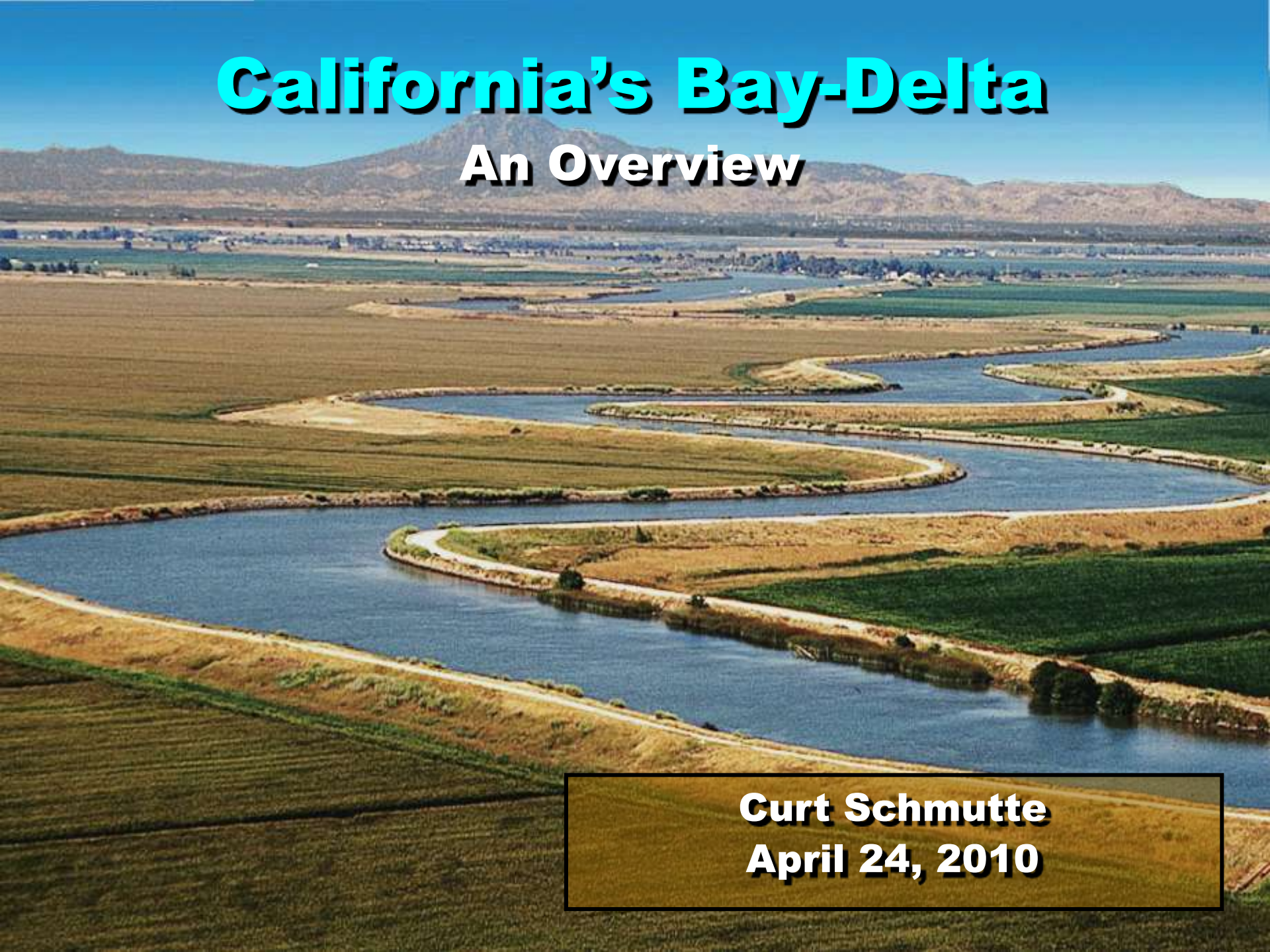



# **California's Bay-Delta**

## **An Overview**



**Curt Schmutte**  
**April 24, 2010**

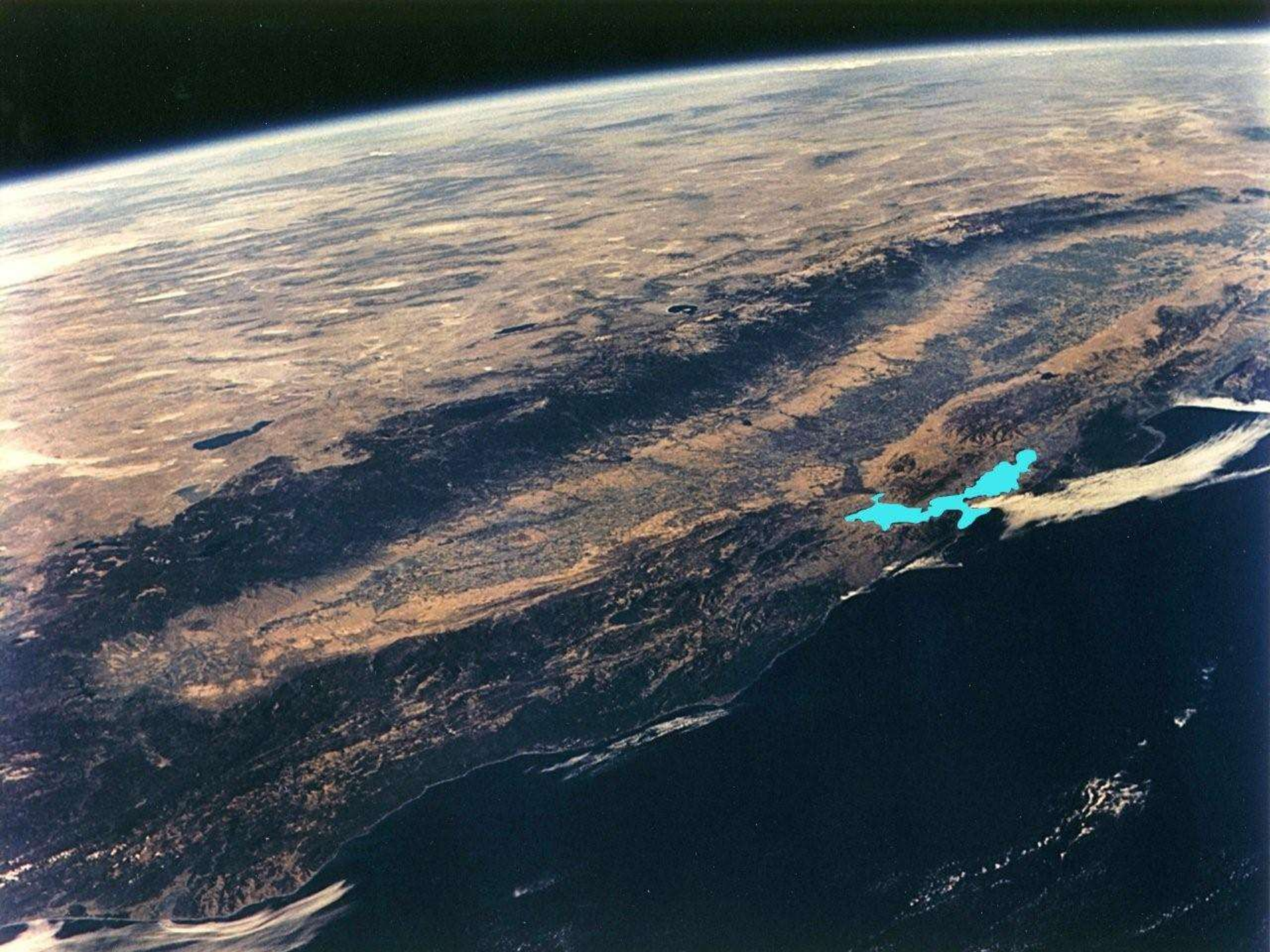


- 
- A topographic map of a river basin, likely the Sacramento-San Joaquin River Delta. The map shows a complex network of rivers and tributaries flowing from a mountainous region in the upper left towards a large, flat delta area in the lower right. The terrain is color-coded to show elevation, with darker green and brown tones indicating higher elevations and lighter green/yellow tones indicating lower elevations. The delta area is characterized by a dense network of distributaries and a large, flat expanse of water. The map is set against a dark blue background, possibly representing the ocean.
- 193 MAF avg precip
  - 71 MAF avg runoff
  - 65 % flows to ocean

