Plenary Session

35th Annual Salmonid Restoration Conference held in Davis, California from March 29 - April 1, 2017.

Session Overview

- Master of Ceremonies:
  - Thomas Williams, NOAA Fisheries, Southwest Fisheries Science Center

Presentations

Video Recording of Complete Plenary Session Located at
http://dctv.davismedia.org/content/35th-annual-salmonid-restoration-conference-plenary-session-full

(*) The Epic California Drought as Viewed from Space: Drought vs. Chronic Water Scarcity and Implications for Sustainability
Jay Famiglietti, Ph.D., NASA Jet Propulsion Lab, and UC Irvine
*presentation not included

(Slide 4) Salmon Restoration and the Re-engineering of Water in California
Jay R. Lund, Ph.D., Director, Center for Watershed Sciences, UC Davis

(Slide 29) If Salmon Could Talk…
Felicia Marcus, Chairwoman, State Water Resources Control Board

Salmon Restoration and Re-Engineering California's Water System

Jay R. Lund

Director, Center for Watershed Sciences

Professor of Civil and Environmental Engineering

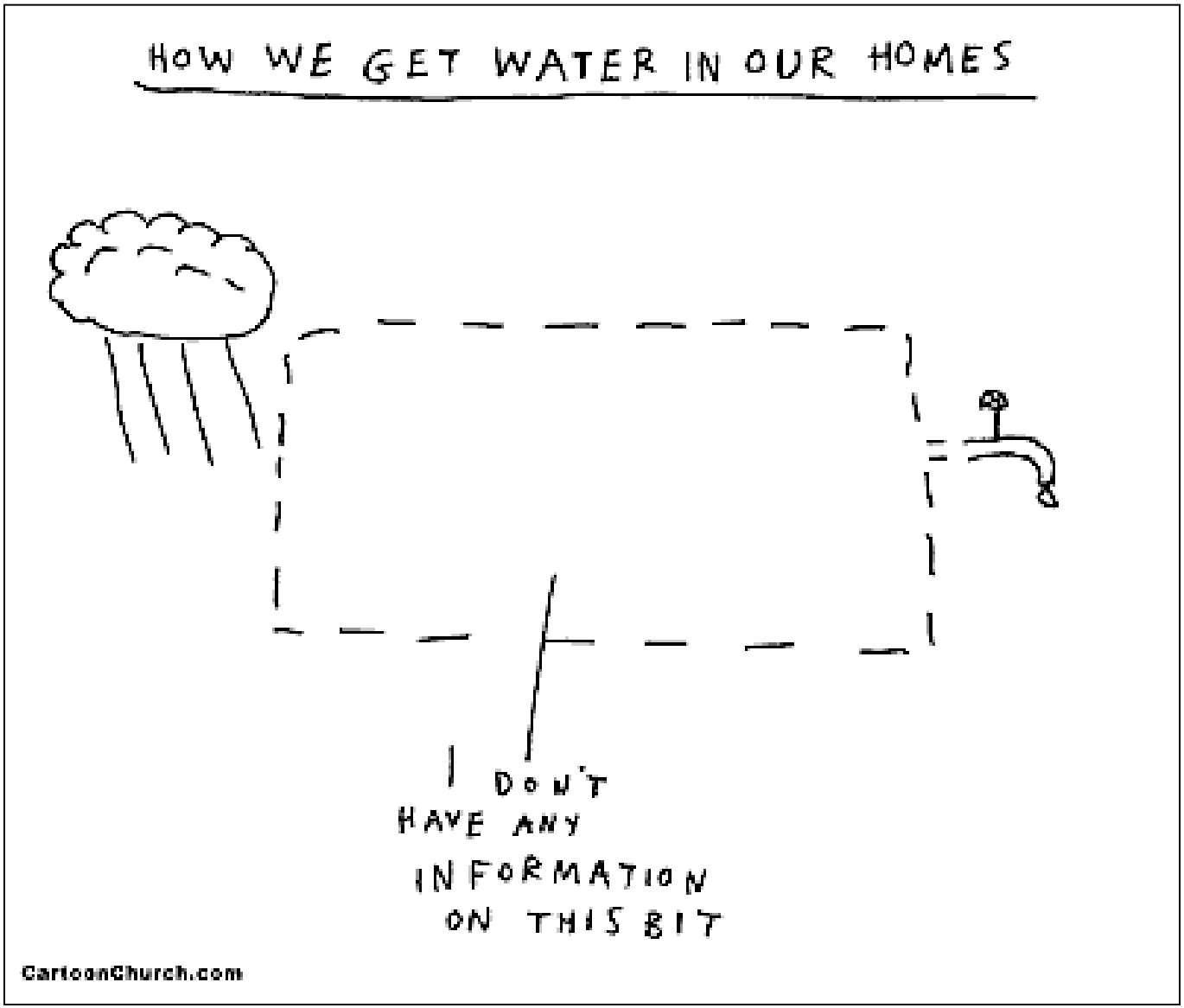
University of California, Davis

watershed.ucdavis.edu/shed/lund/

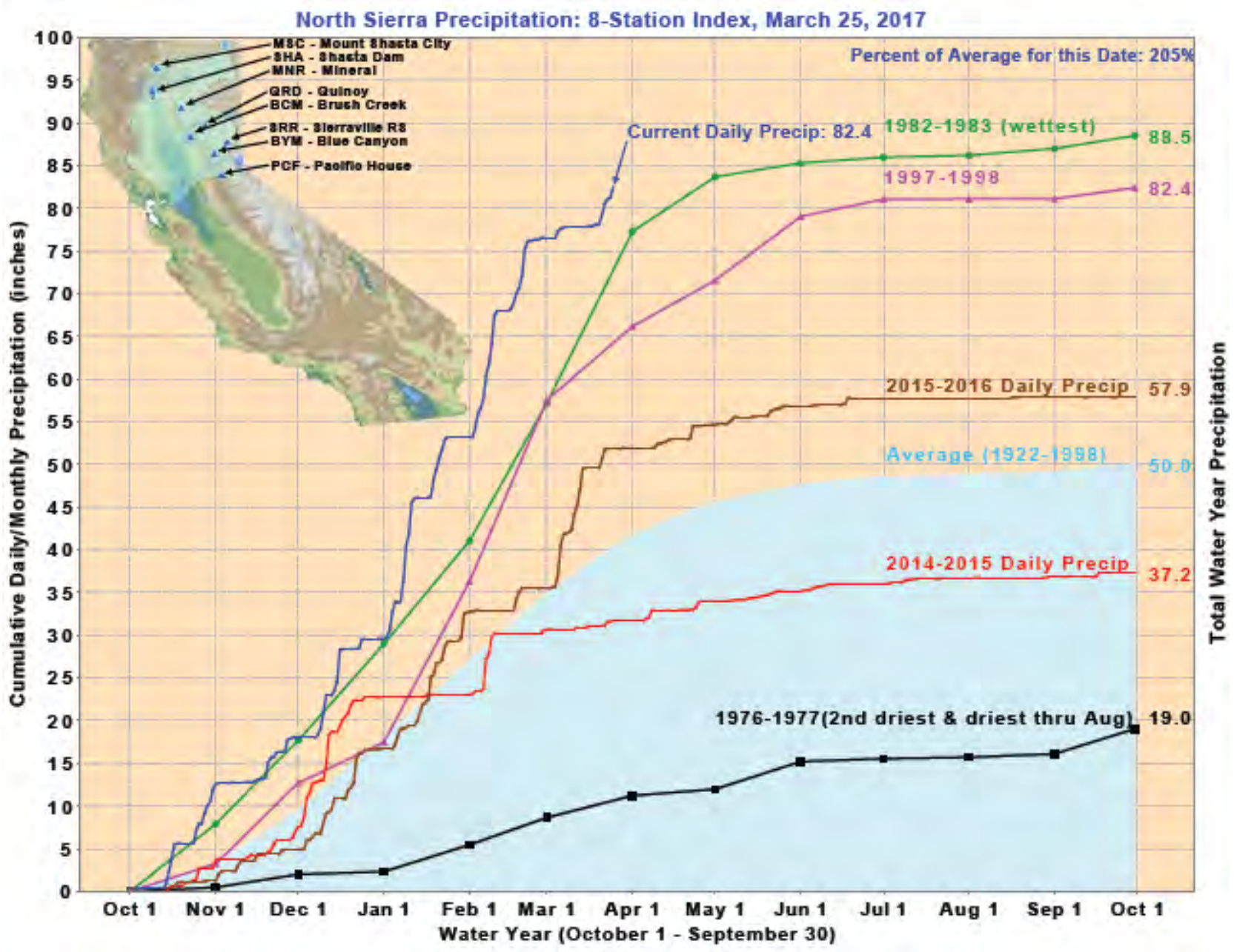
CaliforniaWaterBlog.com

35th Salmonid Restoration Conference

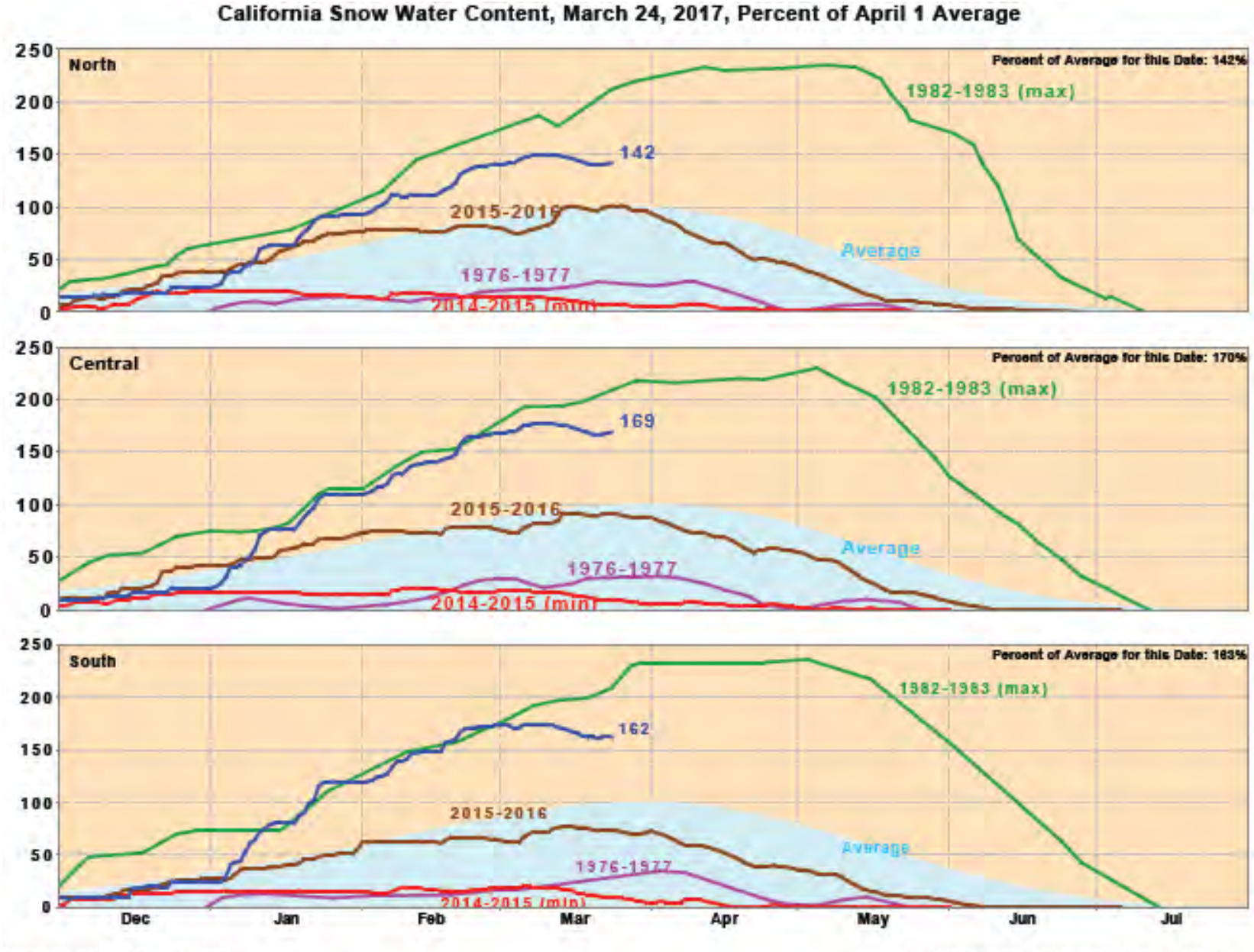
Where to begin?



