THE FUTURE OF CALIFORNIA'S INLAND FISHES

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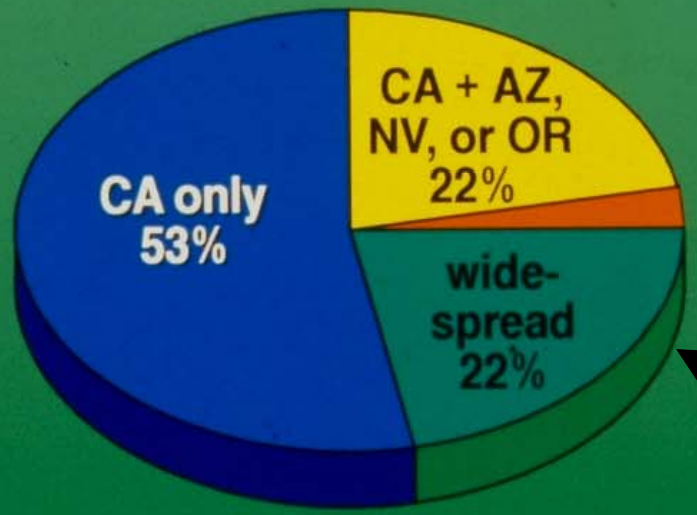
Endemism in Native California Fishes



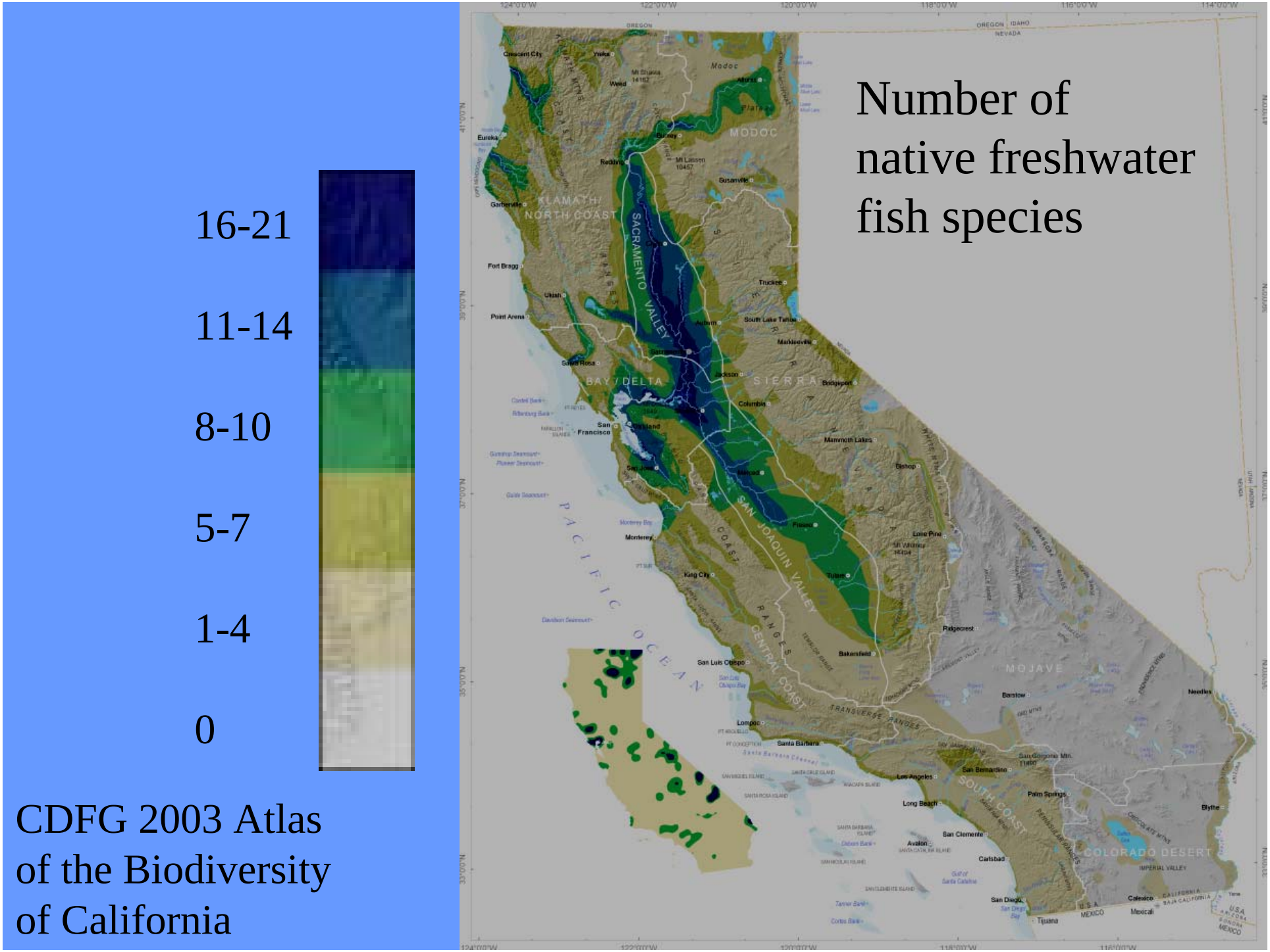
Mostly with distinct CA populations

Found only in California

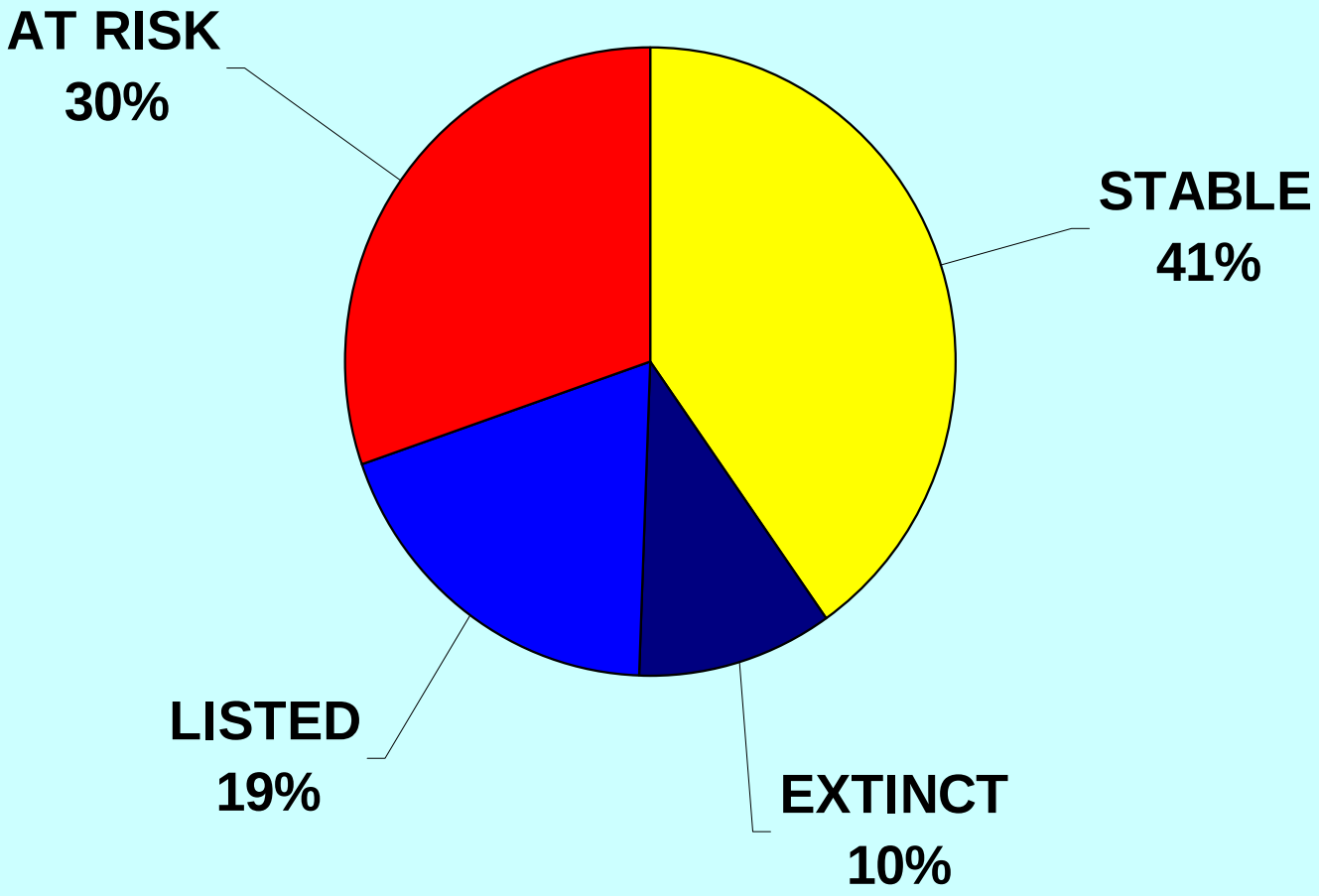
Found in California and adjacent state(s)

