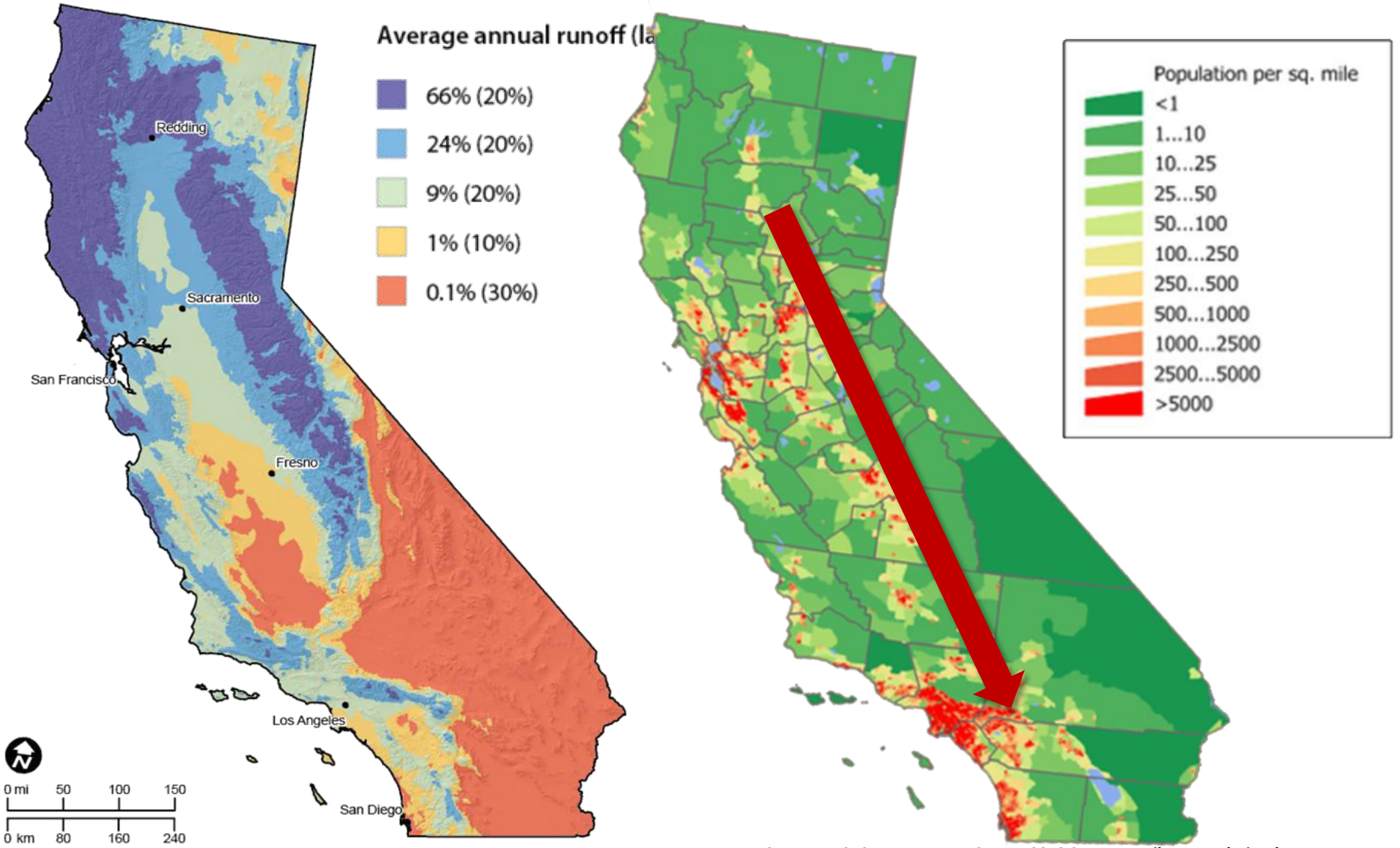
Balancing Ecosystem Recovery and Water Supply in a Highly Modified Environment: The California Story

Dr. David Zippin, ICF International
San Francisco, CA USA

Presentation Outline

- California's Water: Now
- California's Water: The Future
- Three Approaches to Balancing Water Supply and Ecosystem Recovery

California Rainfall and Population



Source: U.S. Census Bureau Census 2012 Summary File 1 population by census tract

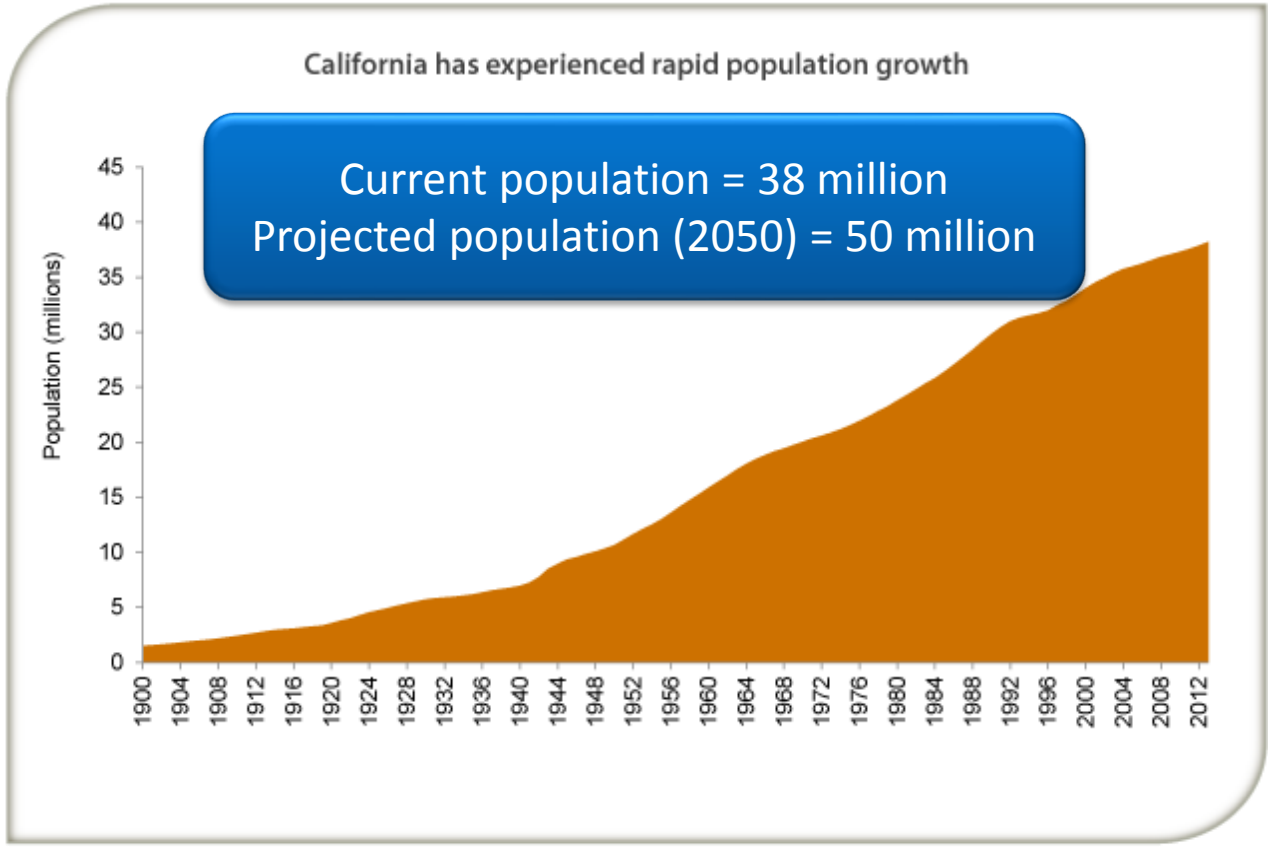
State and Federal Water Projects

- 54 reservoirs and lakes
- 1,200 miles of canals and pipelines
- 16 hydro facilities