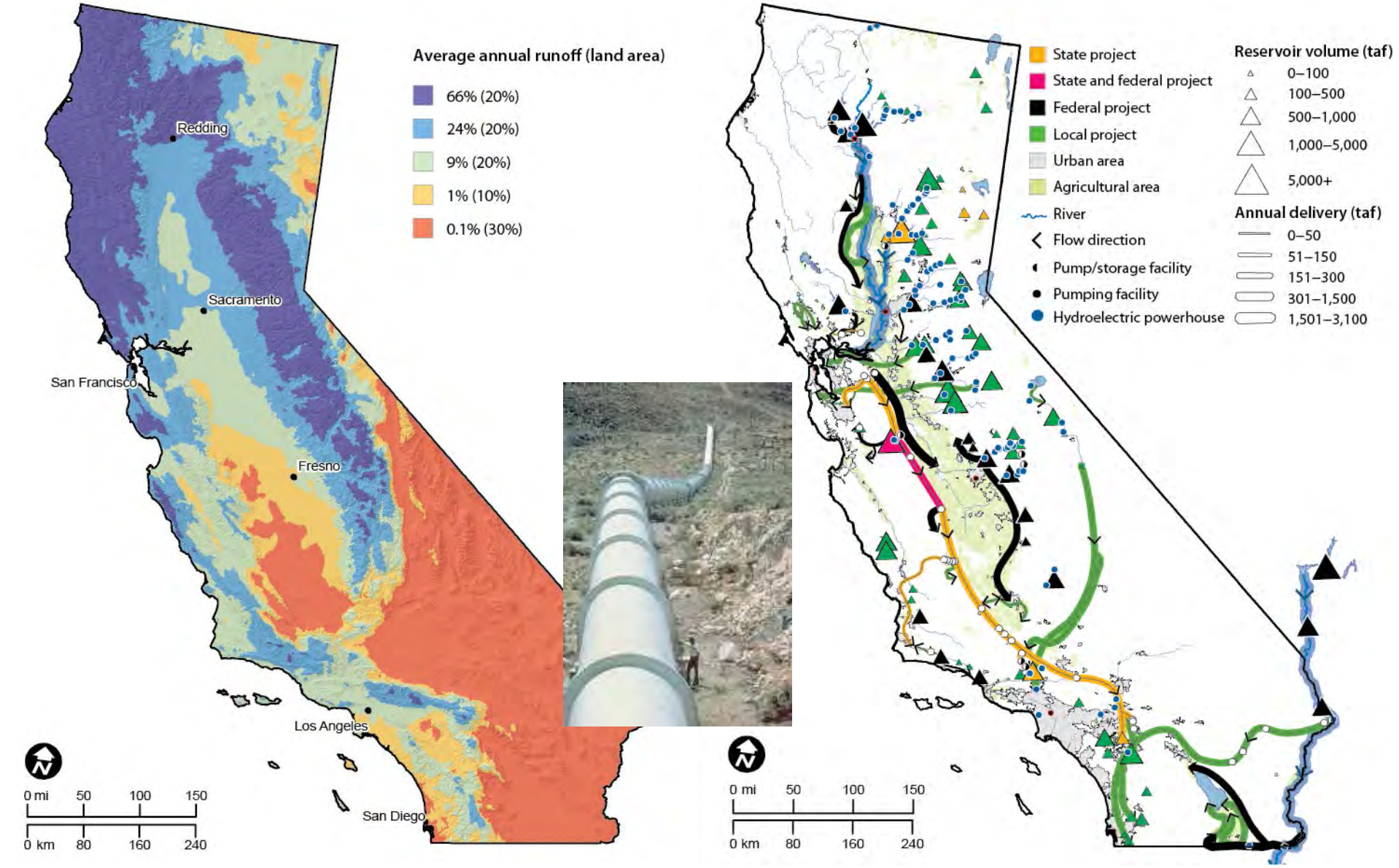
Sacramento Valley Precipitation



Sierra Snowpack



Water and People in California

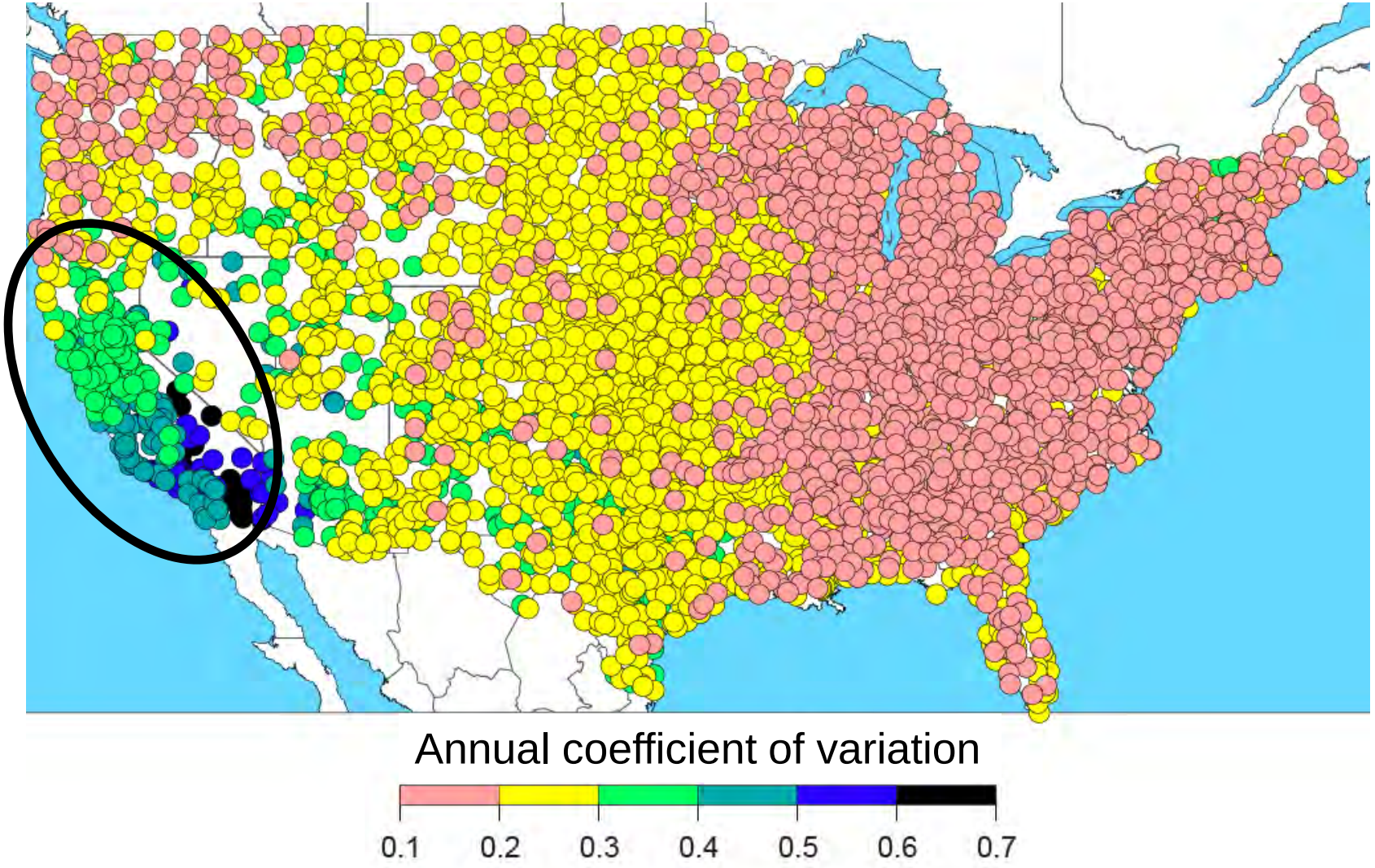


Natural Runoff Variation

Unimpaired Delta Outflow

Source: California DWR

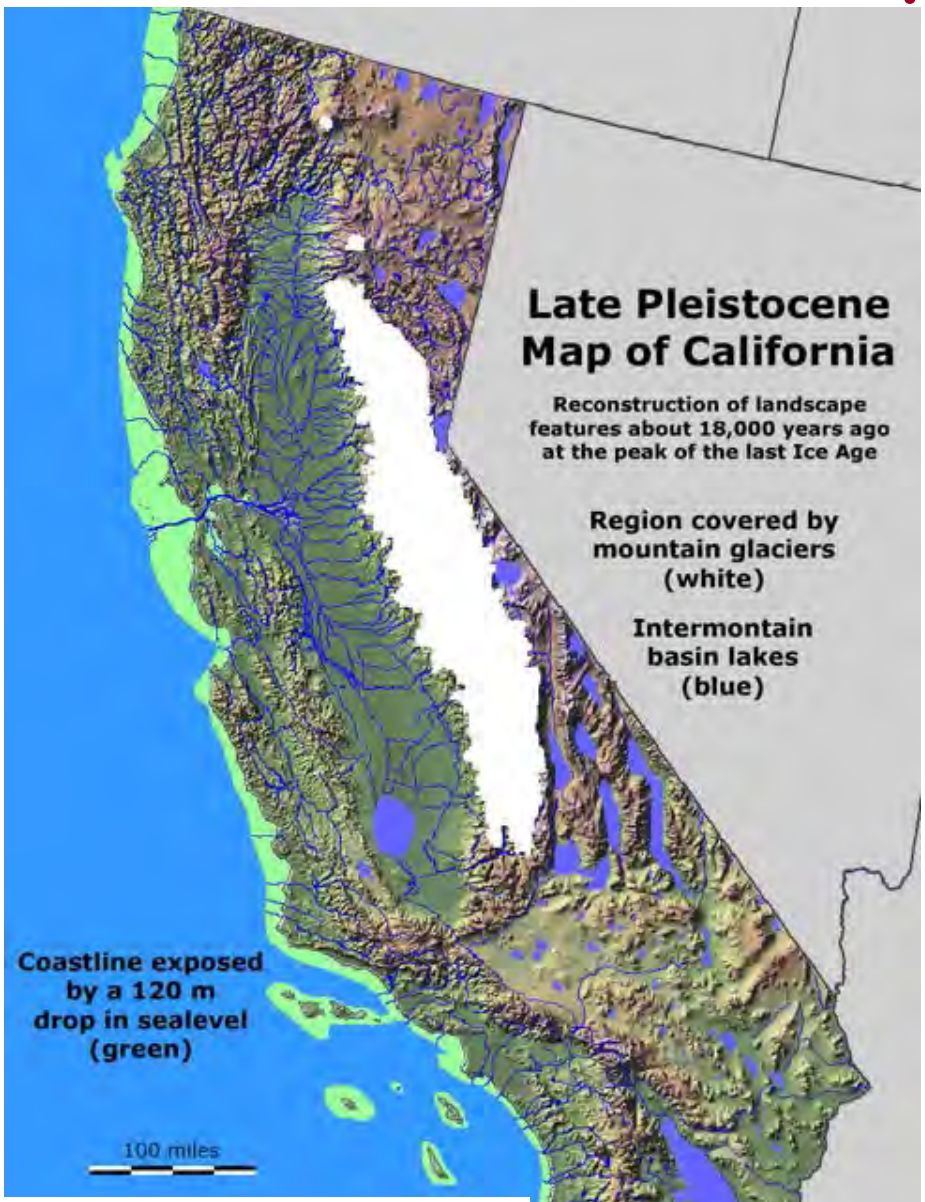
Most annual rainfall variability in US



SOURCE: Michael Dettinger, 2011. “Climate Change, Atmospheric Rivers, and Floods in California—A Multimodel Analysis of Storm Frequency and Magnitude Changes.” Journal of the American Water Resources Association 47(3):514-523.

NOTES: Dots represent the coefficient of variation of total annual precipitation at weather stations for 1951-2008. Larger values have greater year-to-year variability.

