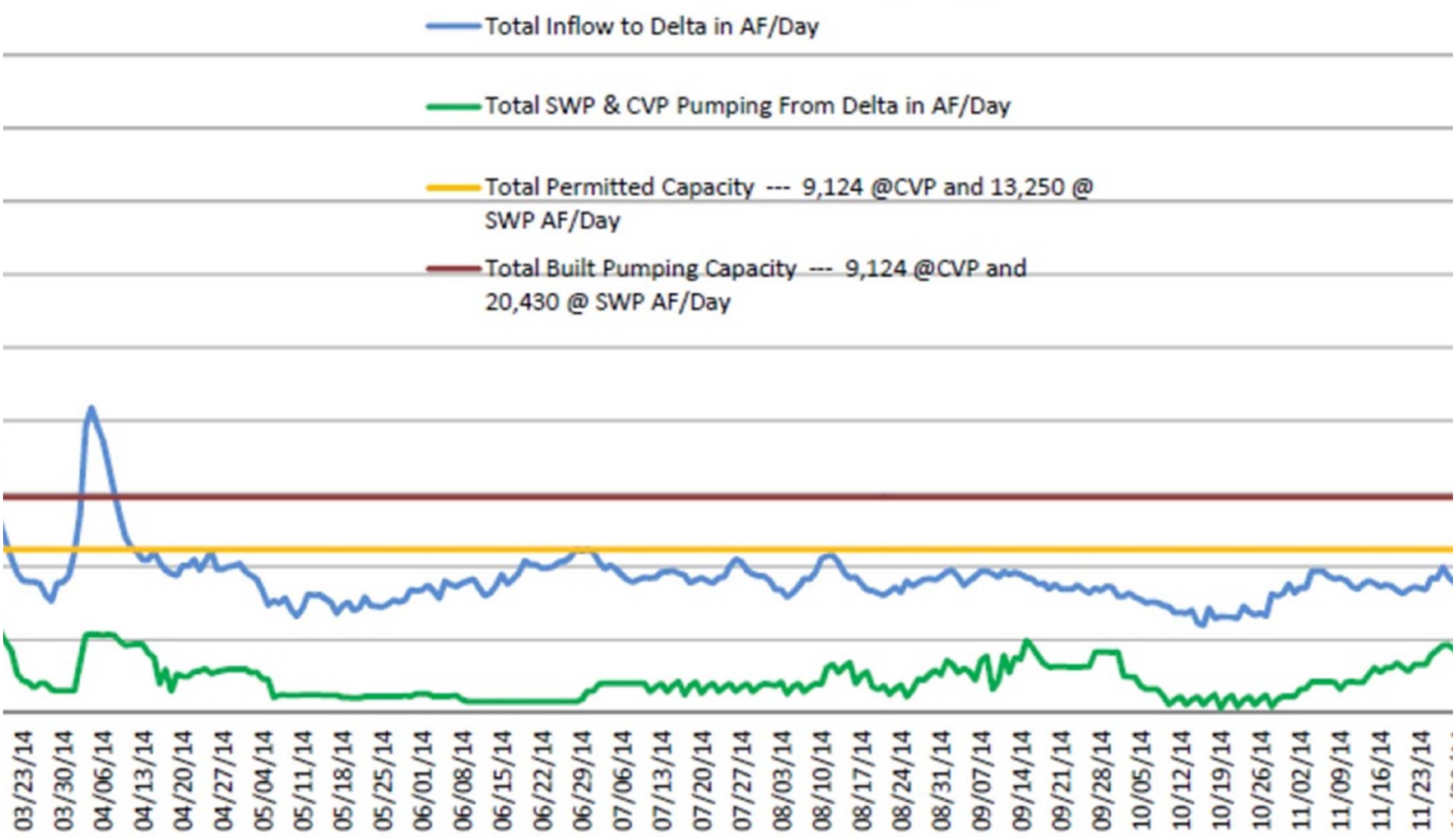
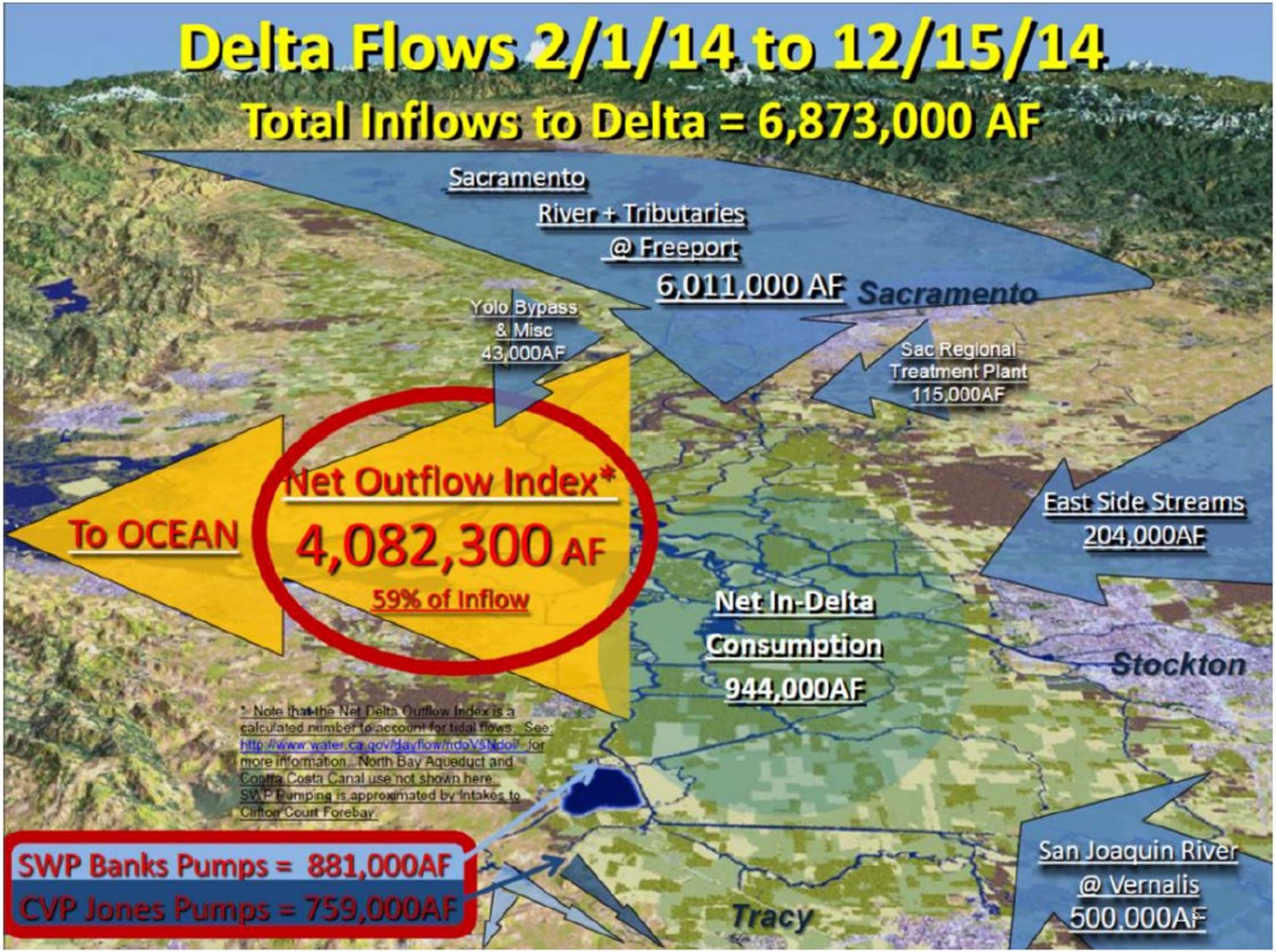