Largest publically-built and operated water supply project in the world

Bay-Delta is the <u>hub</u> of this infrastructure

California Population Growth

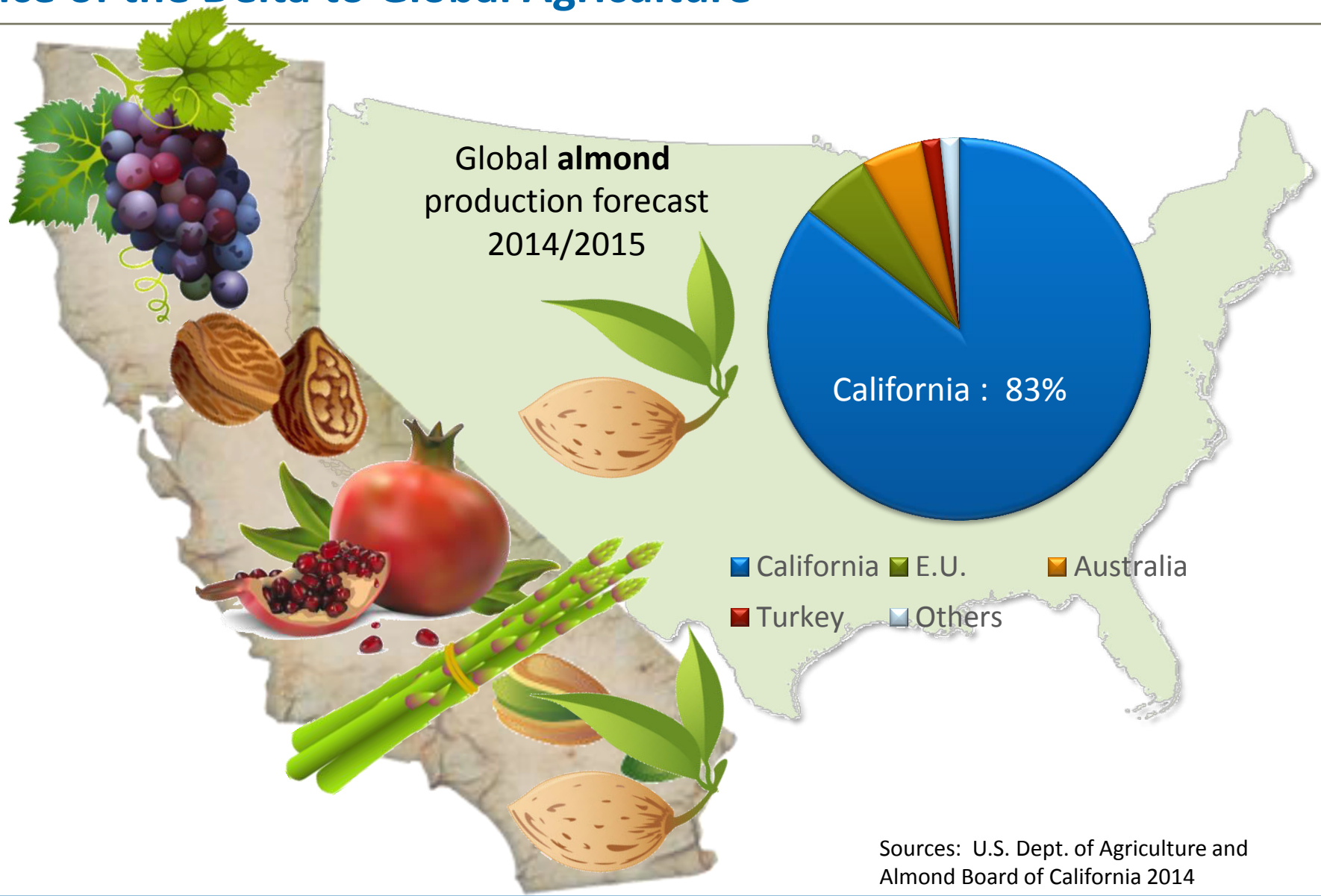


Source: California Department of Finance estimates.

From: Just the Facts: California's Population, PPIC, 2014.

1960 Population = 15.7 million

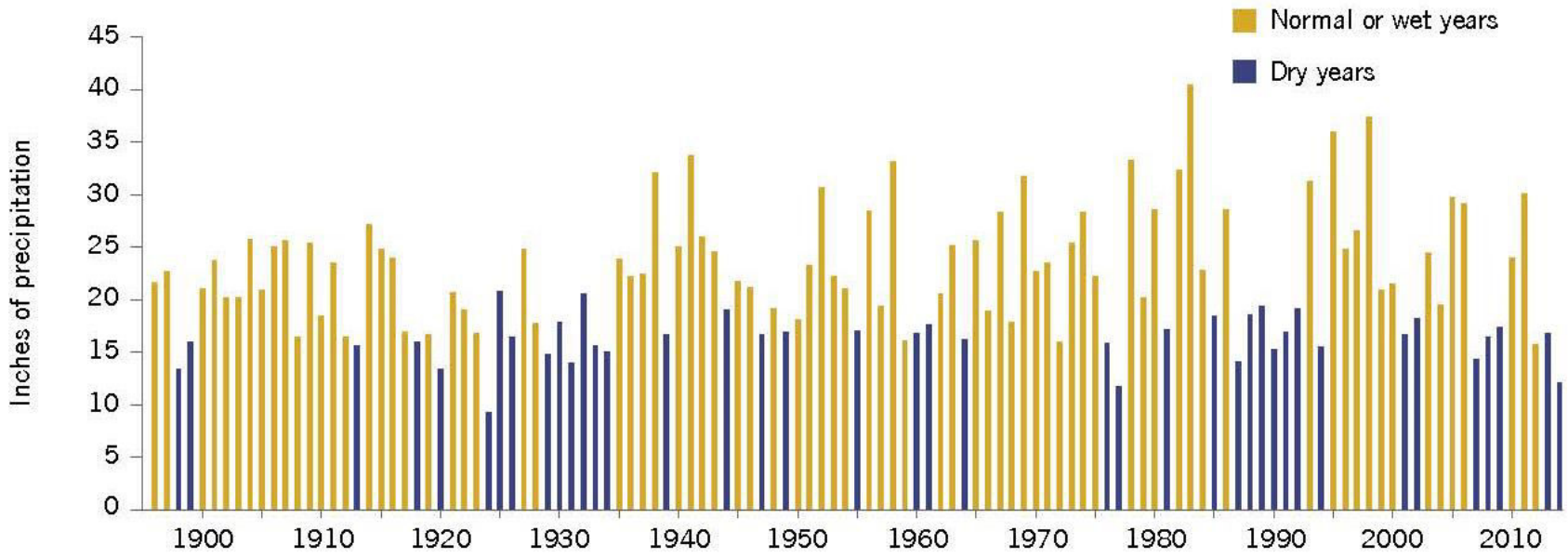
Importance of the Delta to Global Agriculture



Sources: U.S. Dept. of Agriculture and Almond Board of California 2014

California's Water: The Future

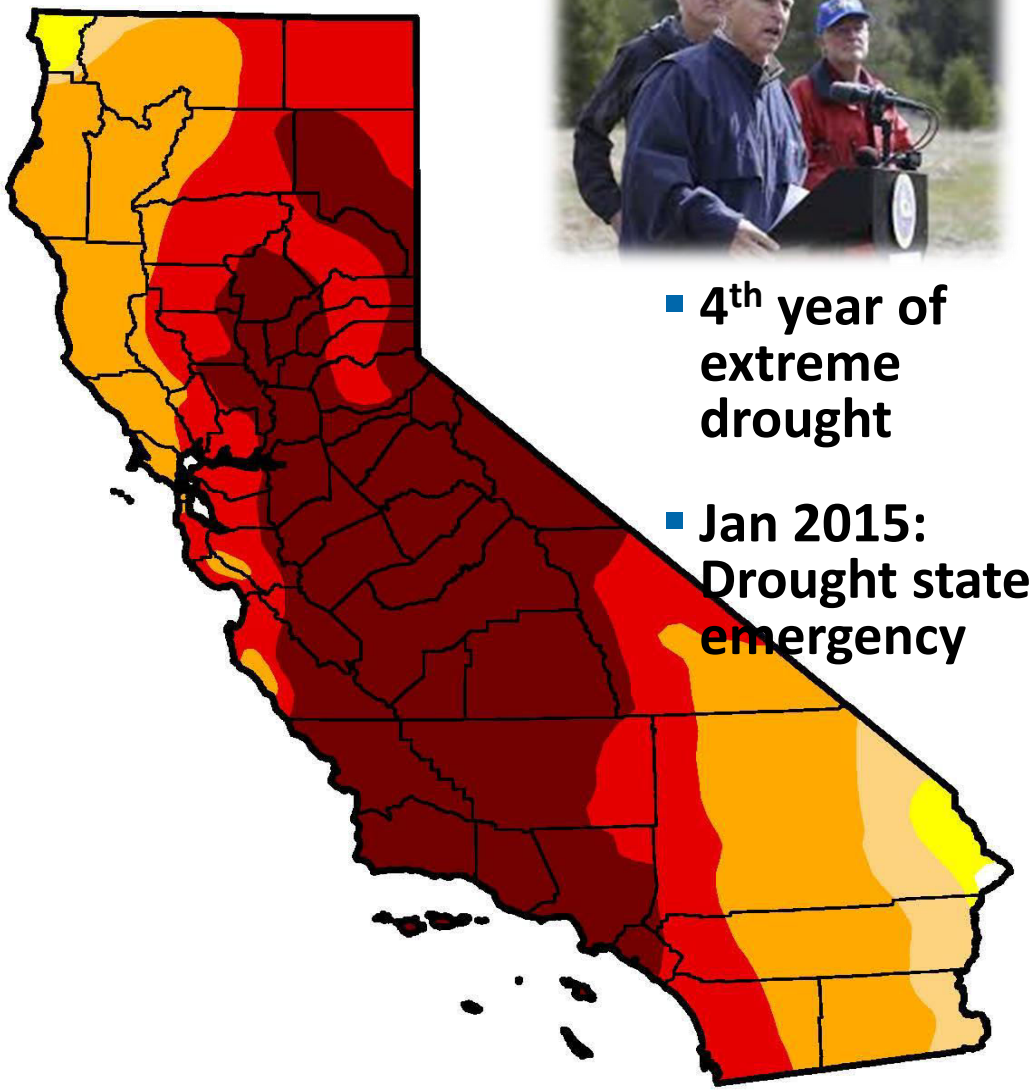
California's Historic Droughts



SOURCE: Western Regional Climate Center.