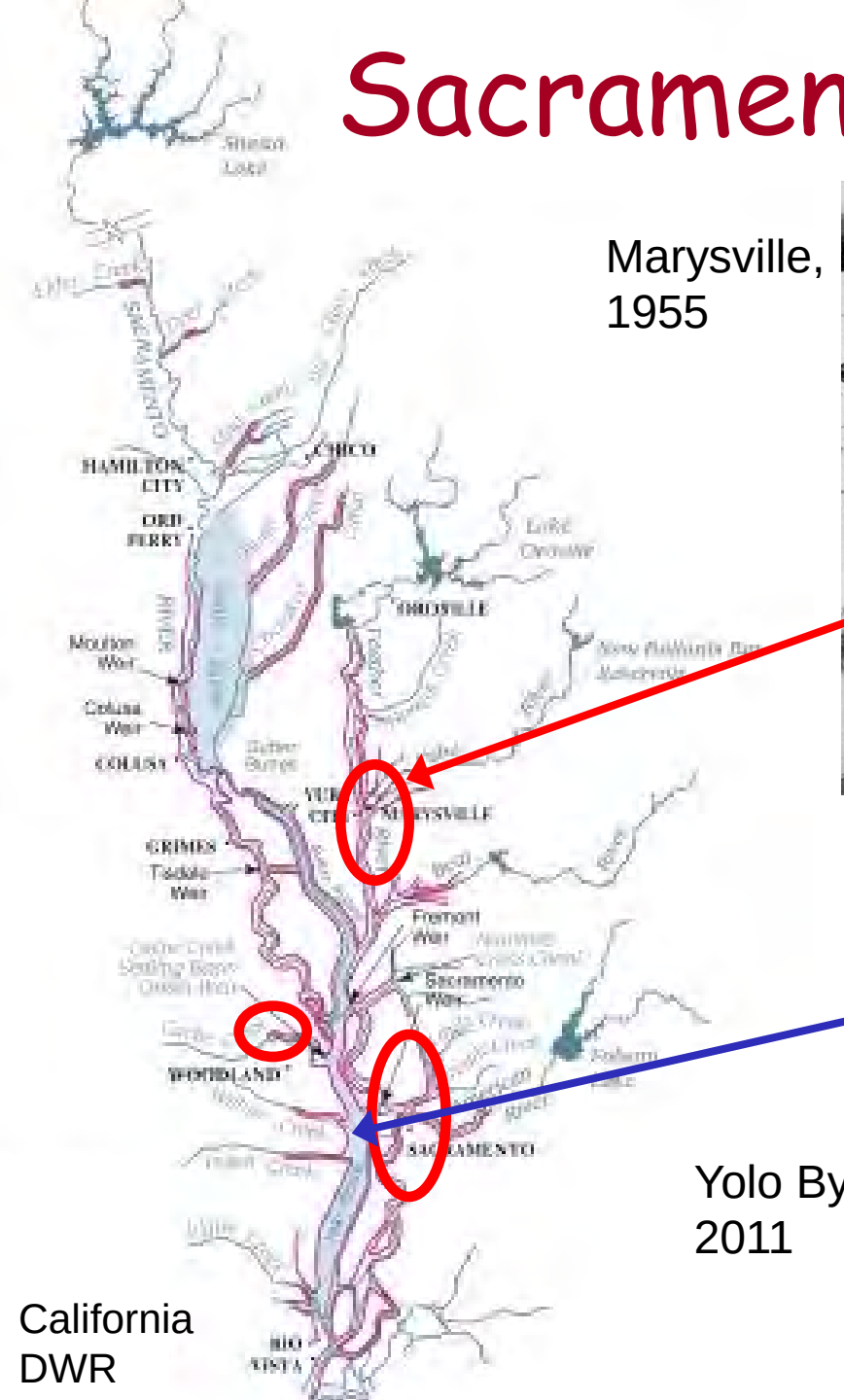
Water Landscape of Yesterday



BC 16,000 Source: USGS

State Water Project

Sacramento Flood By-Pass



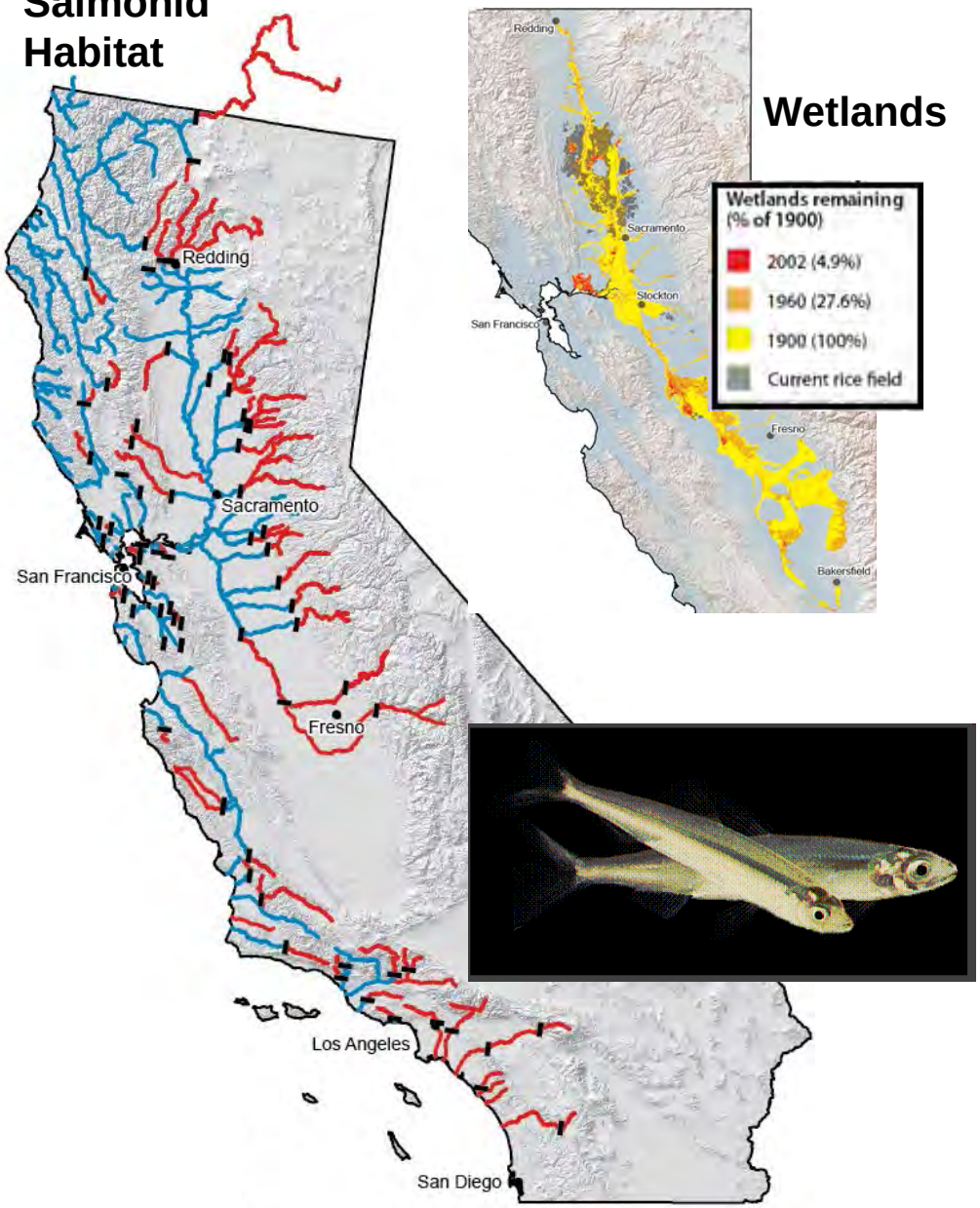
Marysville, 1955

Yolo Bypass, 2011

California DWR

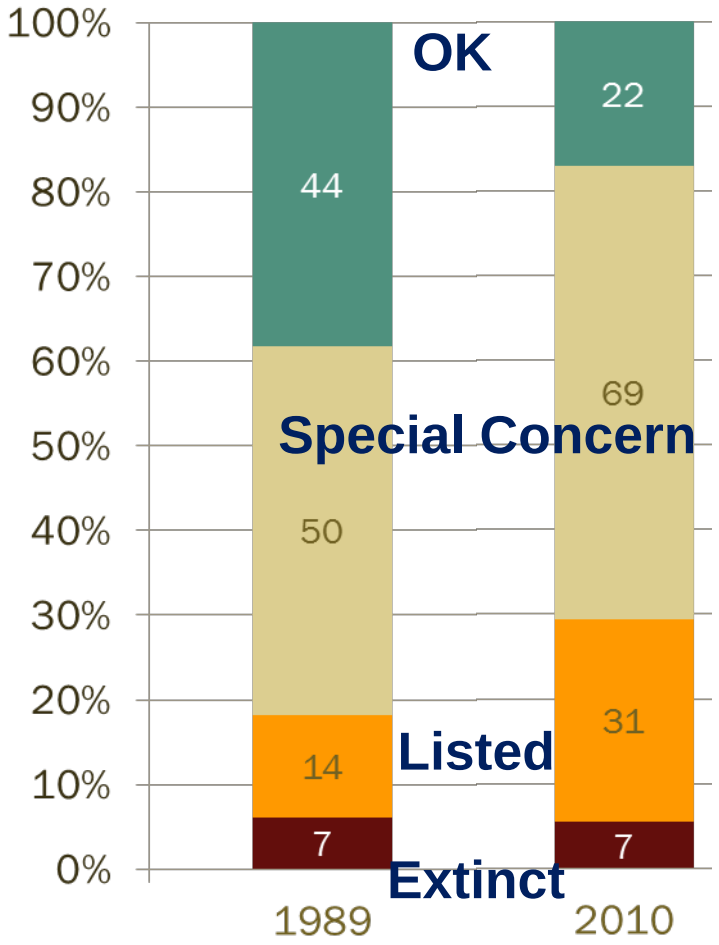
Native Habitat and Fishes

Salmonid Habitat



Wetlands

California's freshwater fishes are losing



Relative Success for Mediterranean Climates

Country/ State	Population (millions)	Wealth (GDP PPP/person)	Food Production ($ billion)	Native Freshwater Aquatic Ecosystem Condition
California	39	$62,000	$45	Struggling, much diminished
Algeria	39	$13,000	$8	Largely eliminated
Australia	24	$68,000	$25	Substantially eliminated
Chile	18	$22,500	$8	Substantially eliminated
Greece	11	$26,000	$6	Largely eliminated
Israel	8	$36,000	$3	Largely eliminated
Italy	61	$35,600	$29	Largely eliminated
Morocco	33	$7,000	$9	Largely eliminated
S. Africa	54	$12,500	$13	Struggling, much diminished
Spain	46	$43,000	$32	Largely eliminated

Recent drought 2012-1016

Lost up to 30% of water supply for 5 years:

1. <3% agriculture revenue loss, but still grew
2. Nearly undetectable urban economic losses
3. Some severe rural water supply impacts
4. Some severe fish impacts
5. Severe forest impacts

Learned importance of groundwater - SGMA

Recent floods - 2017

Wettest year on record, so far:

1. Spillway failures led to evacuating 190,000
2. San Jose flooding evacuated 14,000; $73m
3. Lots of local flooding
4. Wetness will delay farming activities
5. Small levee breaches cause agricultural flooding & unpermitted habitat restoration
6. Fish effects = ???

Lesson - California still has floods

Water Supply Management Portfolio

Water Supply

- Source protection
- Stormwater capture
- System operation
  - Reservoirs
  - Conveyance
- Conjunctive use
- Expand conveyance & storage
- Urban reuse
- New water treatment
  - Wastewater reuse
  - Ocean Desalination
  - Contaminated aquifers

Water Demand and Allocation

- Agricultural water use efficiencies and reductions
- Urban water use efficiencies and reductions
- Ecosystem demand management
- Recreation water use efficiencies

Incentive policies

- Pricing
- Markets
- Subsidies, taxes
- Education

Flood management- portfolio of actions

Preparatory actions	
Protection	**Vulnerability reduction (reduced damage and casualty potential)**
Levees	Relocation of vulnerable human activities
Flood walls and doors	Floodplain zoning and building codes
Closed conduits	Floodproofing–raising structures, sacrificial first floor, flood doors
Channel improvements and flood corridors	Flood warning and evacuation systems
Reservoirs	Flood insurance and reinsurance
Bypasses	Flood risk disclosure
Sacrificial flooding	Public and policymaker education
Flood easements (bypasses, designated flood areas)	Flood preparation and training exercises
Local detention basins, drainage, and pumps	Floodplain mapping, gaging, data collection
Regular inspections, assessments, and maintenance	Community engagement and multi-hazard planning
Response actions	
Levee and flood wall monitoring	Warnings, evacuation calls, and emergency
Flood fighting–sandbagging, sheet pile installation, wave wash protection, splash cap installation, ring levee construction, relief cut, pumping, and breach closure	mobilization High water staking
Flood door closure and gate operation	
Reservoir operation–including coordinated operations, rule curve operations and encroachment, flash board installation, surcharging	
Recovery actions	
Reconstruction and repair of flood infrastructure	Flood damage assessment–flood infrastructure surveys, system performance, damage, response costs
	Flood insurance and reinsurance
	Reconstruction and repair
	Relocation/reconstruction to reduce future vulnerability

Water Quality Management Portfolio

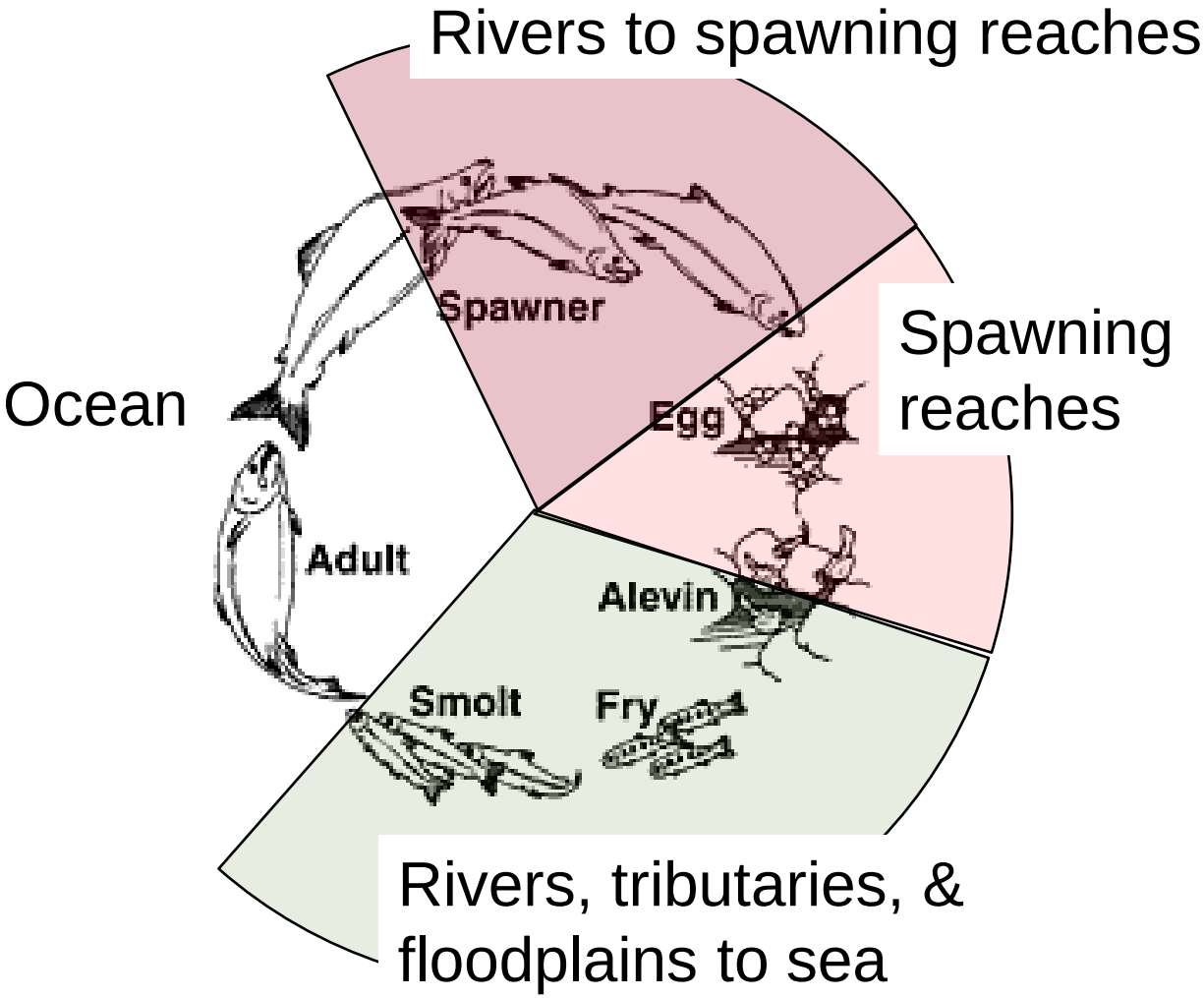
Multiple barriers Infrastructure

- Banned chemicals
- Source protection
  - Rivers, reservoirs
  - Aquifers
- Treatment
- Distribution system
- Public health system

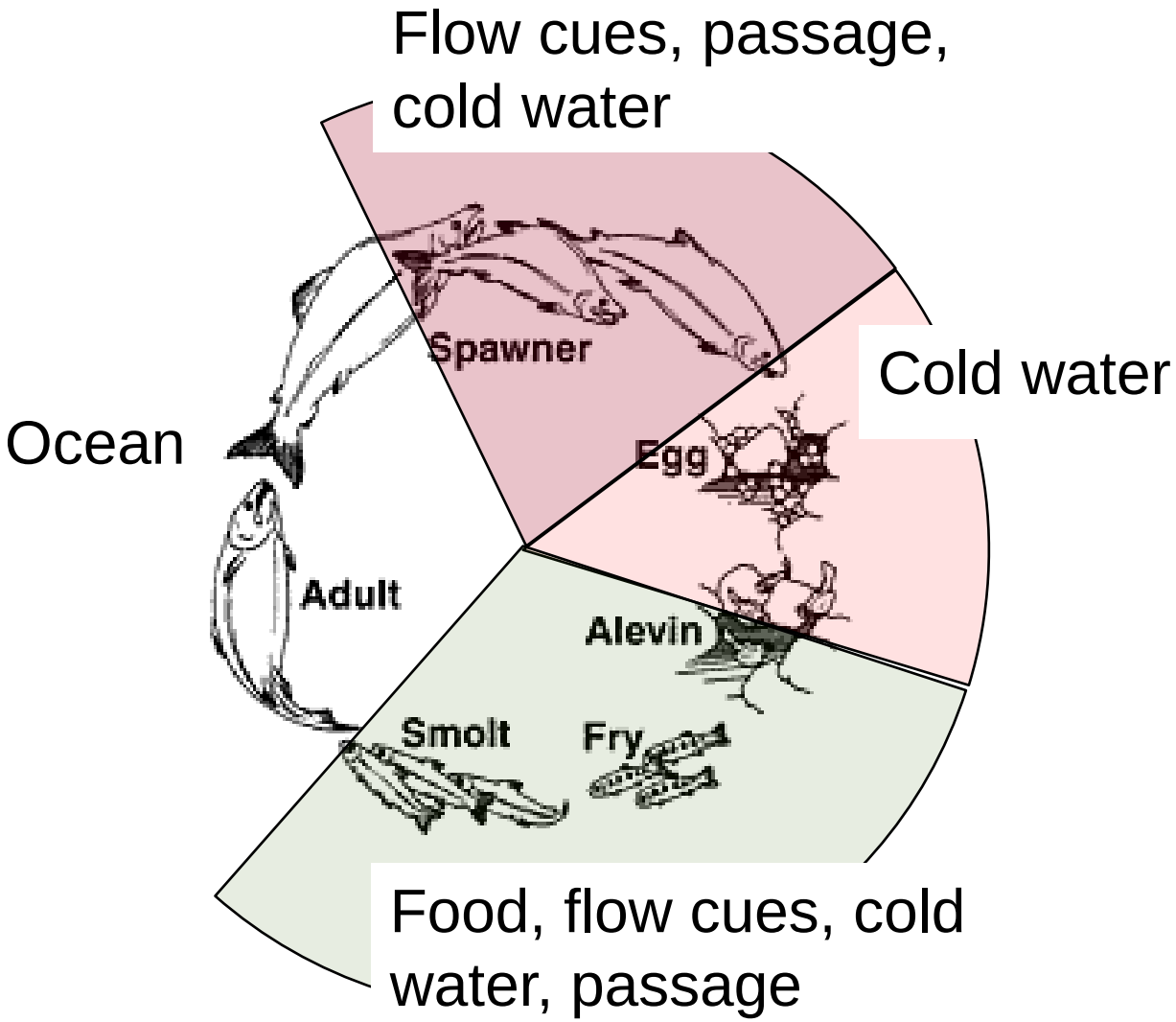
Institutions accountable

- Local water utility, elected boards
- Public health agencies
- State regulators
- Federal regulators
- Professional societies
- Universities

Salmon Life and Habitat Locations



Salmon Life and Habitat Needs

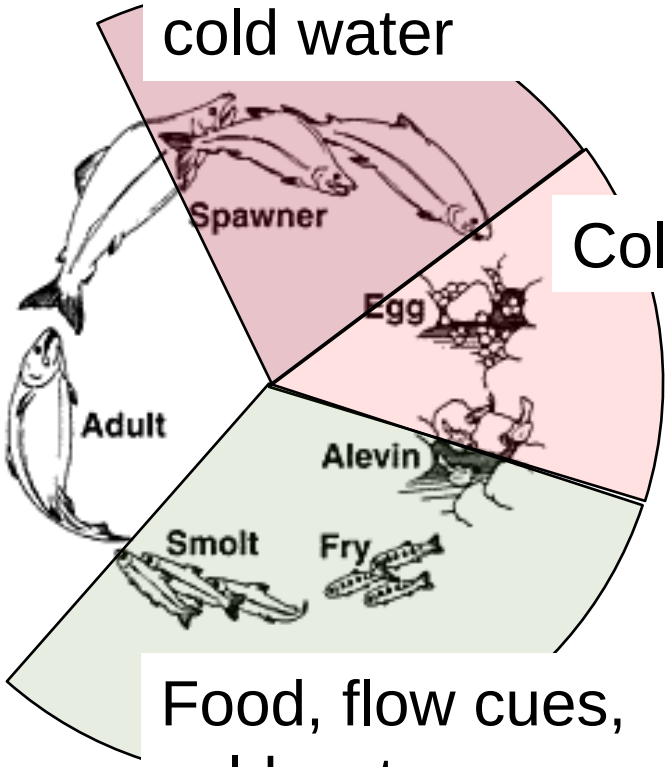


Re-Engineering for Salmon

Cold water and pulse operations; fish ladders, dam removal

Flow cues, passage, cold water

Harvest policies



Cold water

Steady cold flow operations; spring strongholds

Food, flow cues, cold water, passage

Tributary, floodplain, main stem habitats (diversity), connectivity, flow pulses, reconciliation