28 MAF  
into Delta

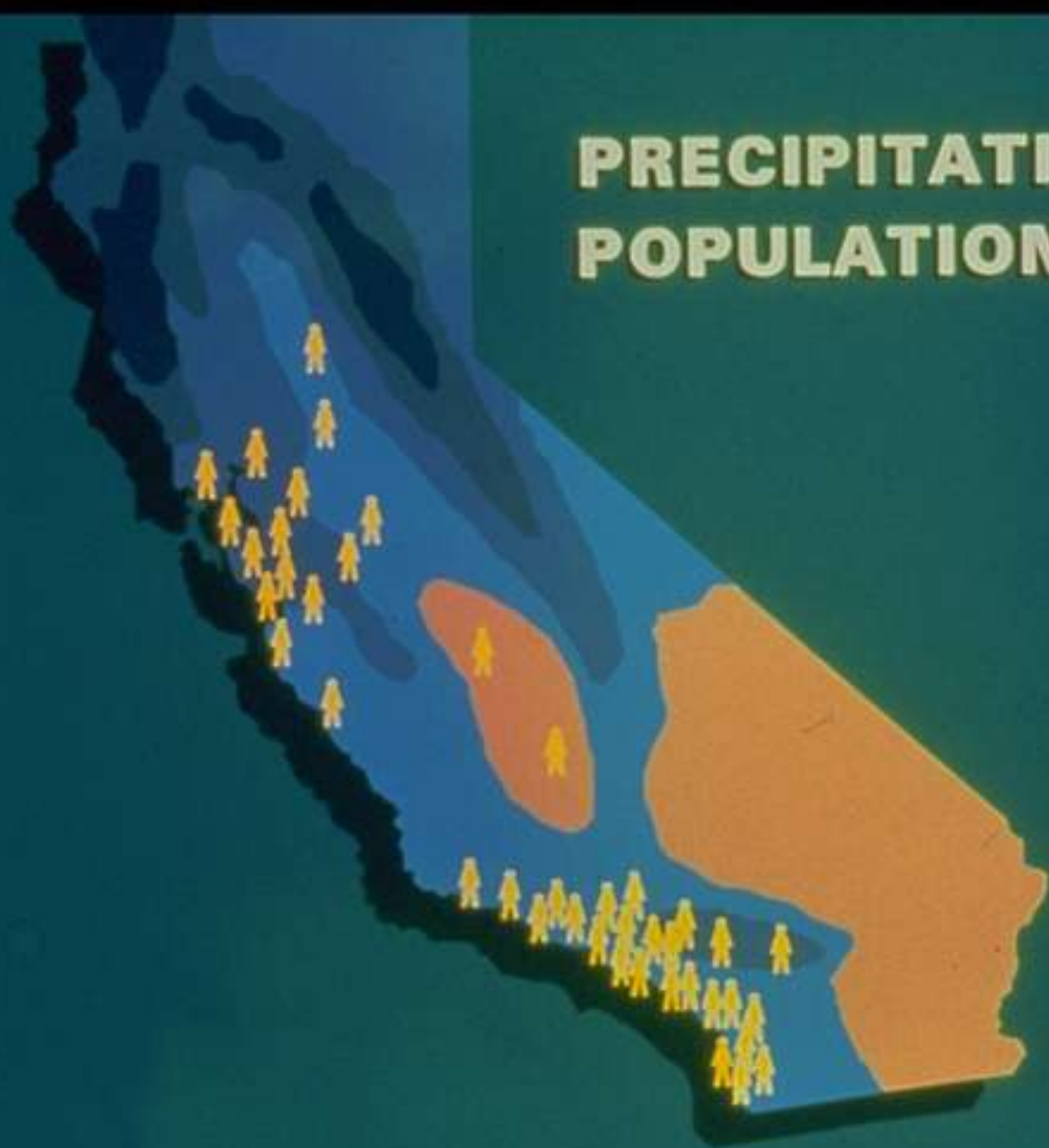
21 MAF  
out to the Bay







# PRECIPITATION AND POPULATION





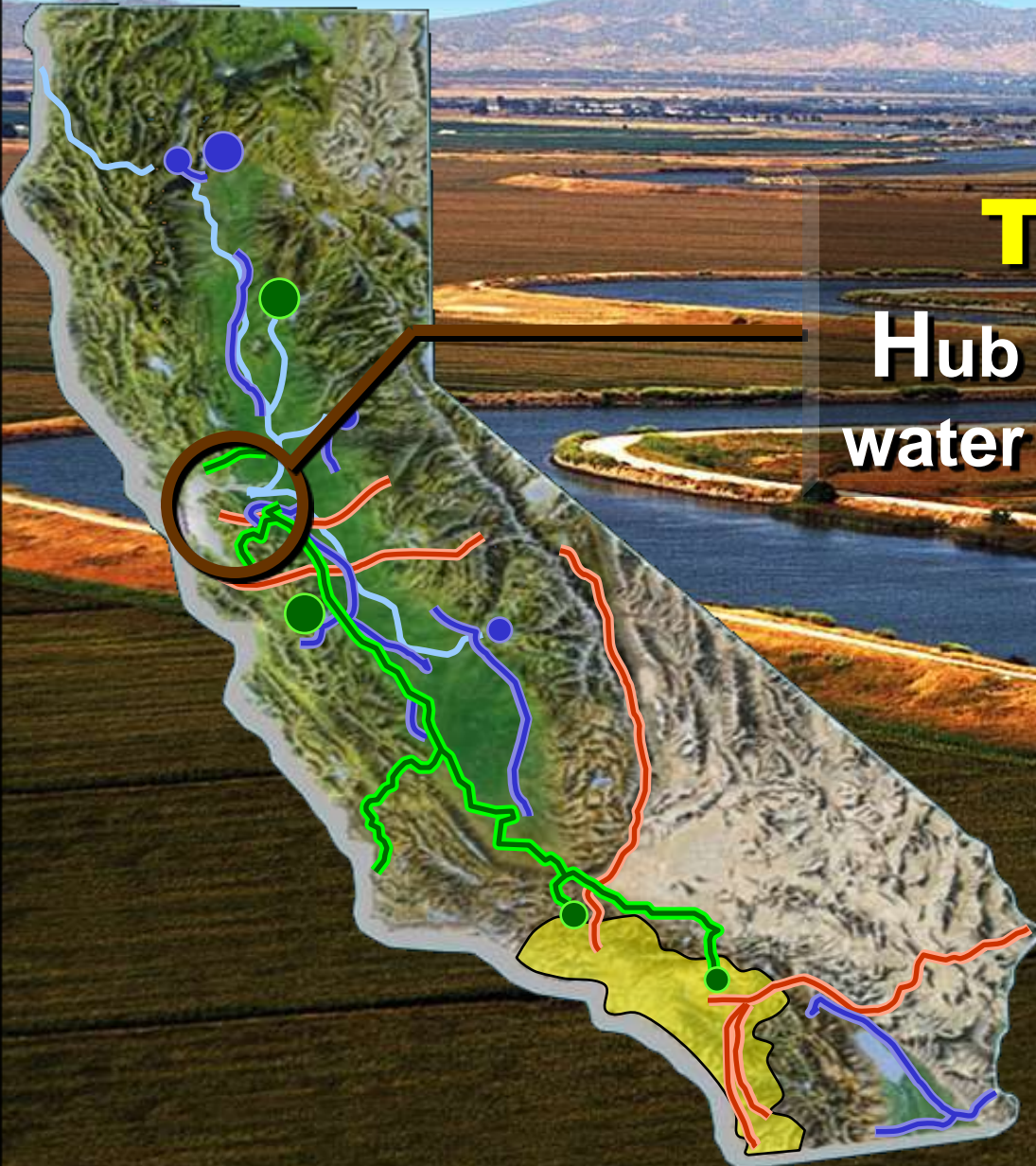
# California





# **THE DELTA**

**Hub of California's  
water supply system**





# Importance of the Bay-Delta

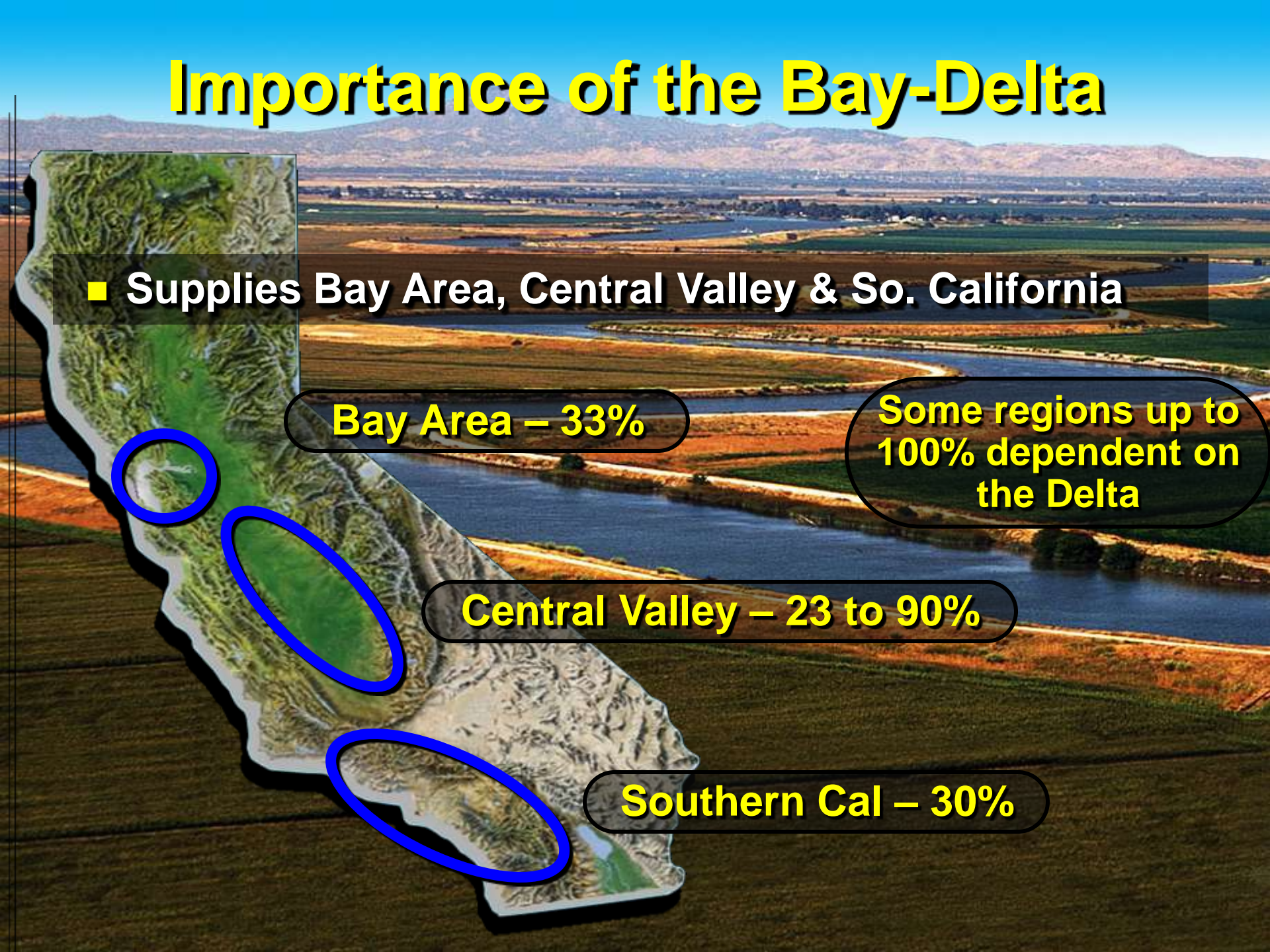
- Supplies Bay Area, Central Valley & So. California

**Bay Area – 33%**

**Some regions up to 100% dependent on the Delta**

**Central Valley – 23 to 90%**

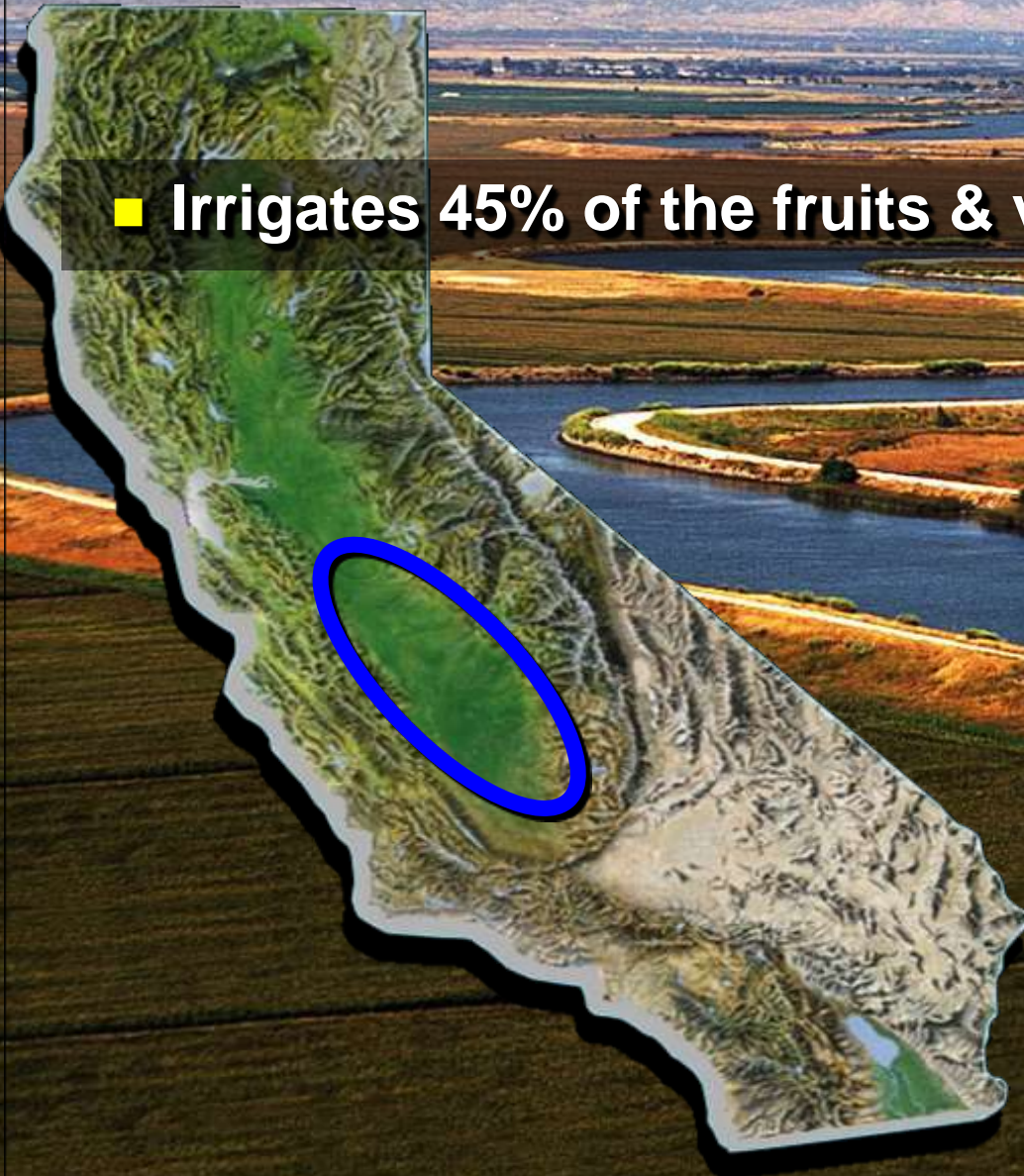
**Southern Cal – 30%**





# Importance of the Bay-Delta

- Irrigates 45% of the fruits & vegetables produced in US





# ***West Coast's largest estuary provides nationwide economic & environmental benefits***



- Navigation - 2 Ports
- Water supply 25 million residents
- Valuable part of Pacific Flyway – ½ waterfowl
- Supports 80% state's salmon fisheries
- Recreational boating and wind surfing
- Duck hunting and bass fishing/tournaments

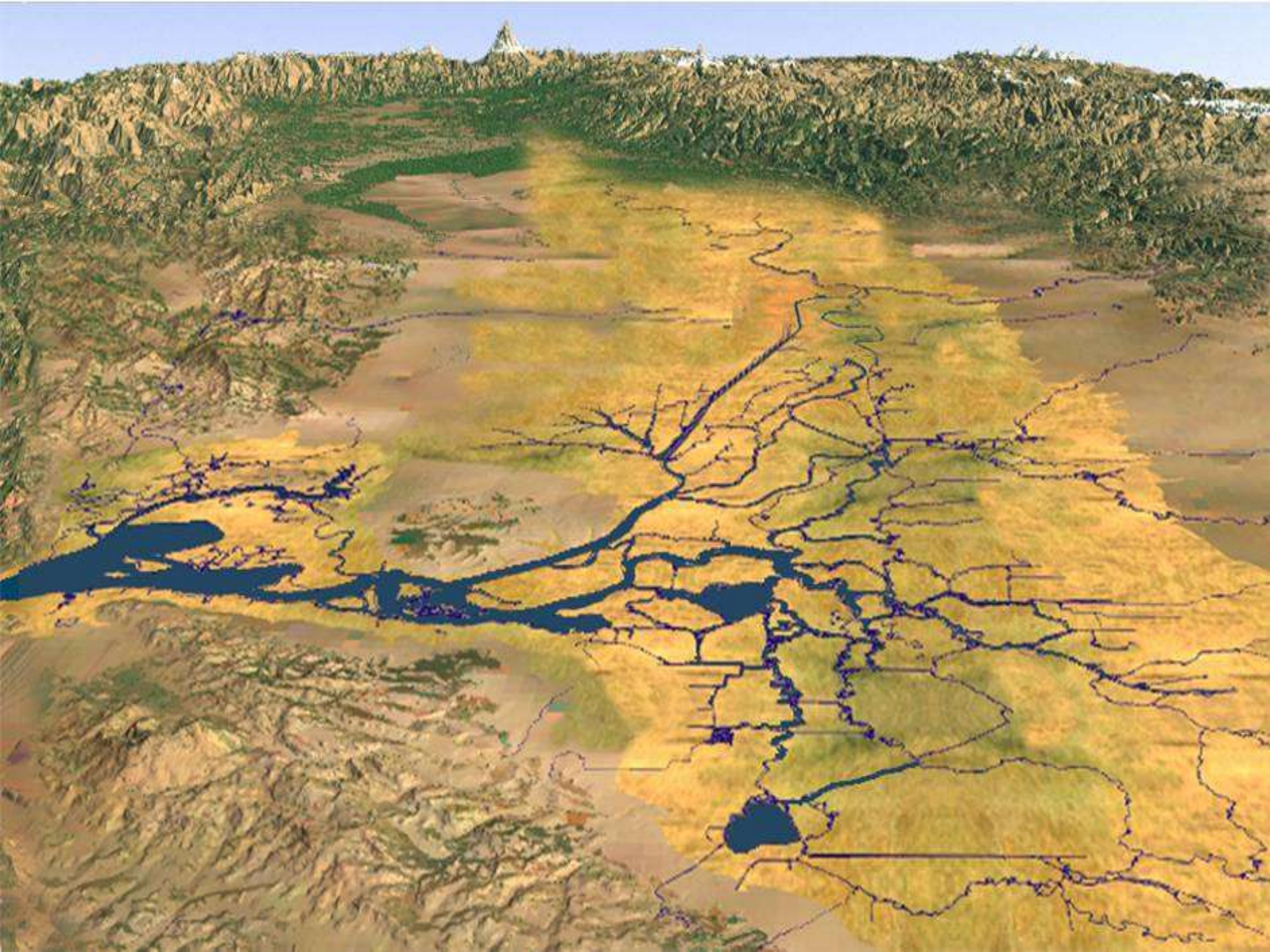


# Valuable Ecosystem

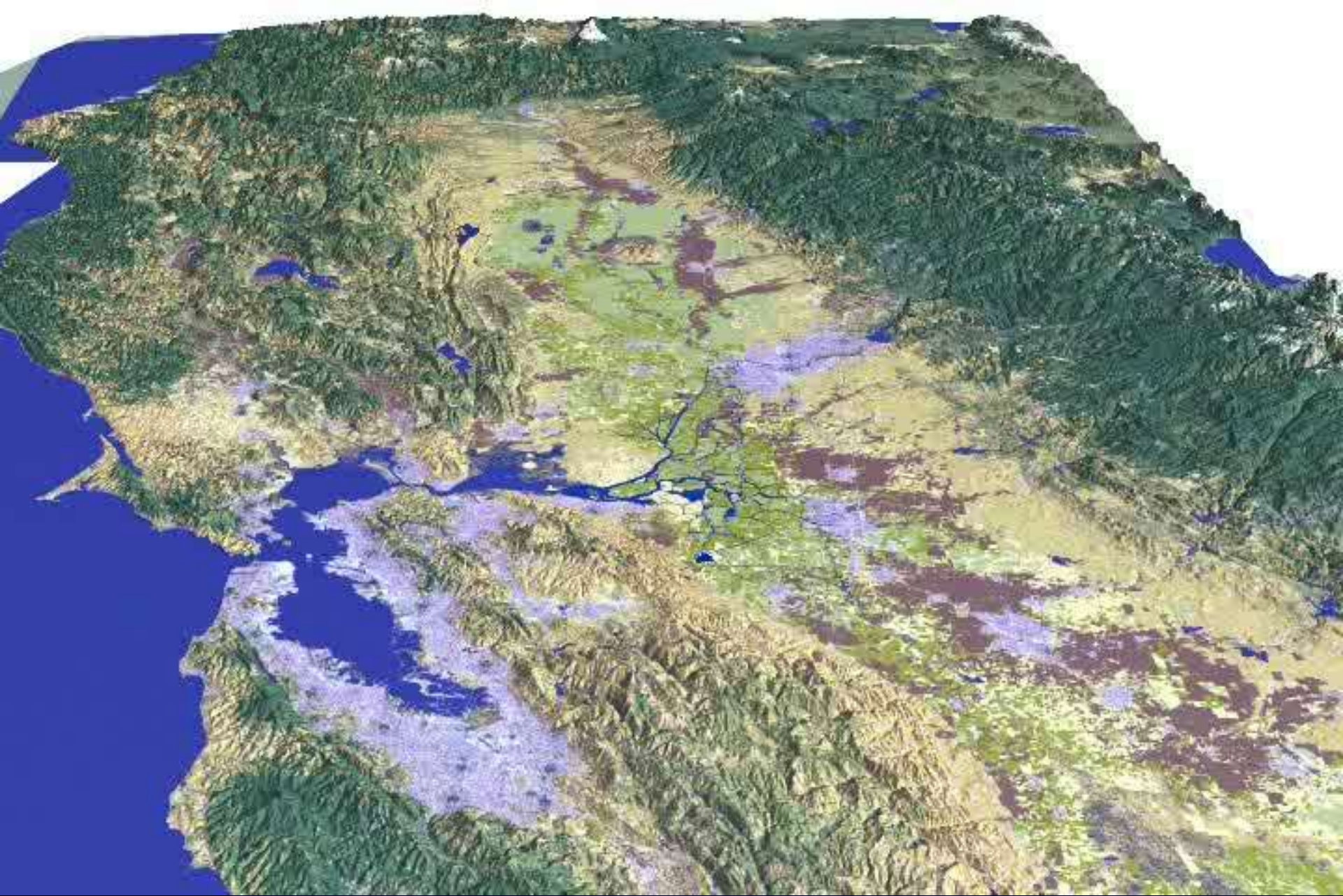
- Over 450 plants & animals
- Over 50 different fish
- Over 225 bird species