Source: Rich Pedroncelli/Associated Press

U.S. Drought Monitor
California

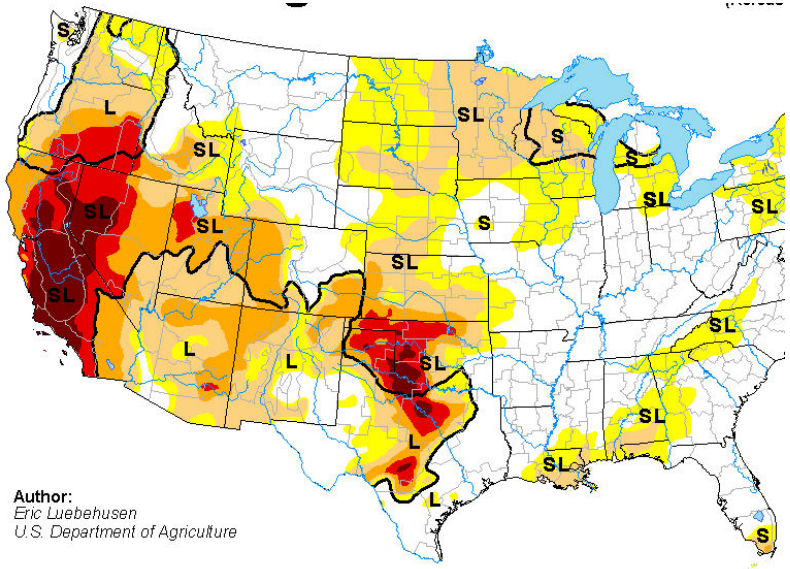


- 4th year of extreme drought
- Jan 2015: Drought state of emergency

March 31, 2015

(Released Thursday, Apr. 2, 2015)

Valid 7 a.m. EST



Author:
Eric Luebehusen
U.S. Department of Agriculture

Intensity:

- 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. See accompanying text summary for forecast statements.

Author:
Eric Luebehusen
U.S. Department of Agriculture

http://droughtmonitor.unl.edu/

California Snowpack at Historic Lows

- **April 2015: Peak snowpack in Sierra Nevada Range at 5% of historic average (worst in 75 years)**

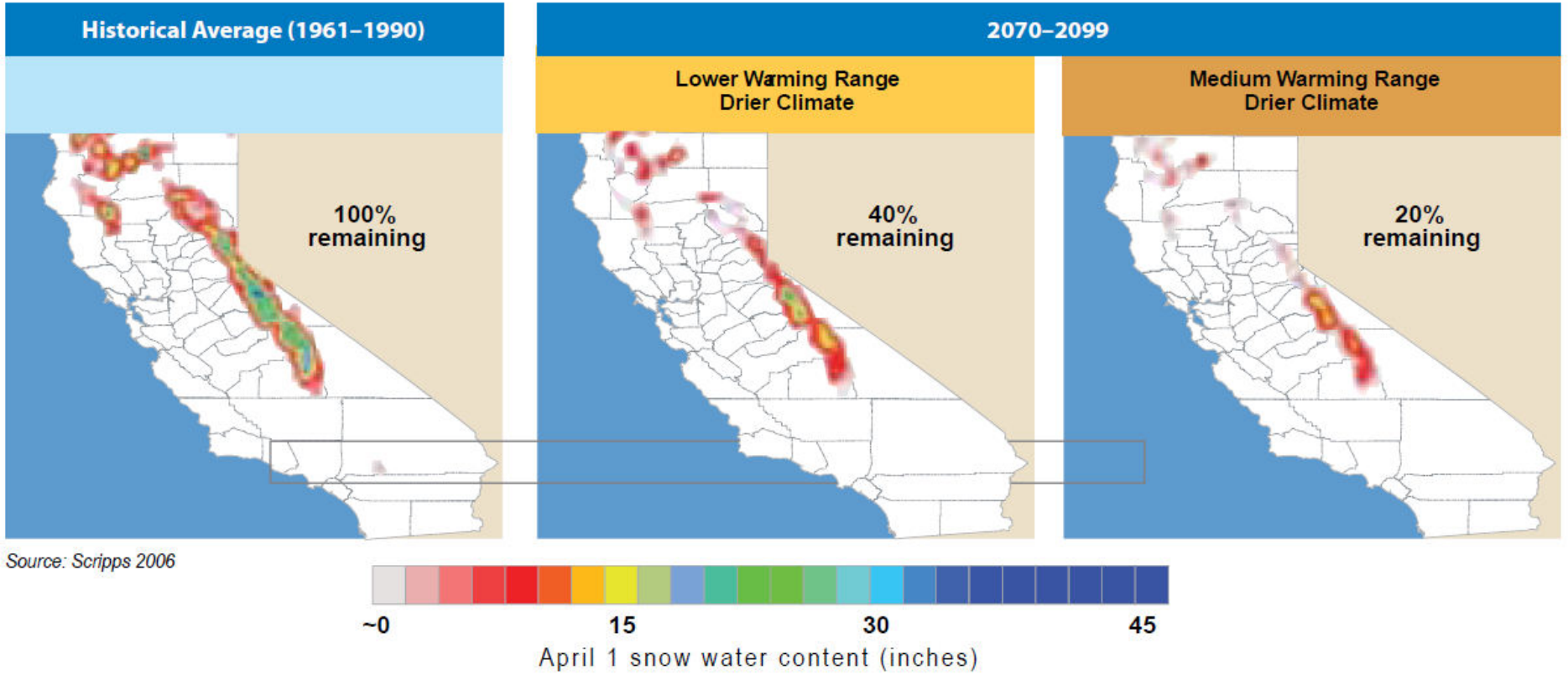
NASA Image January 18, 2013

NASA Image January 18, 2014

Climate Change Effects

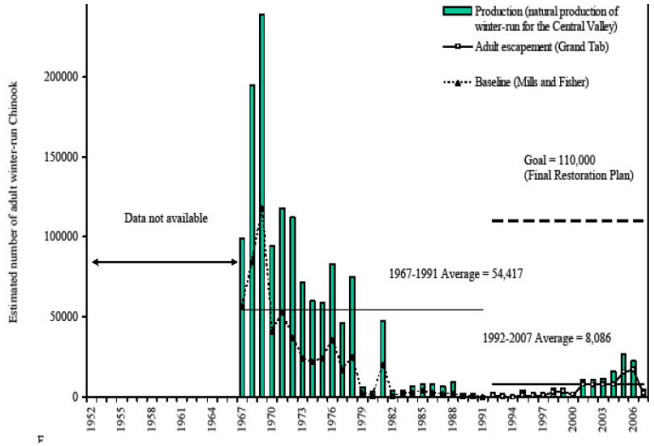
Decreasing California Snowpack

These figures show projections of how two climate scenarios may reduce Sierra snowpacks to 40% and 20% of recent historical averages