Building an Integrated Ecosystem Portfolio

Life-cycle support

- Ocean harvesting
- Return spawners
- Eggs
- Rearing juveniles
- Return to sea

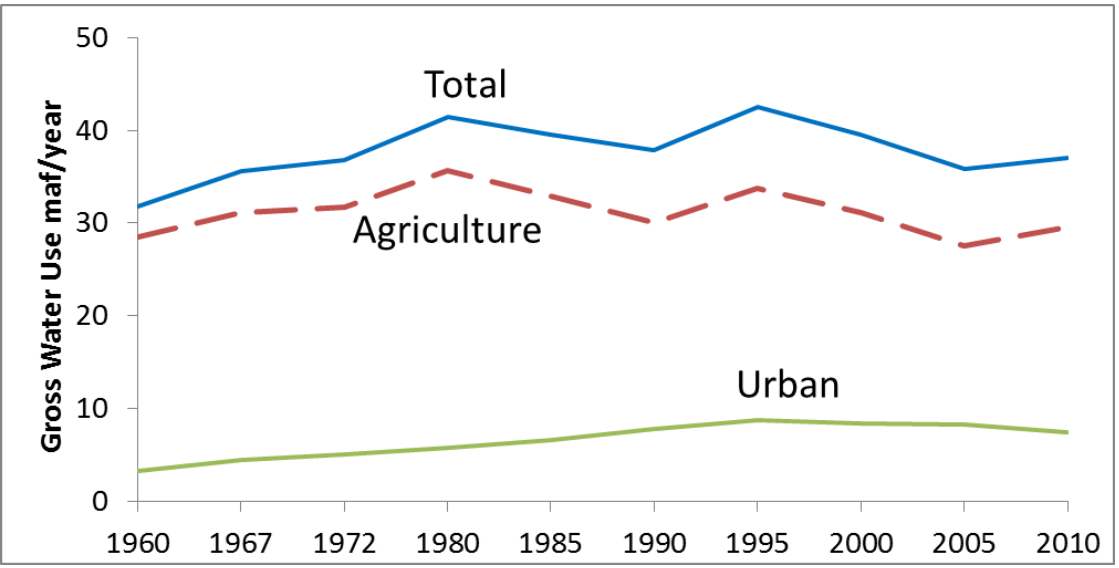
Population only as strong as its weakest stage

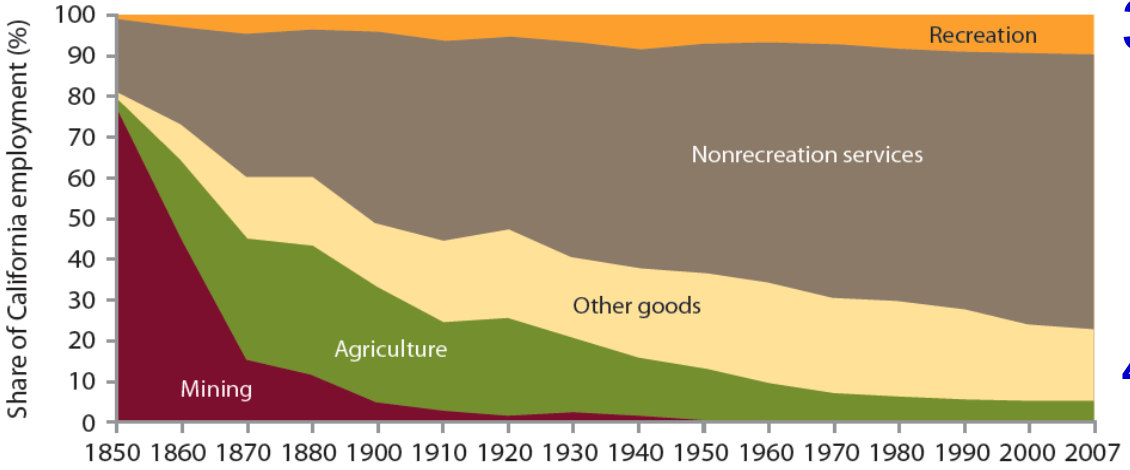
Assets and organization to give flexibility

Institutional support

- Local groups
- Local government
- State government
- Federal government
- NGOs
- Professional societies
- Organized science and education
- Funding for each level
- Common framework

Reasons for Hope

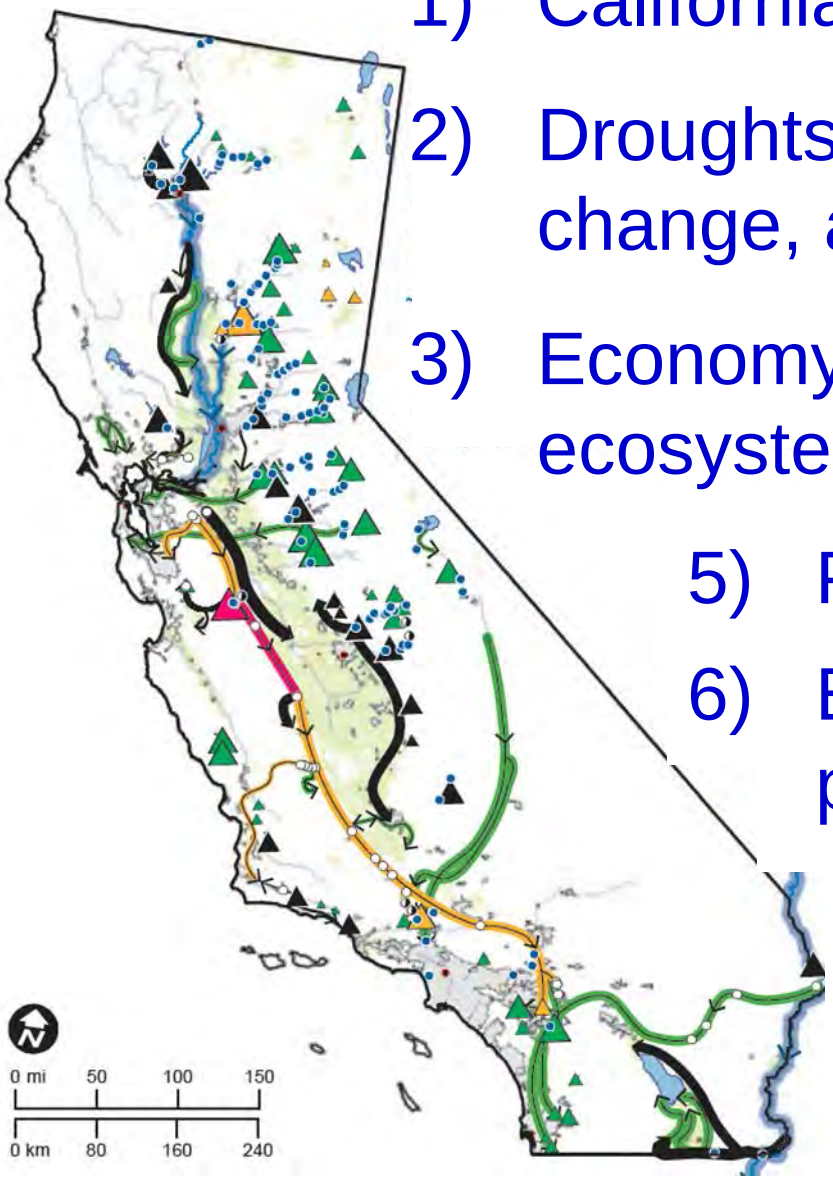




1) Human water use peaked?
2) Economy depends less on water abundance
3) Water markets shift use and civilize change
4) We agree we have a problem

Source: Hanak et al. 2011

Conclusions



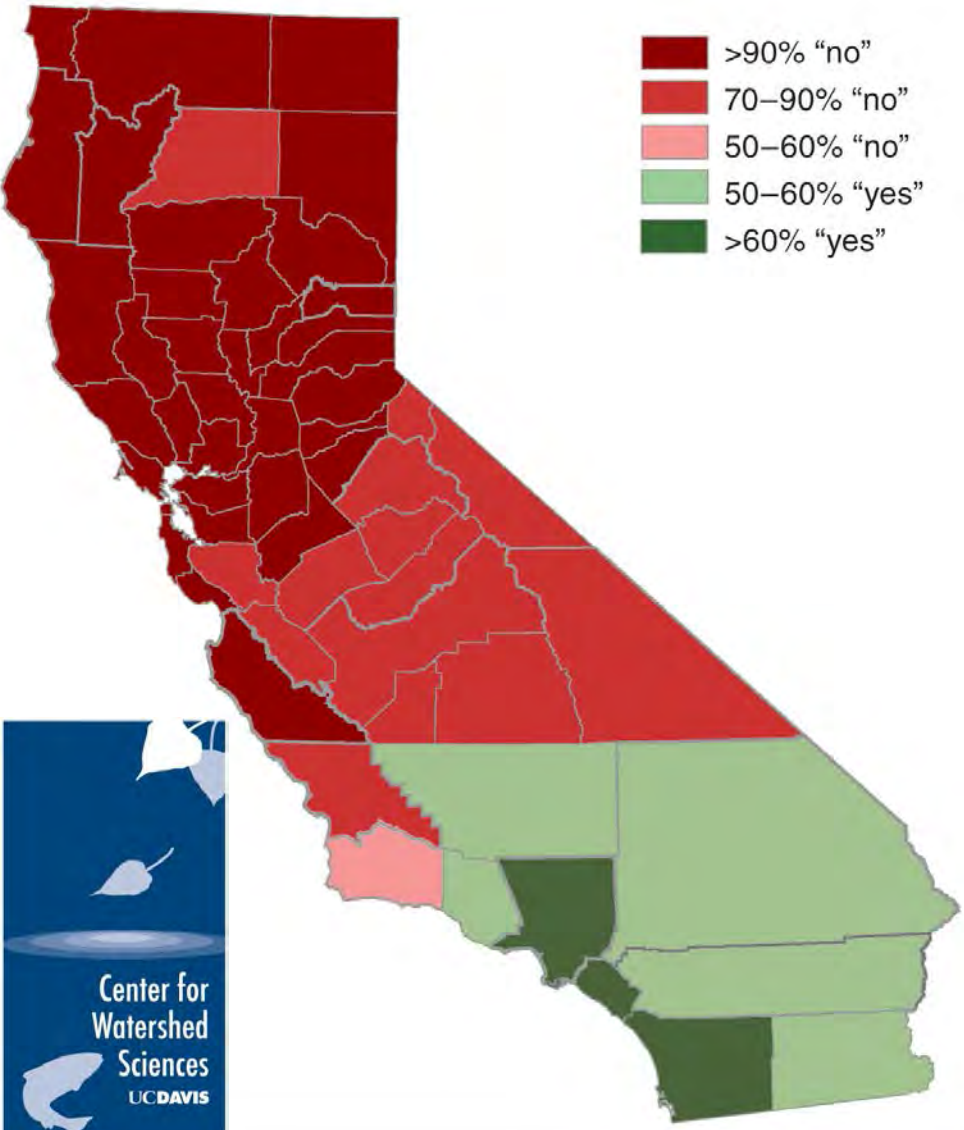
1) California is dry, with many demands
2) Droughts and floods remind us to change, and prepare.
3) Economy is robust to water, overall. But ecosystems most harmed/least prepared
5) Portfolios core of water success
6) Ecosystems need organized portfolios of actions/assets
6) Better water accounting
7) Avoid panic/complacency

Resistance is Futile

1) Flooding in parts of the Delta
2) Reduced Delta diversions
3) Less irrigated land in the southern Central Valley
4) Less urban water use, more reuse & storm capture
5) Some native species unsustainable in the wild
6) Funding solutions mostly local and regional
7) State's leverage is mostly regulatory, not funding
8) Nitrate groundwater contamination will grow
9) Groundwater will be managed more tightly
10) The Salton Sink will be largely restored

Calif. water problems inevitable, but we can do better.

Suggested Readings



Hanak et al. (2011) *Managing California's Water*, PPIC.org

Hanak et al. (2010) *Myths of California Water*, PPIC.org

Hundley (1992), *The Great Thirst*, UC Press.

Kelley (1989), *Battling the Inland Sea*, UC Press.

Lund et al. (2010) *Comparing Futures for the Sacramento San Joaquin Delta*, UC Press

Pisani (1983), *From Family Farms to Agribusiness*, UC Press

MavensNotebook.com

CaliforniaWaterBlog.com

Center for Watershed Sciences UCDAVIS

If Salmon Could Talk…..

Felicia Marcus
Chair, State Water Resources Control Board

Salmonid Restoration Federation

Davis, CA

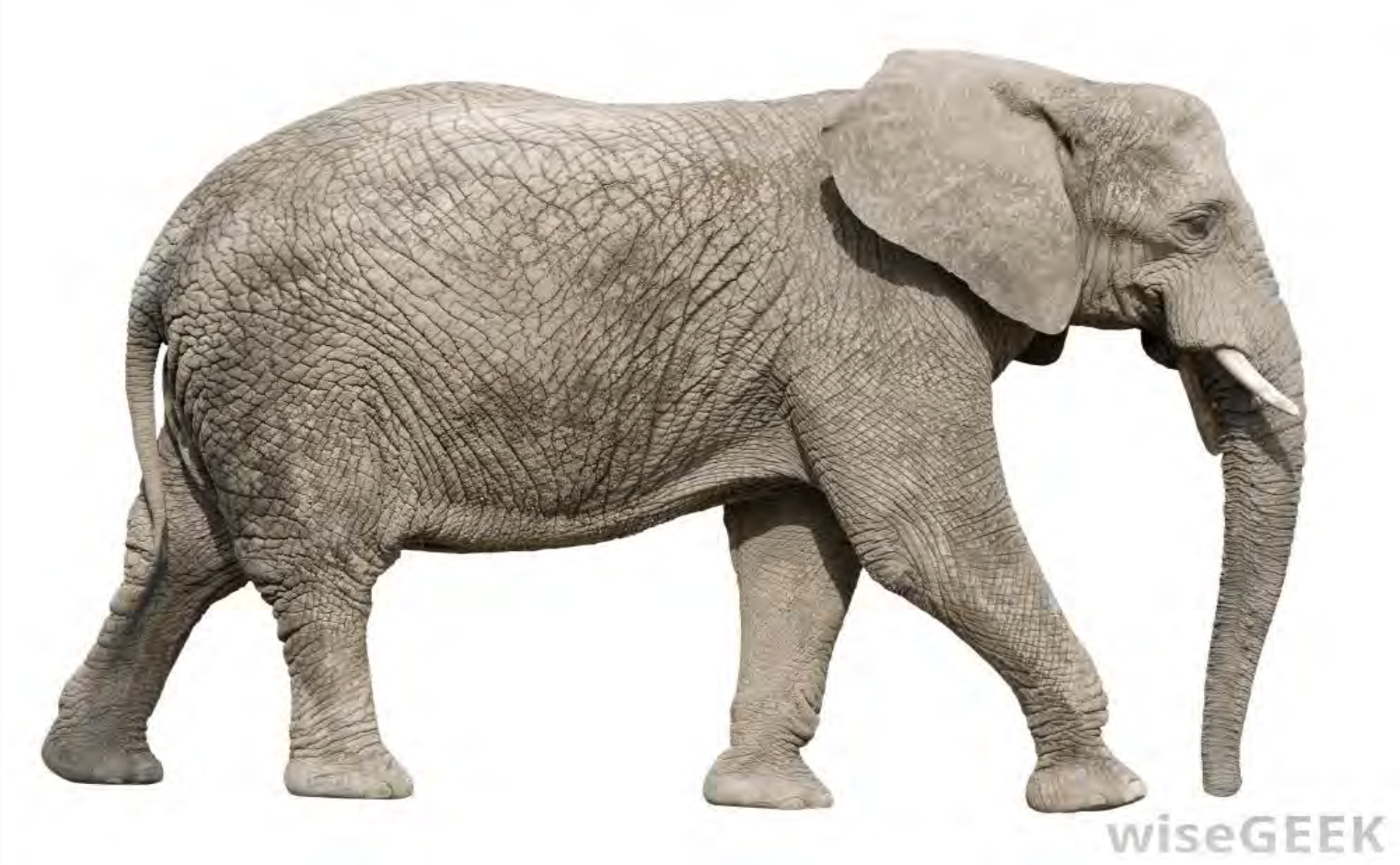
March 31, 2017

STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

Overview

- Introduction
- CA Water *Context—unless Jay did it all*
- Bay Delta--*but not that thing I can't talk about*
- *…About that talking salmon*