Widespread but peripheral in California

Widespread


Number of native freshwater fish species
16-21
11-14
8-10
5-7
1-4
0
CDFG 2003 Atlas of the Biodiversity of California
SACRAMENTO VALLEY
SAN JOAQUIN VALLEY
SIERRA
KLAMATH/ NORTH COAST
MODOC
BAY / DELTA
MOJAVE
SOUTH COAST
COLORADO DESERT
CENTRAL COAST
TRANSVERSE RANGES
PACIFIC OCEAN
Crescent City
Eureka
Redding
Susanville
Fort Bragg
Ukiah
Point Arena
Truckee
Sacramento
San Francisco
Oakland
San Jose
Monterey
Fresno
Mammoth Lakes
Bishop
Lone Pine
Tulare
King City
Bakersfield
Ridgecrest
Barstow
Needles
San Luis Obispo
Lompoc
Santa Barbara
Los Angeles
San Bernardino
Palm Springs
Blythe
Long Beach
San Clemente
Avalon
Carlsbad
San Diego
Tijuana
Mexicali
Calexico
OREGON
NEVADA
IDAHO
MEXICO

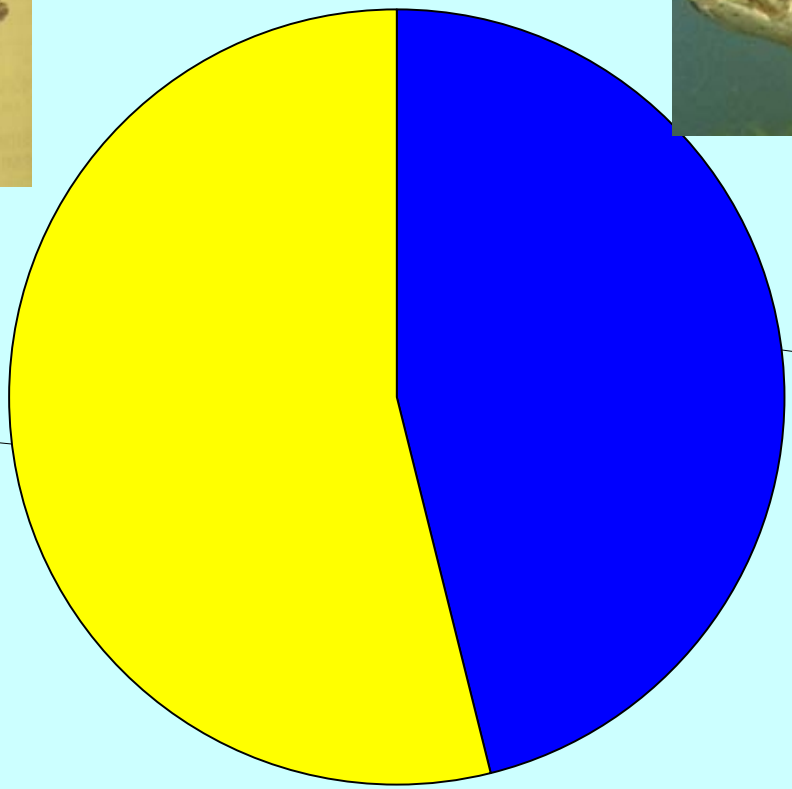
STATUS
NATIVE CALIFORNIA FISH SPECIES
N = 67



FRESHWATER FISHES OF CALIFORNIA

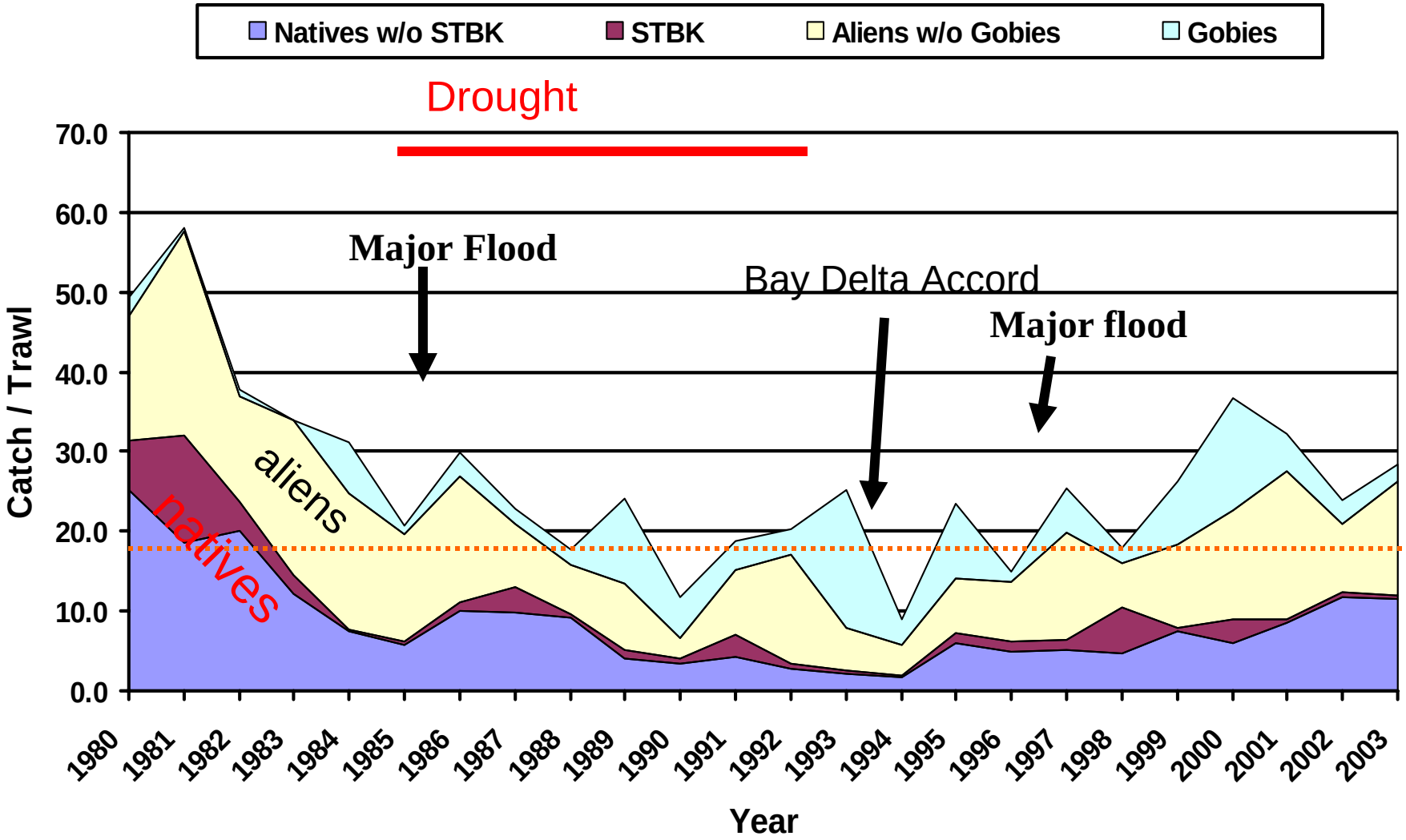
N = 118

does not include extinct species



Status of fishes since CALFED (1996)