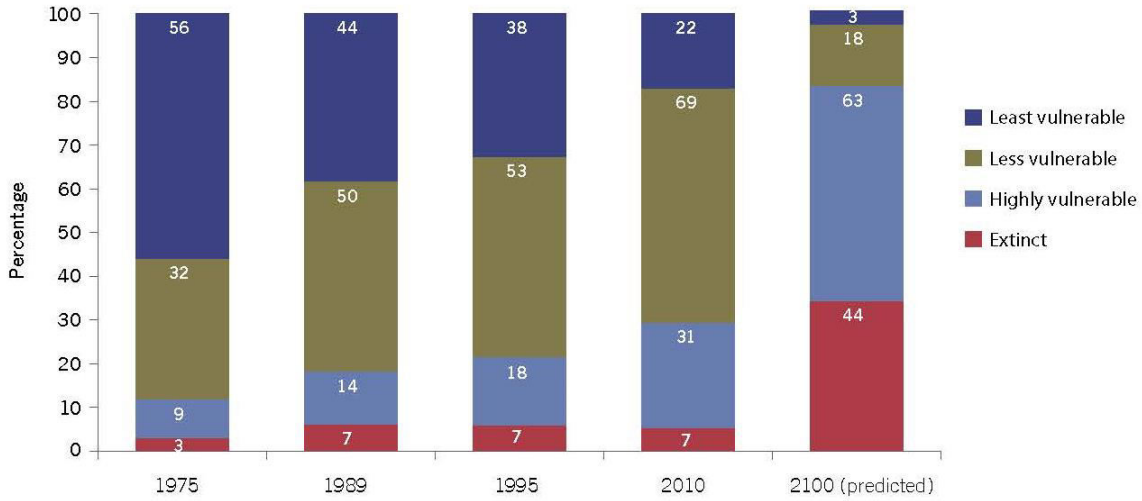


Source: Scripps 2006

Native Fish Declines

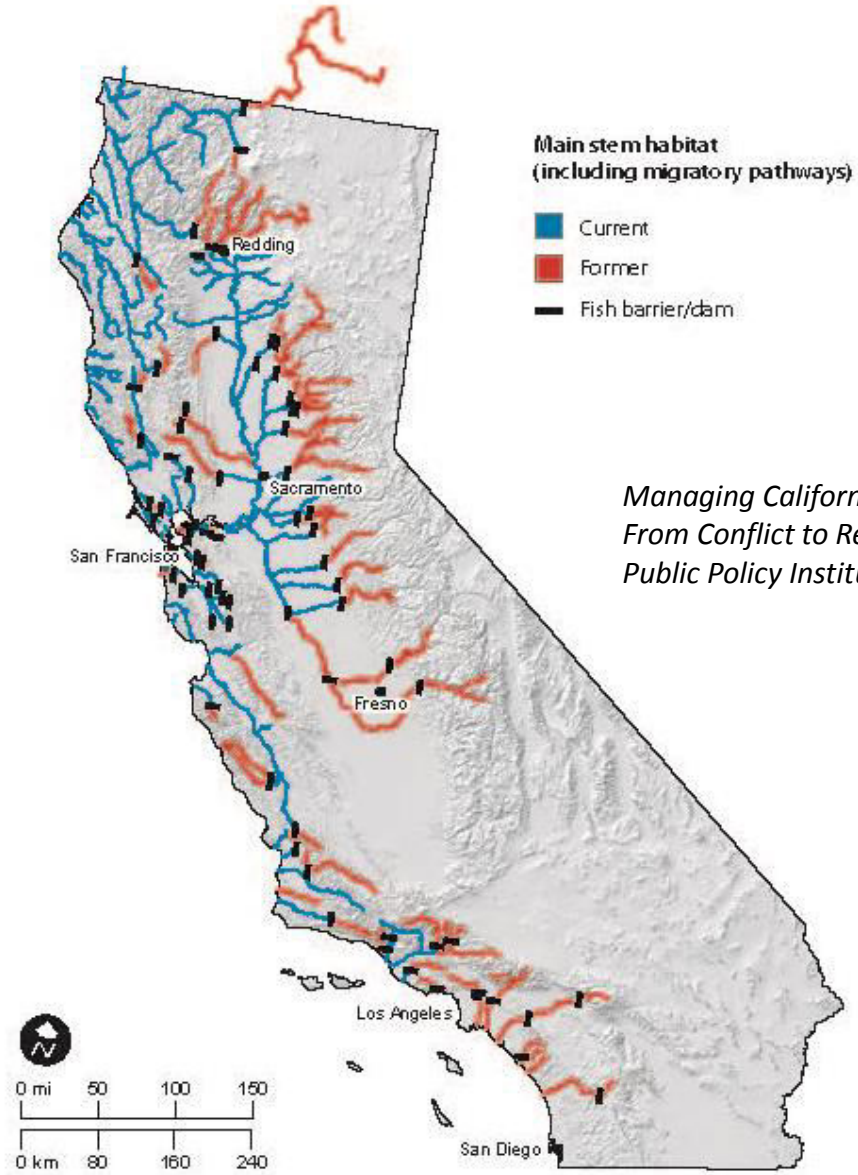


CALIFORNIA'S NATIVE FRESHWATER FISHES ARE IN TROUBLE



SOURCES: R. M. Quiñones and P. B. Moyle, "California's Freshwater Fishes: Status and Management," *FiSHMED Fishes in Mediterranean Environments* (2015). P. B. Moyle, J. D. Kiernan, P. K. Crain, and R. M. Quiñones, "Climate Change Vulnerability of Native and Alien Freshwater Fishes of California: A Systematic Assessment Approach," *PLoS One* (May 22, 2013), doi:10.1371/journal.pone.0063883.

Figure 5.1
Dams and diversions have cut off access to high-quality spawning and rearing habitat for salmon and steelhead



SOURCE: Moyle, Israel, and Purdy (2008).
NOTE: The map includes only habitat in larger rivers and major tributaries; the actual number of miles of stream cut off is much higher than shown.

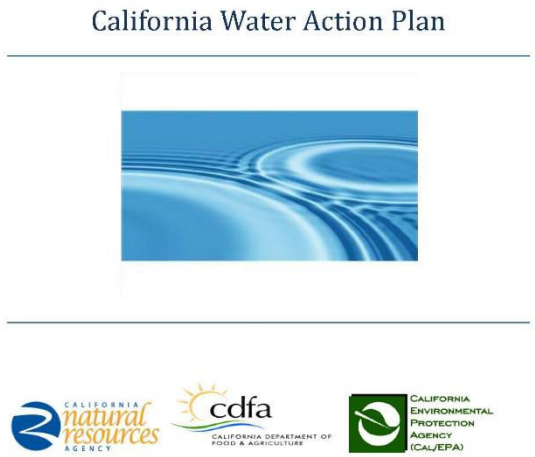
Managing California's Water: From Conflict to Reconciliation
Public Policy Institute of CA, 2011

Three Approaches to Balancing Water Supply and Ecosystem Restoration

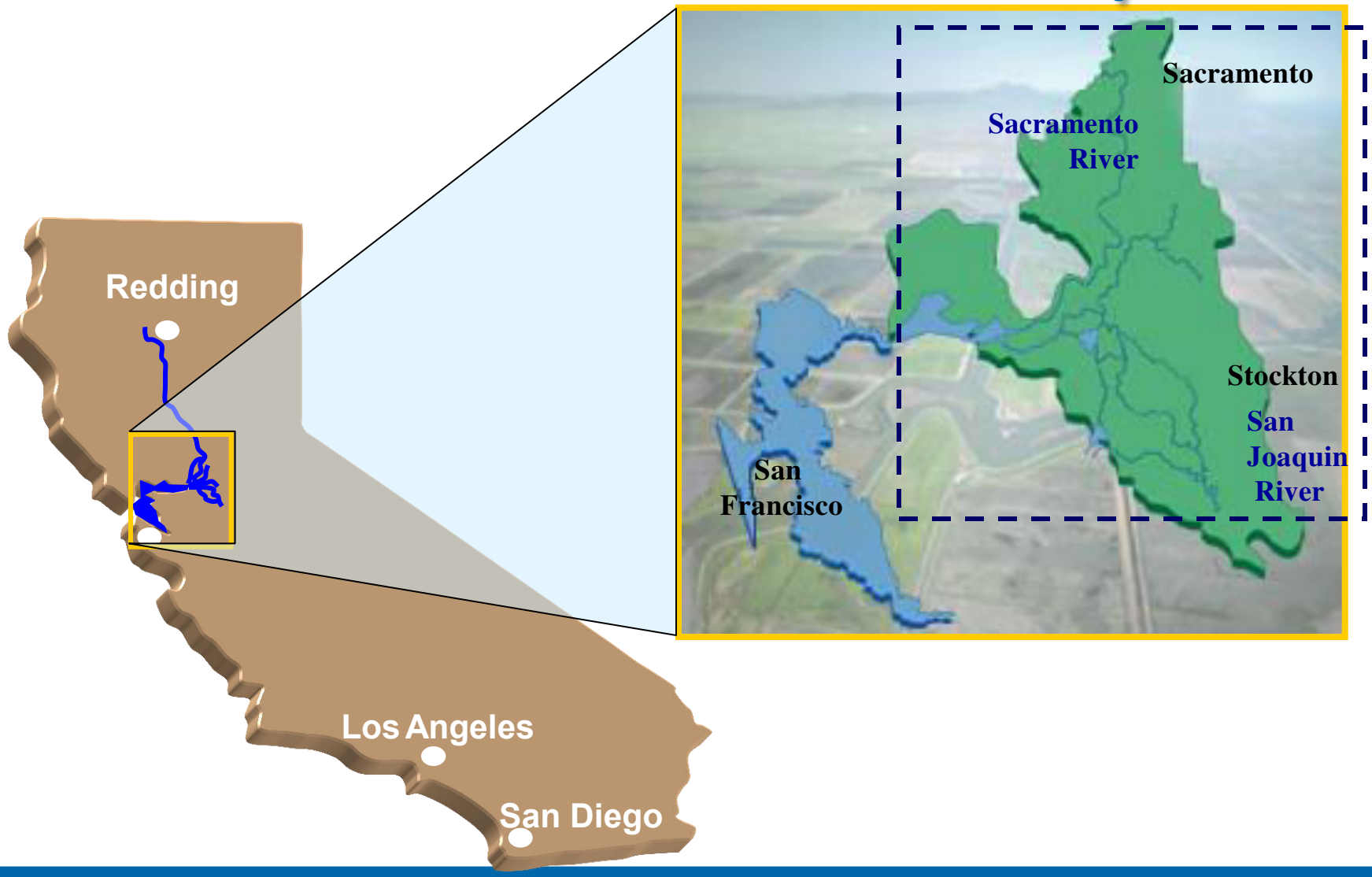
Three Broad Approaches to "Optimizing" Water Use