All you need to know about CA water policy

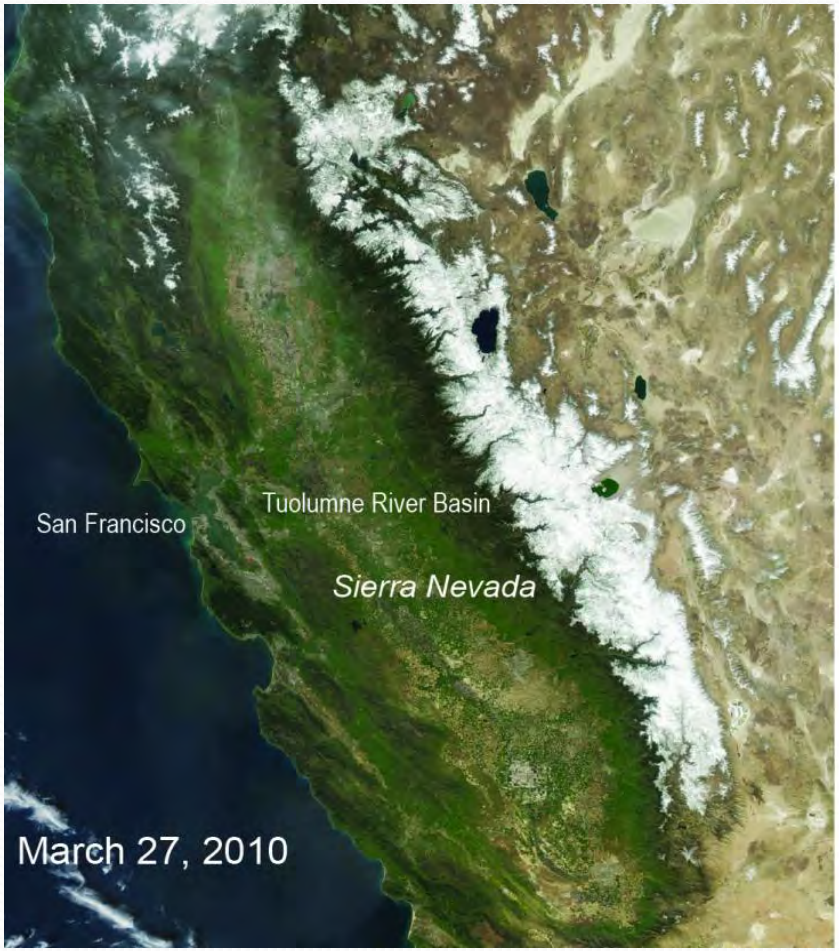


Major Water Projects

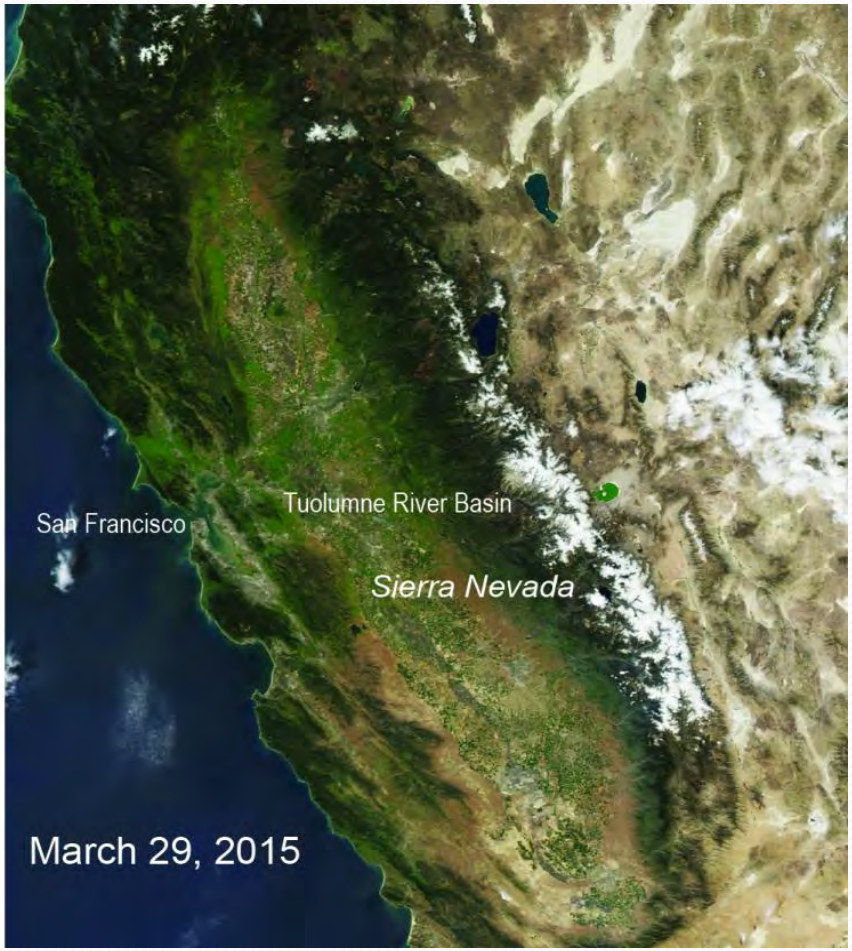
- Federal – Central Valley Project (CVP)
- State – State Water Project (SWP)
- Local – Many other projects throughout state, including Colorado River system, Hetch Hetchy, EBMUD, Owens Valley

Source: Water Environment Foundation

This is California on Climate Change



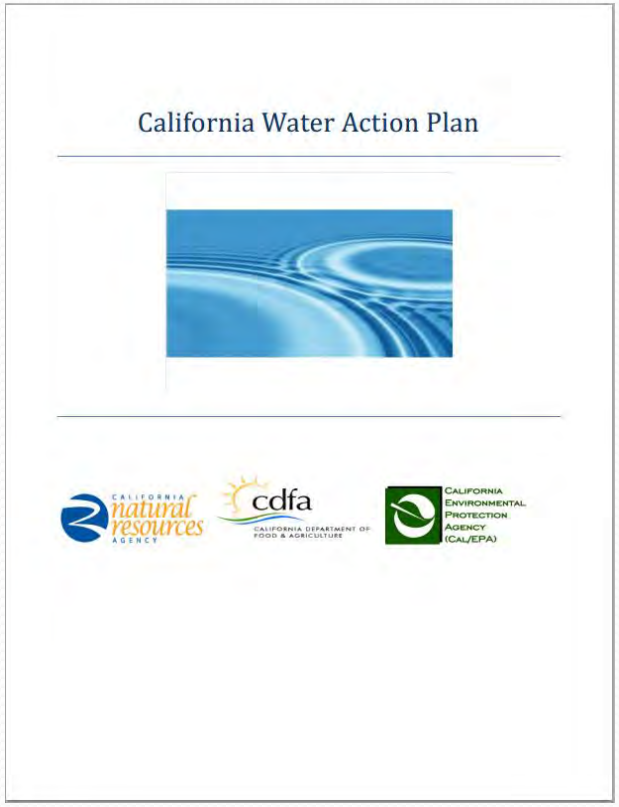
March 27, 2010



March 29, 2015

Source: NASA

California Water Action Plan



- Make Conservation a California Way of Life
- Increase Regional Self-Reliance and Integrated Water Management Across All Levels of Government
- Achieve the Co-Equal Goals for the Delta
- Protect and Restore Important Ecosystems
- Manage and Prepare for Dry Periods
- Expand Water Storage Capacity and Improve Groundwater Management
- Provide Safe Water for All Communities
- Increase Flood Protection
- Increase Operational and Regulatory Efficiency
- Identify Sustainable and Integrated Financing Opportunities

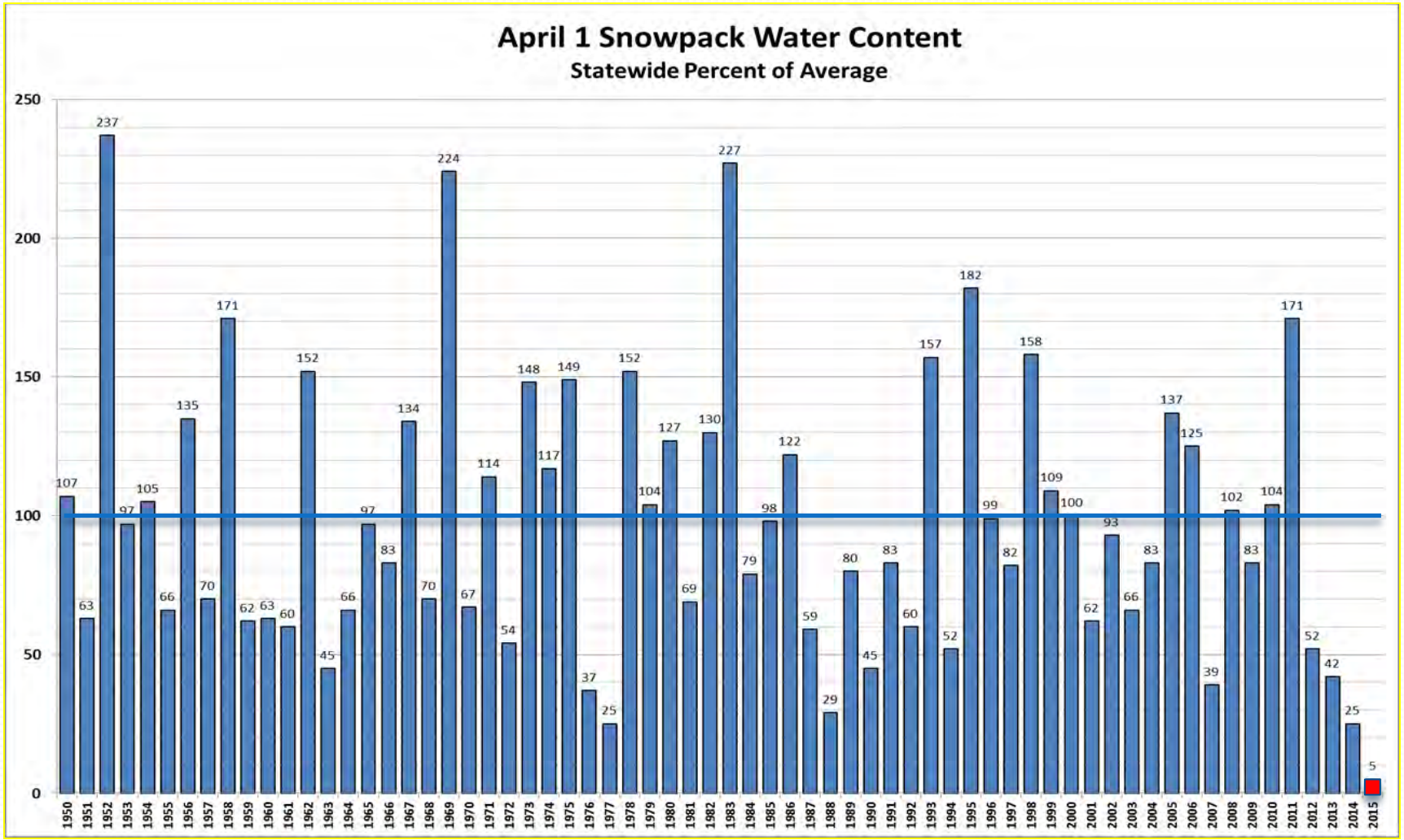
Recent crisis: Worst drought in modern times

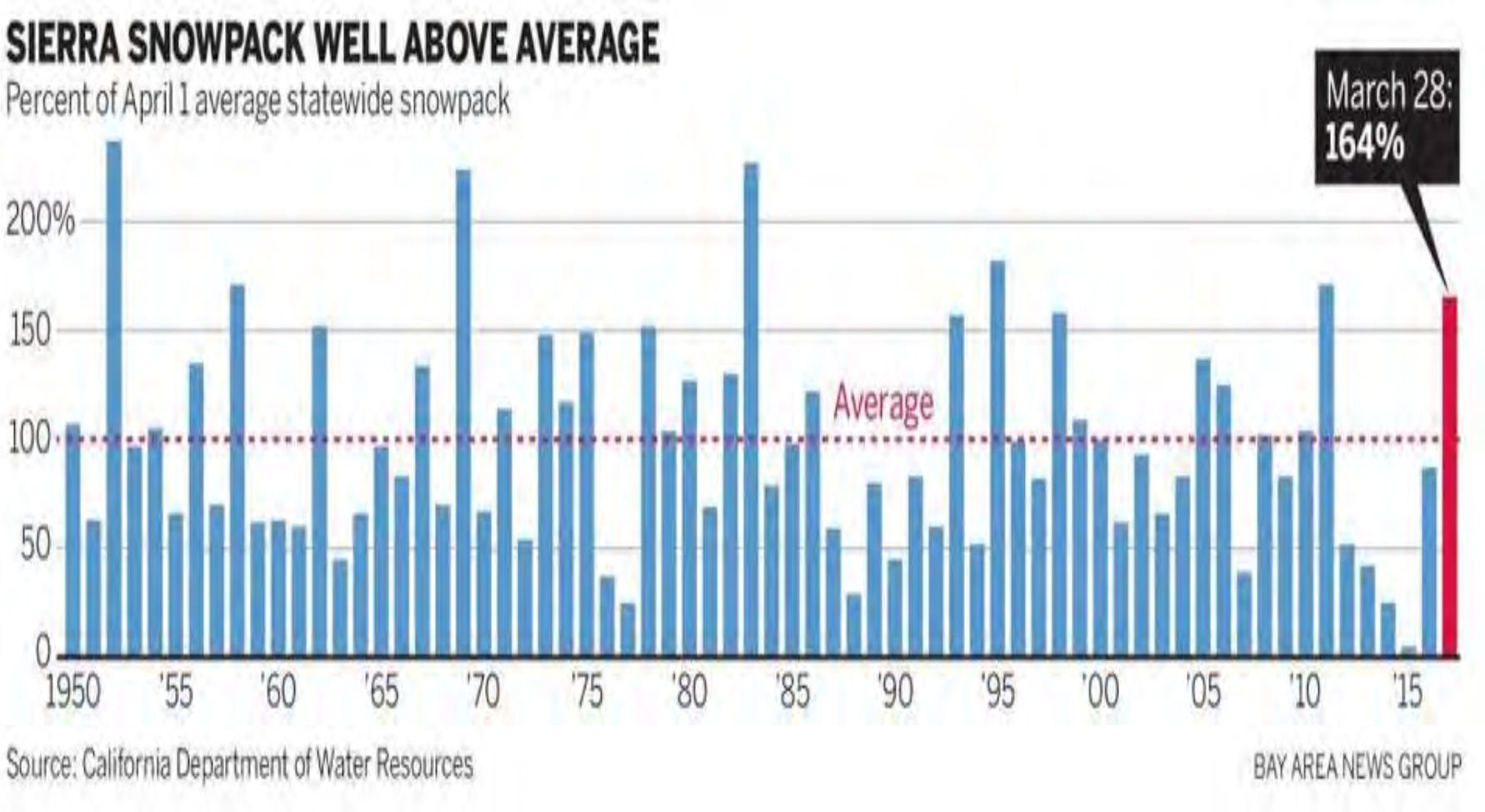
January, 2013 *January, 2014*

Harbinger of things to come—think Australia and Climate Change

Credit: NASA

2015 Statewide Snow Water Content




SIERRA SNOWPACK WELL ABOVE AVERAGE
Percent of April 1 average statewide snowpack
March 28:
164%
200%
150
100
50
0
Average
1950
'55
'60
'65
'70
'75
'80
'85
'90
'95
'00
'05
'10
'15
Source: California Department of Water Resources
BAY AREA NEWS GROUP