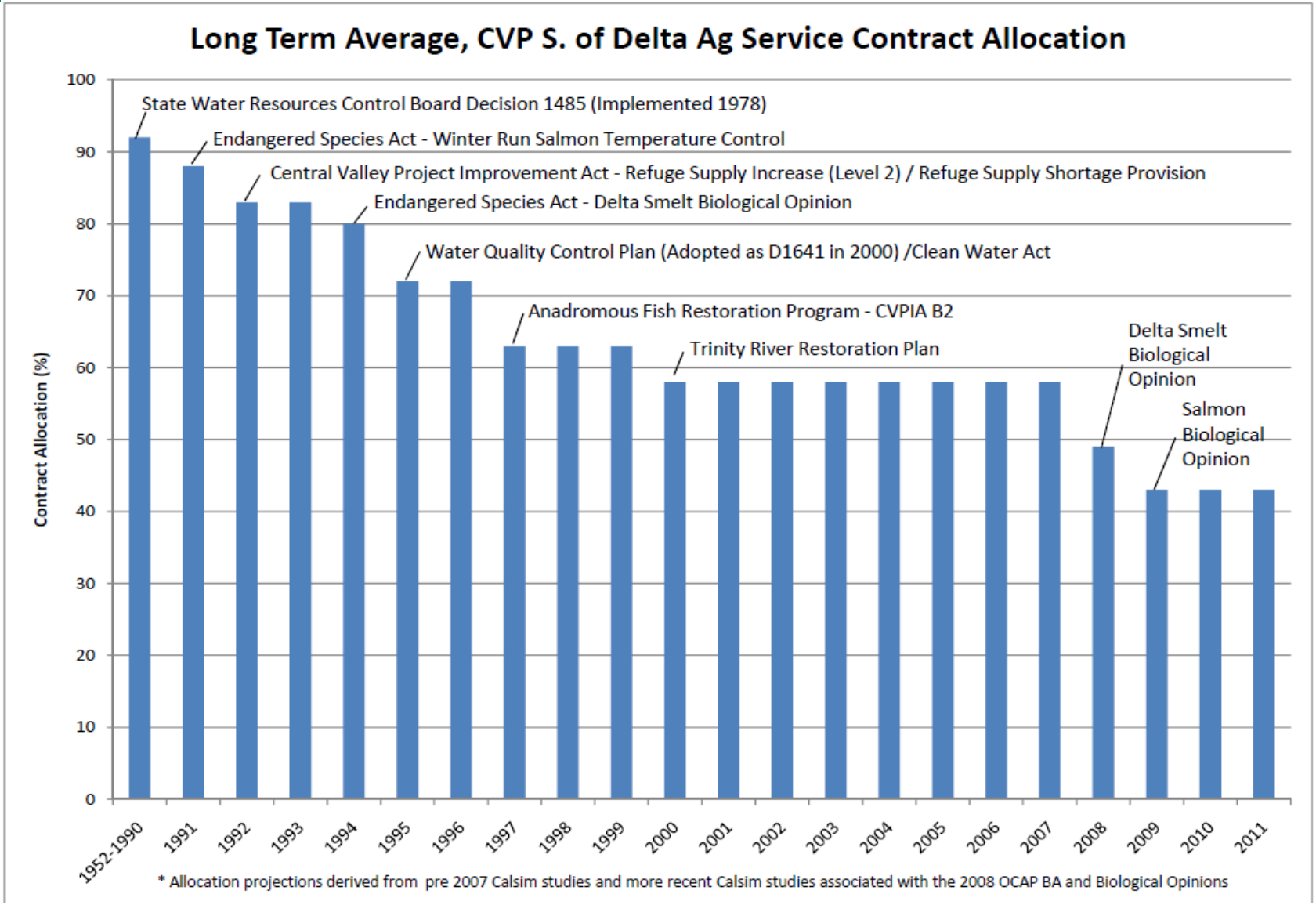
Water Storage & Distribution in CA