1. Reduce water demand and increase water use efficiency
2. Restore ecosystems to improve native species populations and increase ecosystem resilience
3. Upgrade engineered systems to increase their flexibility

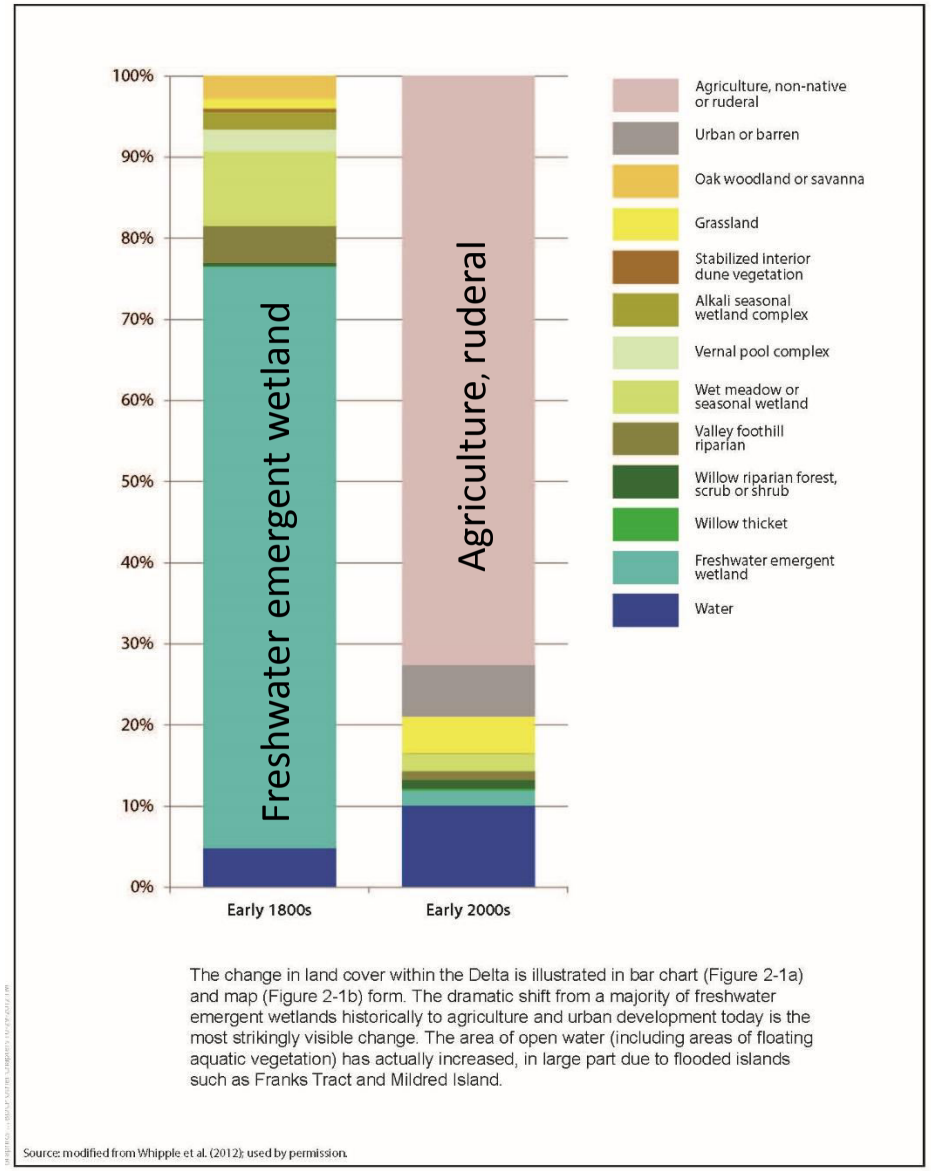
- 2014-2018 California Water Action Plan: all three approaches



Restoring and Fixing The Sacramento-San Joaquin Delta



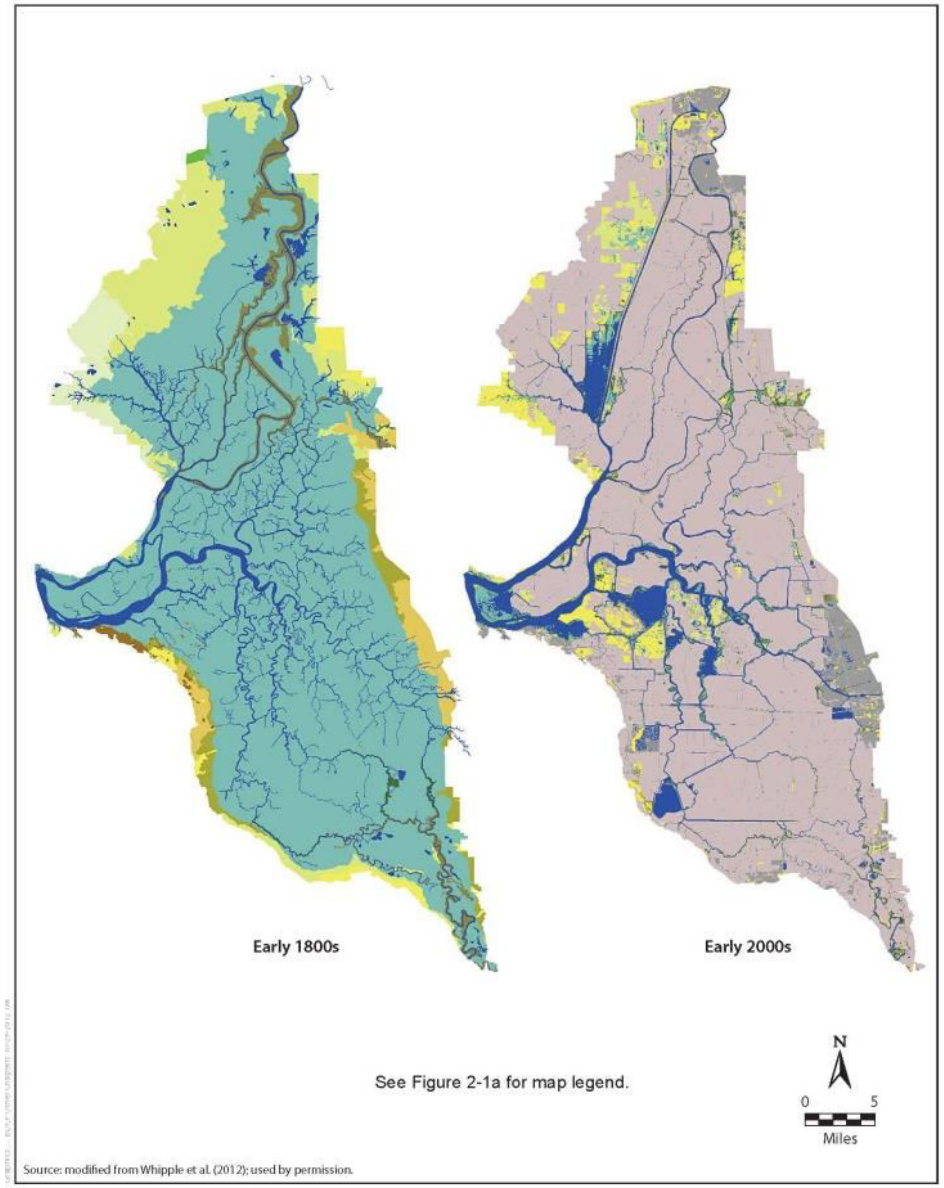
Historic Delta



The change in land cover within the Delta is illustrated in bar chart (Figure 2-1a) and map (Figure 2-1b) form. The dramatic shift from a majority of freshwater emergent wetlands historically to agriculture and urban development today is the most strikingly visible change. The area of open water (including areas of floating aquatic vegetation) has actually increased, in large part due to flooded islands such as Franks Tract and Mildred Island.