Selected impacts

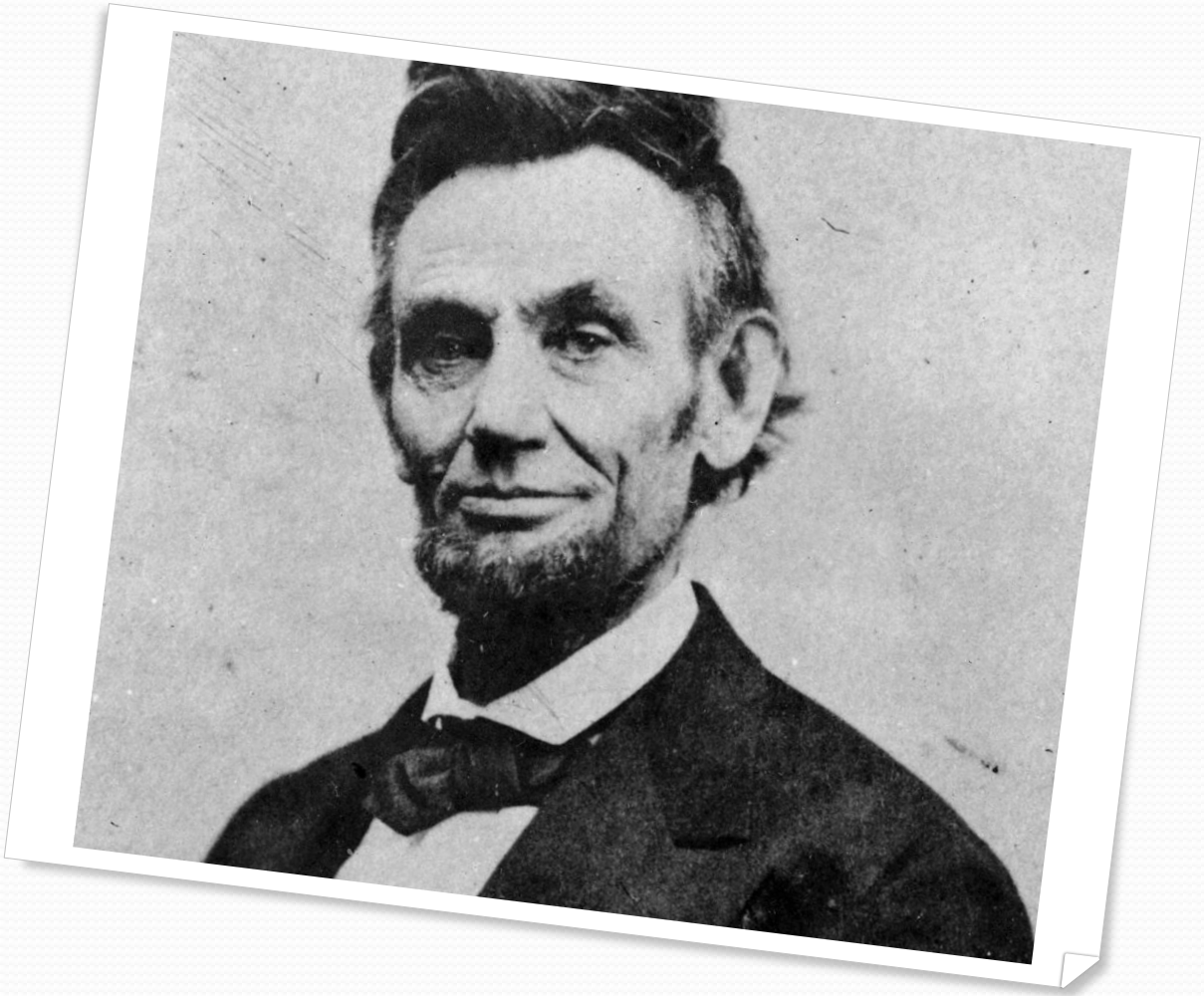
Selected Actions—

Water Bond 2014

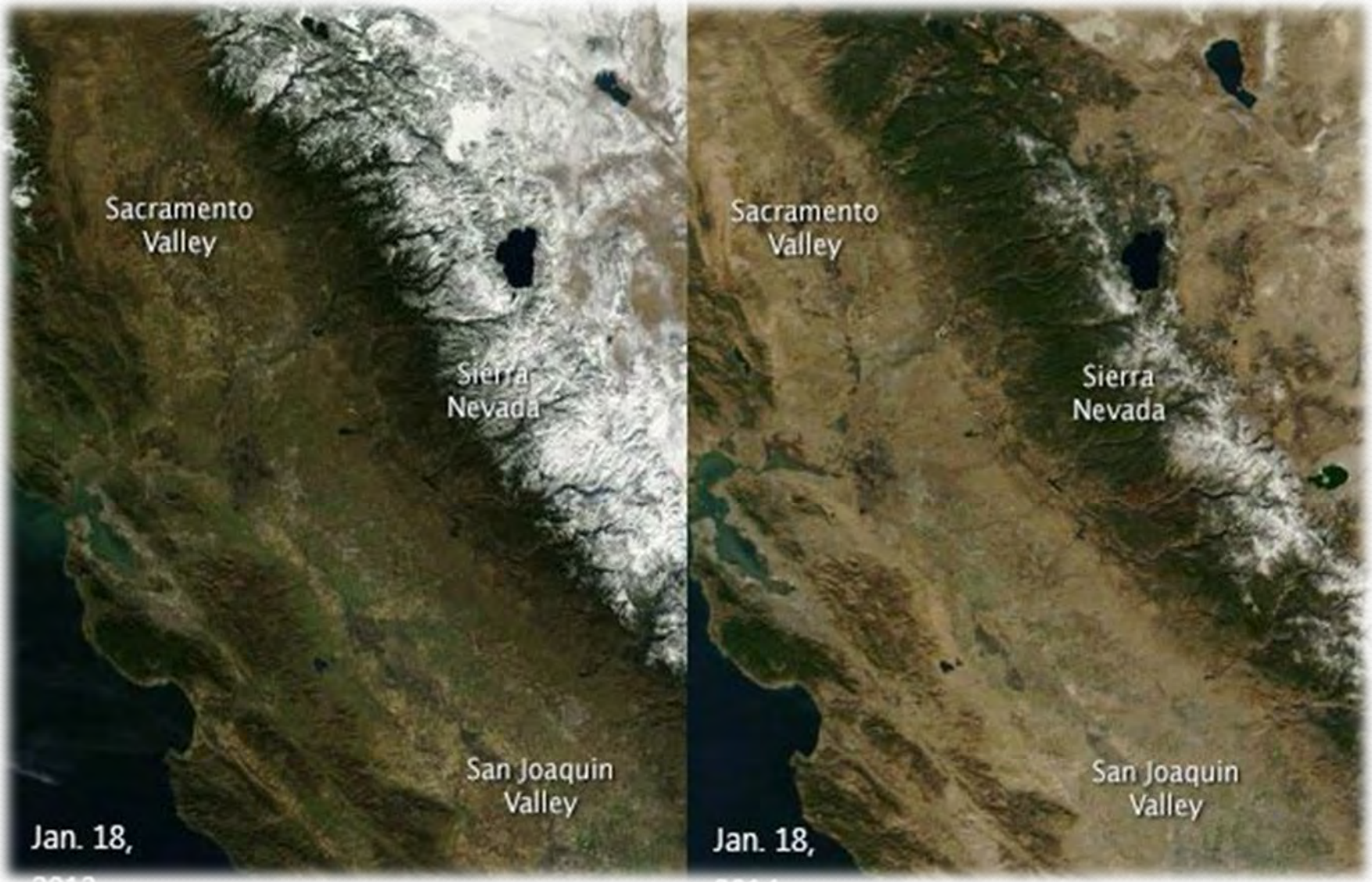
- AB 1471 (Rendon)
- Water Quality, Supply, and Infrastructure Improvement Act of 2014 – $7.545B
- Hard fought, but near unanimous vote at end
- Real mix of “all of the above” minus BDCP
- Down-payment on full needs, but a lot that is good, visible, and paves way for next round

Dealing with reality

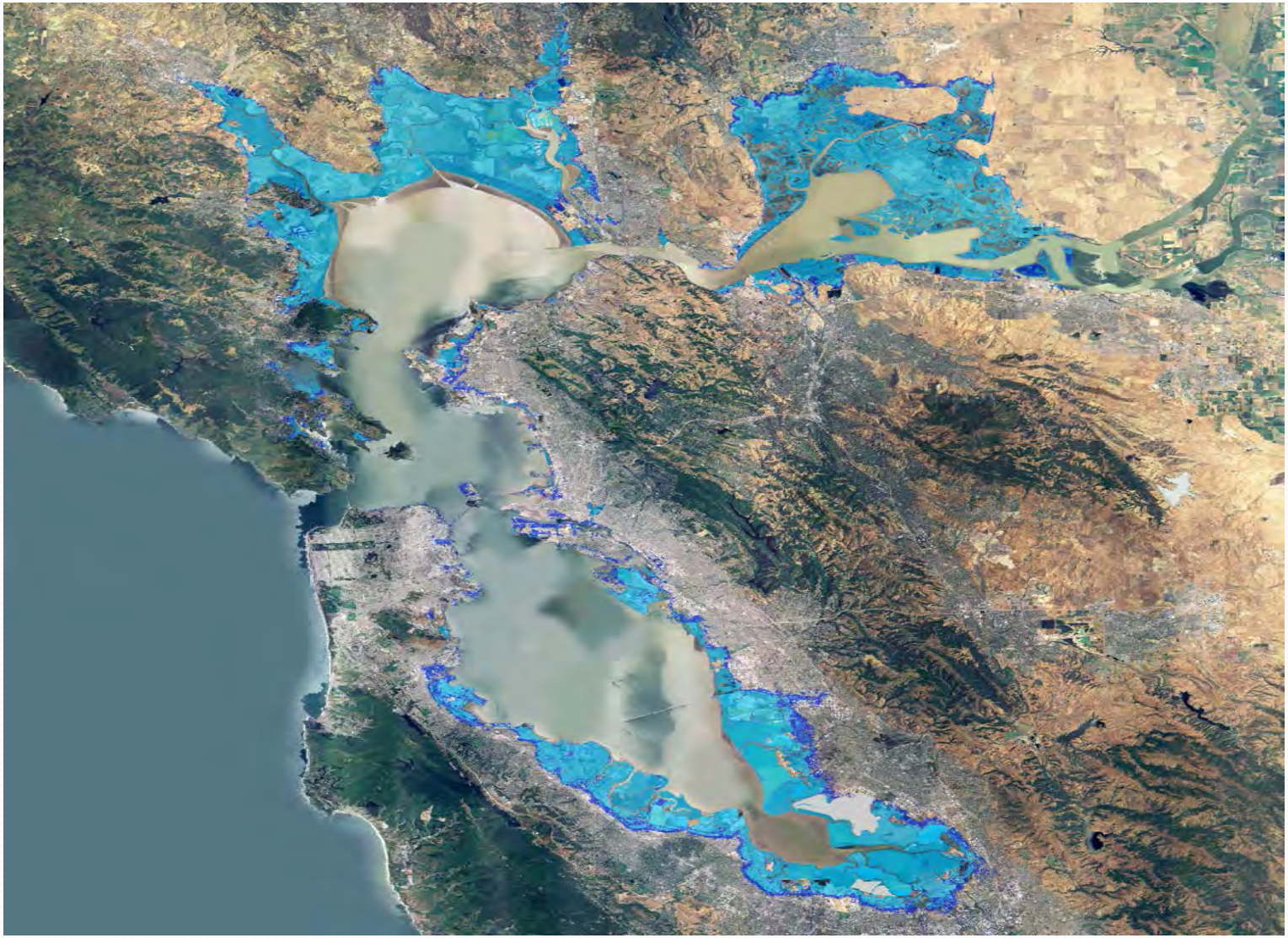
"I am a firm believer in the people. If given the truth, they can be depended upon to meet any national crisis. The great point is to bring them the real facts, and beer."