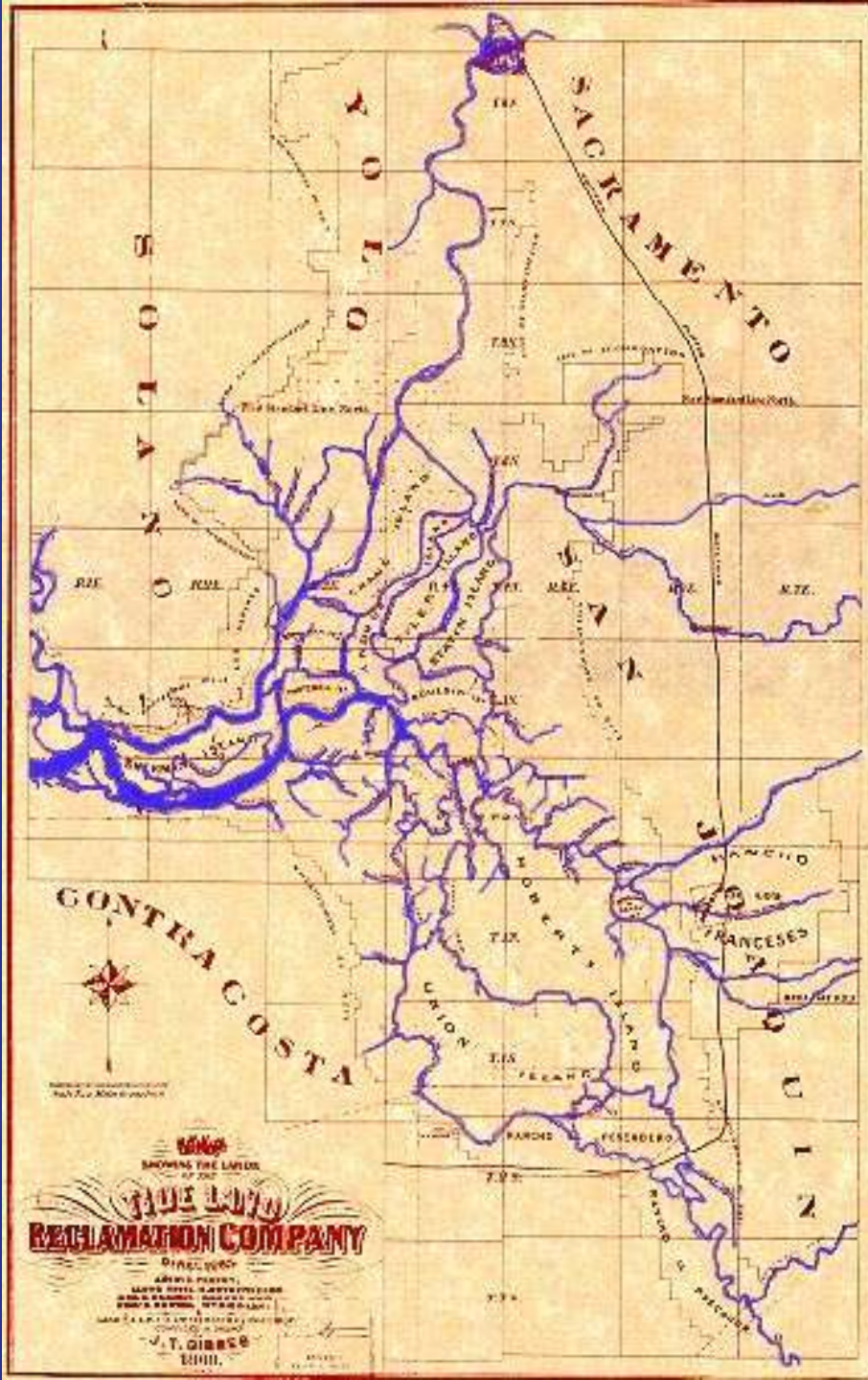












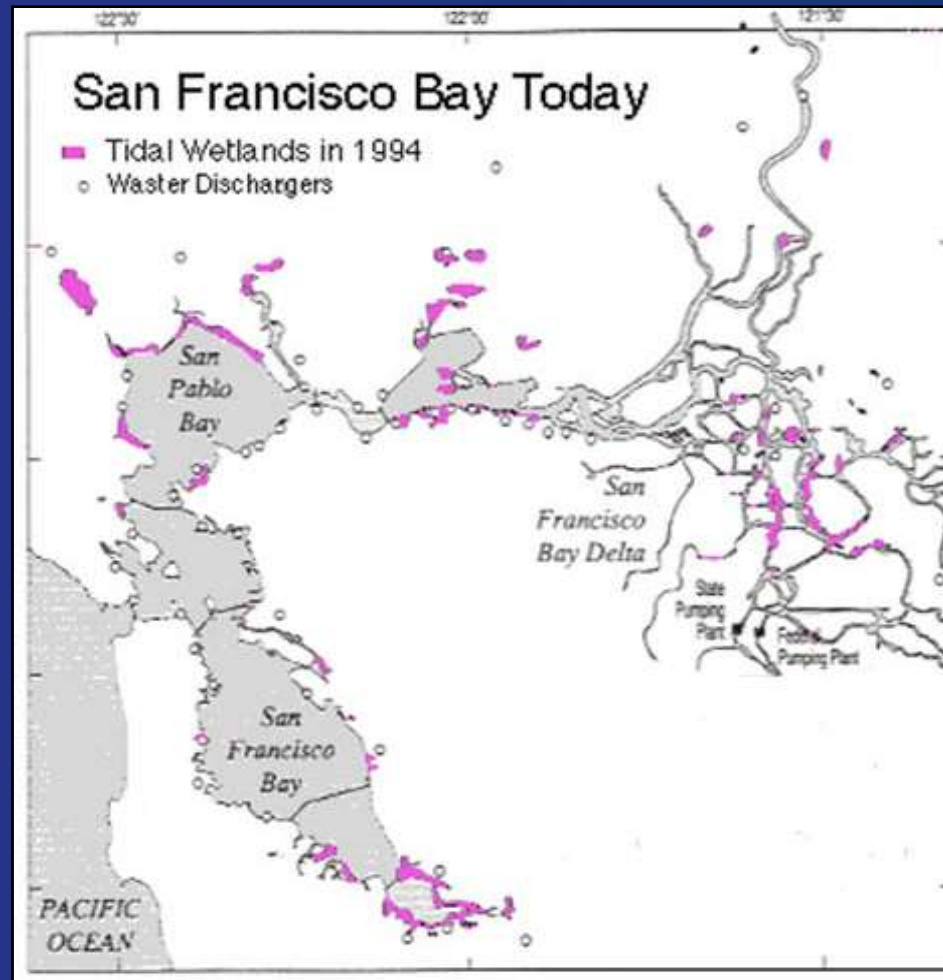
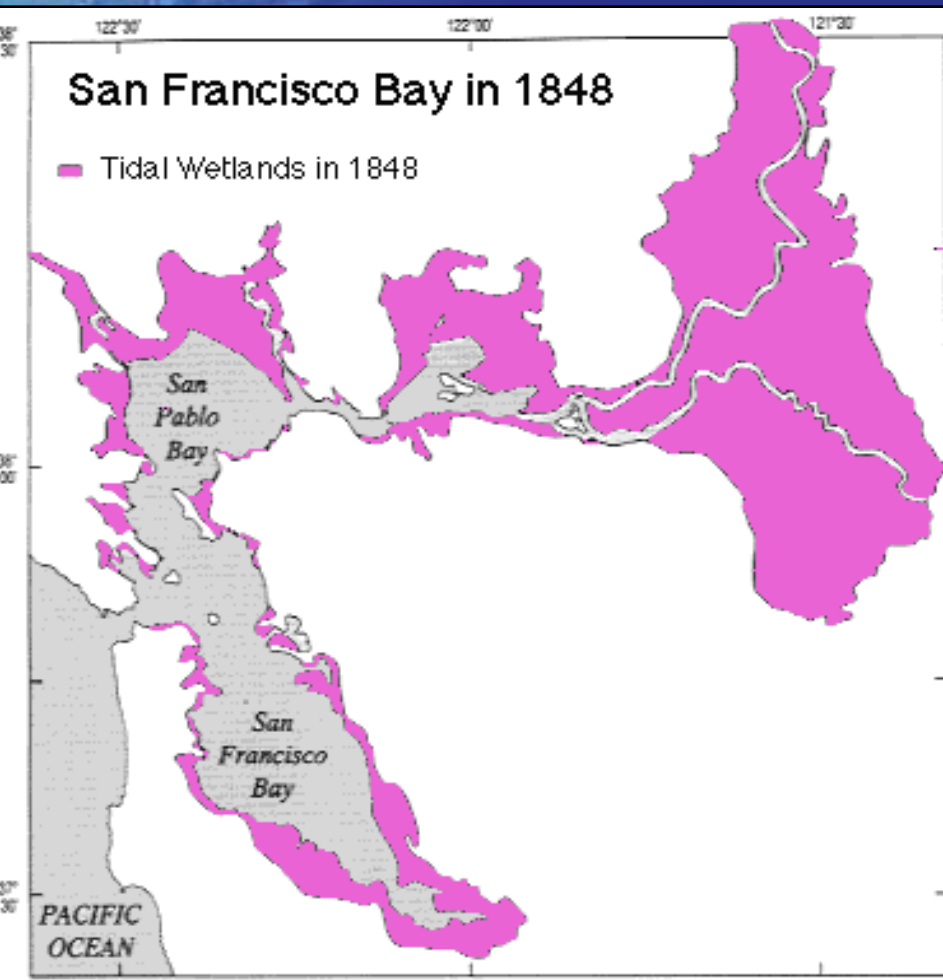