San Joaquin/Sacramento Delta Inflows and Actual Central Valley Project + State Water Project Pumping vs. Capacity for Pumping

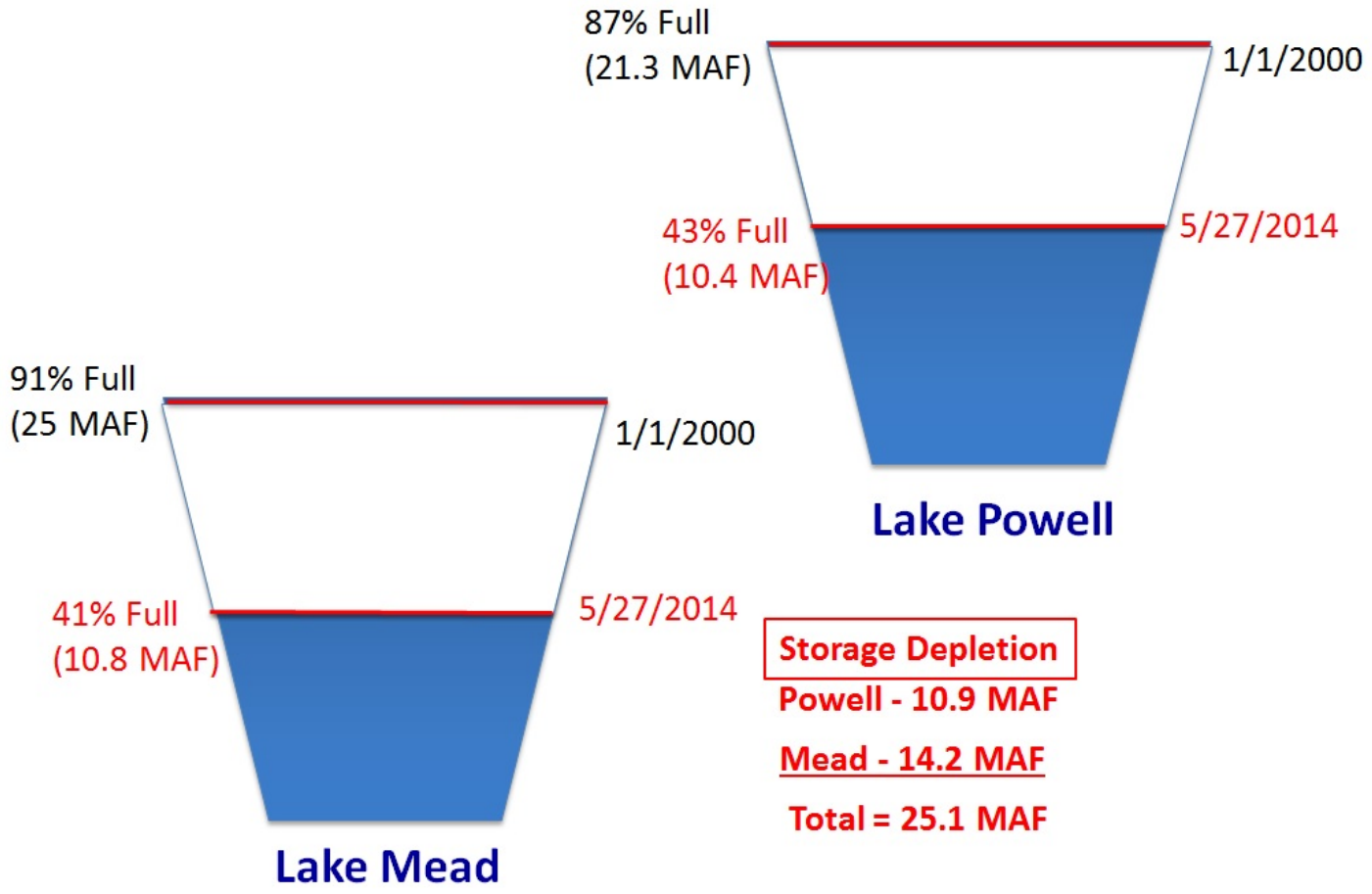



Delta Flows 2/1/14 to 12/15/14
Total Inflows to Delta = 6,873,000 AF
Sacramento River + Tributaries @ Freeport
6,011,000 AF
Sacramento
Yolo Bypass & Misc 43,000AF
Sac Regional Treatment Plant 115,000AF
East Side Streams 204,000AF
To OCEAN
Net Outflow Index*
4,082,300 AF
59% of Inflow
Net In-Delta Consumption 944,000AF
Stockton
* Note that the Net Delta Outflow Index is a calculated number to account for tidal flows. See http://www.water.ca.gov/dayflow/hdoVsNdoi/ for more information. North Bay Aqueduct and Contra Costa Canal use not shown here. SWP Pumping is approximated by Intakes to Clifton Court Forebay.
SWP Banks Pumps = 881,000AF
CVP Jones Pumps = 759,000AF
Tracy
San Joaquin River @ Vernalis 500,000AF

Lost Water: SAC-SJ Delta Operations Rebalancing Conveyance & "Flows"



Colorado River System Storage



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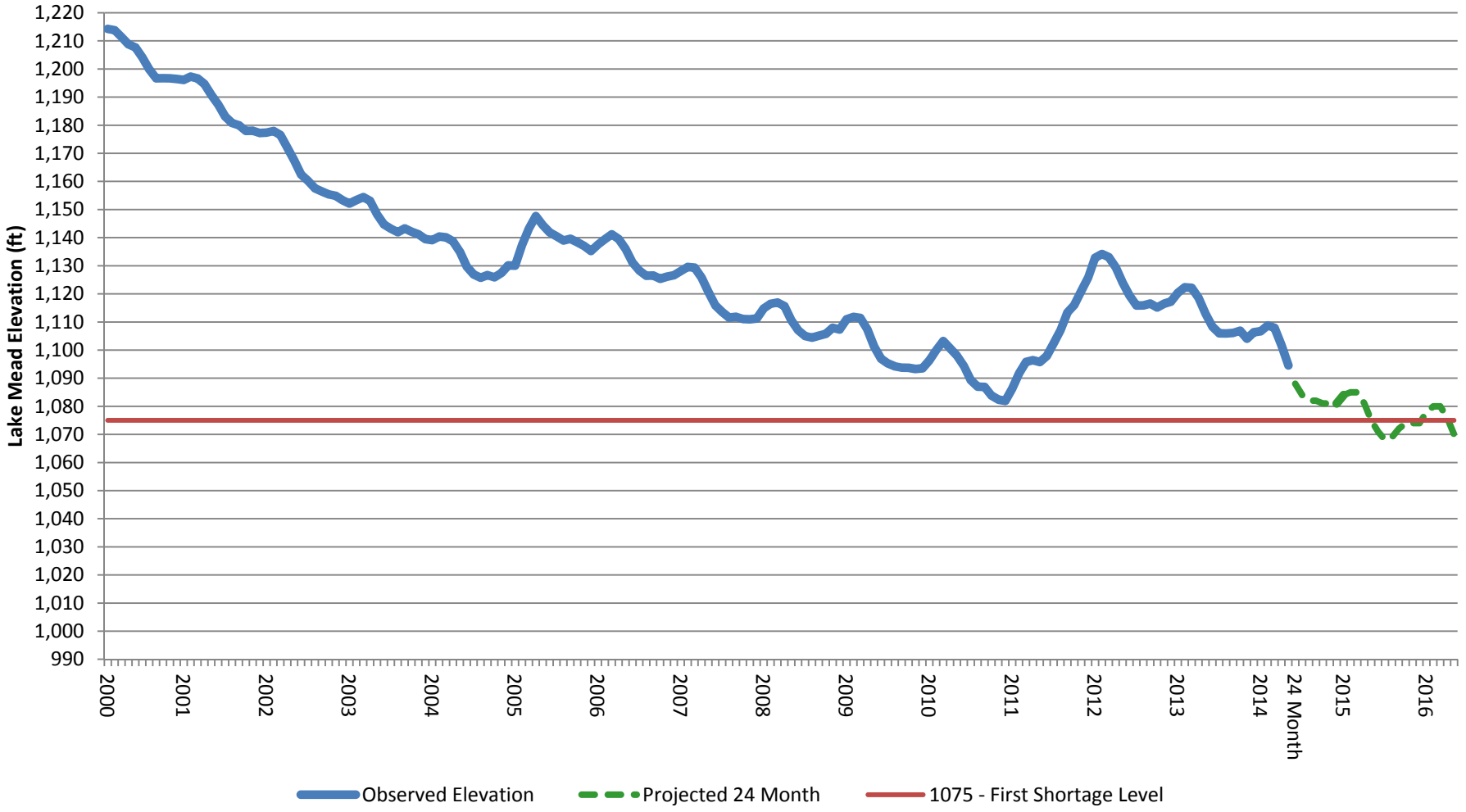
Lake Mead Since 2000