Suisun Marsh Annual Fish Catch

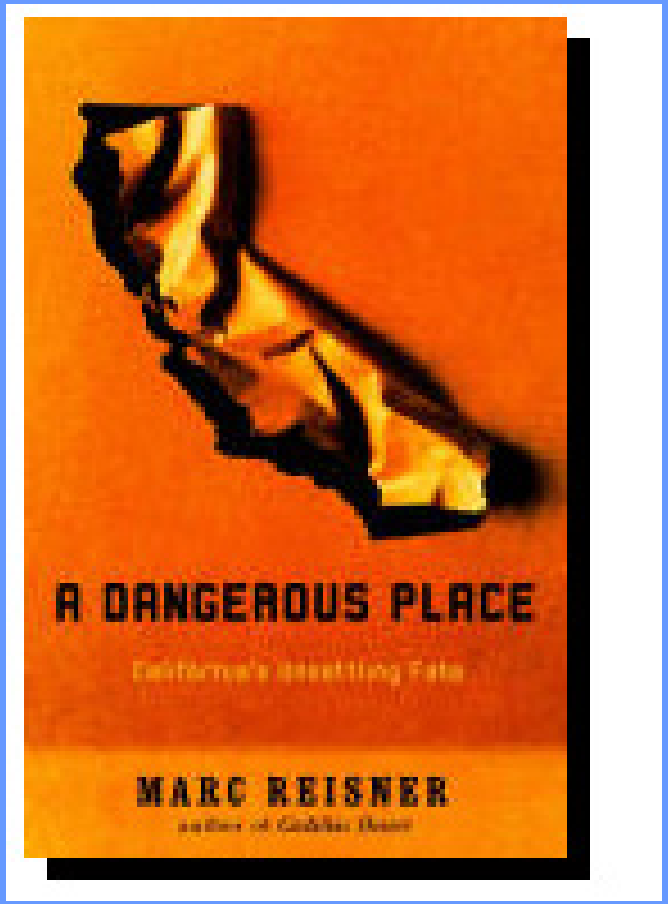


Will the next 50 years be as benign?

Benign Growth vs. Major Disaster

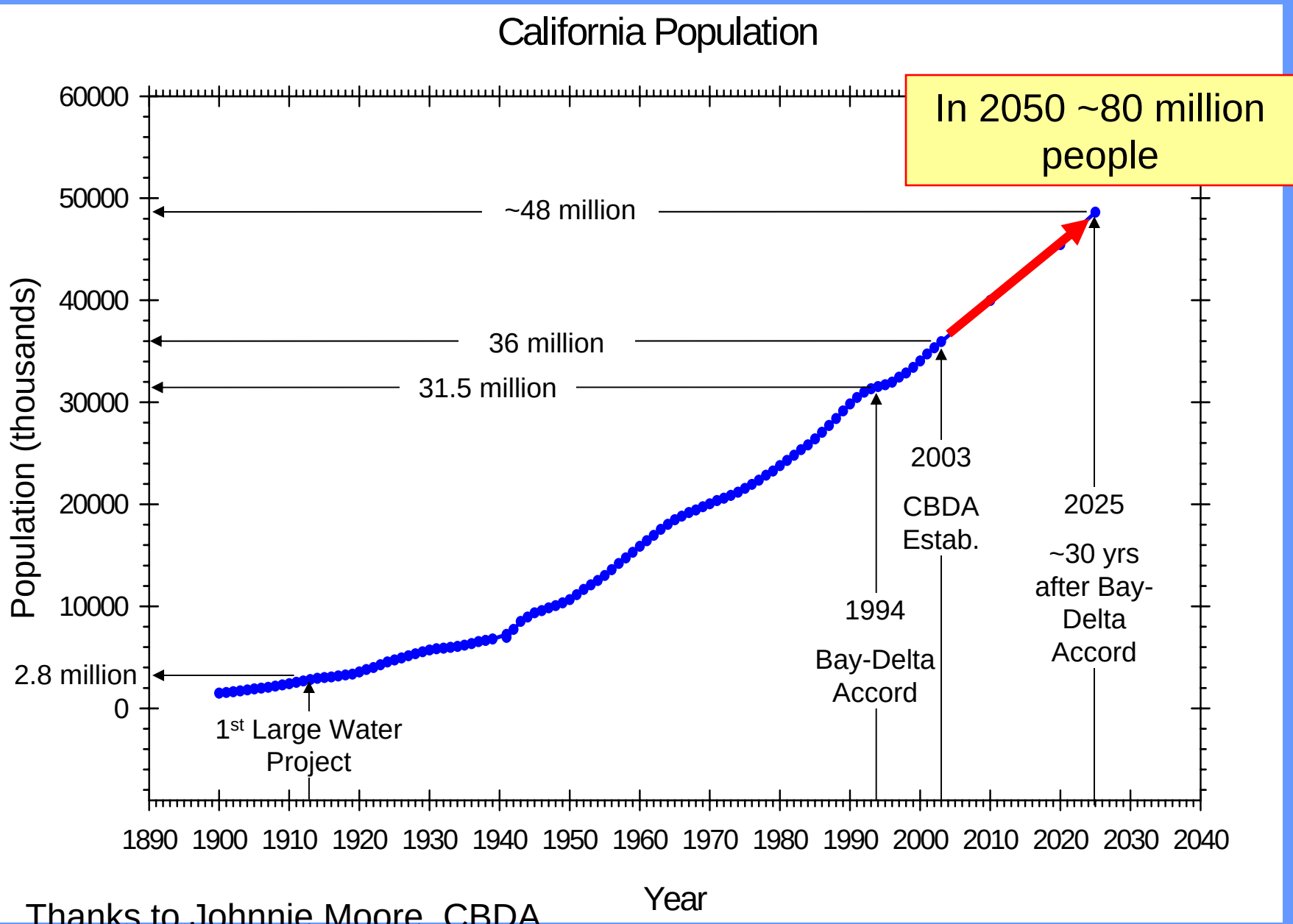
What, me worry?

vs.