# Historic Delta



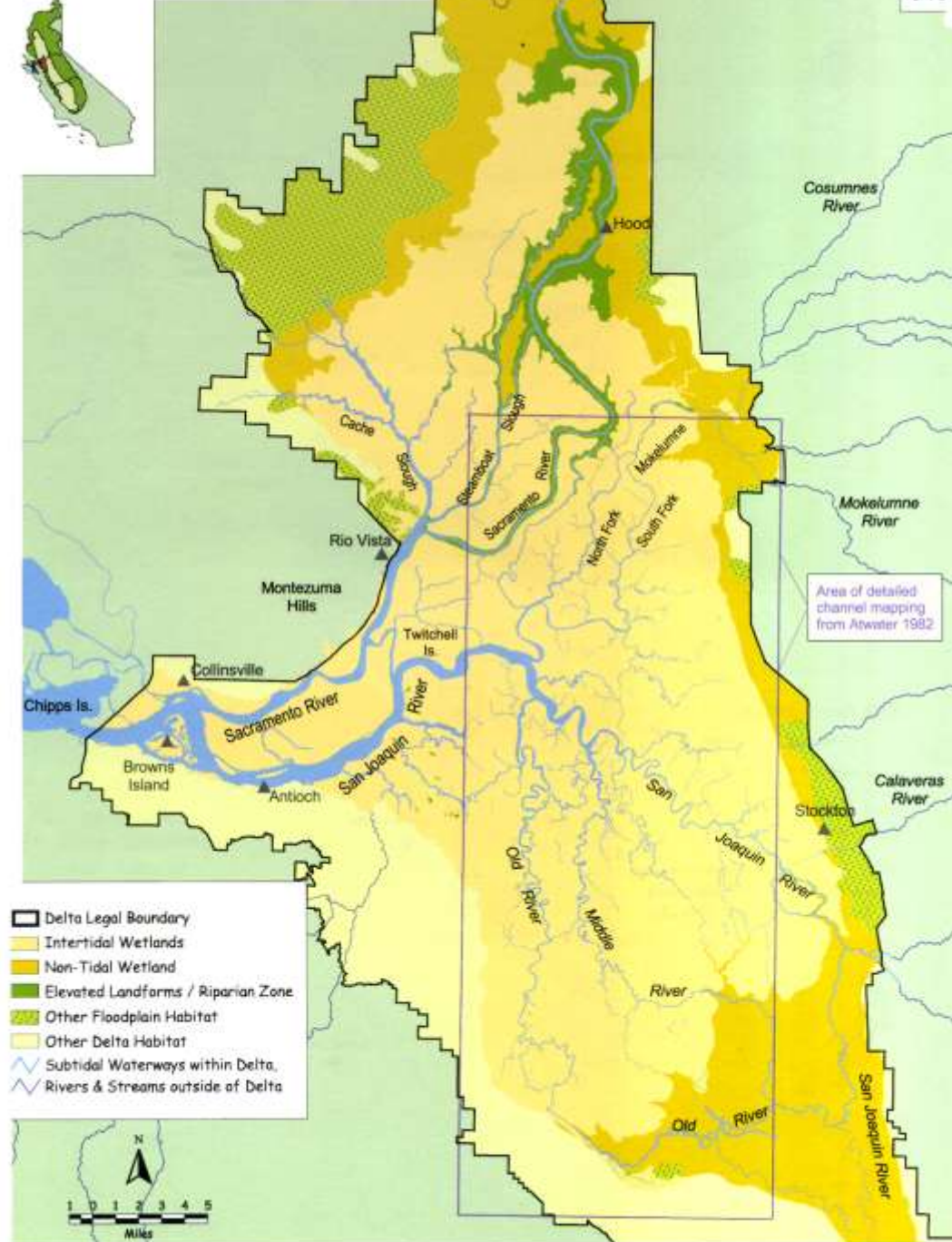


# Fish evolved to vastly different landscape





# Historic Tidal Wetlands

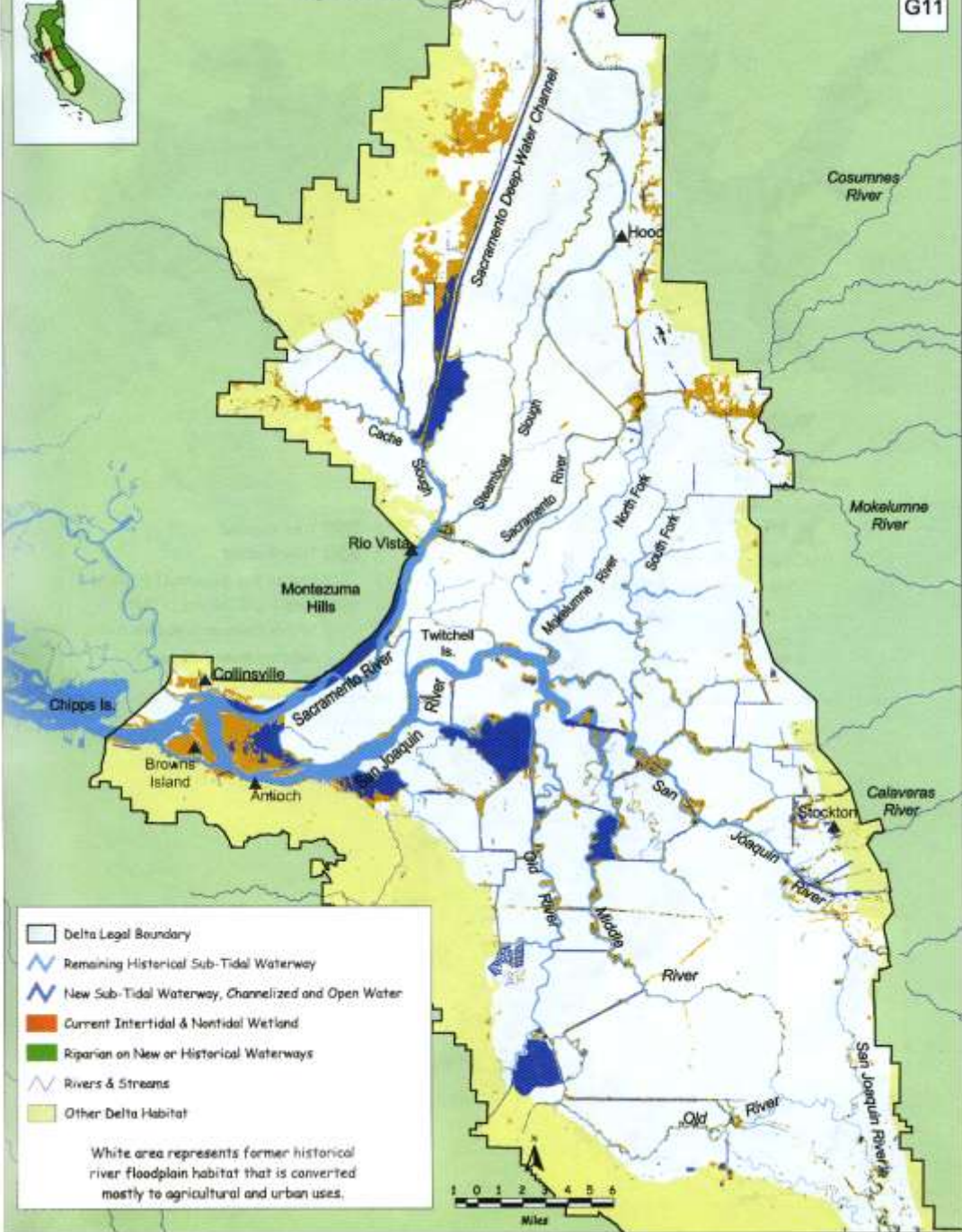


The Delta Historical Aquatic Ecosystem



An aerial photograph of a coastal wetland area. A river or estuary flows through the landscape, which is a mix of green agricultural fields and brownish, marshy wetland areas. The text 'Very few Tidal Wetlands remain' is overlaid in yellow on the right side of the image.

**Very few  
Tidal  
Wetlands  
remain**

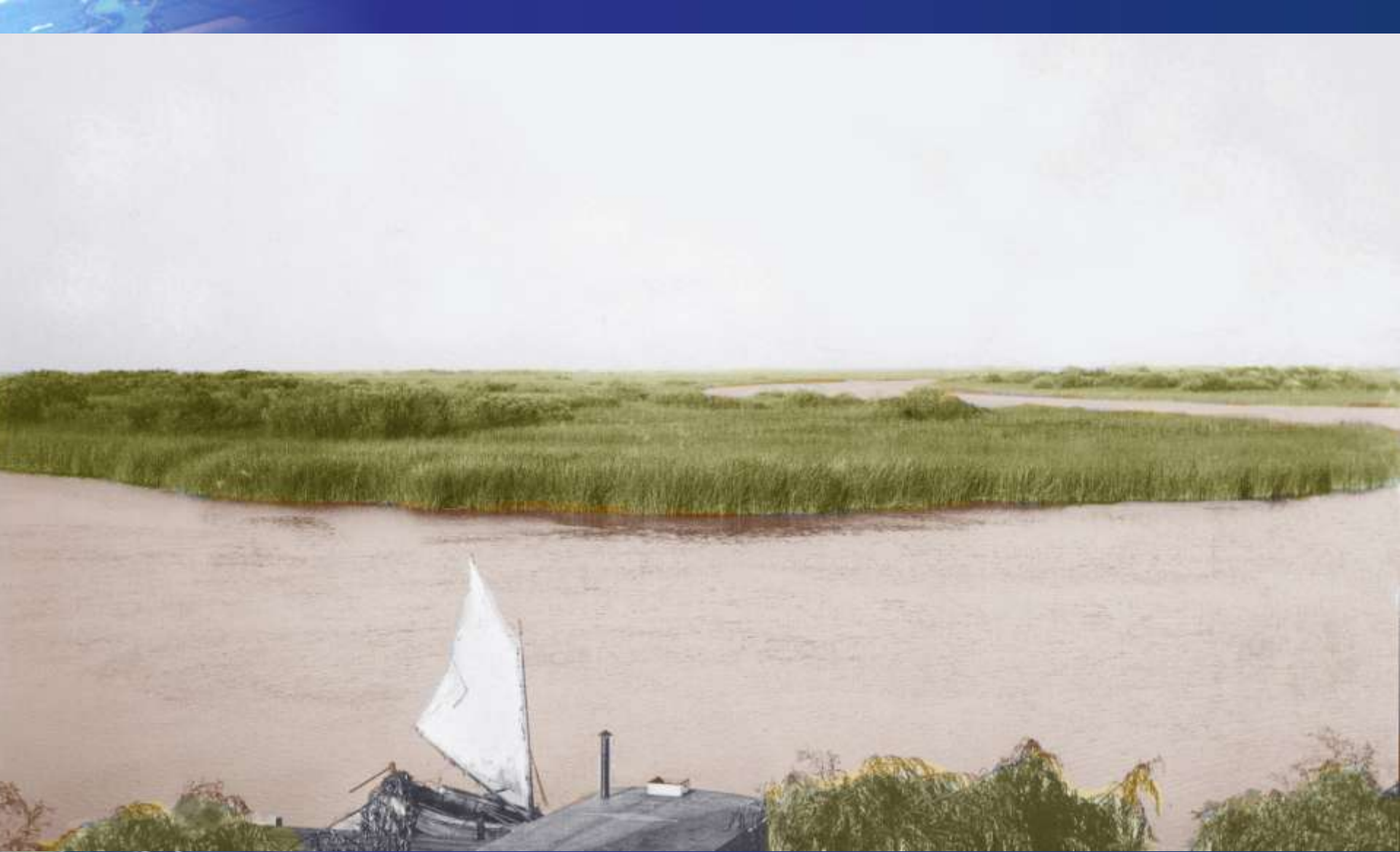


## The Delta Current Ecosystem

















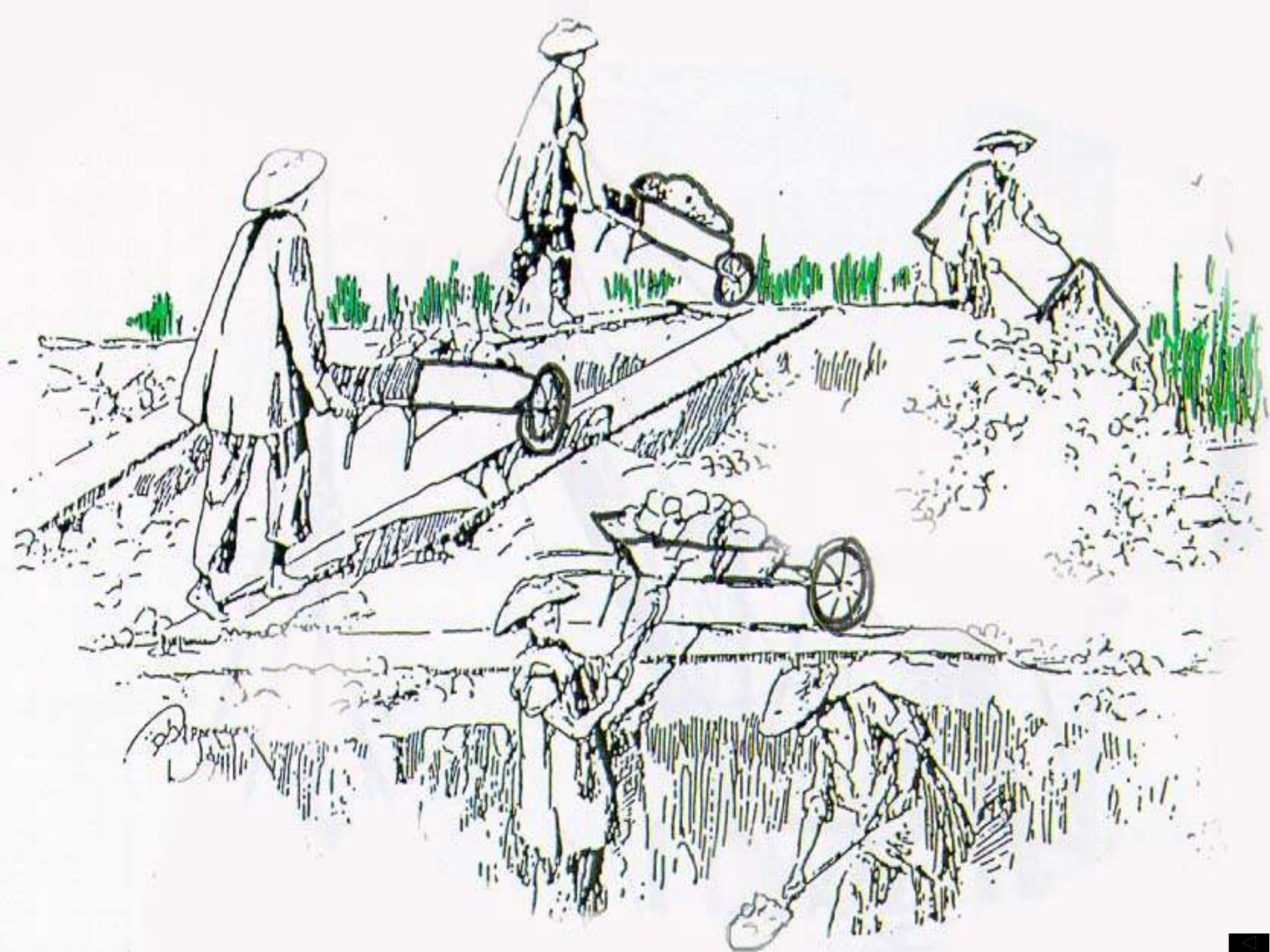


# Diversity of Habitat

- Temperature
- Depth
- Turbidity
- Salinity
- Residence Time
- Velocity Gradients