Source: modified from Whipple et al. (2012); used by permission.

Figure 2-1a
Land Cover Change in the Delta between the Early 1800s and Early 2000s



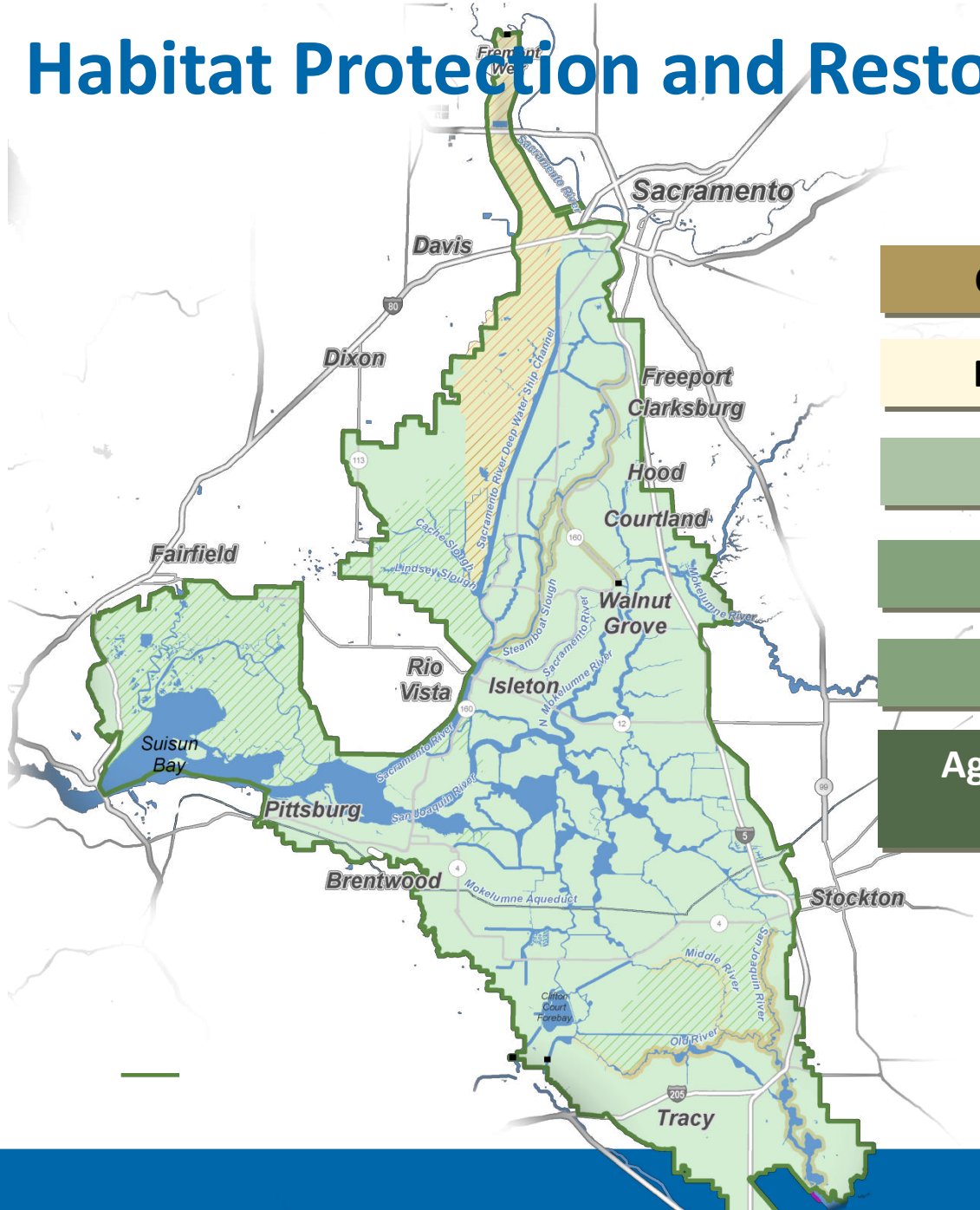
Source: modified from Whipple et al. (2012); used by permission.

Figure 2-1b
Land Cover Change in the Delta between the Early 1800s and Early 2000s

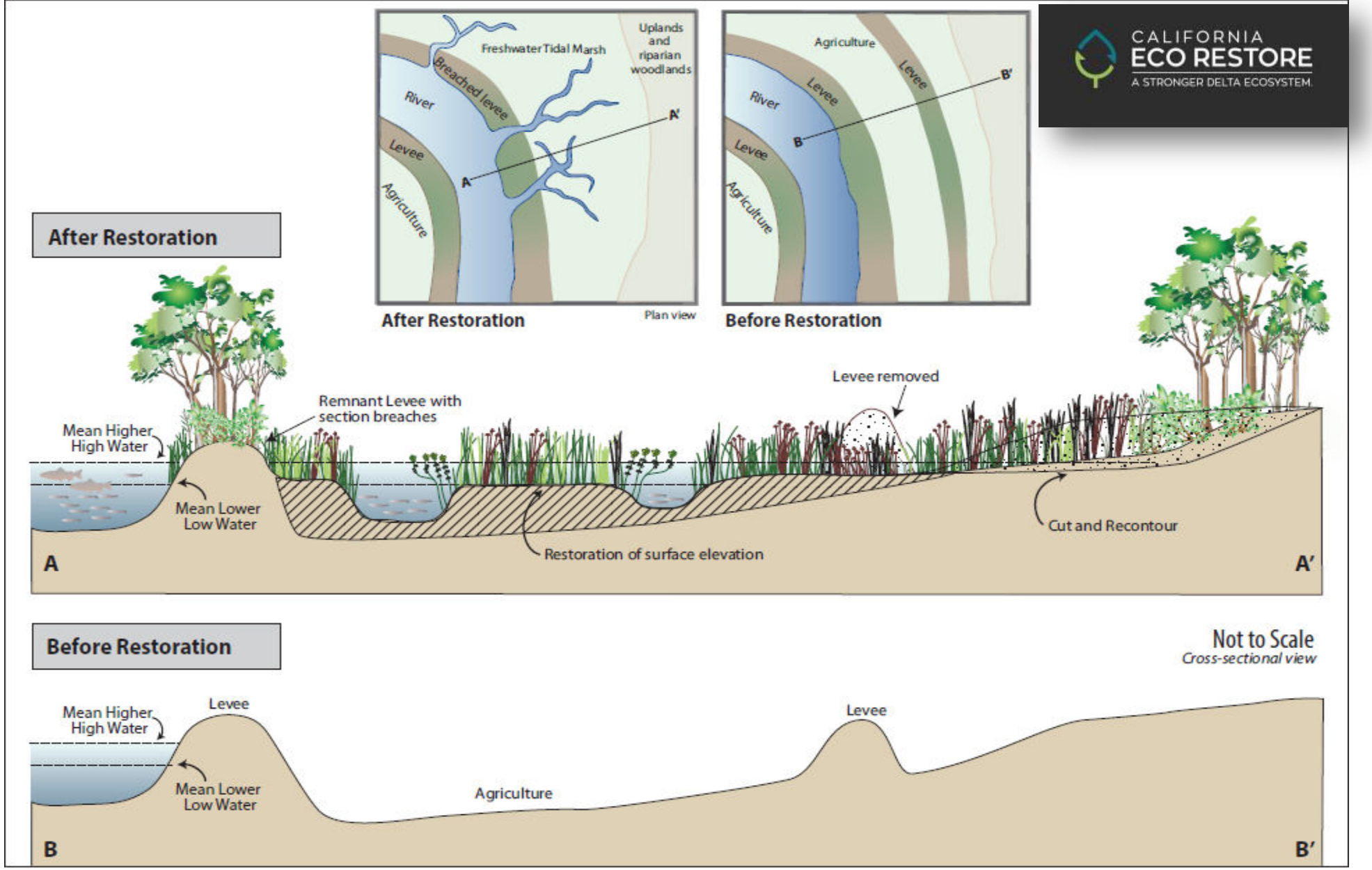
Modernize California Water System

Ecological Restoration

Habitat Protection and Restoration



- Channel Margin Enhancement
- New and Enhanced Floodplain
- Riparian Forest Restoration
- Tidal Wetland Restoration
- Non-Tidal Marsh Restoration
- Agriculture and Grassland Habitat Preservation