Reasons to be pessimistic about the future of native fishes

- Human population growth
- Climate change
- Rising sea level
- Earthquakes



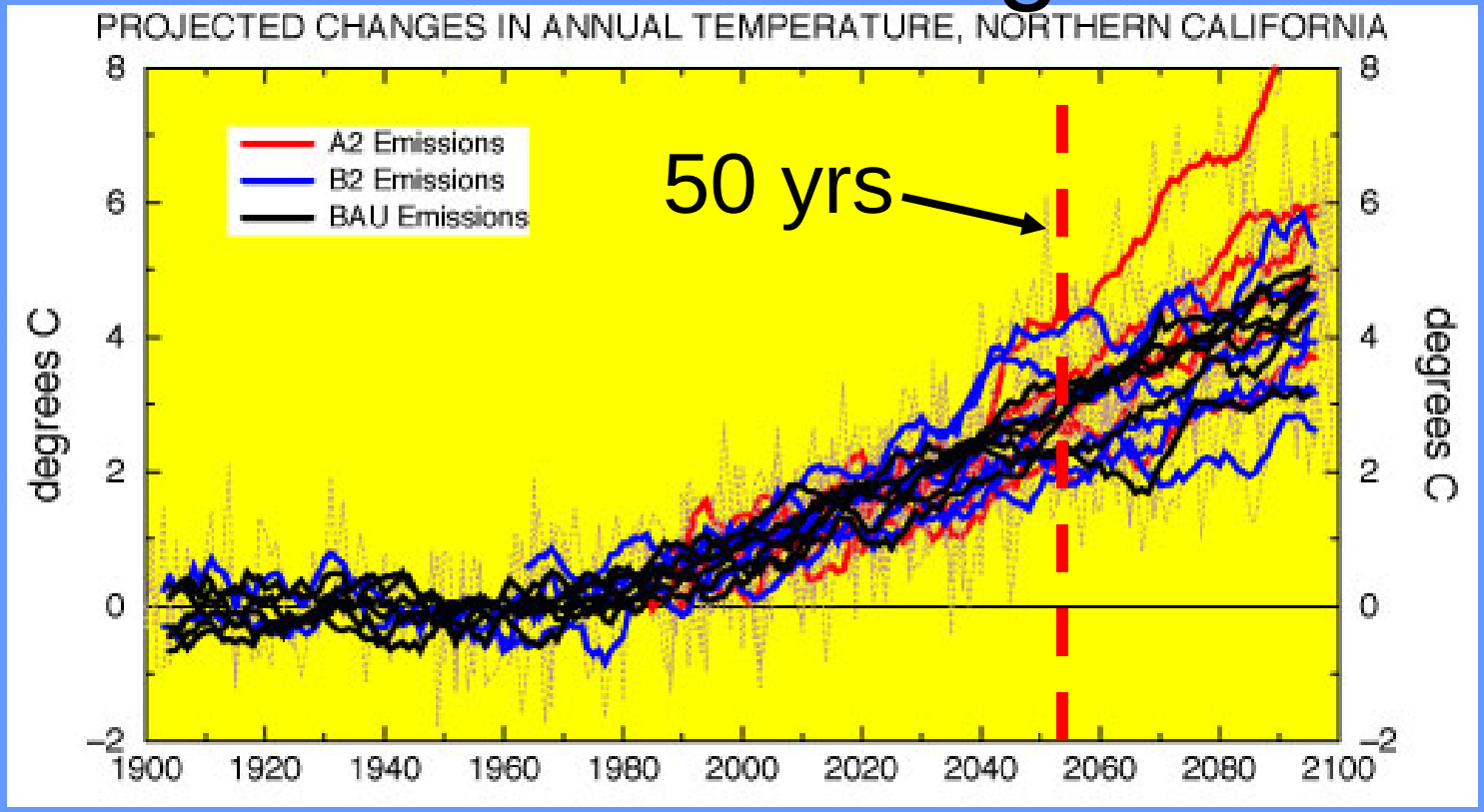
Thanks to Johnnie Moore, CBDA

Likely consequences 1

- Increased human demand for water
- Demand for more storage
- Demand for more and bigger levees
- Higher percent of flowing water in regulated streams

San Joaquin landscape

Climate change



2-4ºC rise in mean air temperatures

More variable precipitation, but most likely drier

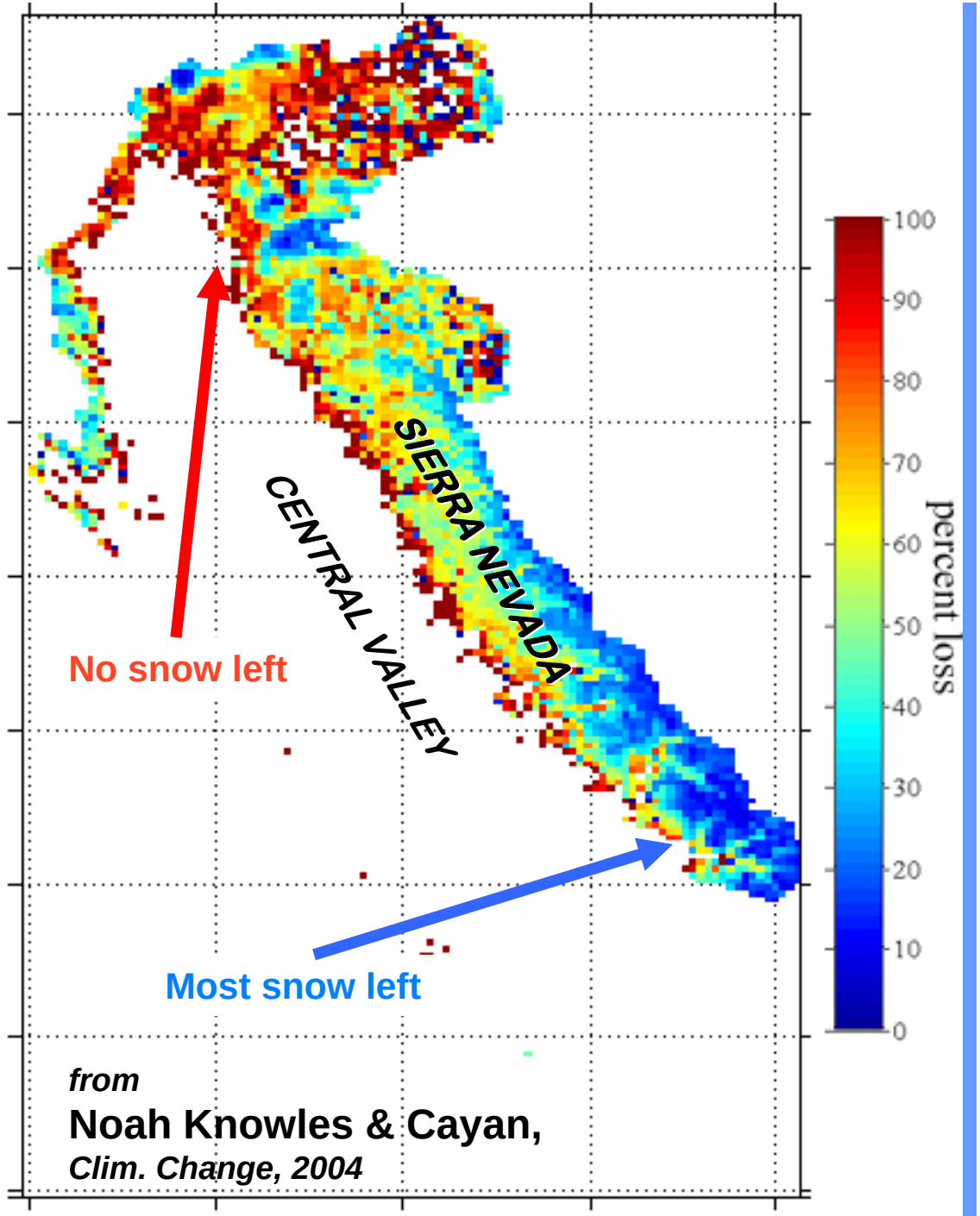
Thanks to Mike Dettinger, USGS

CLIMATE CHANGE

This means:

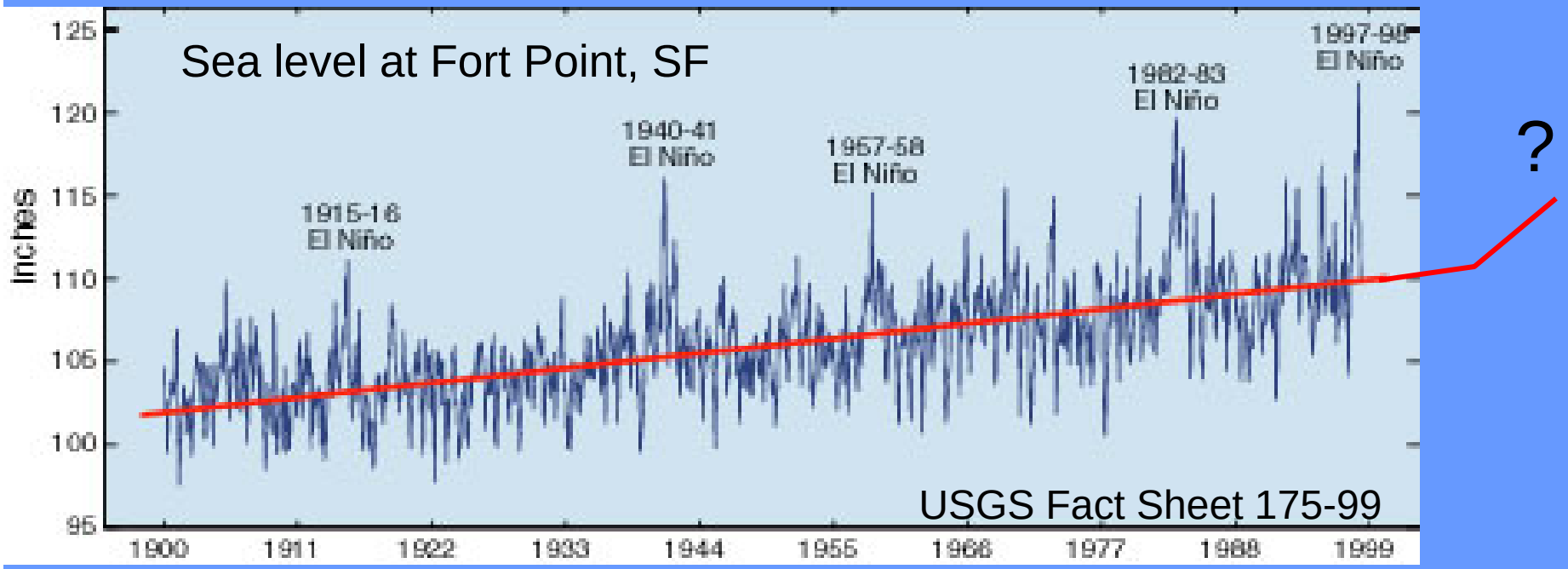
earlier snow melt & major reductions in snow pack of the Sierra Nevada

Thanks to Mike Dettinger, USGS



USGS

Rising sea level



Sea level rise

9-13 cm by 2050

19-41 cm by 2100

Hayhoe et al. 2004


MAJOR
FAULTS

Conclusions: the next 50 years

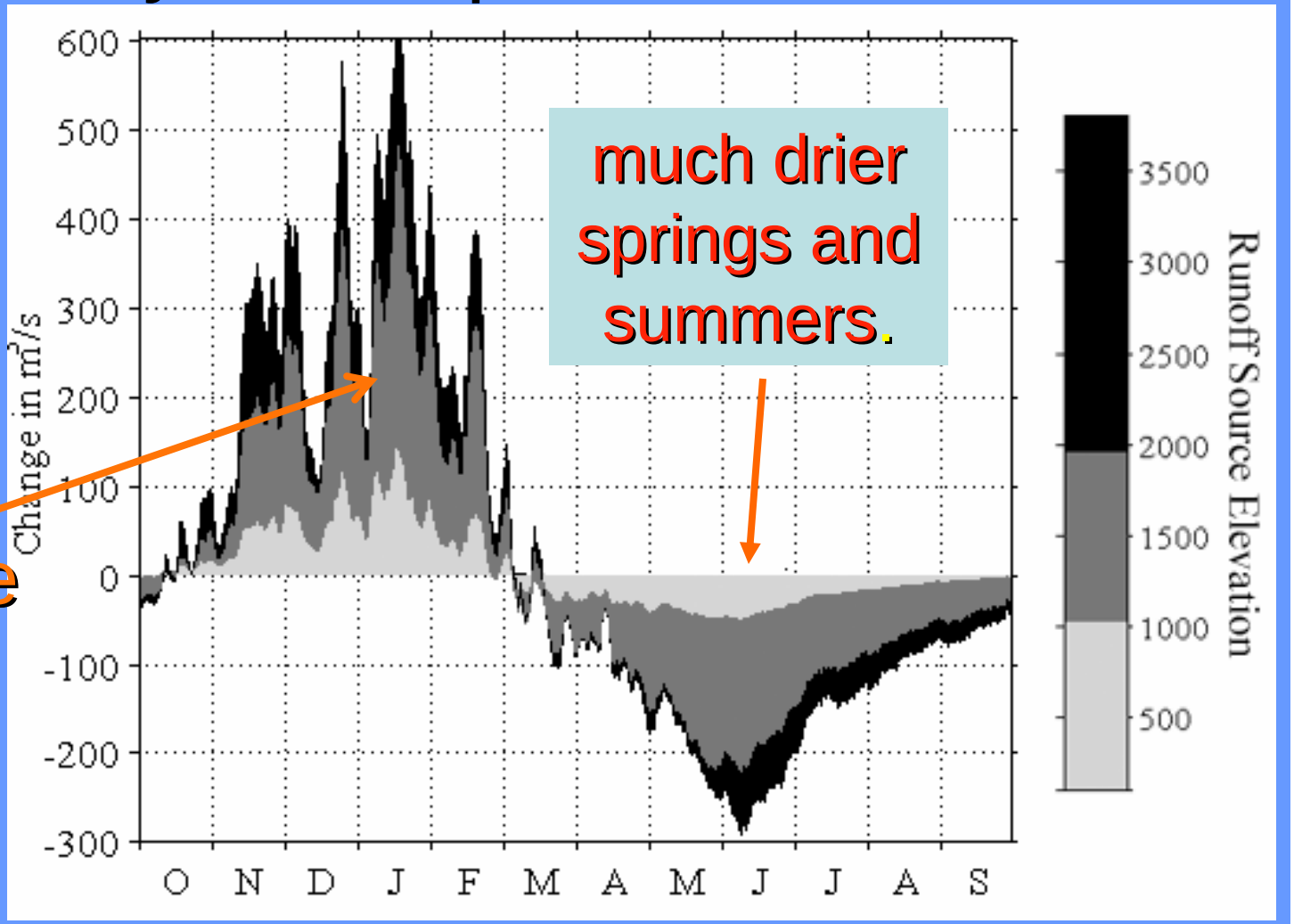
Thanks to Jeff Mount

- Gradual change a certainty; abrupt change highly likely
- Estimates of change are conservative
- CALFED program planning depends on a fixed, rather than dynamic landscape

Likely Consequences 2:
Flooding of areas below sea level

Photos: DWR, 1998

Likely consequences 3



Changes in Freshwater Inflow to SF Bay, 2060 – 3000

***Thanks to Mike Dettinger**. From: Knowles and Cayan, 2004; http://www.cgd.ucar.edu/cas/ACACIA/workshops/precip/dettinger.pdf*