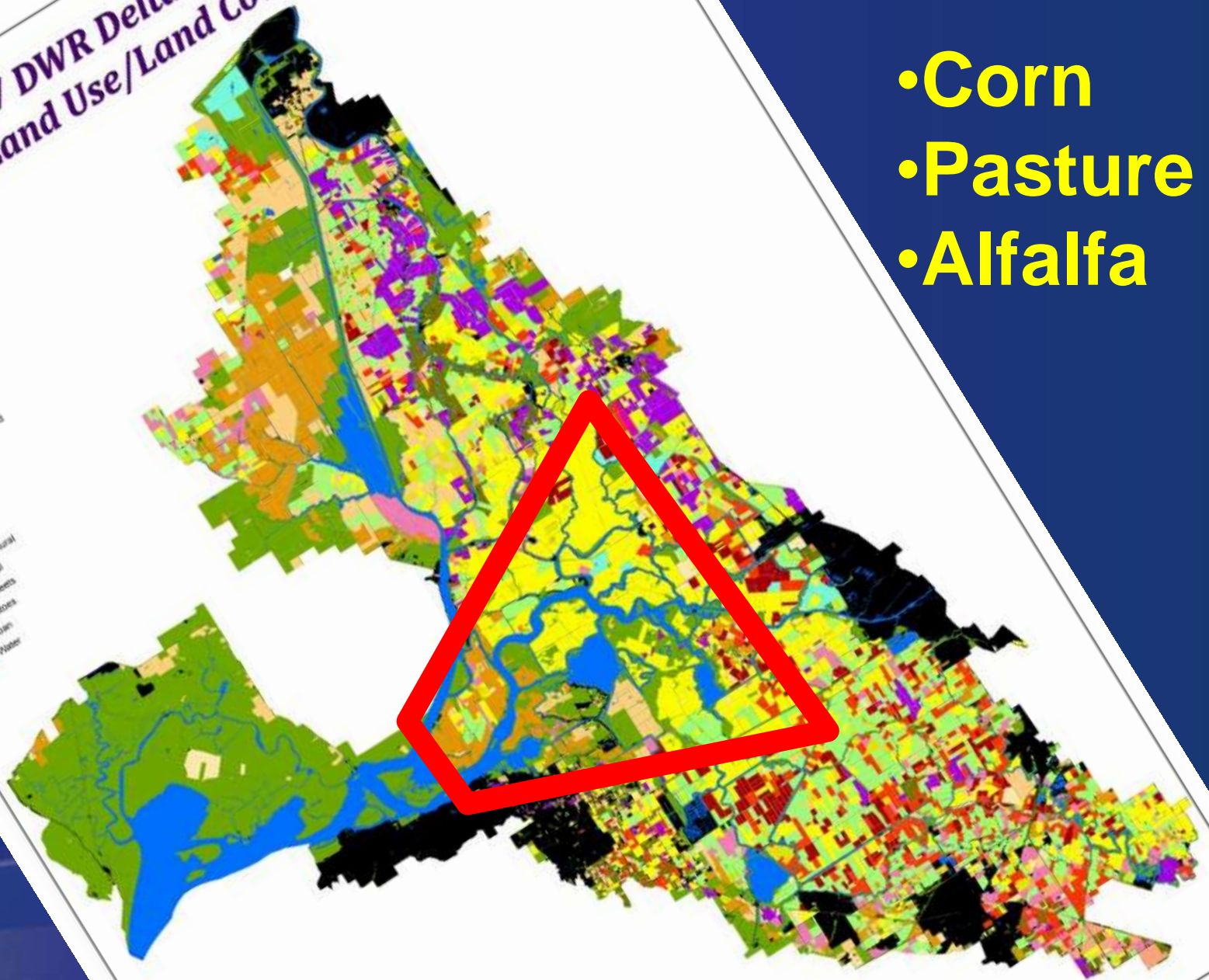






# 2005/2007 DWR Delta-Suisun Land Use/Land Cover

- Corn
- Pasture
- Alfalfa























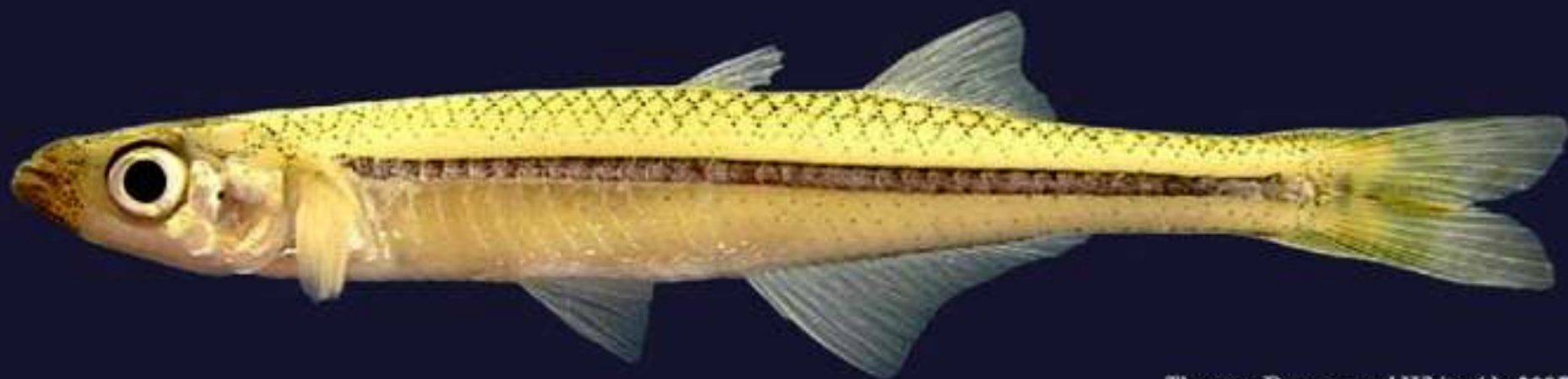






















# Delta Inflow

## Sacramento River

~80% Inflow; good quality

## East Side Rivers

~5% Inflow; good quality

## Ocean/Tidal

High salinity

## San Joaquin River

~15% Inflow; poor quality



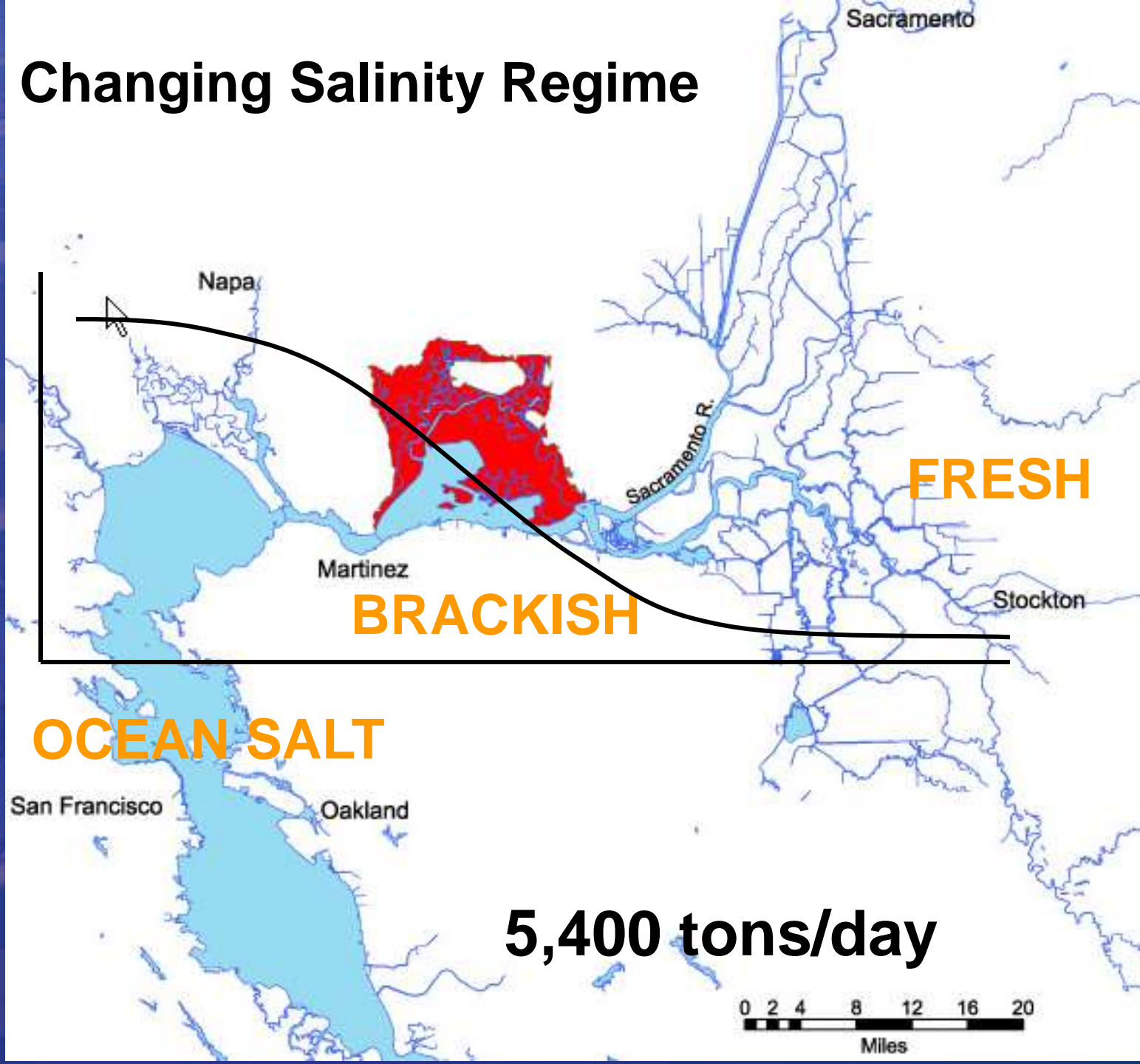


# Changing Salinity Regime

35 ppt

Salinity

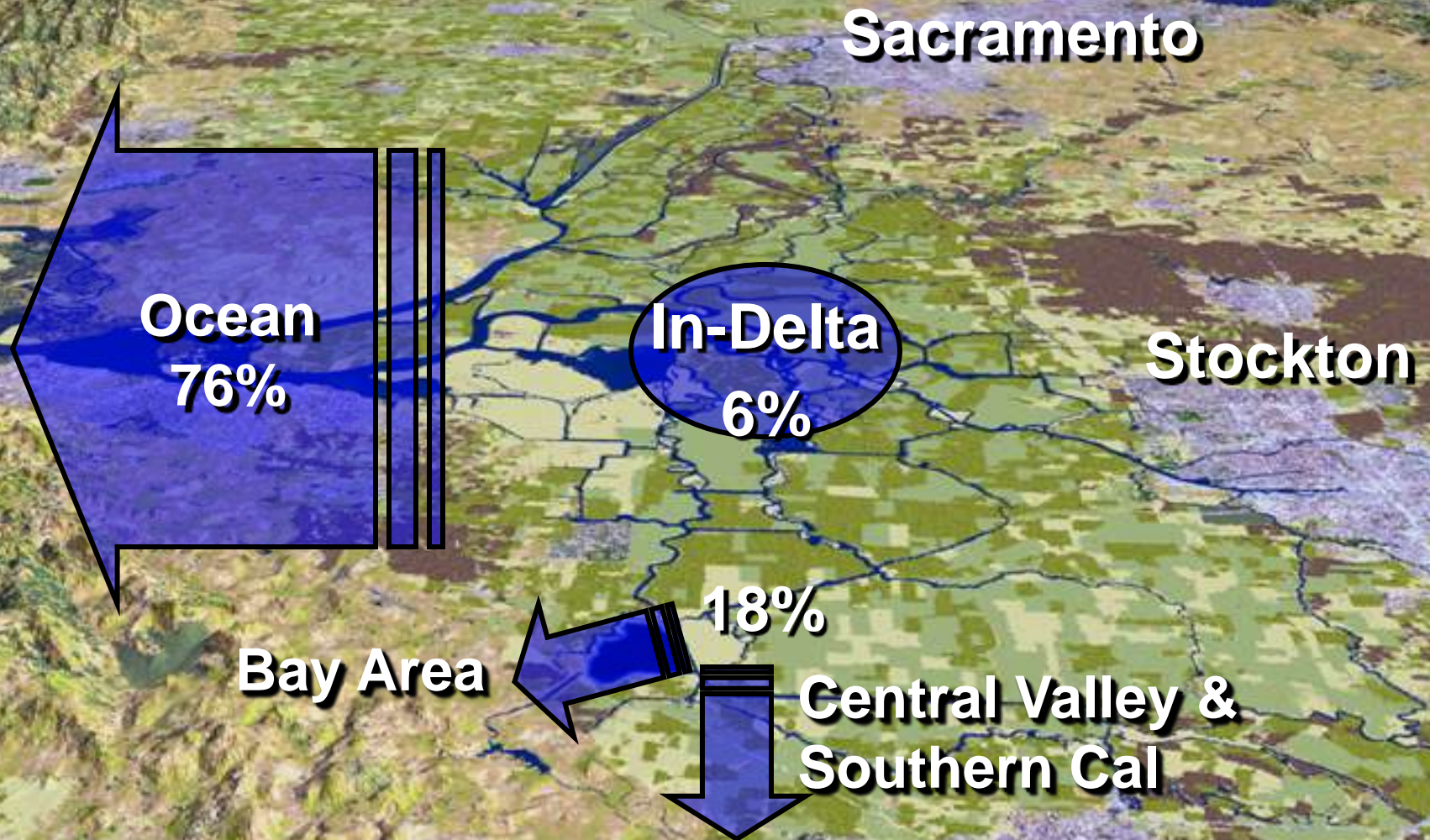
0 ppt



5,400 tons/day



# Delta Water Use





# How Water Gets to the California Economy





# Key Delta Risks

## Sea Level Rise



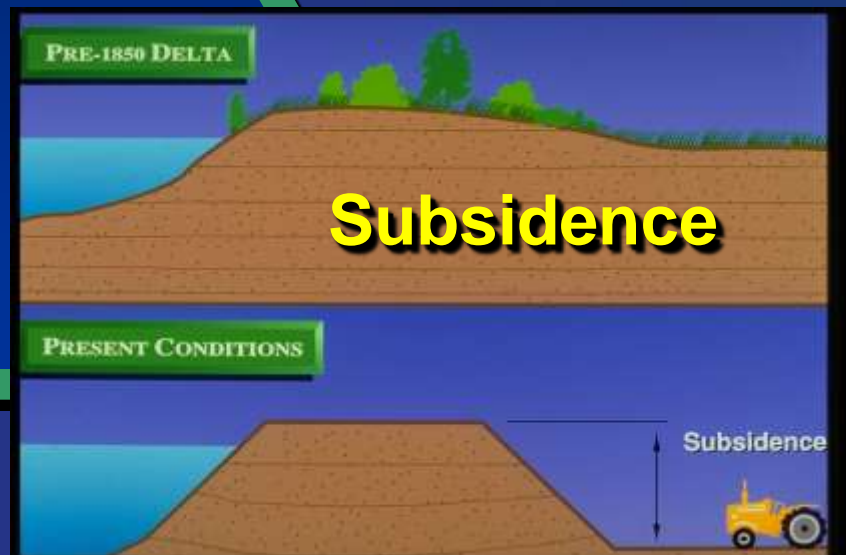