Reality: Loss of snowpack

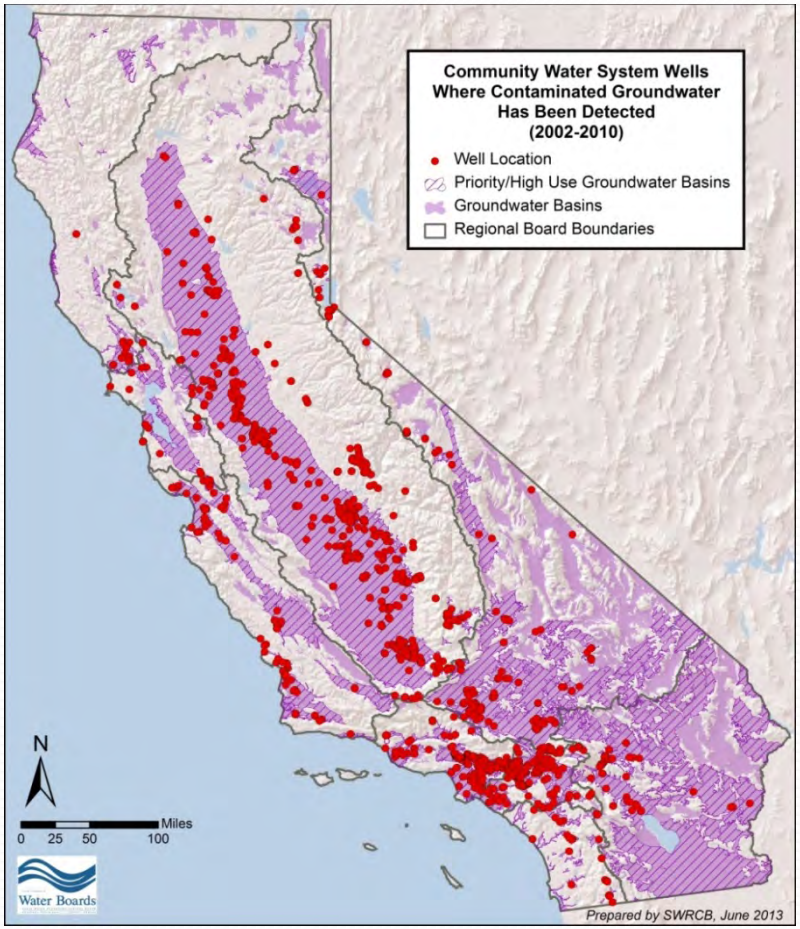


Reality: Sea Level Rise

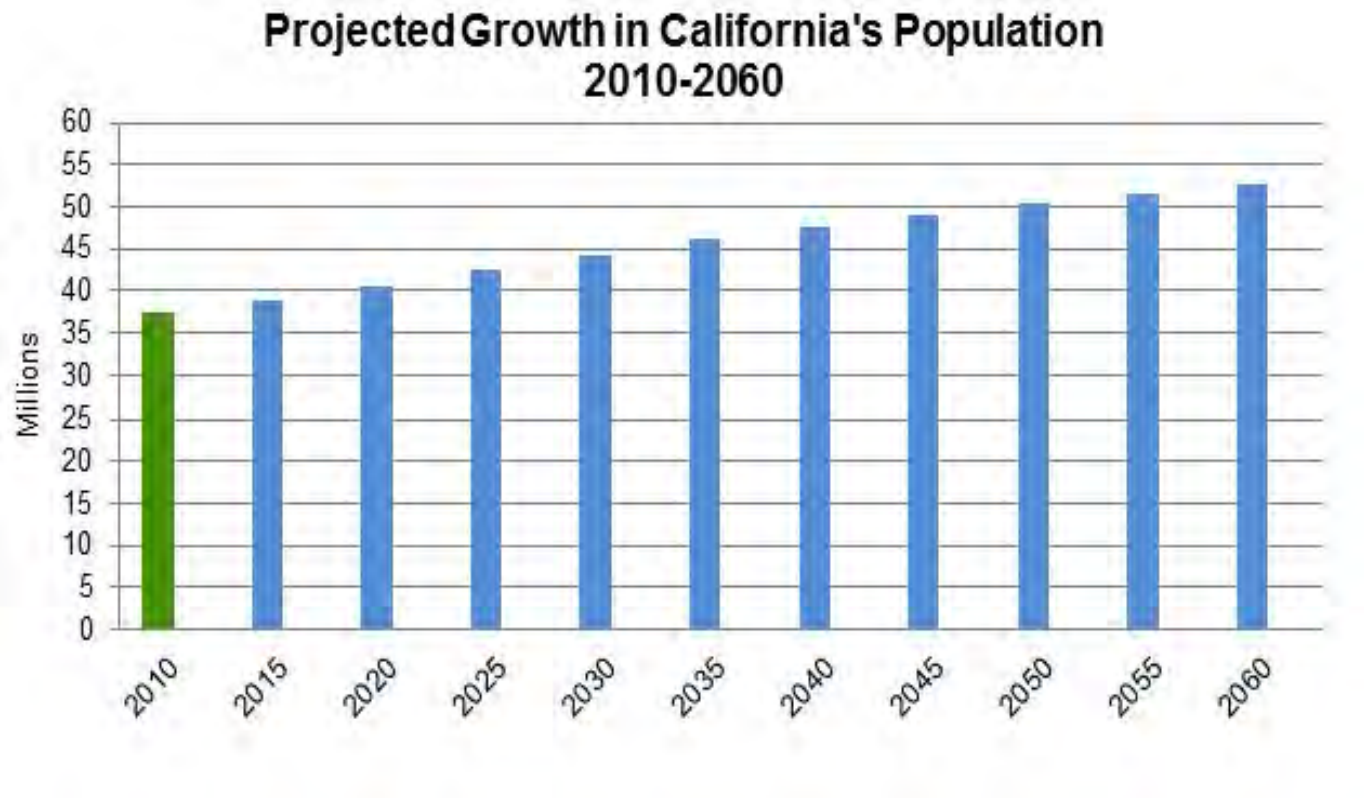


Reality: The Delta needs our help

Reality: Community Well Systems Where Contamination has been Detected



Reality: Population will rise

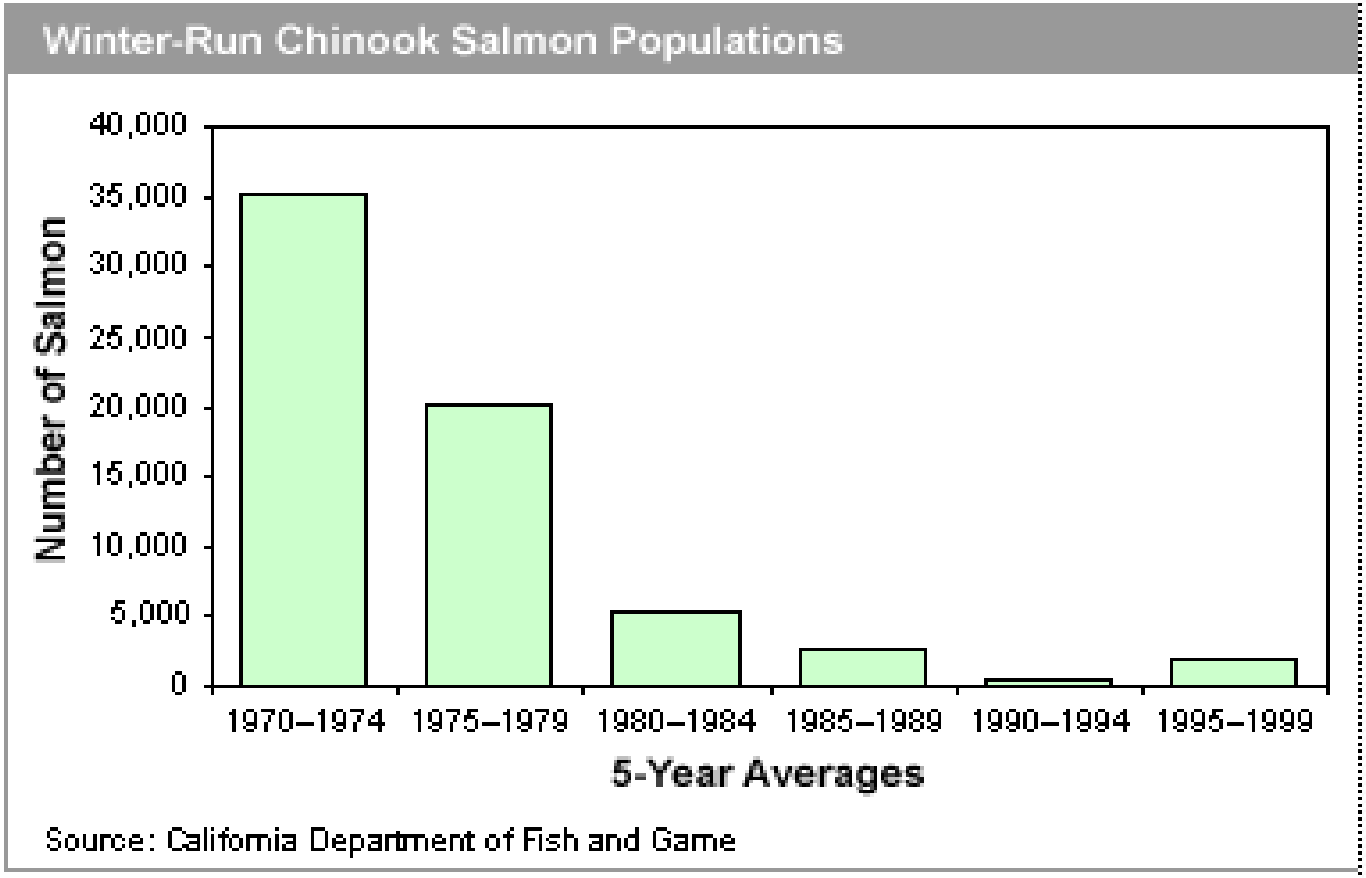


- Source: Department of Finance; Controller Betty Yee website

Reality: Our infrastructure is aging and inadequate to the times

Reality: California agriculture is precious resource for all of us

Reality: Fish and wildlife are imperiled



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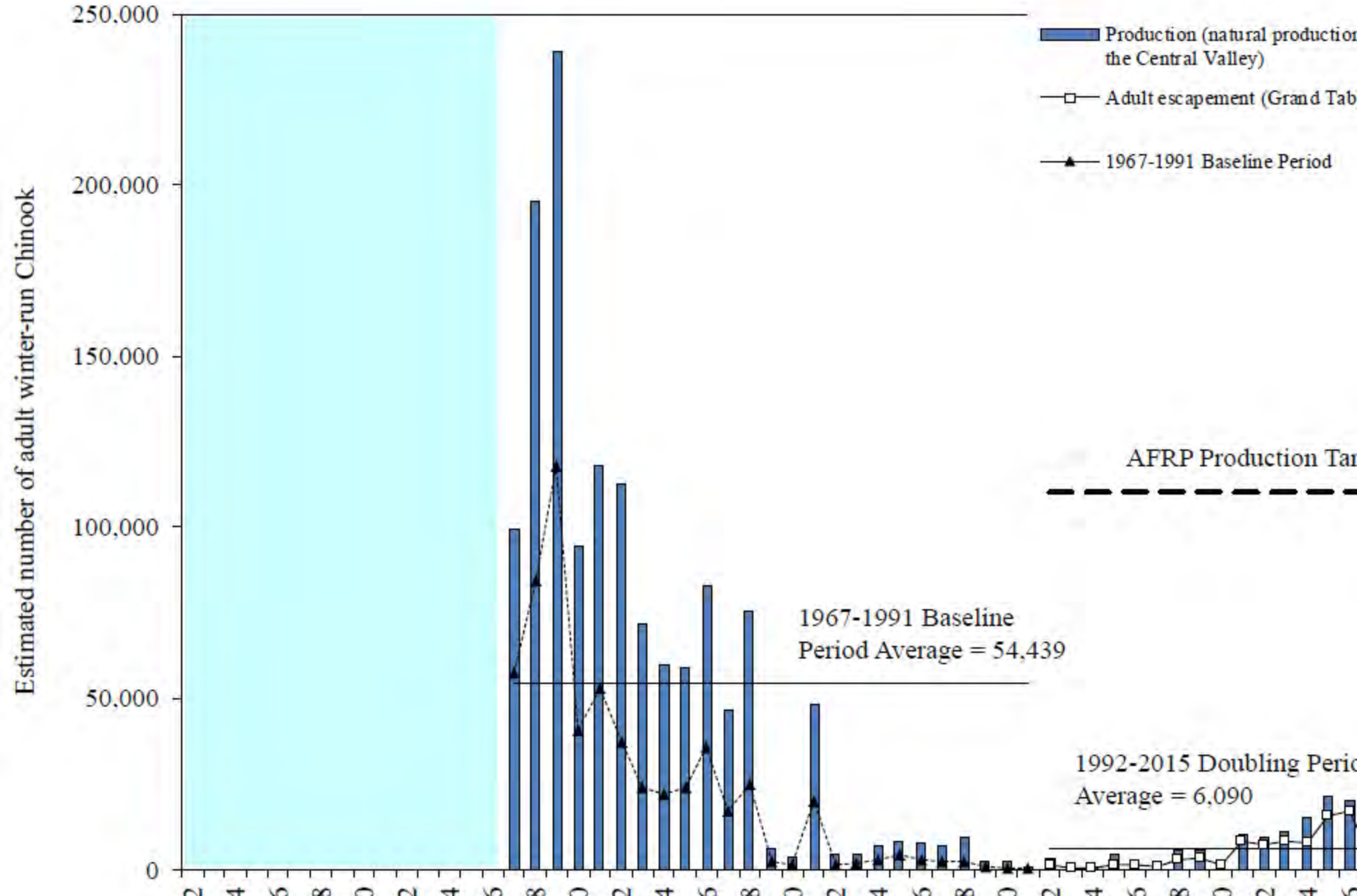
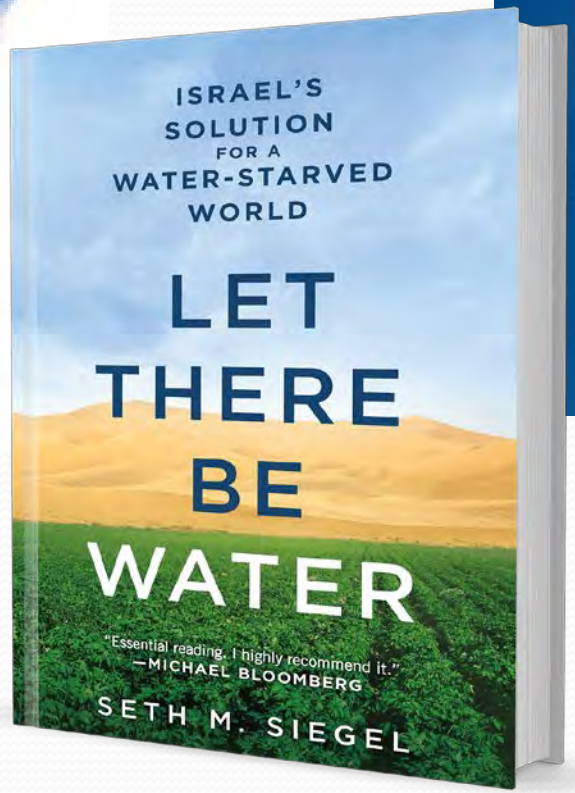

250,000
200,000
150,000
100,000
50,000
0
Estimated number of adult winter-run Chinook
Production (natural production
the Central Valley)
Adult escapement (Grand Tab
1967-1991 Baseline Period
AFRP Production Tar
1967-1991 Baseline
Period Average = 54,439
1992-2015 Doubling Perio
Average = 6,090

Reality: Lack of statewide groundwater management has been a problem

Reality: We can do something about it



Reality: We are doing something about it

- Myriad Individual acts of transcending traditional silos
  - Integrated Regional Water Management
  - Drought "angels"
  - Fish/farmer win/wins—e.g., rice
- Legislative agreements, e.g.,
  - "Human right to water"
  - 2009 legislation/"coalition of the willing"
  - Groundwater legislation
  - Water Bond--$7.57 billion
  - Water Rights improvements, including measurement
- Water Action Plan and other examples, e.g.,
  - Conservation, recycling, stormwater acceleration
  - Public support for conservation, for fish/wildlife, for agriculture
  - 25% savings examples
  - Groundwater management movement
  - Elevation of floodplain restoration in public discourse, upper watersheds
  - Delta actions, regulatory and Cal Eco-Restore and that other thing I can't talk about in motion

Water Board Priorities

Overall: Implement Water Action Plan and Steward Bond Monies Effectively

Water Supply

Dealing with drought and…

- **Bay-Delta Water Quality Plans**
- Delta Water Fix: Water Rights Permit change
- Resolving multi-decadal conflicts between water users
- Taking Public Trust and Waste and Unreasonable Use responsibilities seriously and thoughtfully
- Groundwater management: lend support/observe/act effectively
- Mandatory Urban Conservation Regs: bridge and pivot to long term efficiency, including permanent
- ***Cannabis curve***

Action over stasis

Water Quality

Big point source to diffuse externality of socially productive exercise

- **Safe Drinking Water:** top of charts
- Stormwater Elevation
- Recycled water advancement
- Desal policy: implement
- Contaminated GW basins: accelerate cleanup/functional use
- Irrigated lands appeals and implementation
- Fracking/O&G: implement SB4+
- Nutrients/Harmful Algae blooms
- …Toxicity/**Wetlands**/etc…
- ***Cannabis curve***