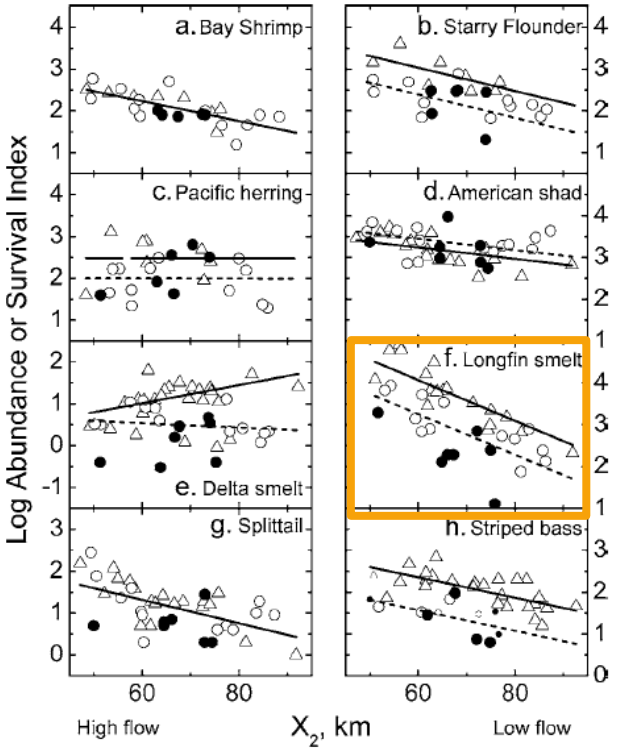
Tidal Emergent Wetland concept

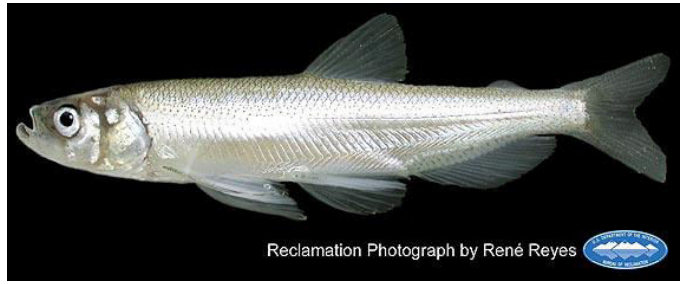
Habitat Protection and Restoration: Funding

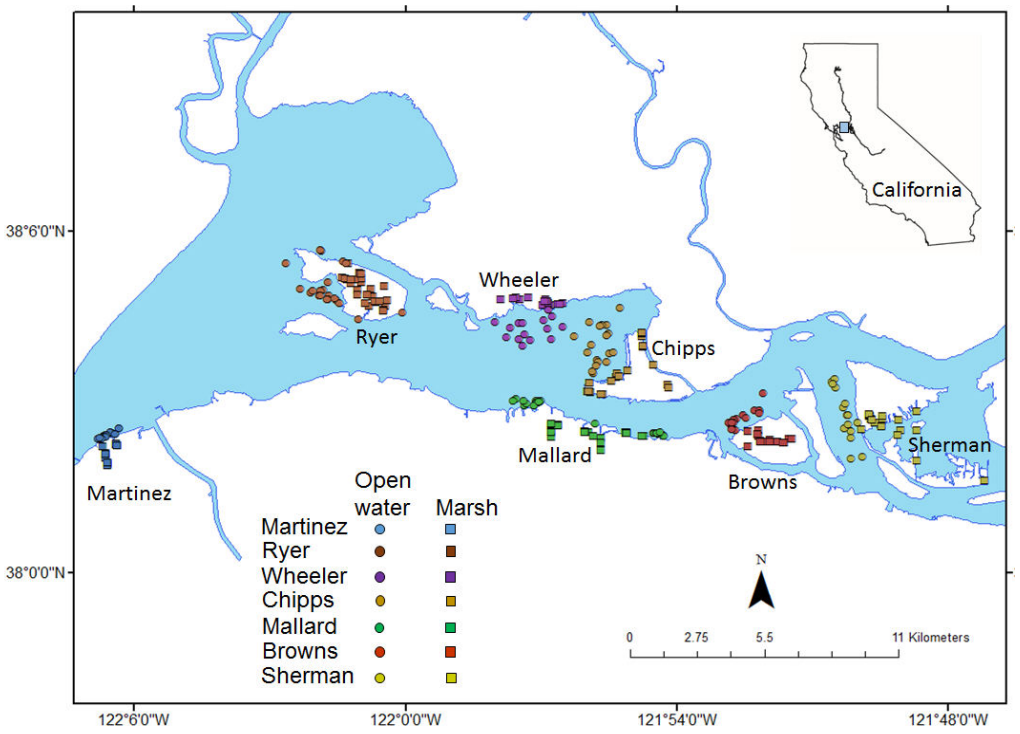
- **November 2014: California voters passed USD $7.5 billion bond to fund**
  - Water conservation
  - **Aquatic habitat conservation: USD $1.5 billion (USD$375 million in Delta)**
  - Groundwater management
  - New water storage projects

Habitat Restoration: Restore Flows to Benefit Native Fish

- Current debate over the magnitude and timing of outflows necessary to protect longfin smelt
- ICF is conducting field studies to improve understanding of longfin smelt life history
- Results will be integrated into future operational and restoration efforts





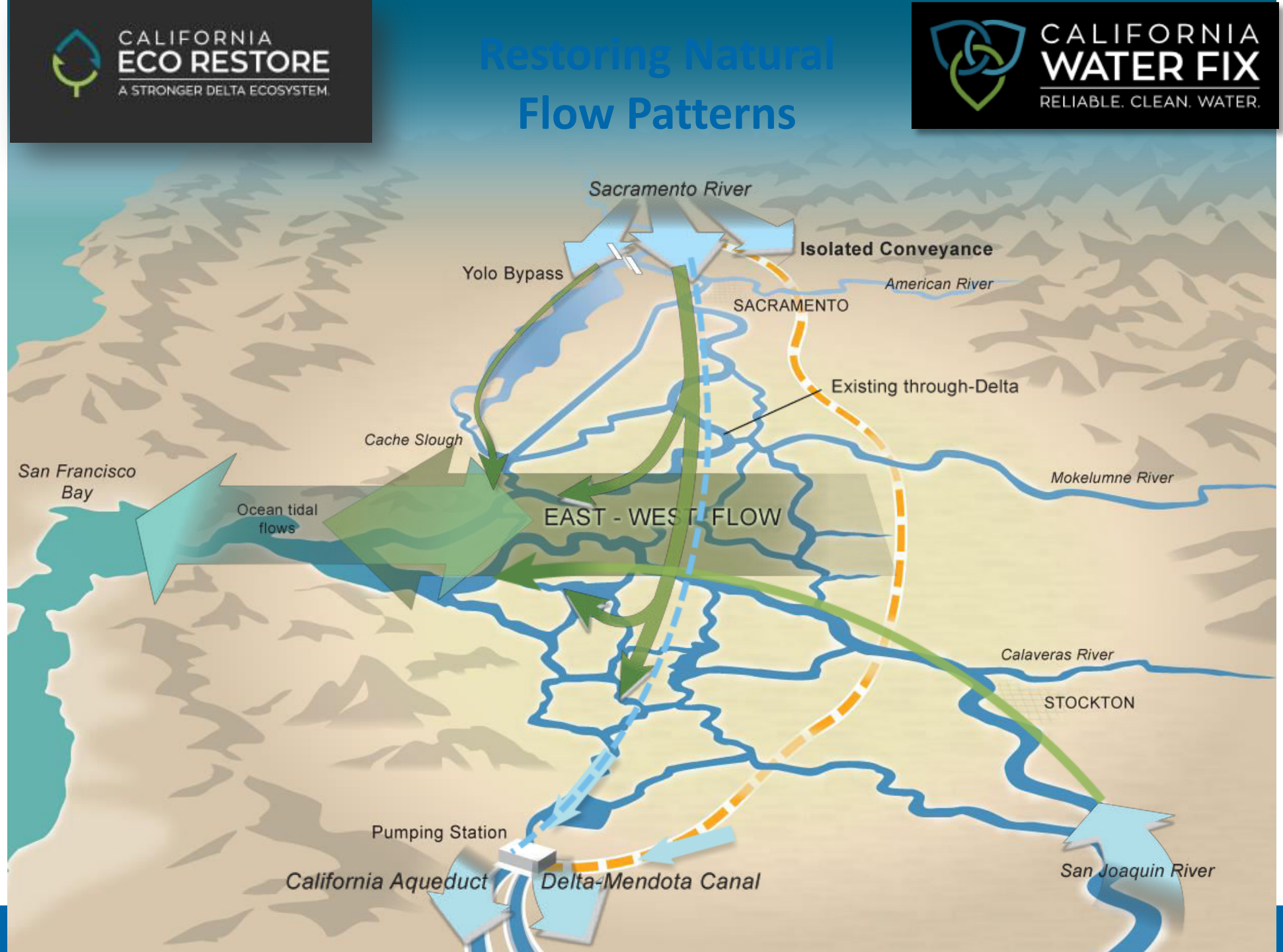


How State and Federal Water Project Supplies Flow through the Delta

CALIFORNIA ECO RESTORE
A STRONGER DELTA ECOSYSTEM

Restoring Natural Flow Patterns

CALIFORNIA WATER FIX
RELIABLE. CLEAN. WATER.