## Seismic Risk Bay Area Faults



PRE-1850 DELTA

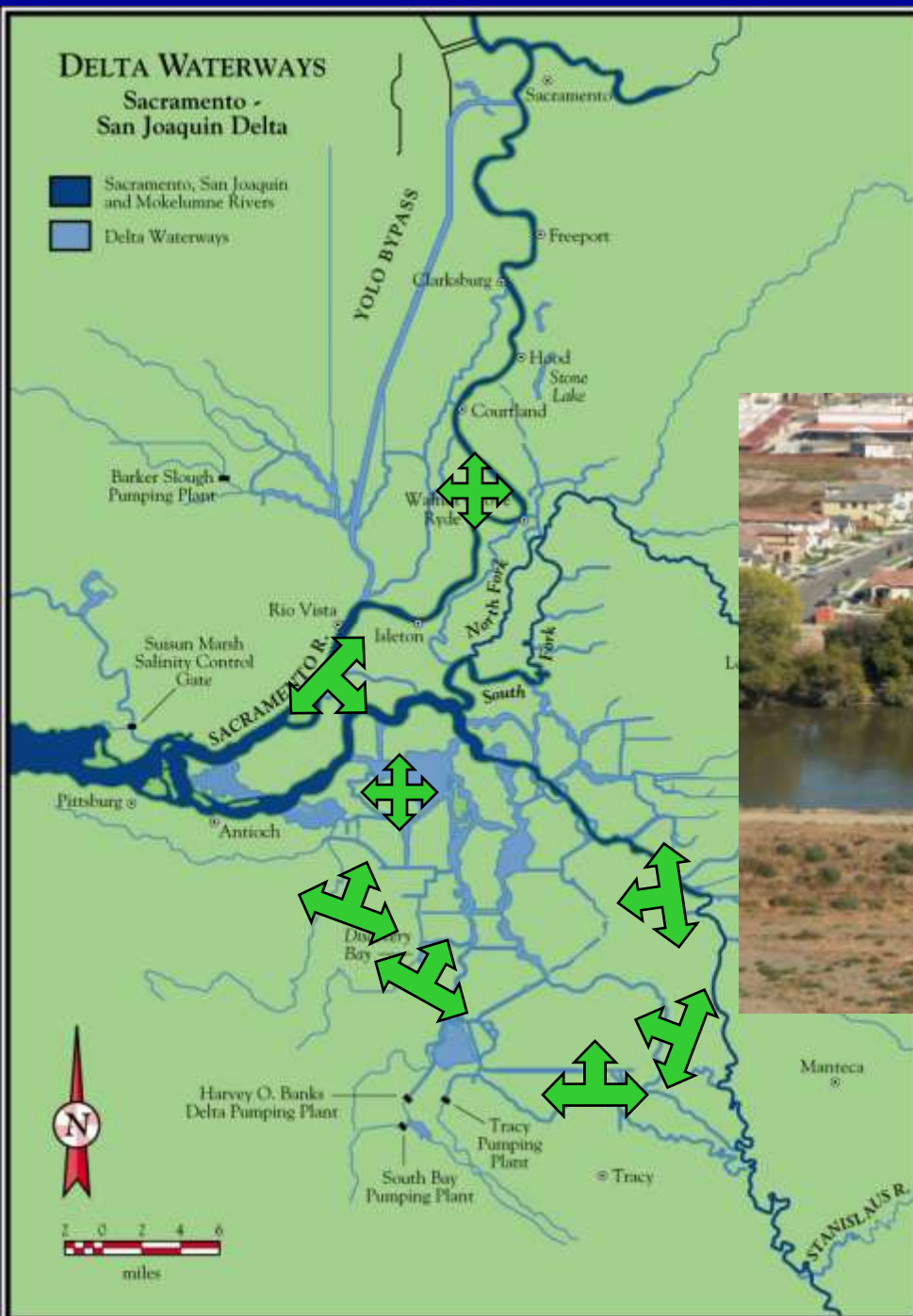
## Subsidence

PRESENT CONDITIONS





# Conversion to Homes

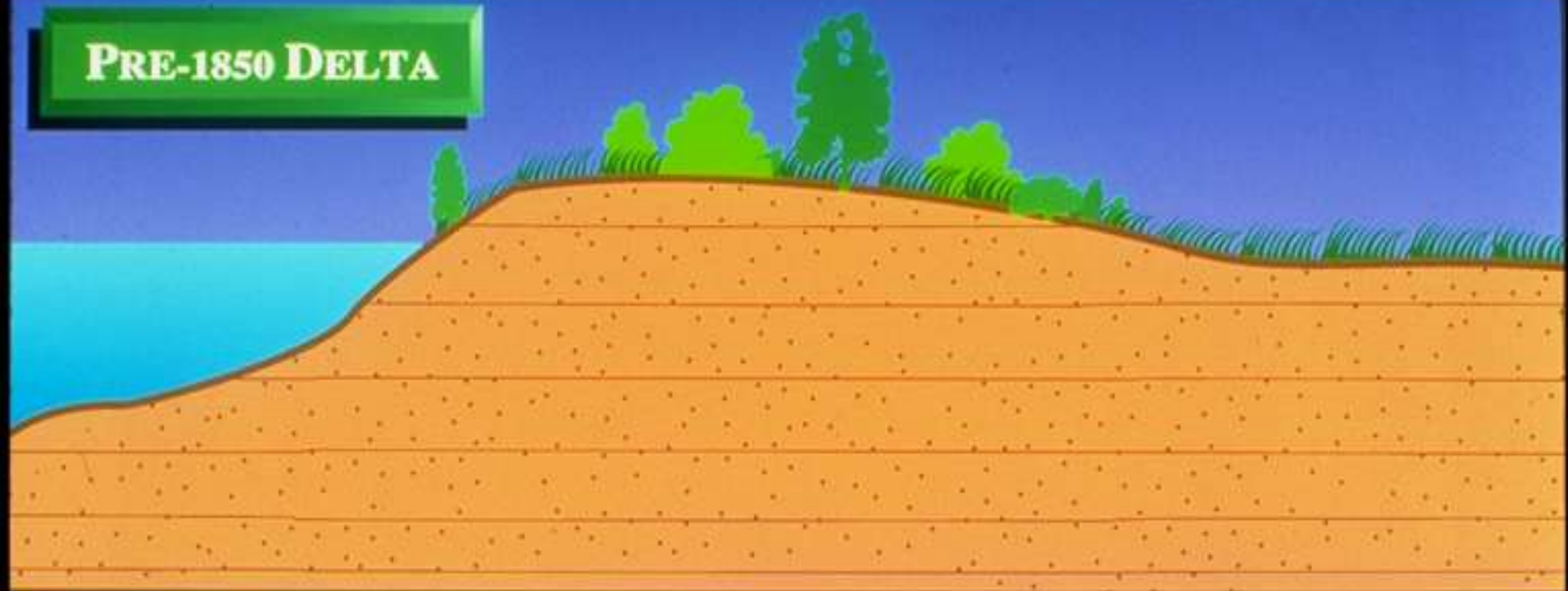




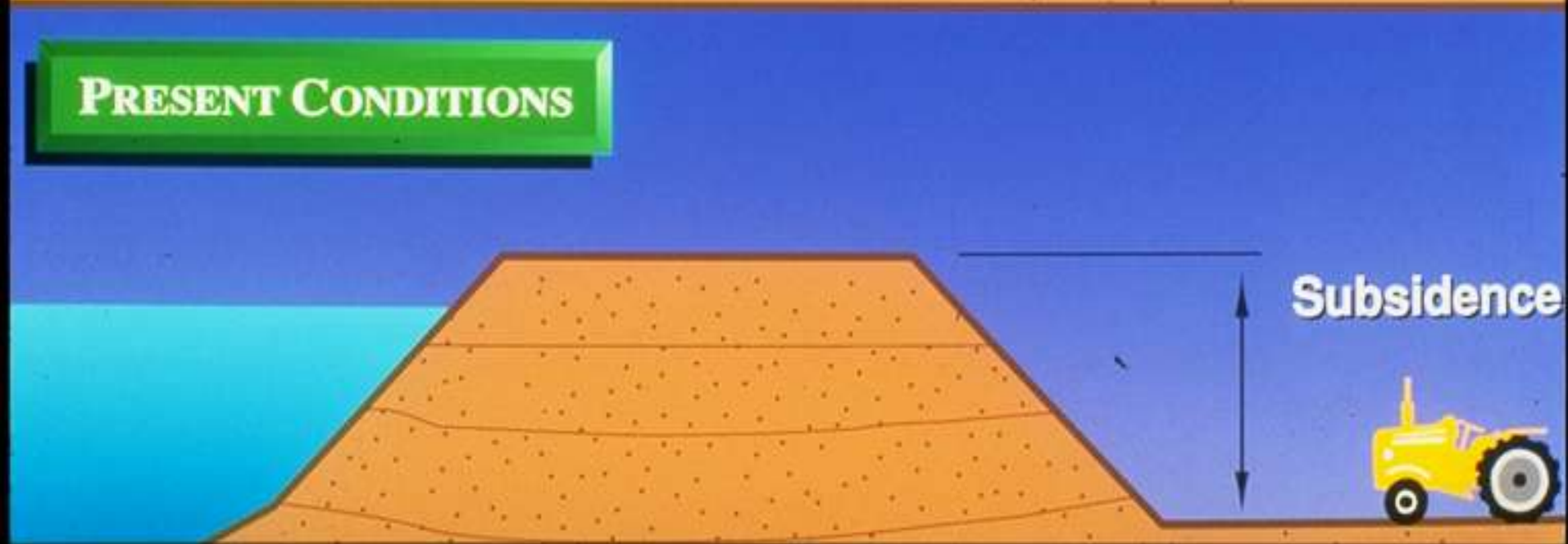




## PRE-1850 DELTA



## PRESENT CONDITIONS





# Microbial Decomposition

Plant  
Matter

1.7 Tons/ac.

Carbon  
Dioxide

4.9 Tons/ac.

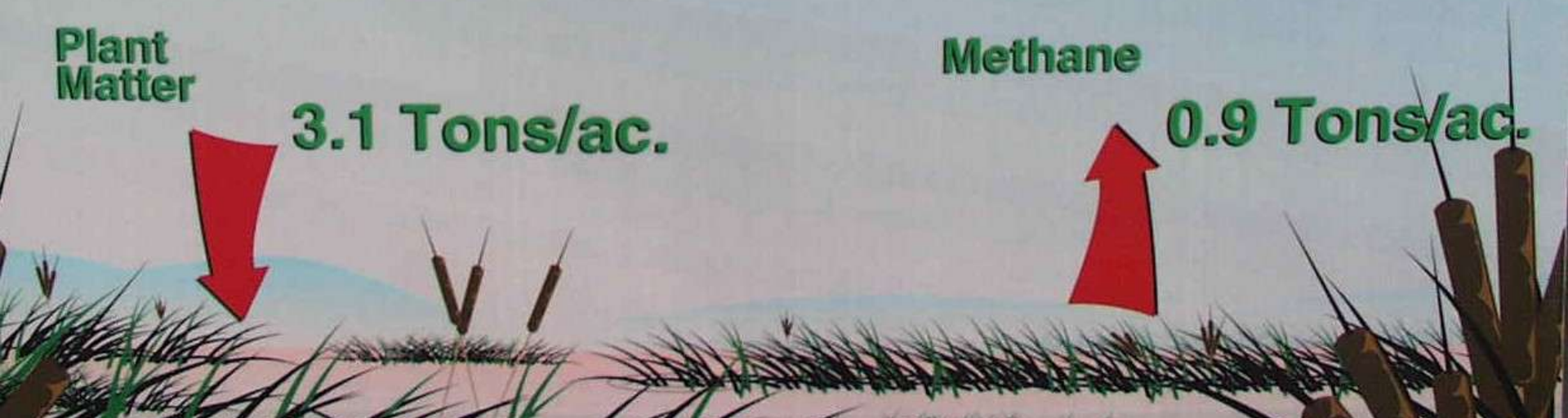


Plant  
Matter

3.1 Tons/ac.

Methane

0.9 Tons/ac.





# Land Subsidence

## Due to Farming of Peat Soils

- 30 ft.

- 20 ft.

- 5 ft.