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Water Budget at Lake Mead

Inflow	= 9.0 maf
(release from Powell + side flows)	
Outflow	= - 9.6 maf
(AZ, CA, NV, and Mexico delivery + downstream regulation and gains/losses)	
Mead evaporation losses	= - 0.6 maf
Balance	**= - 1.2 maf**

Given basic apportionments in the Lower Basin, the allotment to Mexico, and an 8.23 maf release from Lake Powell, Lake Mead storage declines about 12 feet each year.

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Risk to All Colorado River Users

- Without equalization or corrective action, Lake Mead will fall below elevation 1000 in 5-8 years
- If Lake Mead is below elevation 1000:
  - Impacts SNWA ability to withdraw water
  - Less that 4.5 MAF left in storage in Lake Mead
  - Reduced power generation and efficiency at Hoover Dam, potential cavitation or vibration damage

- ***What will the Secretary of the Interior do?***

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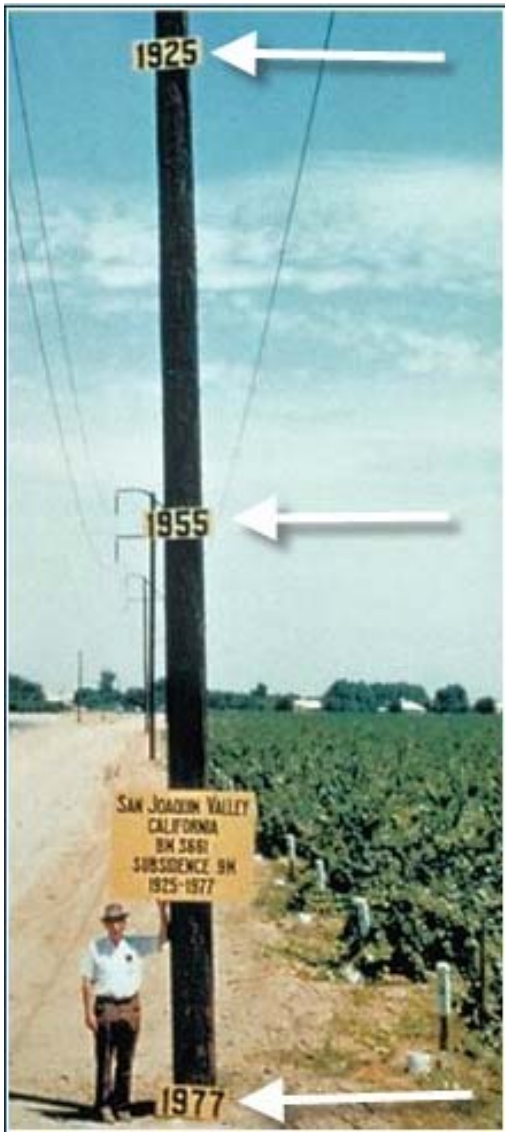
Focus on Groundwater

- USGS researcher Joseph F. Poland stands at the approximate location of maximum land subsidence in the United States, located in the San Joaquin Valley, southwest of Mendota, California.