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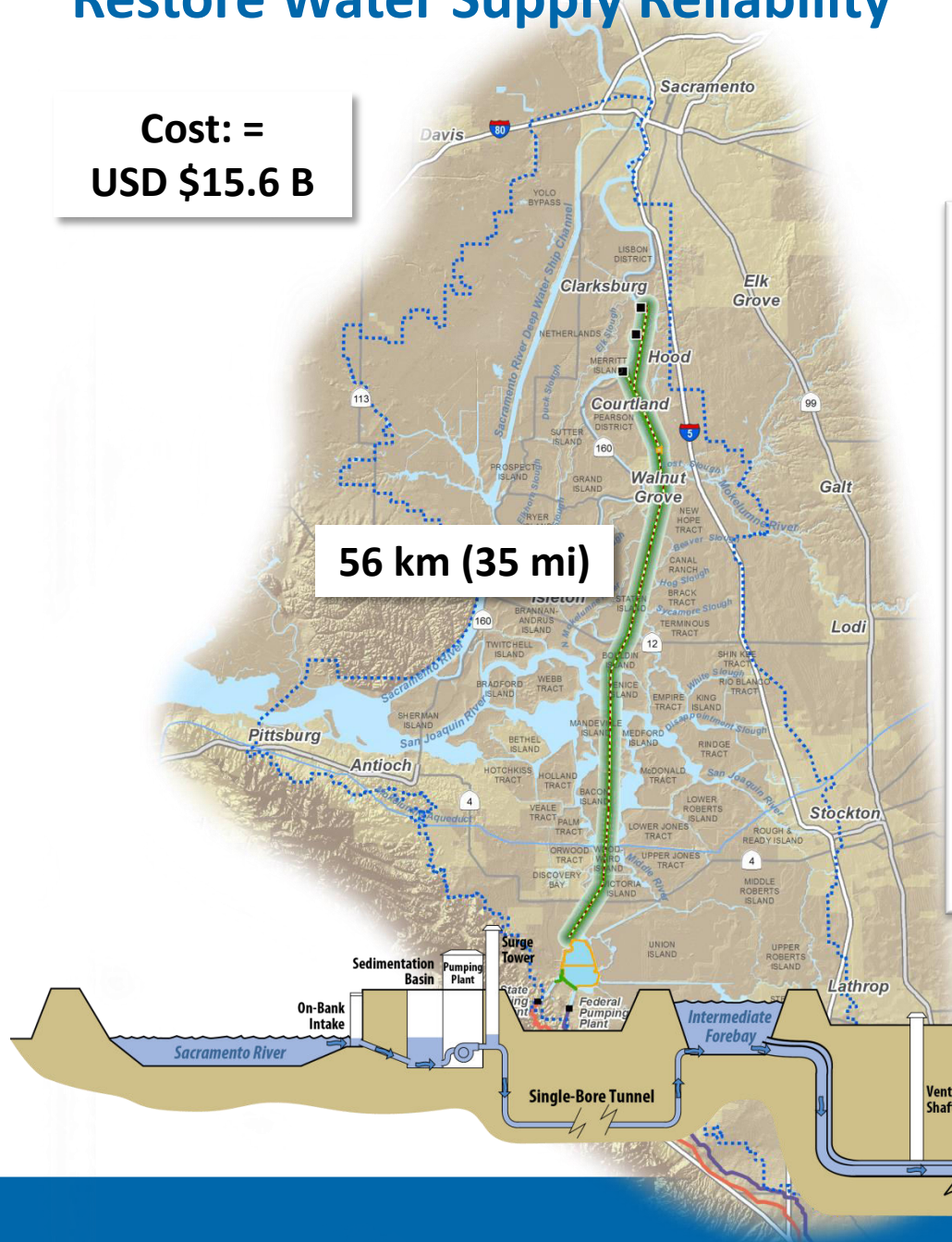
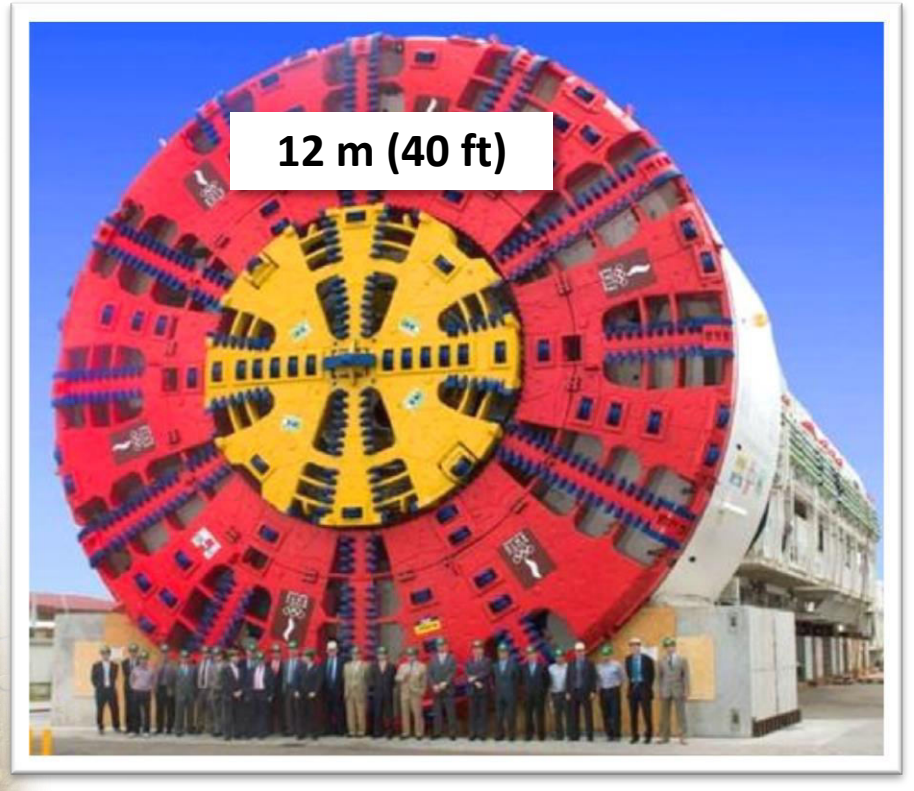
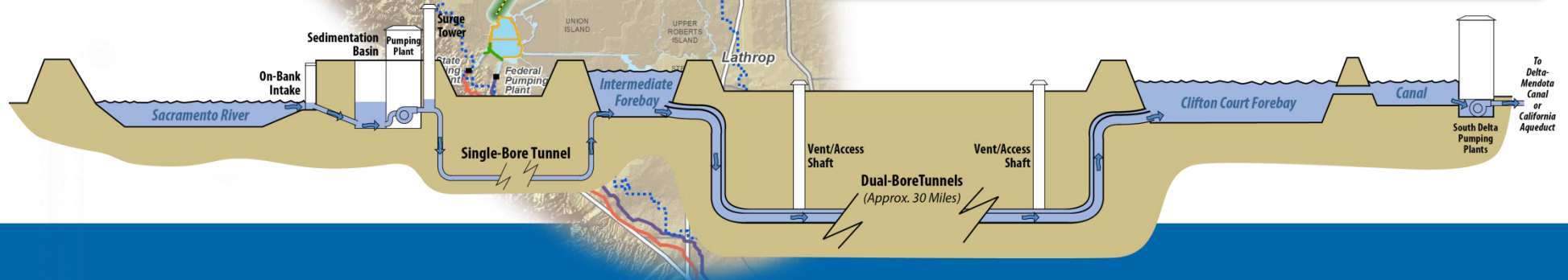
Restore Water Supply Reliability

CALIFORNIA WATER FIX
RELIABLE. CLEAN. WATER.

Cost: =
USD $15.6 B







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Timeline

- **December 2013:**
  - Public Draft Bay Delta Conservation Plan
  - Public Draft Environmental Impact Assessment
- **June-July 2015:**
  - Recirculated Public Draft Environmental Impact Assessment (on CA Water Fix)
- **December 2015:**
  - Final Environmental Impact Assessment
- **July 2016:**
  - **Break ground** for CA Water Fix and initial phase of CA EcoRestore

Thank You!