### Subsidence

- ~ 1.5 ft. per decade
- 30 ft. in some areas

Elevation Color Codes



- 30 feet

Sea Level



# Island Flooding

**PPIC - 90% probability half islands flood next 50 years**

**DRMS – 50% chance 20+ islands fail due to quake by 2030**

**High Risk Zone**

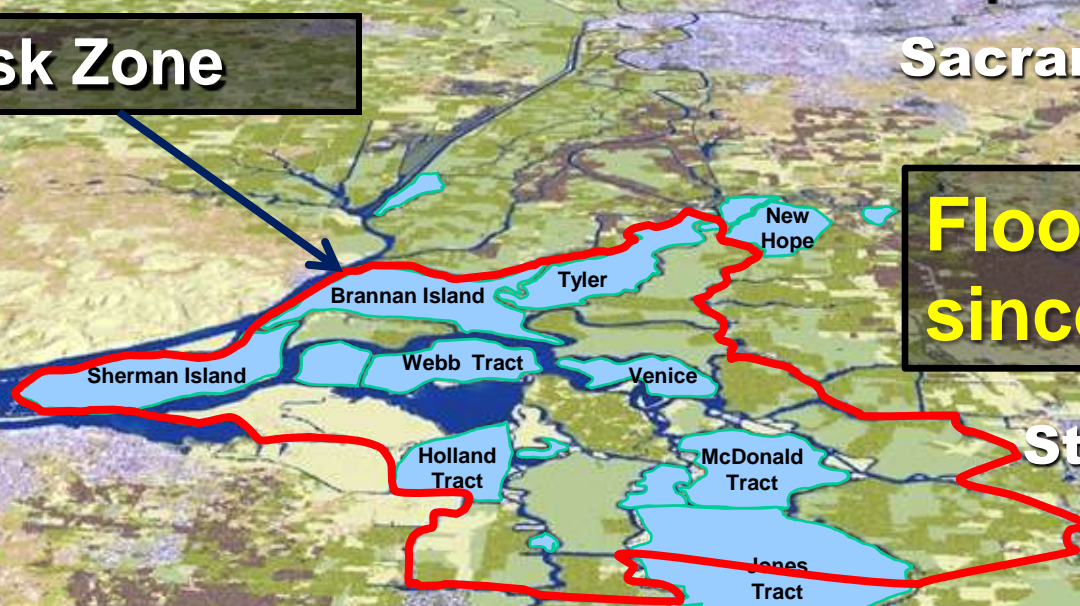
**Sacramento**

**Flooded  
since 1960**

**Bay  
Area**

**Stockton**

**162 Delta levee breaches have occurred in past  
century**





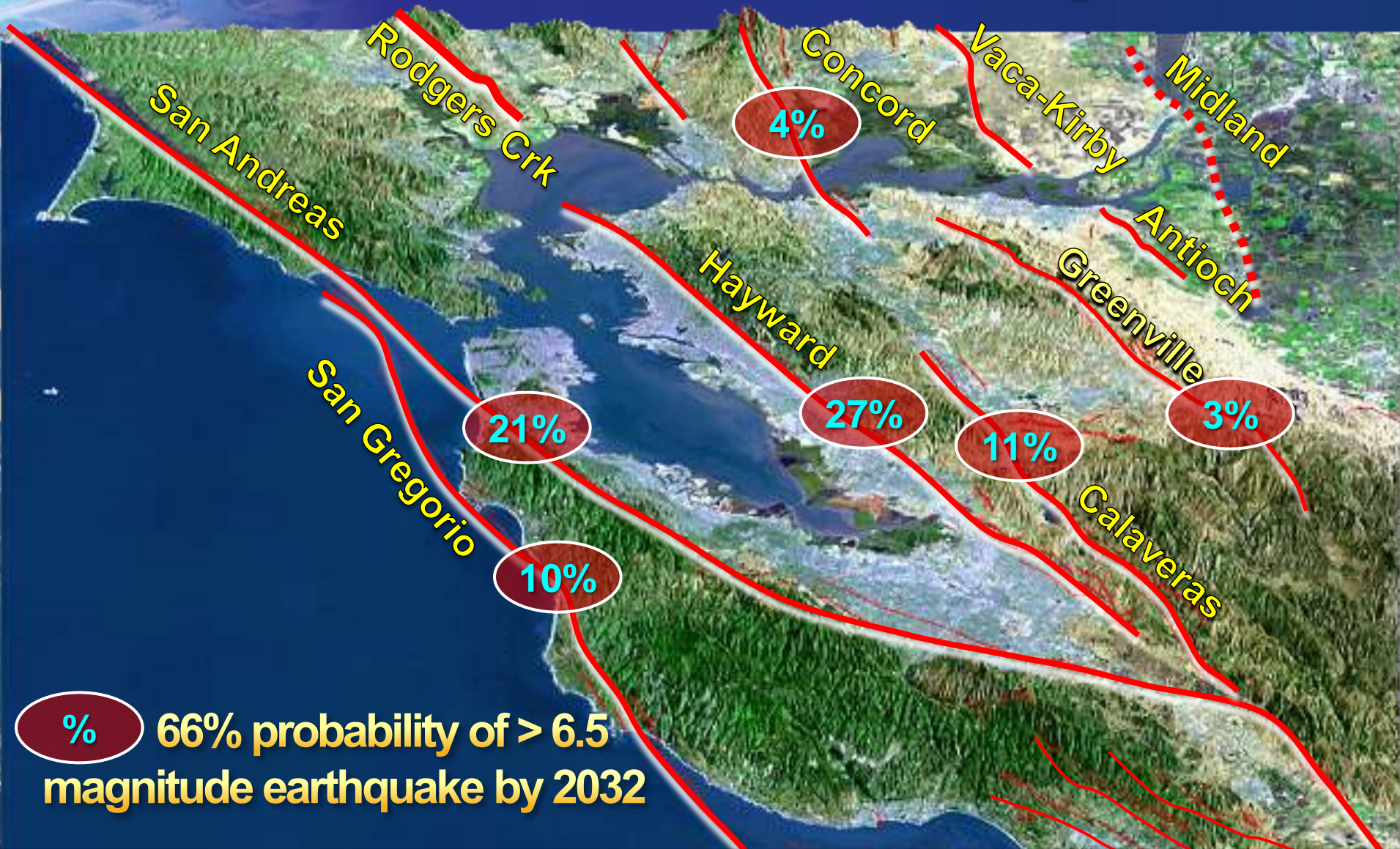








# Seismic Vulnerability



Bay-Delta Region Major Faults



## Past Seismic Events in the Bay-Delta Region

**Past Seismic Events in the Bay-Delta Region**

62% probability for at least one magnitude 6.7 or greater quake 2003 to 2032

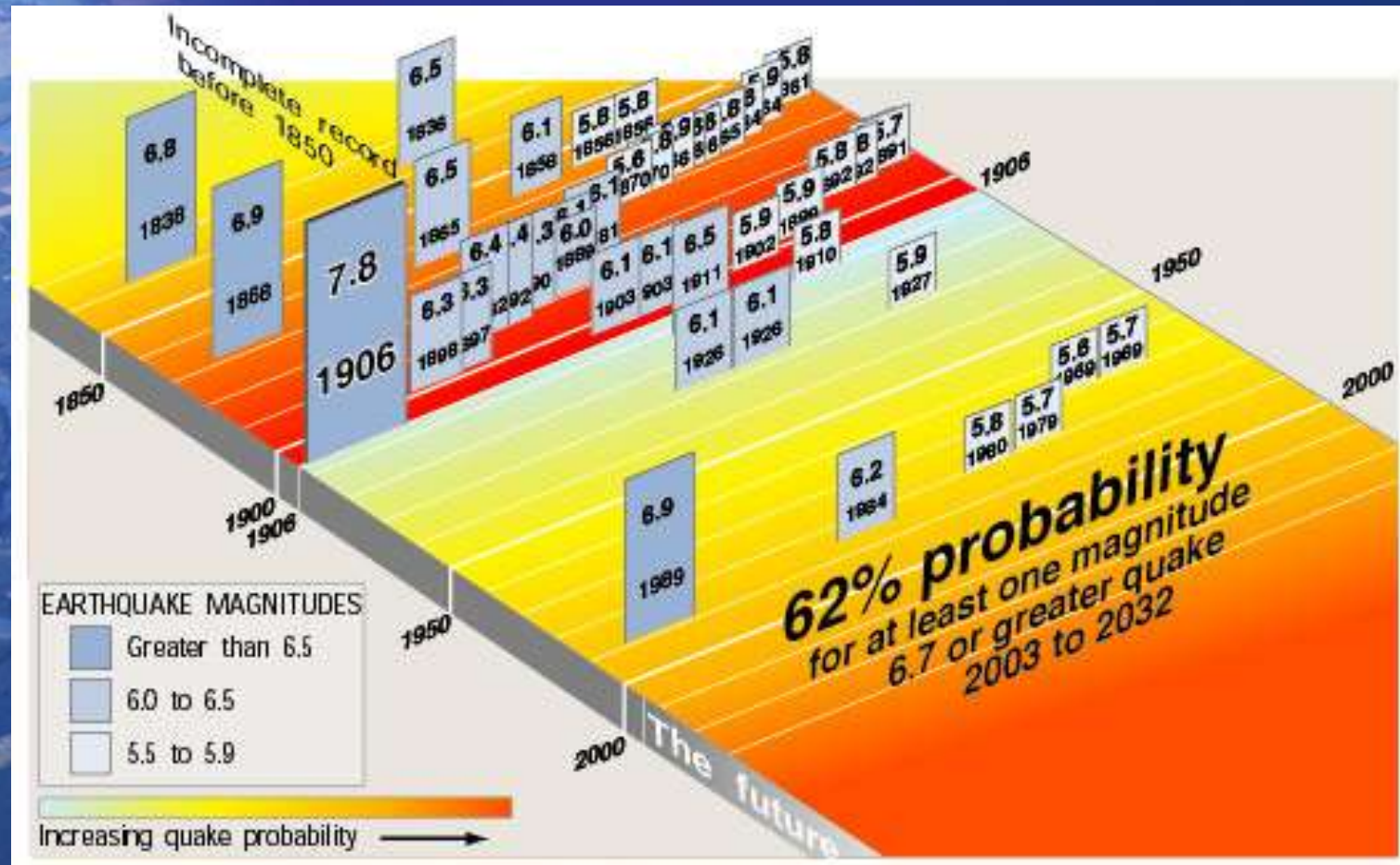
The future

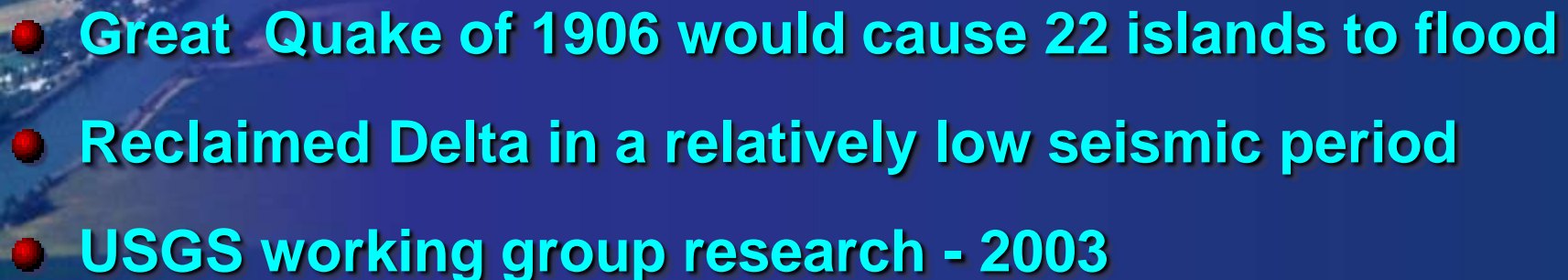
Increasing quake probability

EARTHQUAKE MAGNITUDES

- Greater than 6.5
- 6.0 to 6.5
- 5.5 to 5.9

- Great Quake of 1906 would cause 22 islands to flood
- Reclaimed Delta in a relatively low seismic period
- USGS working group research - 2003



- 
- **Great Quake of 1906 would cause 22 islands to flood**
  - **Reclaimed Delta in a relatively low seismic period**
  - **USGS working group research - 2003**

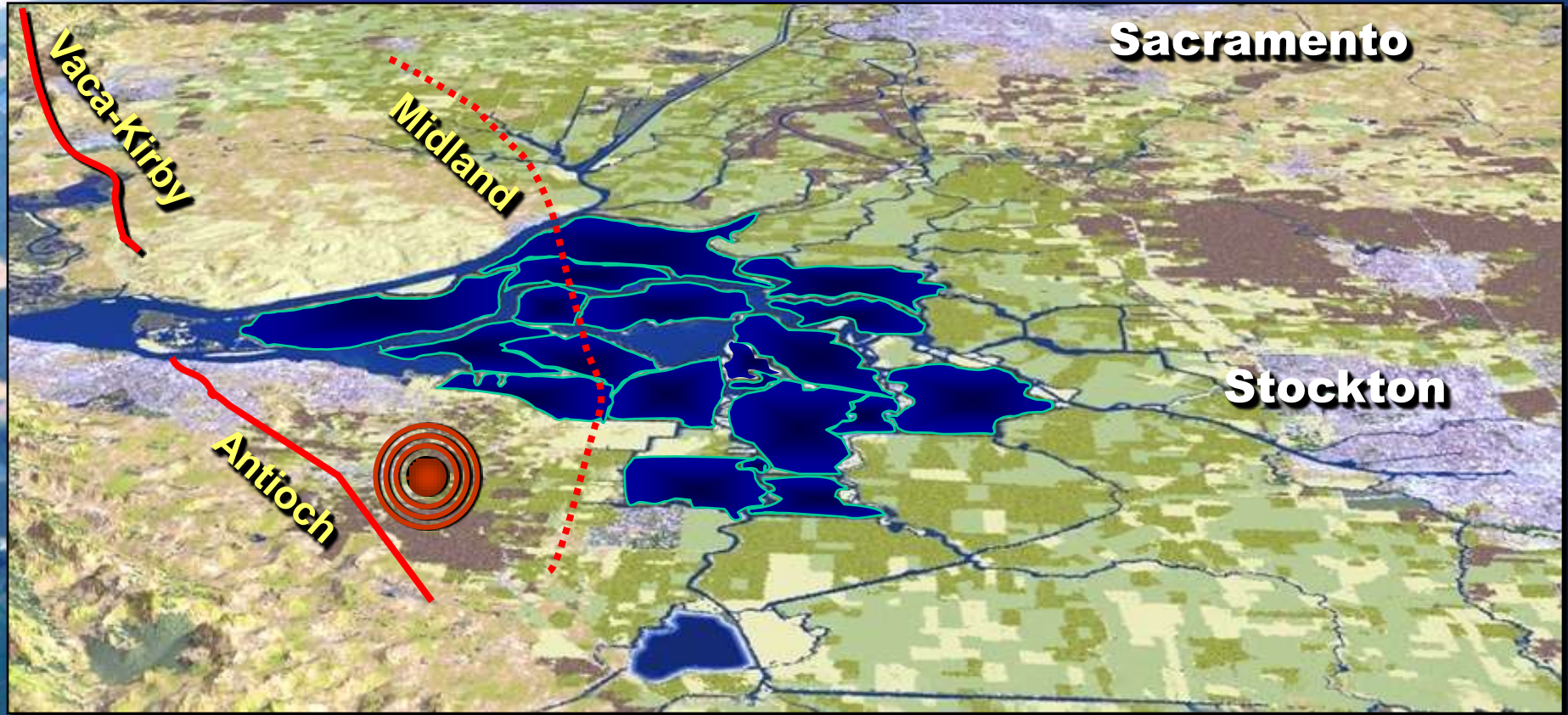


# 8 Days in the Delta after an Earthquake





# Seismic Vulnerability

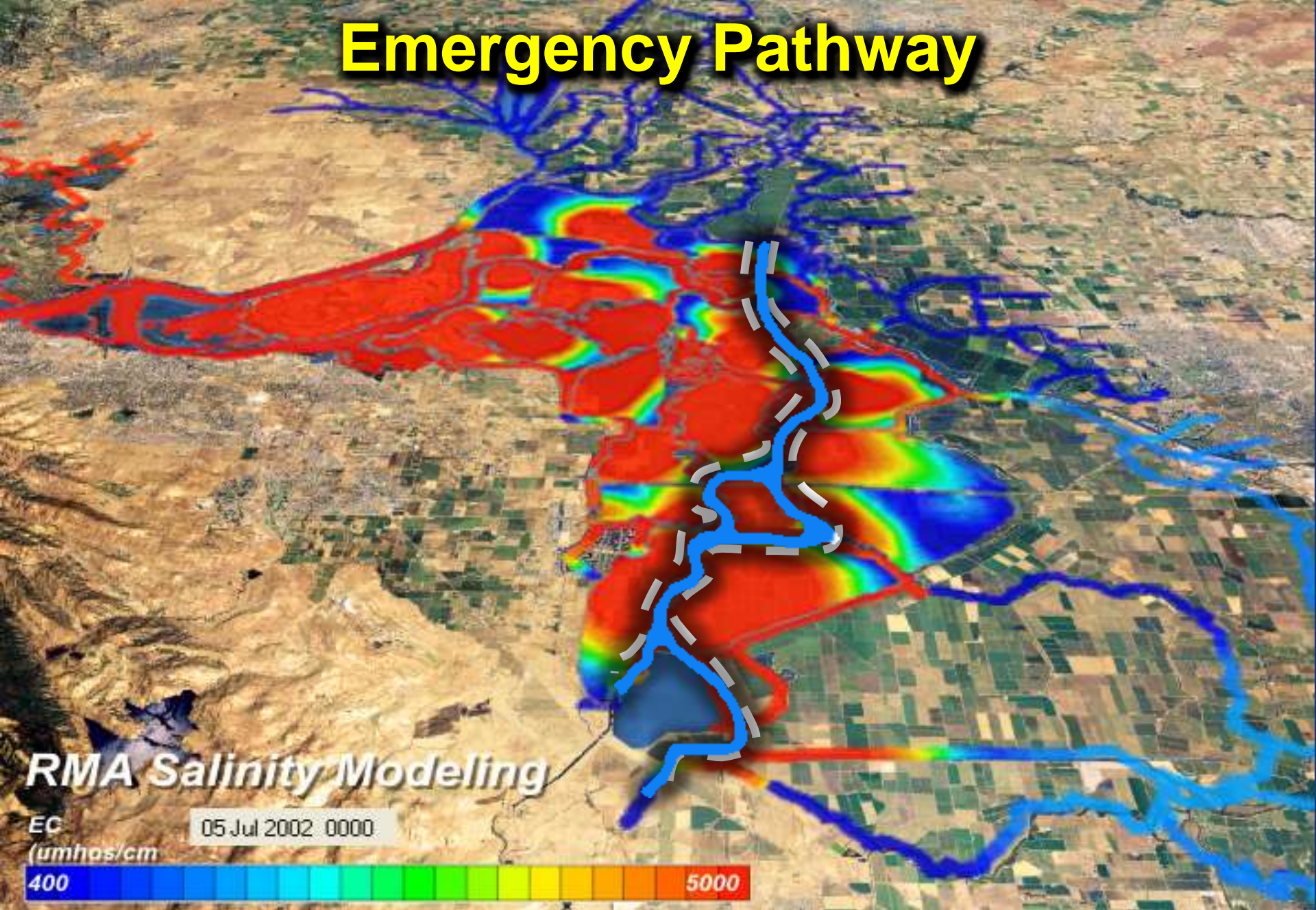


**\$2.3 billion in levee repairs (optimistic assumptions)**

**30% chance, \$30 B economic loss by 2030**



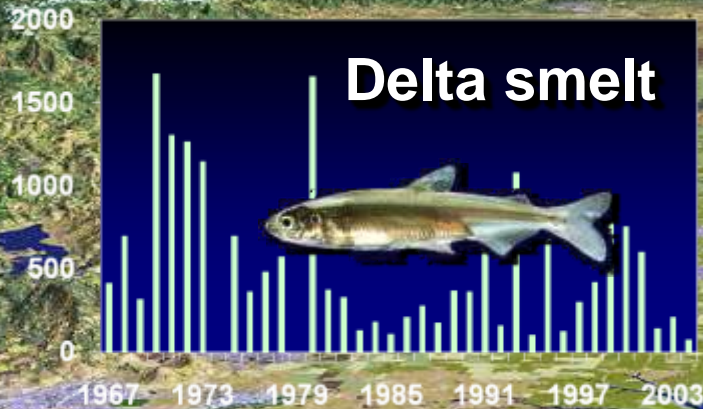
# Emergency Pathway



**Estimated export resumption within 6-months**



# FWS restricts southerly flows



Sacramento


Stockton

SWP Pumps  
CVP Pumps



# Regulatory Water Costs

## 2008-2009 FWS & NMFS Impacts

- 
- 2008 = ~670,000 acre-ft ( ~\$167 M)
  - 2009 = ~360,000 acre-ft
  - 2010 = ~400,000 AF ( as of 3/14/10)
  - Smelt water costs = 20-33% annually
  - New salmon opinion = additional 10% cut
  - MWD 2010 losses = San Diego annual use