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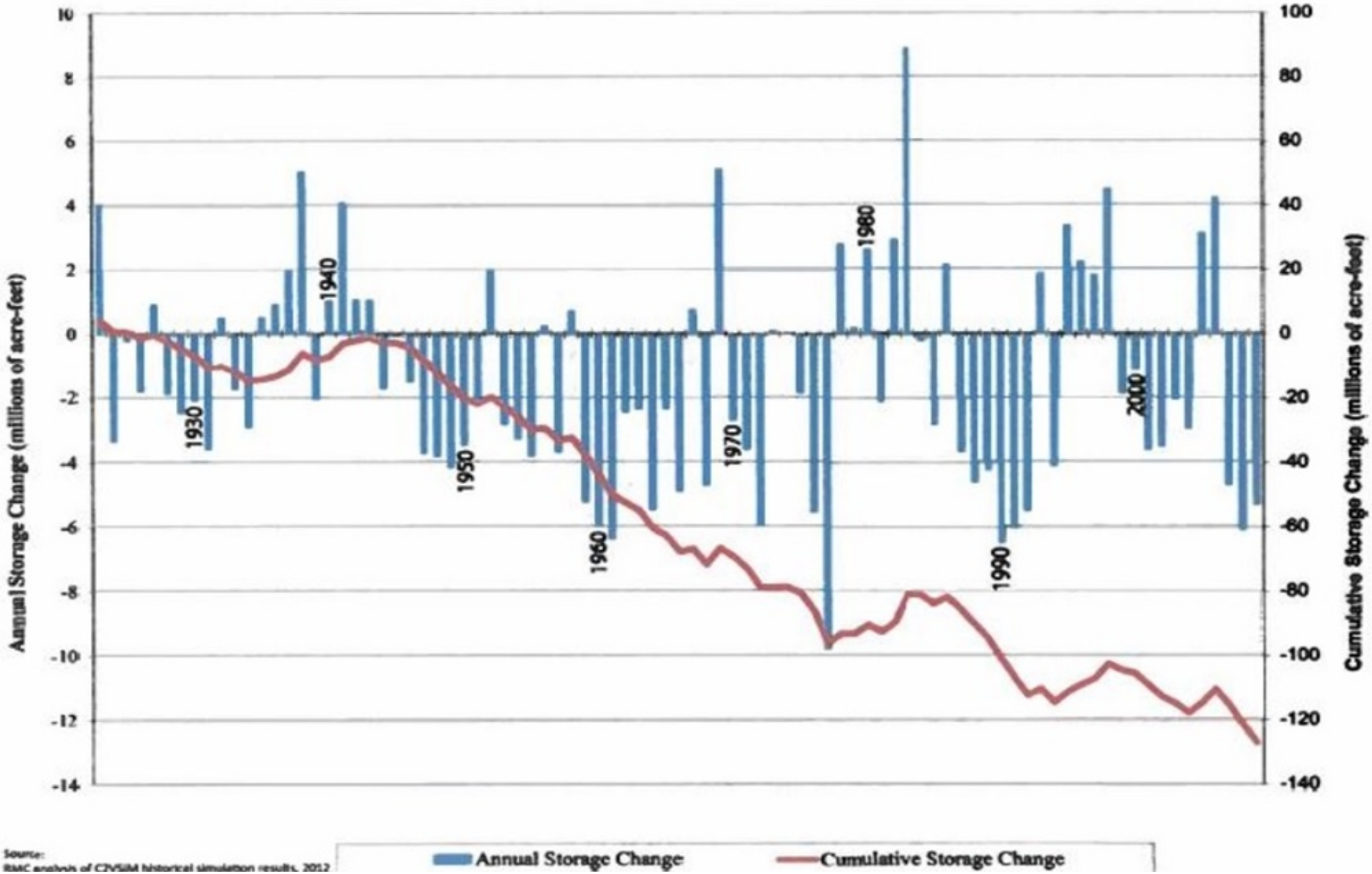
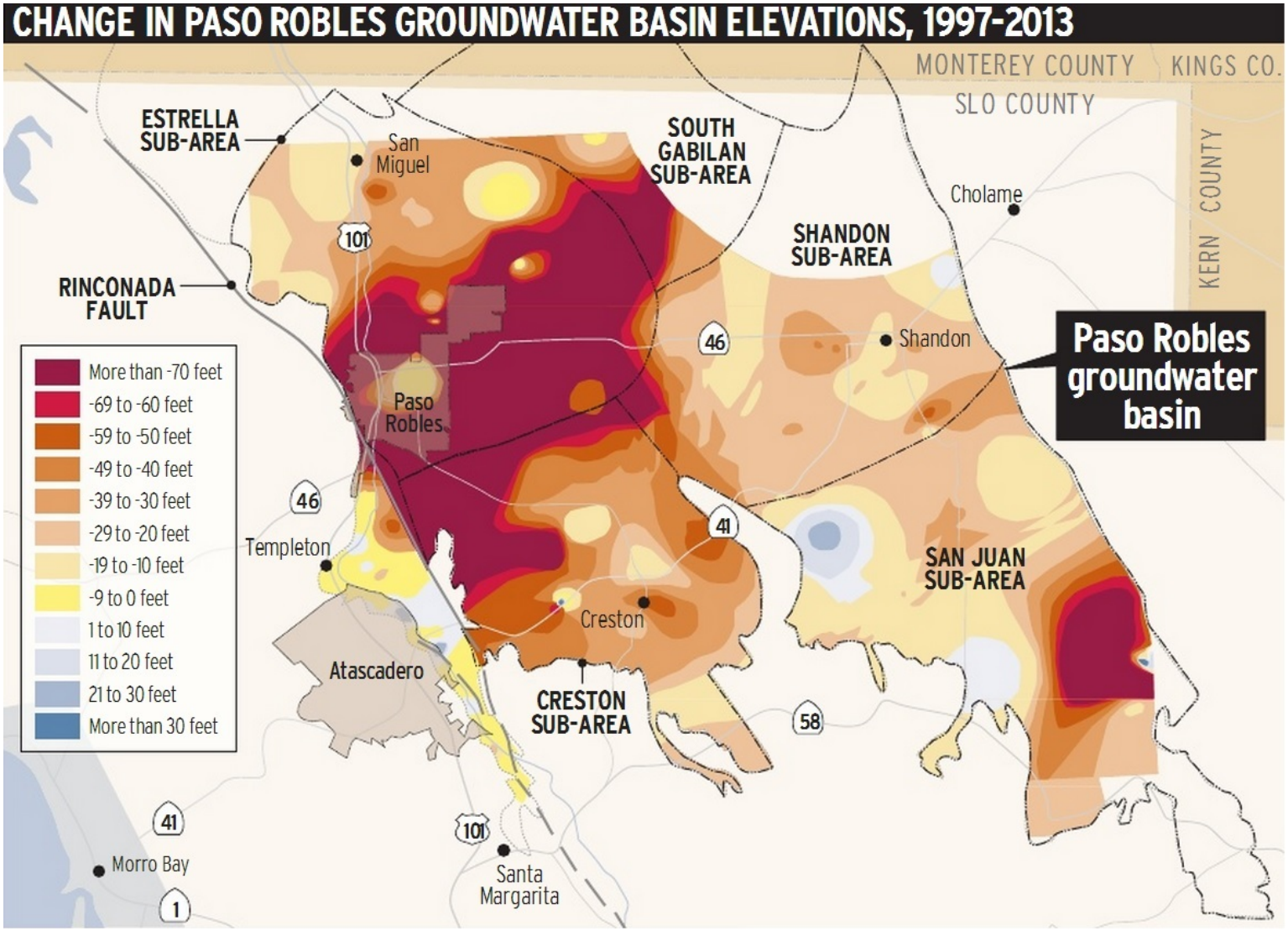
Central Valley Overdraft Since 1922