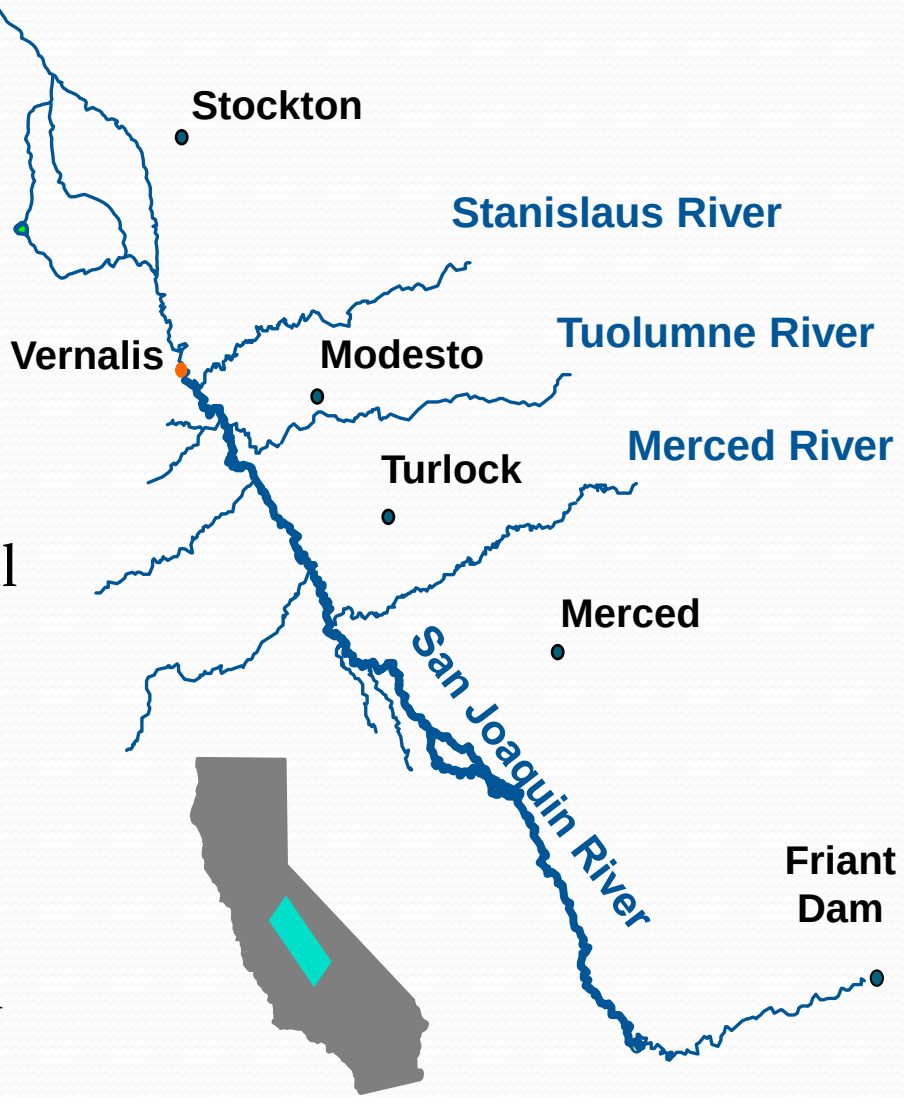
Did I say action over stasis?

Bay-Delta Water Quality Control Plan (Bay-Delta Plan)

Phase I: Update of San Joaquin River flow and Southern Delta Salinity Requirements

Staff proposal:

- Focus on tributaries
- Provide a portion (40% of unimpaired flows) of the February – June inflows to the Stanislaus, Tuolumne, and Merced Rivers for environmental purposes to achieve critical ecological functions with other measures in an adaptive management framework
- Modify salinity requirements to reasonably protect agriculture
- Adaptive management invitaton and incentive



Phase II: Sacramento River and Delta Tributary Inflows, Delta Outflows, Coldwater Habitat and Interior Flows

At Scientific Basis Report stage, headed to peer review.

After workshops, hearing, draft, ISB review

Proposal in summer.

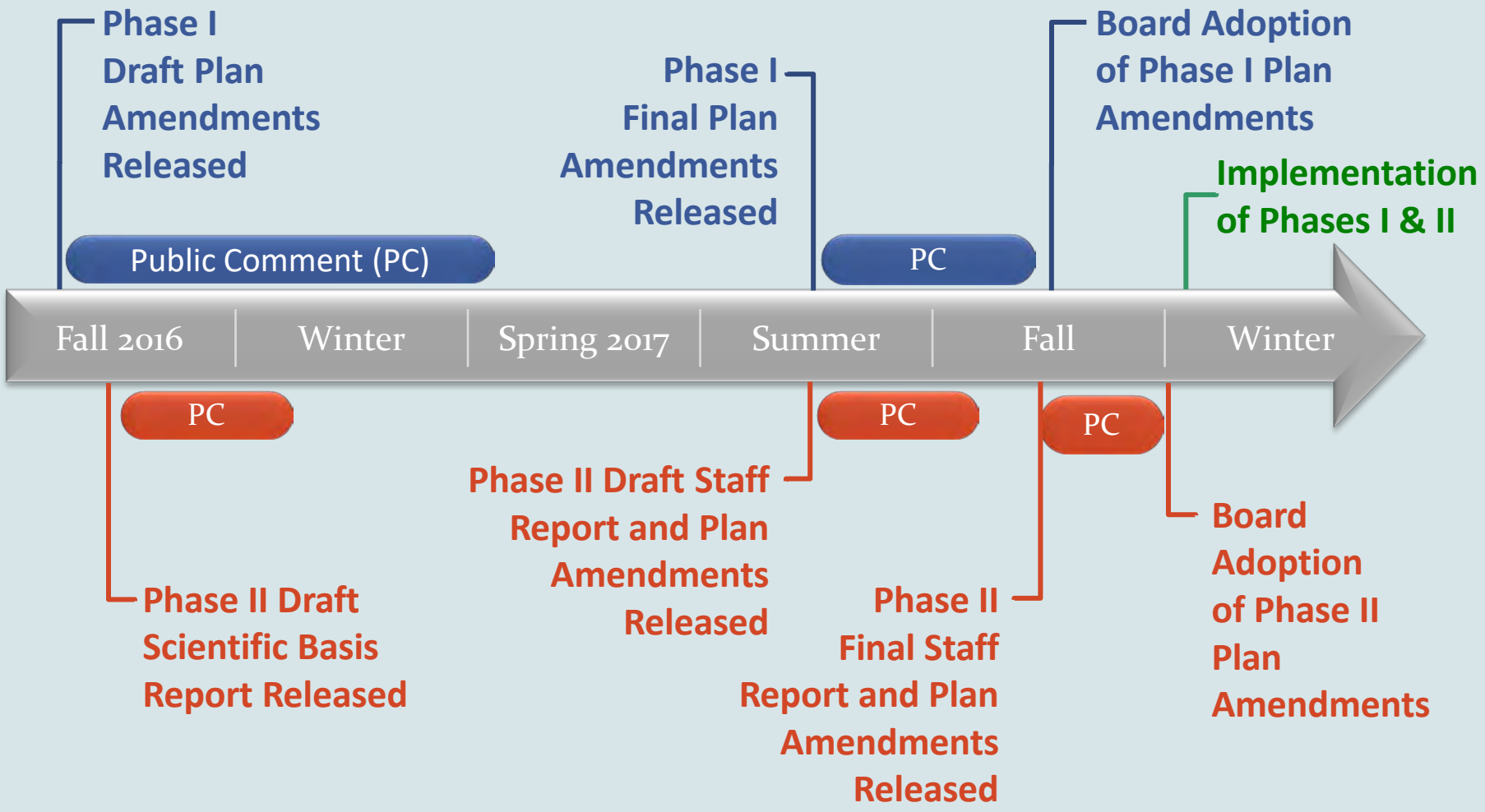
Update of the Bay-Delta Plan

- Common components of the Phase I and II updates:
  - Adaptive management with account of water for environmental purposes based on percent of unimpaired flows;
  - Integration with non-flow measures;
  - Encouragement of settlements; and
  - Balancing competing uses of water

Why Focus on Flow?

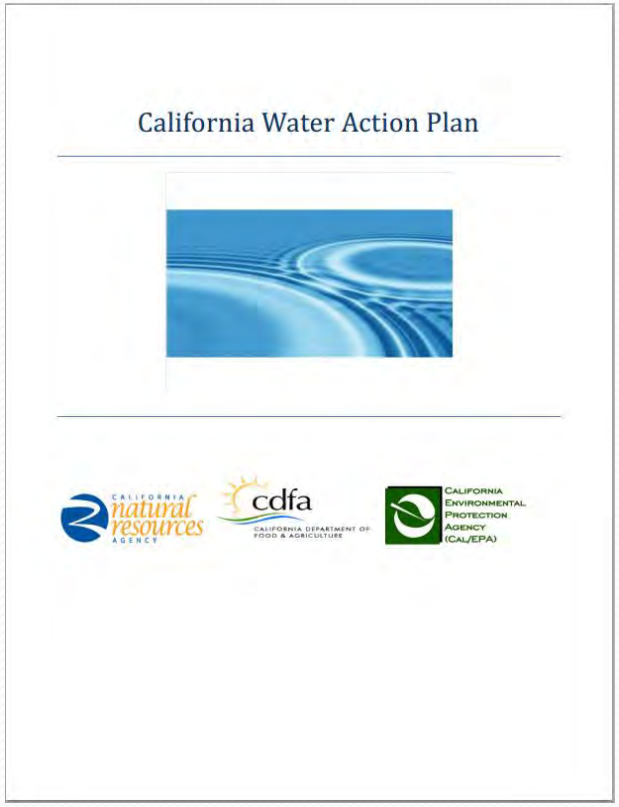
- Scientific studies show that flow is major factor in survival of fish and aquatic organisms
- **Many benefits of flow:** improved growth and survival of native aquatic species by improving migration, water temperatures and other habitat conditions
- **Flow affects:** risk of disease, risk of predation, reproductive success, growth, smoltification, migration, feeding behavior, and other ecological factors
- Board has primary authority over flow; the Board will assist other agencies which have authority to require non-flow measures and is trying to incentivize more non-flow measures
- *Flow is essential and is now inadequate, flow helps with all needs, but fish need more than flow!*

Bay-Delta Plan Update Timeline



More information at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/

California Water Action Plan



- Make Conservation a California Way of Life
- Increase Regional Self-Reliance and Integrated Water Management Across All Levels of Government
- Achieve the Co-Equal Goals for the Delta
- Protect and Restore Important Ecosystems
- Manage and Prepare for Dry Periods
- Expand Water Storage Capacity and Improve Groundwater Management
- Provide Safe Water for All Communities
- Increase Flood Protection
- Increase Operational and Regulatory Efficiency
- Identify Sustainable and Integrated Financing Opportunities

STOP THE REGULATORY DROUGHT


Mr. President, we need:
1. Water 2. Dams 3. Fish
Steve Brandau
OUTFRONT

DRAFT

6-30-16

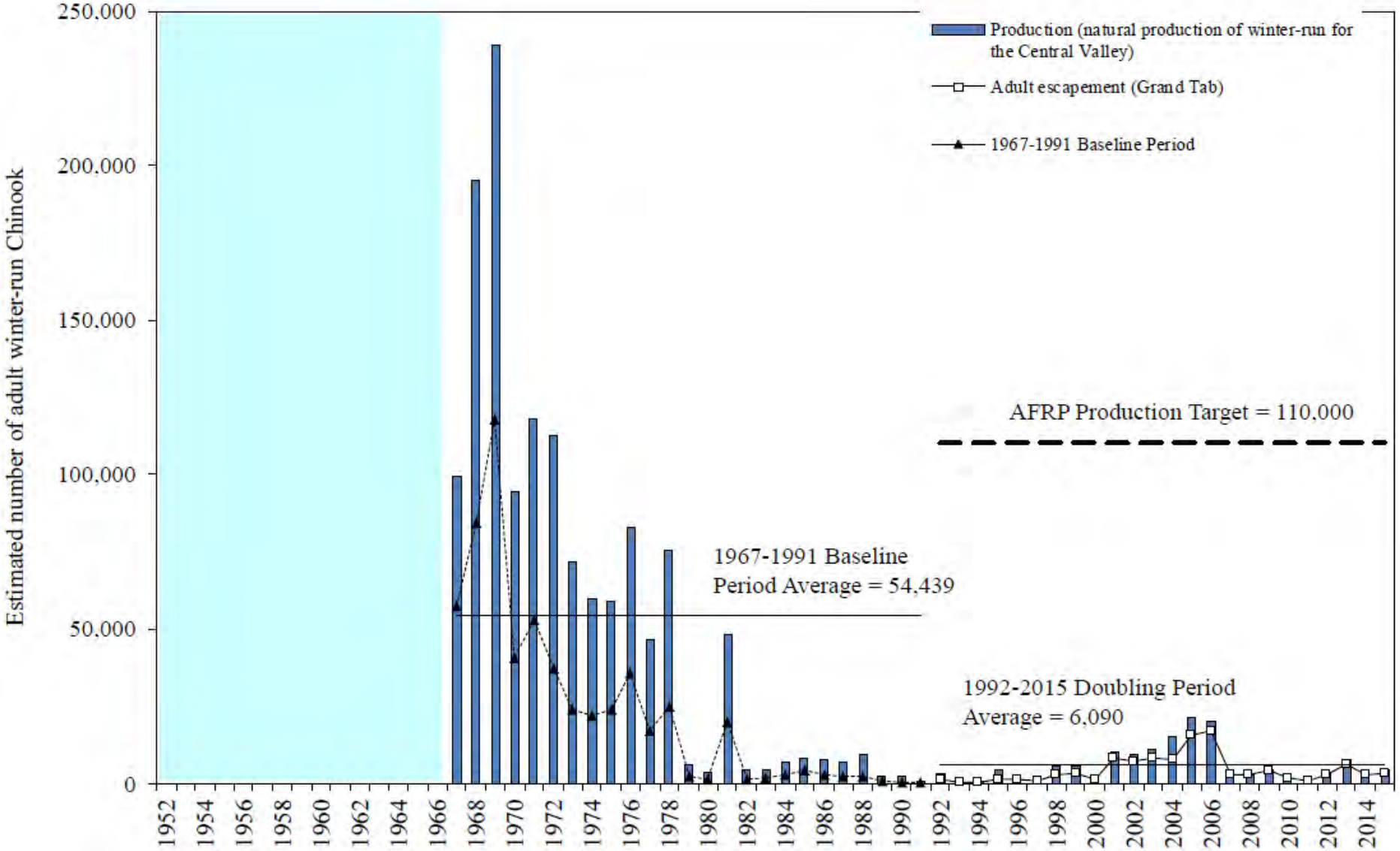


Figure 4. Estimated yearly adult natural production, and in river adult escapements of winter-run Chinook salmon in the Central Valley rivers and streams. ▭ = data was not available for 1952-1966. 1992-2015 numbers are from CDFG Grand Tab (Apr 11, 2016). 1967-1991 Baseline Period numbers are from Mills and Fisher (CDFG, 1994).


WHAT THE FRACK?
ARROWHEAD
PURE QUALITY
100% MOUNTAIN SPRING WATER

Like a chicken talking to a duck…


gettyimages
Justin Bailie

Yes. Some are red. And some are blue.

Some are old. And some are new.

Some are sad.

And some are glad.

And some are very, very bad.

Why are they
sad and glad and bad?
I do not know.
Go ask your dad.

Wendell Berry

- *To cherish what remains of the Earth and to foster its renewal is our only legitimate hope of survival.*
- *Eating is an agricultural act.*
- *You cannot save the land apart from the people, or the people apart from the land.*

Thank you