Likely Consequences 4

- Longer, more severe droughts
- Colorado River:

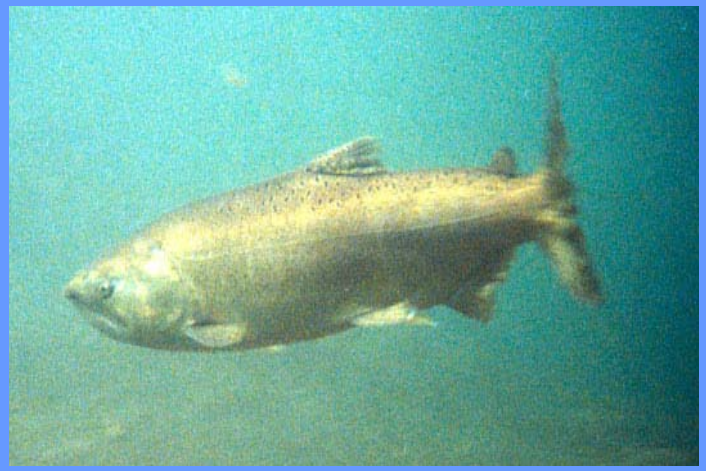
  year 5 of “worst drought in 500 years.”
- Likely to occur even without climate change

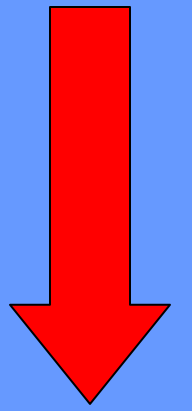
Lake Powell 2002 vs 2003

SO…
WHAT *IS*
THE FUTURE OF CALIFORNIA'S
INLAND FISHES?

In the next 50 years…

- More extinct and endangered native fishes
- Reduced habitat for non-endangered fishes
- Reduced fisheries
- Expansion of non-native fishes

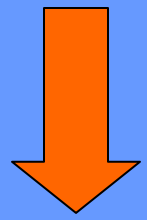




Predictions:
Salmon & other anadromous fishes

- Ranges will be reduced
- Abundances will decline
- More dependence on regulated rivers
- Persistence will require intense conservation efforts
- Changing ocean conditions will increase variability in survival

Predictions:
Spring run chinook salmon



- Existing spawning streams will become marginal
- More dependent on regulated rivers
- More dependent on restored rivers
  - Upper San Joaquin River (below Friant Dam)
  - Battle Creek

What should be done to save native fishes (starting points)?

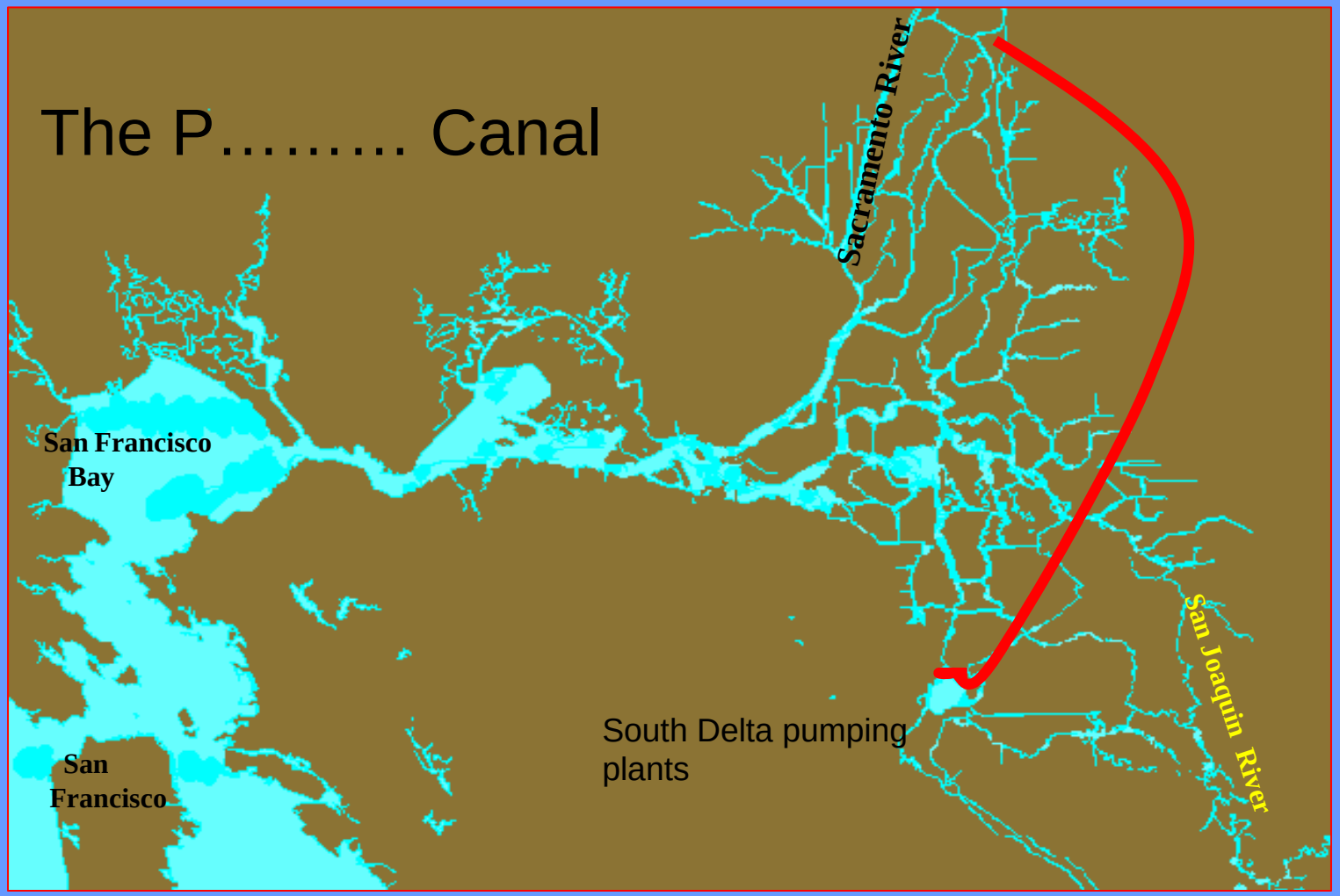
- Recognize that conditions *are* to get worse
- Plan for large-scale changes in water management
- Avoid emergency solutions to water problems

Water management to benefit both fish and people (rampant optimism)

- Use expanded storage for conservation
- More effective water distribution
- Conjunctive water project operations
- Expanded floodplains
  - More Yolo Bypass type projects
- Take marginal farmland out of production