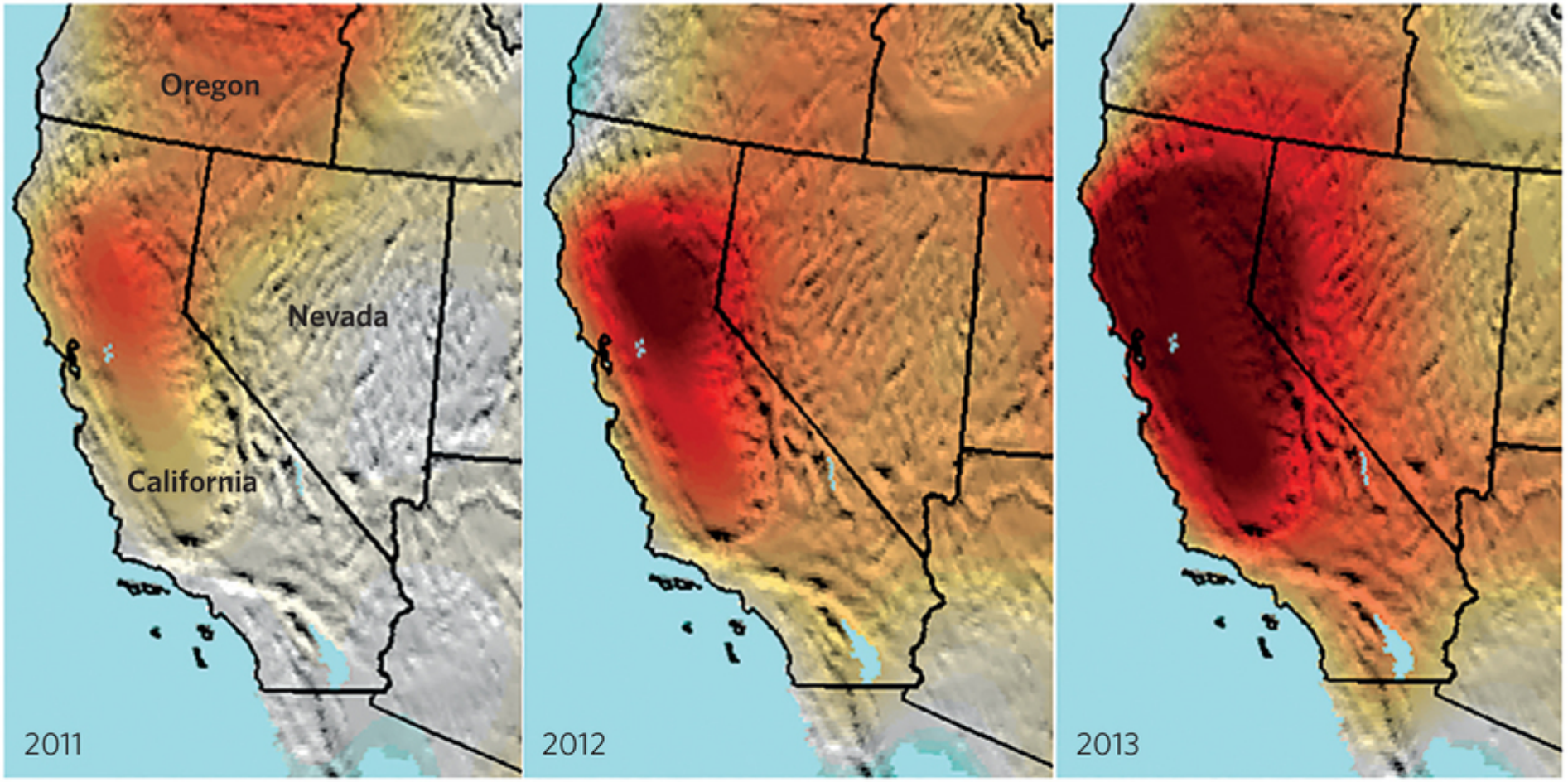


Source:

Paso Robles: Urban growth + Ag growth + Insufficient Infrastructure = ?



NASA's Gravity Recovery and Climate Experiment (GRACE) Satellite Mission



Ogallala Aquifer

- Supports 27% of U.S. irrigated farmland ($20 billion of food and fiber such as corn, soy, wheat, livestock, and cotton)
- Between 1949-1974, annual GW withdrawal quadrupled
- 1975 overdraft equaled the flow of the Colorado River; today's annual overdraft volume is equal to 18 Colorado Rivers.
- Water table is dropping as much as 2 feet/year in some counties
- 30% of Kansas portion is gone; another 39% will be used up within 50 years at current rate
- Once depleted, it would take 6,000 years of rainfall to replenish the aquifer

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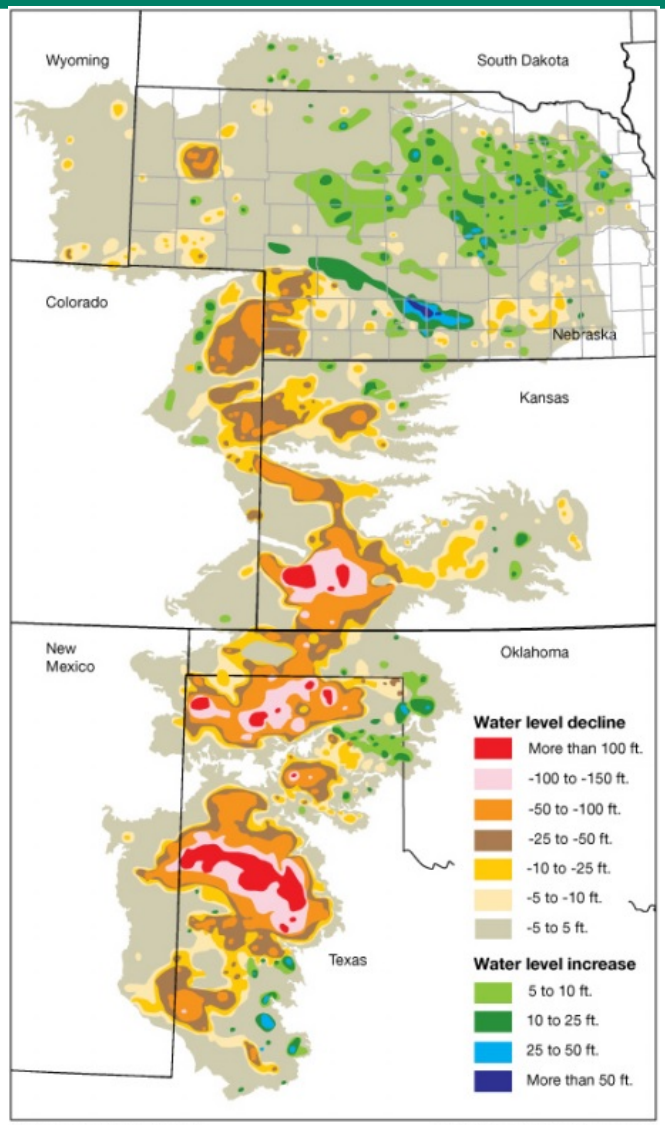
Ogallala Aquifer Overdraft

(Pre-Irrigation Development - 2011)



Source: U.S. Geological Survey

SHEILA STORY/Lincoln Journal Star

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Groundwater Depletion in the U.S.

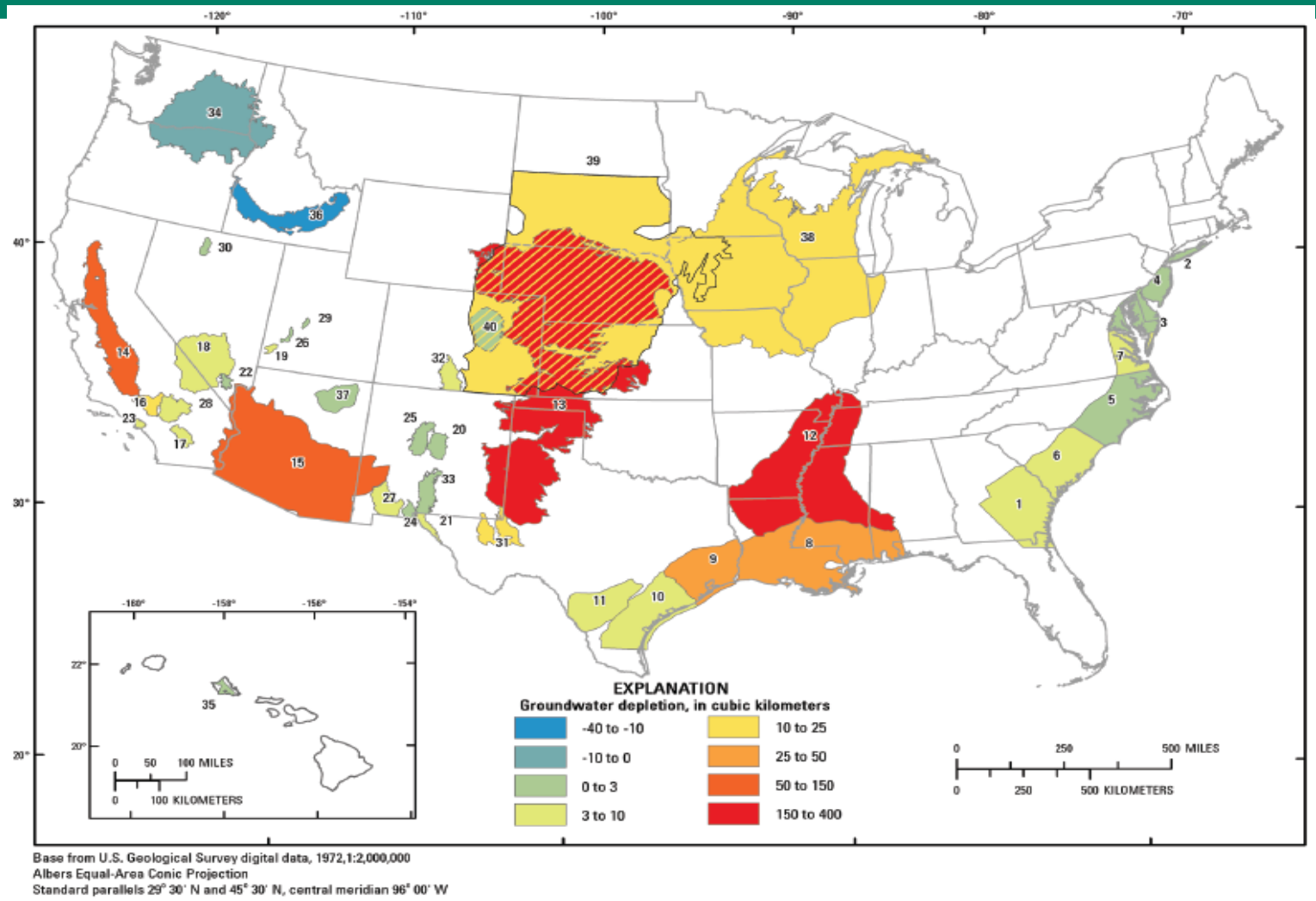

Figure 2. Map of the United States (excluding Alaska) showing cumulative groundwater depletion, 1900 through 2008, in 40 assessed aquifer systems or subareas. Index numbers are defined in table 1. Colors are hatched in the Dakota aquifer (area 39) where the aquifer overlaps with other aquifers having different values of depletion.