Expanded storage

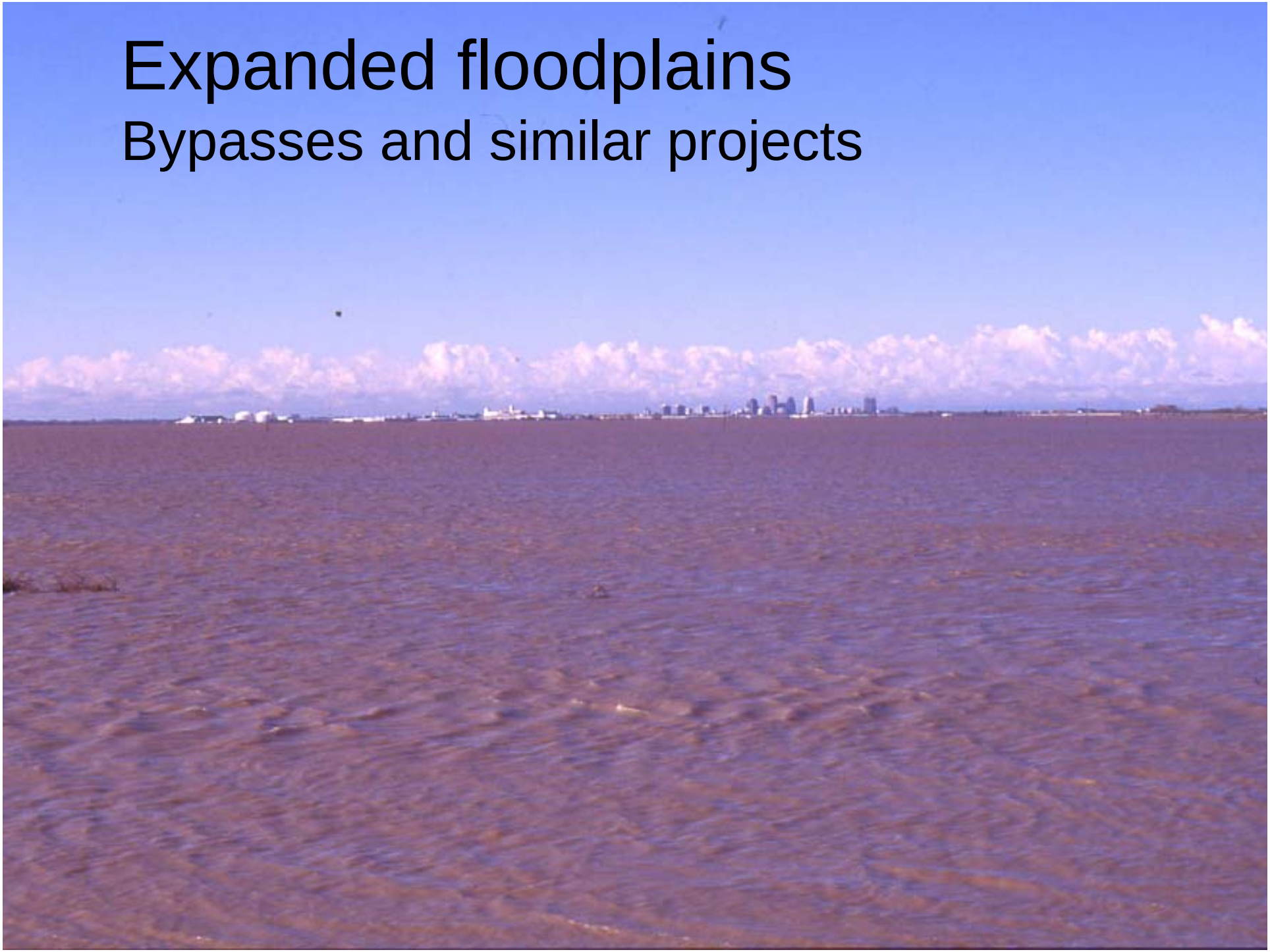
More effective water distribution



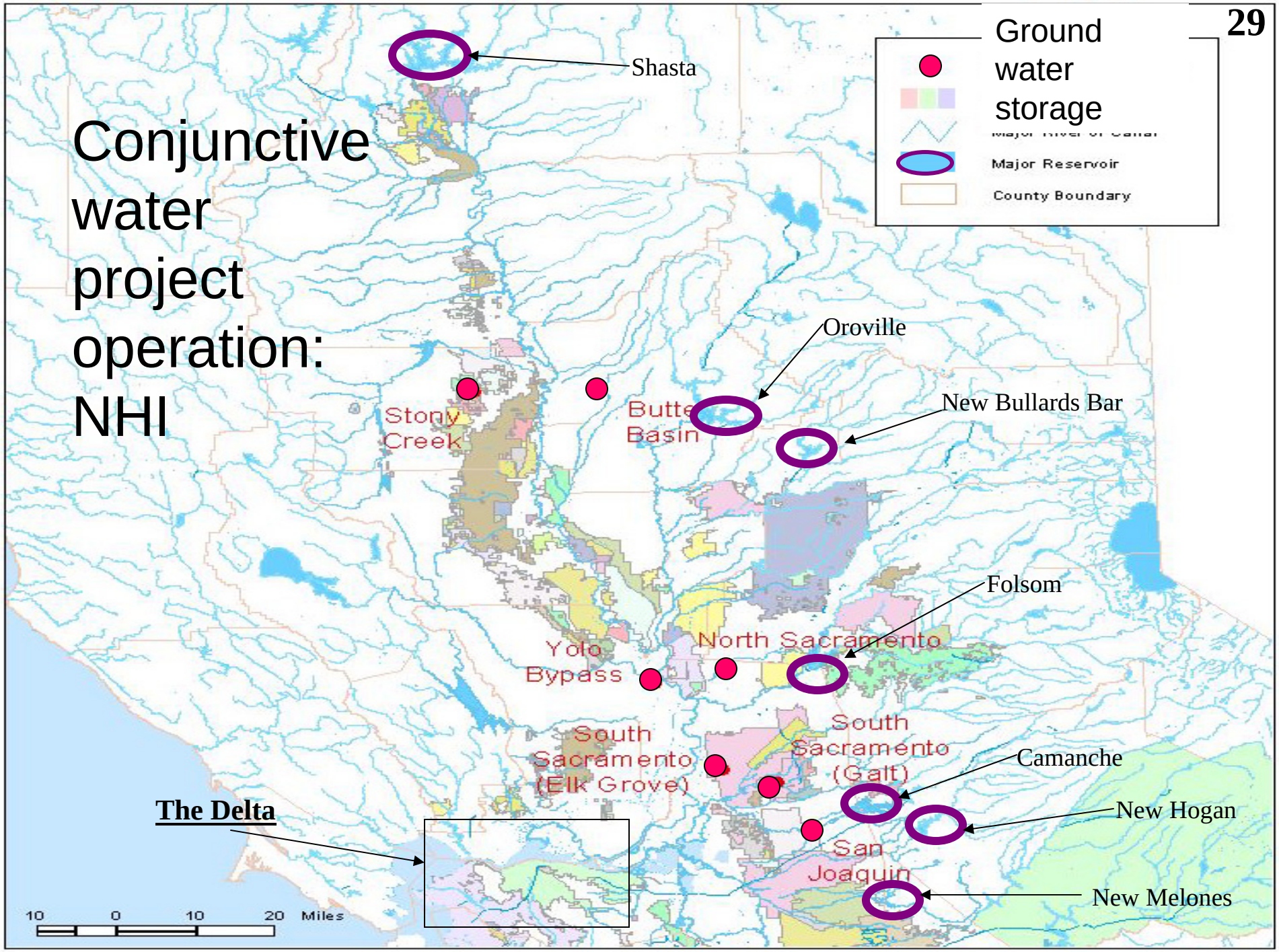
Consider ALL options

Expanded floodplains

Bypasses and similar projects

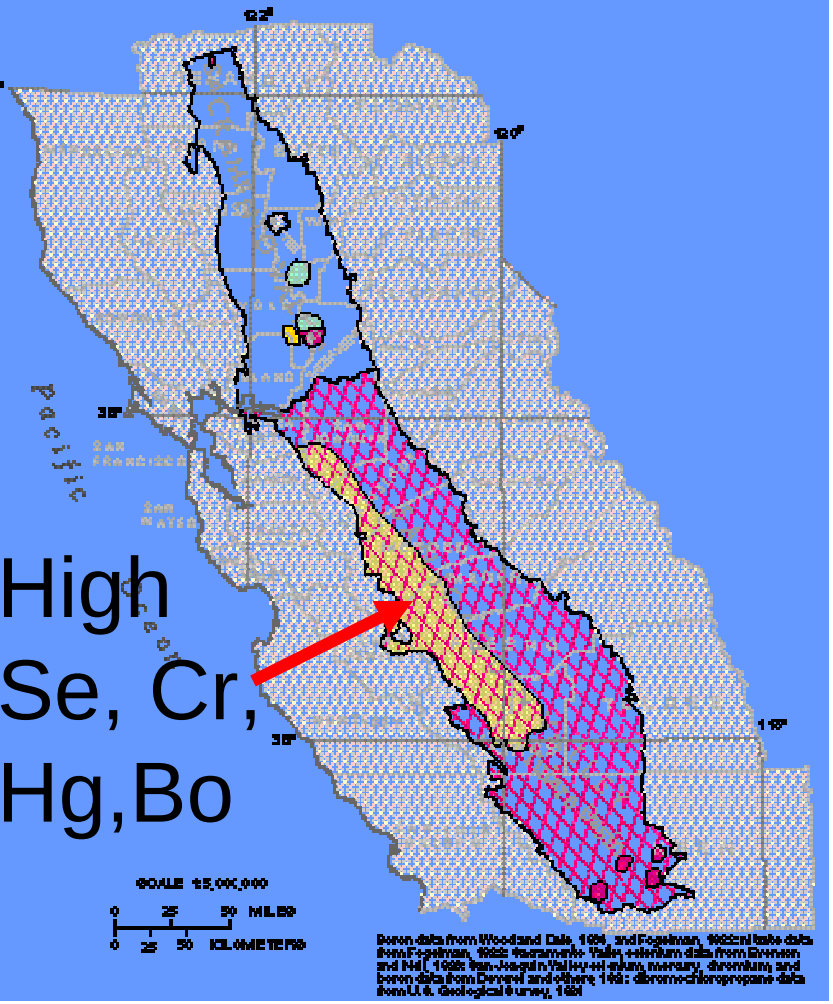


Conjunctive water project operation: NHI



Take marginal farmland out of production

- drainage problems (salts, heavy metals)
- below sea level



Agenda for protecting native fishes

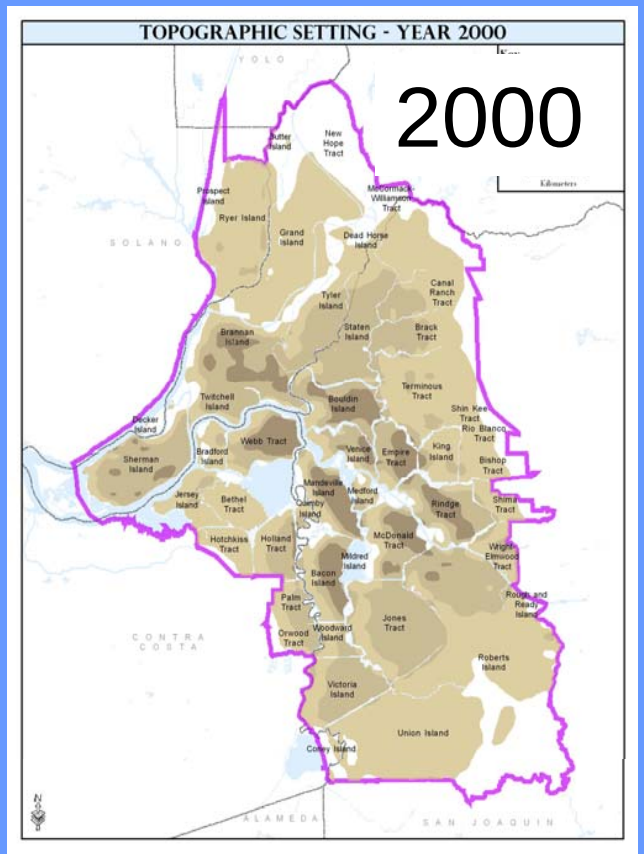
- Expand use of public trust doctrine
- Manage floodplains for native biodiversity
- Restore the San Joaquin River
- Reduce import and spread of alien species
- Increase environmental water