Stretching Each Drop

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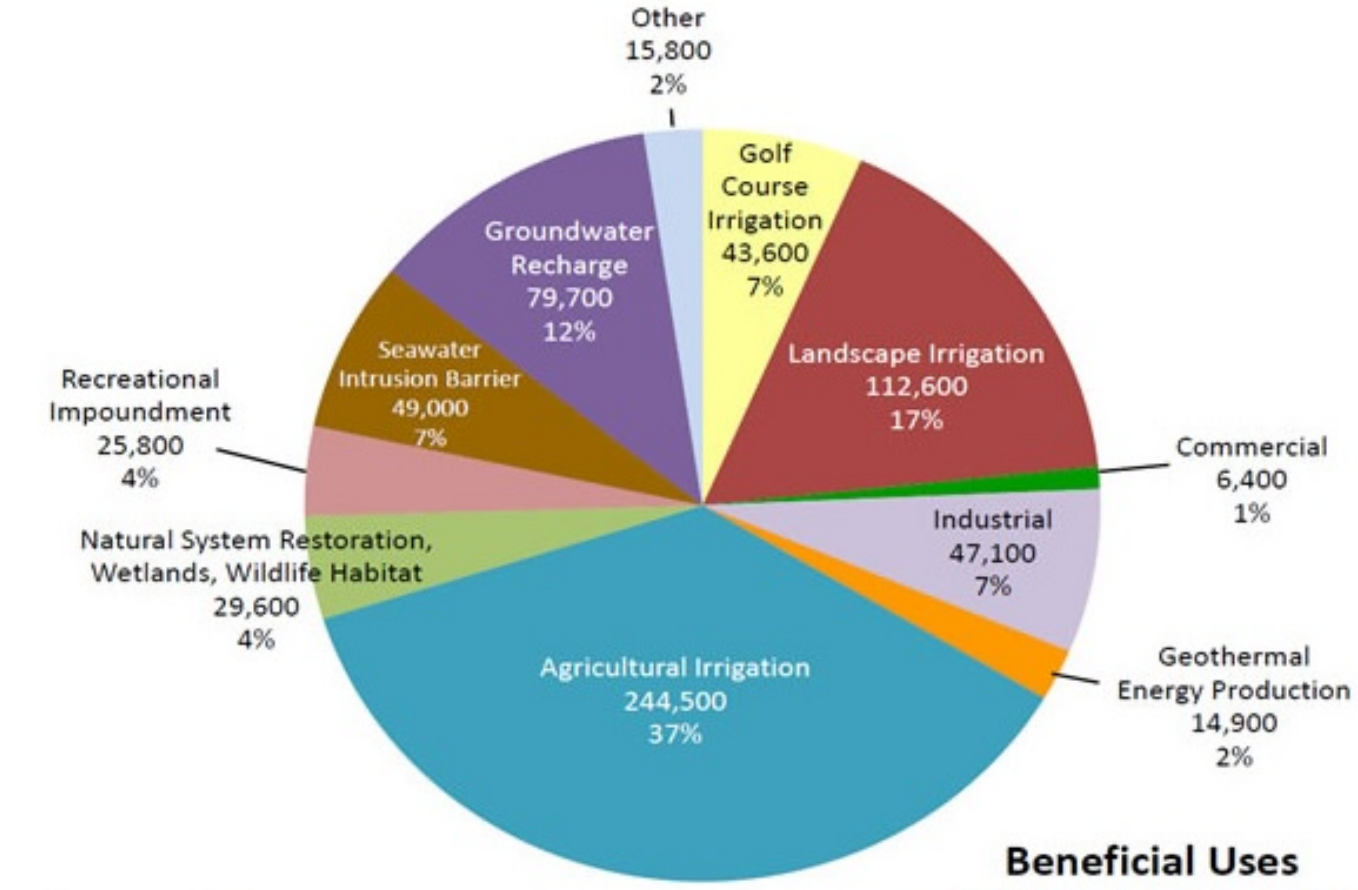
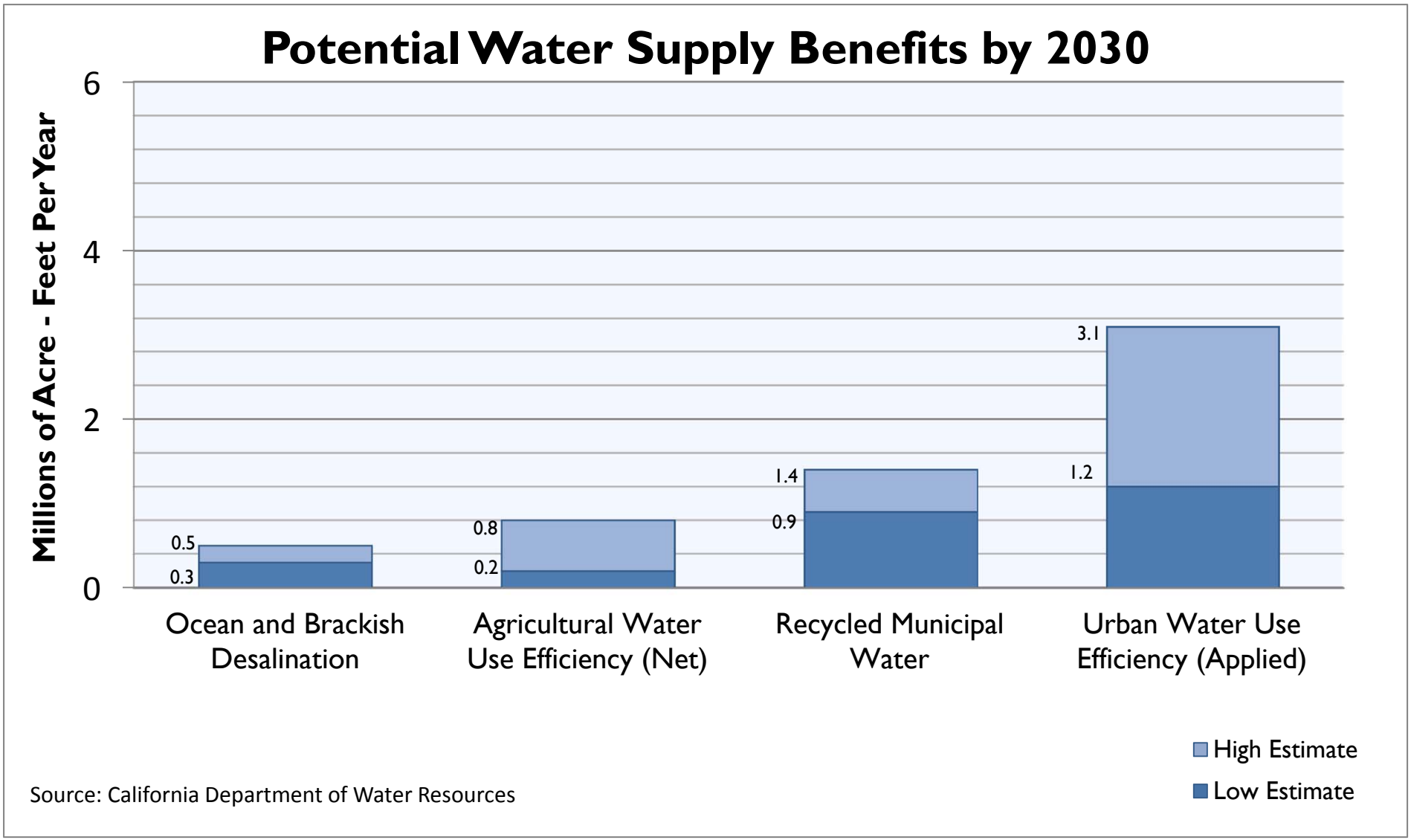
Uses of Reclaimed Water



Source: California Department of Water Resources

Stretching Water Supplies



Source: California Department of Water Resources

Water Quality Regulations

Central Coast (Region 3) / Central Valley (Region 5)

- Proposed Regulation: any water run-off must be of drinking water quality
- Final Regulation: must show progress towards water quality improvements of run-off towards drinkable quality (by 2017?).

- **San Joaquin Valley Order (Region 5)**
  - Proposed Regulation: No nitrogen leaching below the root zone
  - Final Regulation: any leaching must be part of a Management Practices Effectiveness Program within the Irrigated Lands Program (a "science project" that is in the works).

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Source Diversification is the Future

- Transparency, environmental concerns, and social contract have changed the equation
- Economic diversity and ag's disconnect from urban population feed perception of supply imbalance
- Making "new" water supplies economically feasible is today's challenge

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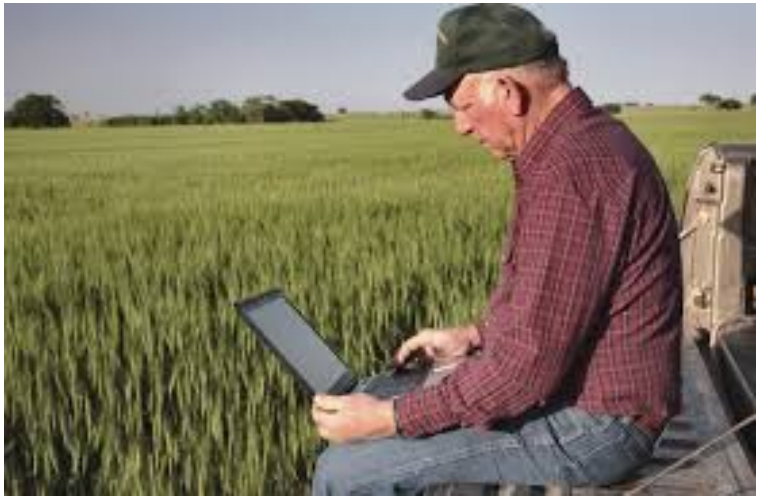
The Future of Agriculture



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