- Permanent funding for restoration, management, and monitoring
  - BDA Ecosystem Restoration Program

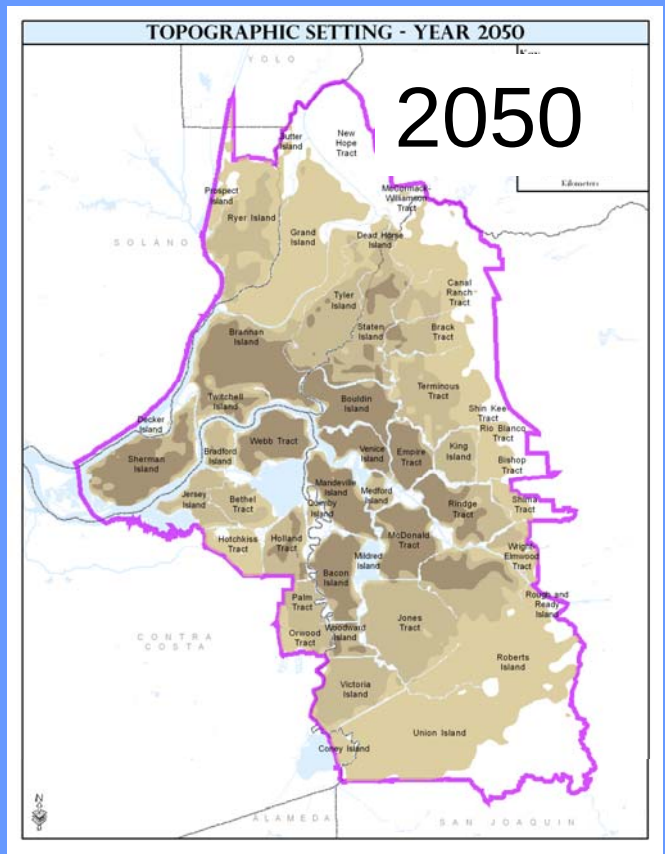
Conclusions
1

- Gradual environmental change a certainty; abrupt change highly likely
  - Aquatic ecosystems will bear brunt of change

Conclusions 2

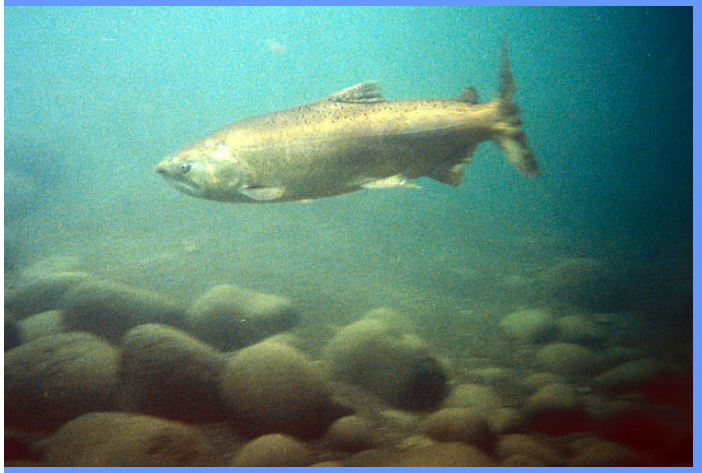
- Agency planning remains predicated on a fixed, rather than dynamic landscape





Conclusions 3

- Native fishes will decline in distribution and abundance
  - More endangered & extinct species
  - Includes iconic species such as salmon



Conclusions 4

- Solutions require foresight, leadership, and $$
  - All in short supply
  - CBDA (CALFED) a step in right direction