# Statewide Impacts



**Up to 40% reductions**  
Bay Area

**No Reductions**  
Agriculture Senior Rights

**Reductions**  
Friant Water Users

**Up to 80% reductions**  
CVP Westside

**Reductions (300,000-600,000 AF/yr)**  
Metropolitan Water Dist.



# Impacts on Fish





# Pumping Result: Fish Conflicts



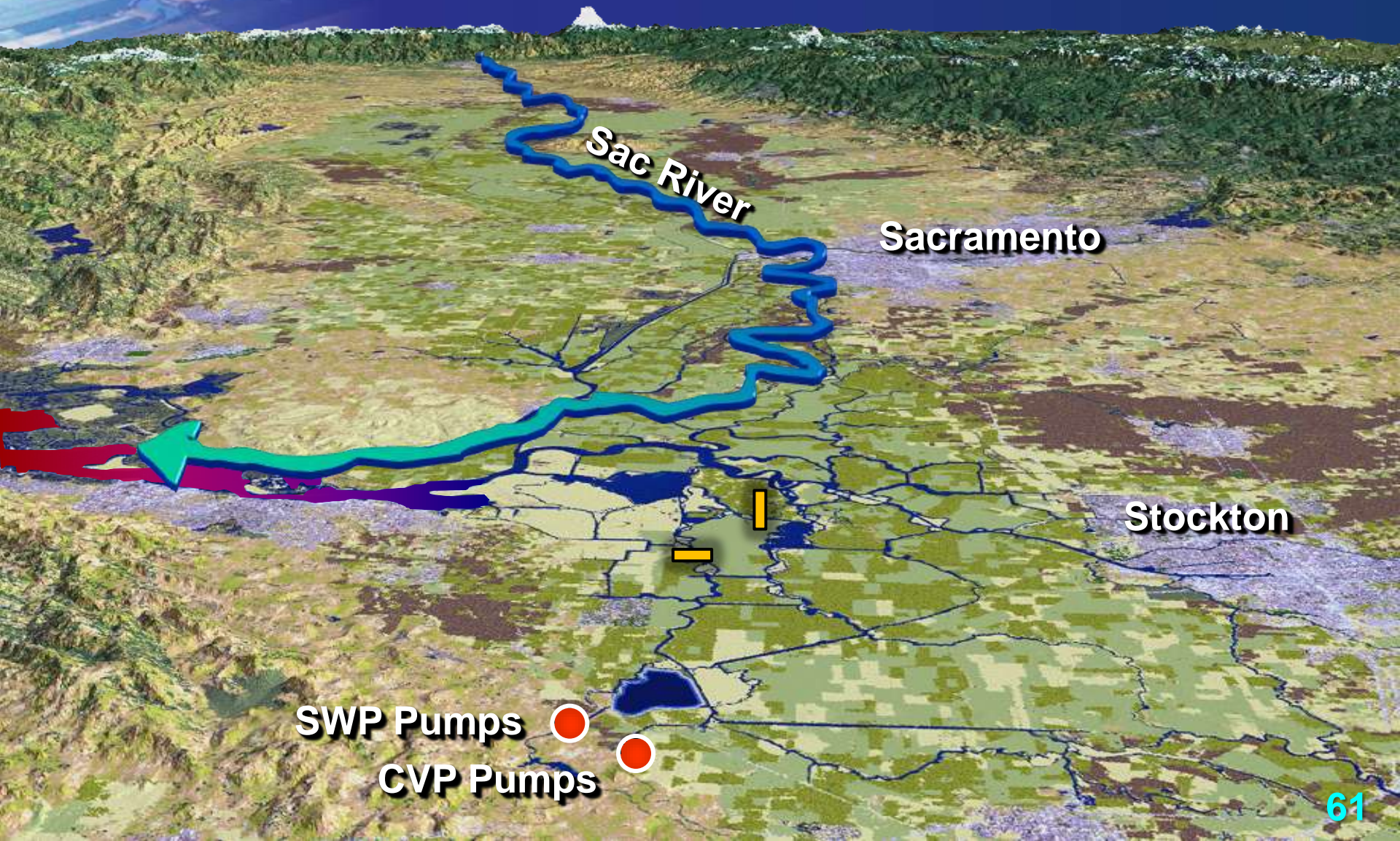
**# of Fish Salvaged At Pumps**

Year	Chinook Salmon	Delta Smelt	Longfin Smelt	Splittail	Striped Bass	Threadfin Shad	Grand Total
2003	33,989	37,910	5,268	19,732	918,816	6,702,728	7,718,443

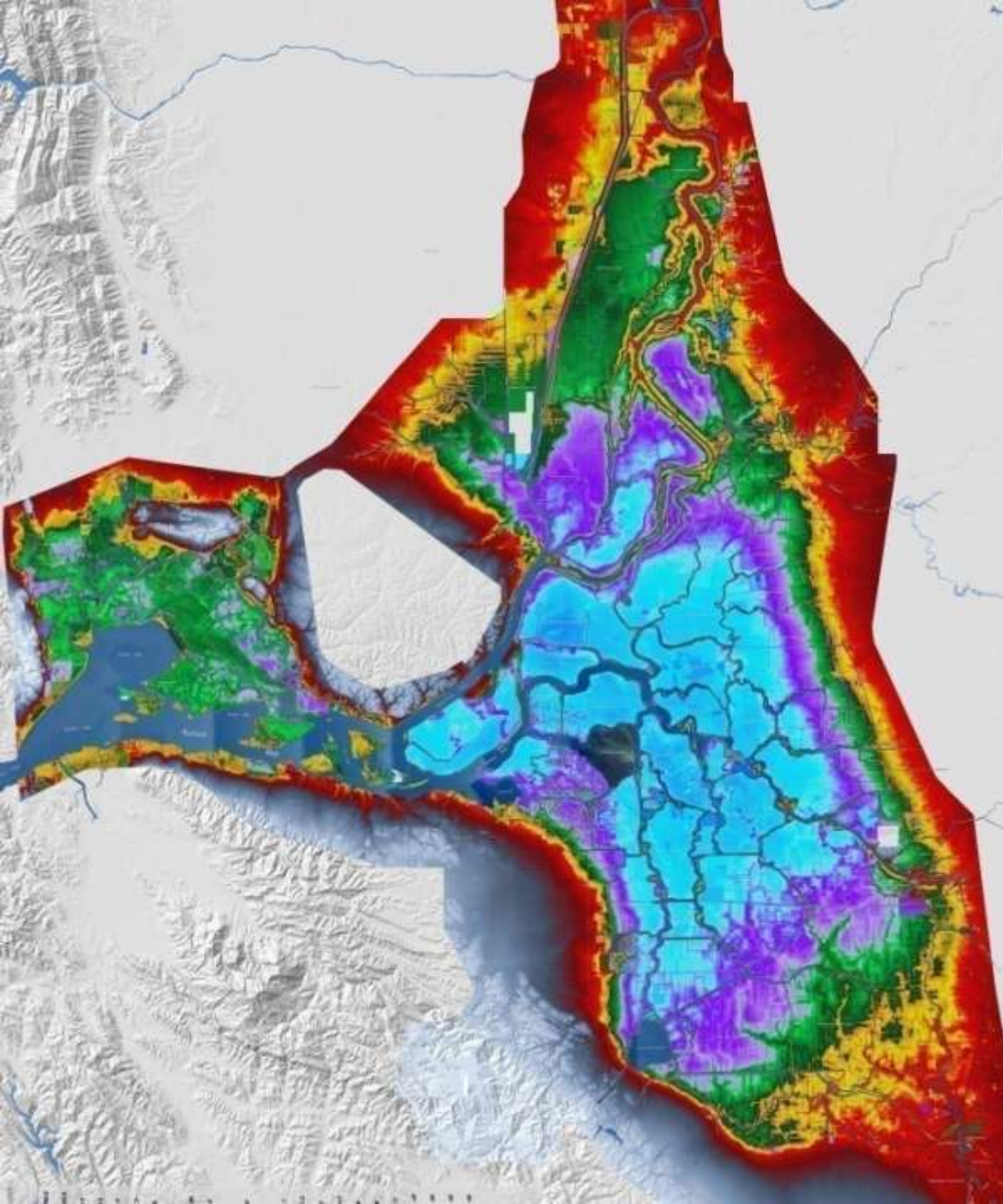


# Near-Term Actions

## 2-Gate Project / Middle River Corridor







**12' +  
supratidal  
intertidal**

**0' to -6'  
(Subsidence reversal)**

**-6' to -30'**



# Bay-Delta Conservation Plan

## Ecosystem Restoration Target Areas







**Naturally restored tidal wetlands on Little Holland**





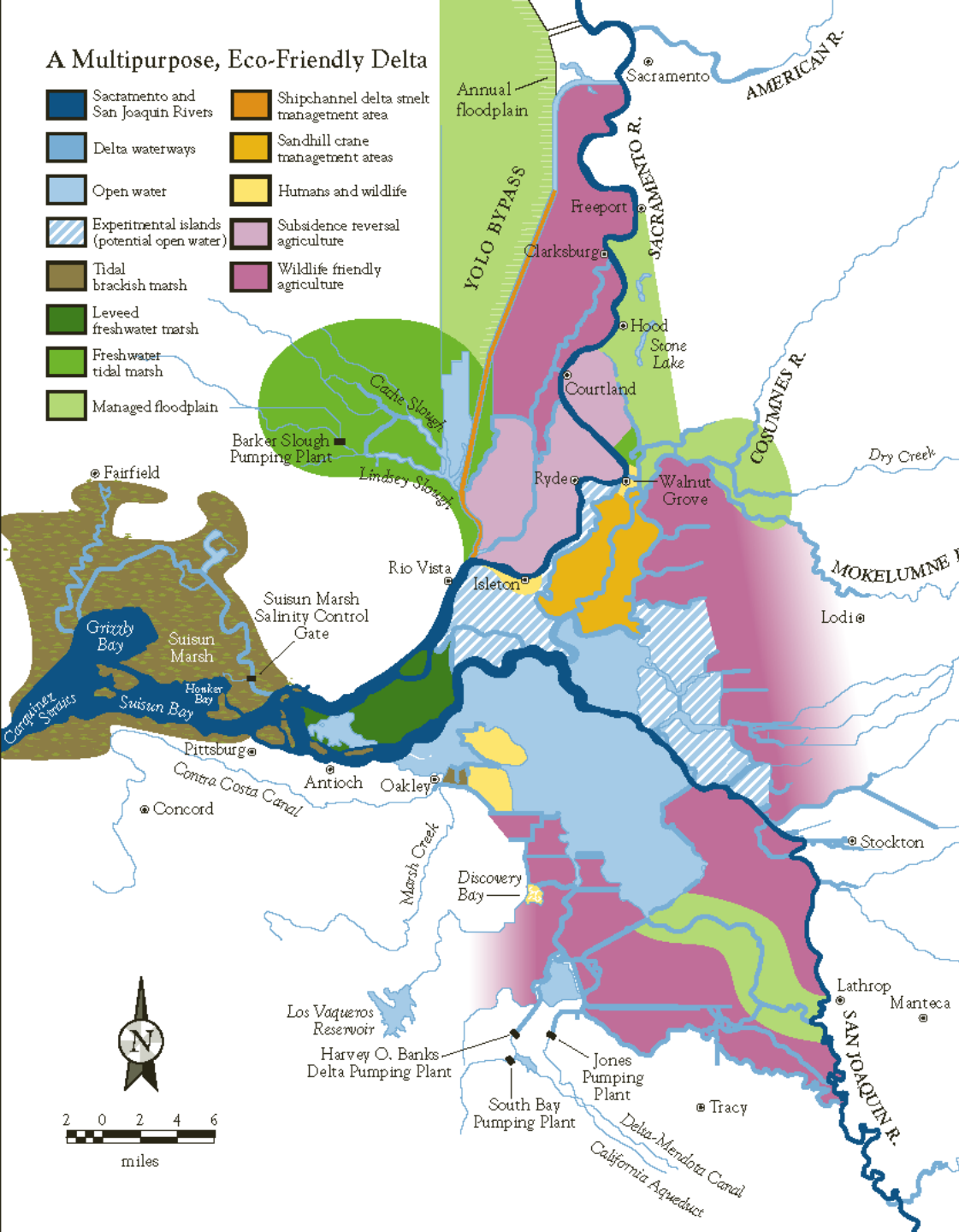
## Yolo Bypass

- ✓ completed by 1930
- ✓ 80% of flood flows
- ✓ almost 60,000 acres
- ✓ 42 fish species
- ✓ splittail & salmon habitat
- ✓ food for the estuary
- ✓ B.O. requires:
  - ✓ 17-20,000 acres
  - ✓ weir modifications



## A Multipurpose, Eco-Friendly Delta

- |   |   |
|---|---|
| Sacramento and San Joaquin Rivers           | Shipchannel delta snelt management area |
| Delta waterways                             | Sandhill crane management areas         |
| Open water                                  | Humans and wildlife                     |
| Experimental islands (potential open water) | Subsidence reversal agriculture         |
| Tidal brackish marsh                        | Wildlife friendly agriculture           |
| Leveed freshwater marsh                     |   |
| Freshwater tidal marsh                      |   |
| Managed floodplain                          |   |



**PPIC**

**Sustainable Delta**



# Water Supply - Ecosystem Separation

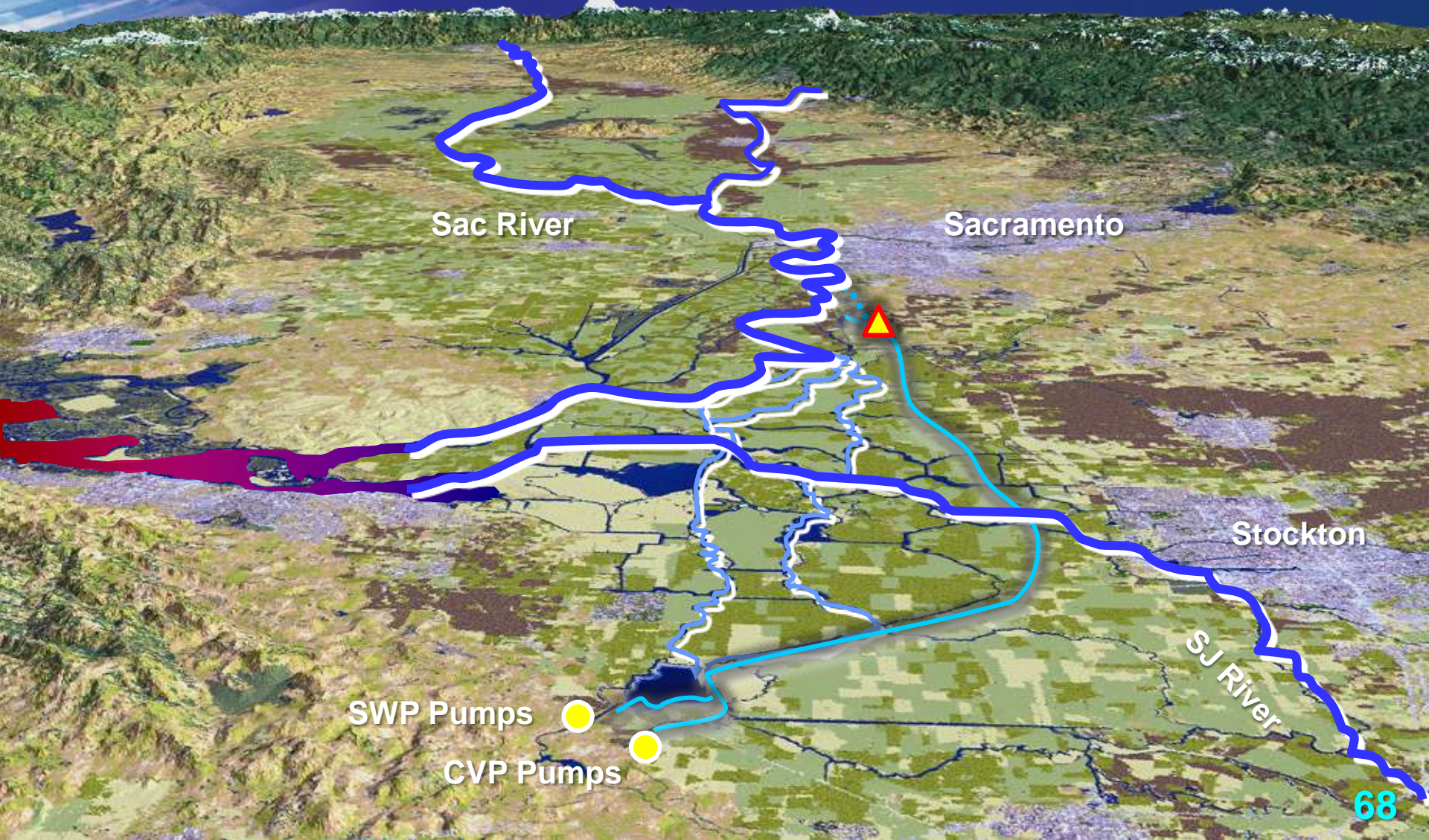
A satellite image of California is shown. A yellow triangle on the central coast indicates a zoomed-in view of the Central Valley. This zoomed-in view shows the Sacramento-San Joaquin River Delta, with a green arrow pointing from the delta towards the coast, indicating the flow of water and the separation of ecosystems.

- Maintain natural fish migration
- Keep carbon & nutrients in the estuary



# Bay-Delta Conservation Plan

## Dual-Conveyance – East Alignment





# Bay-Delta Conservation Plan

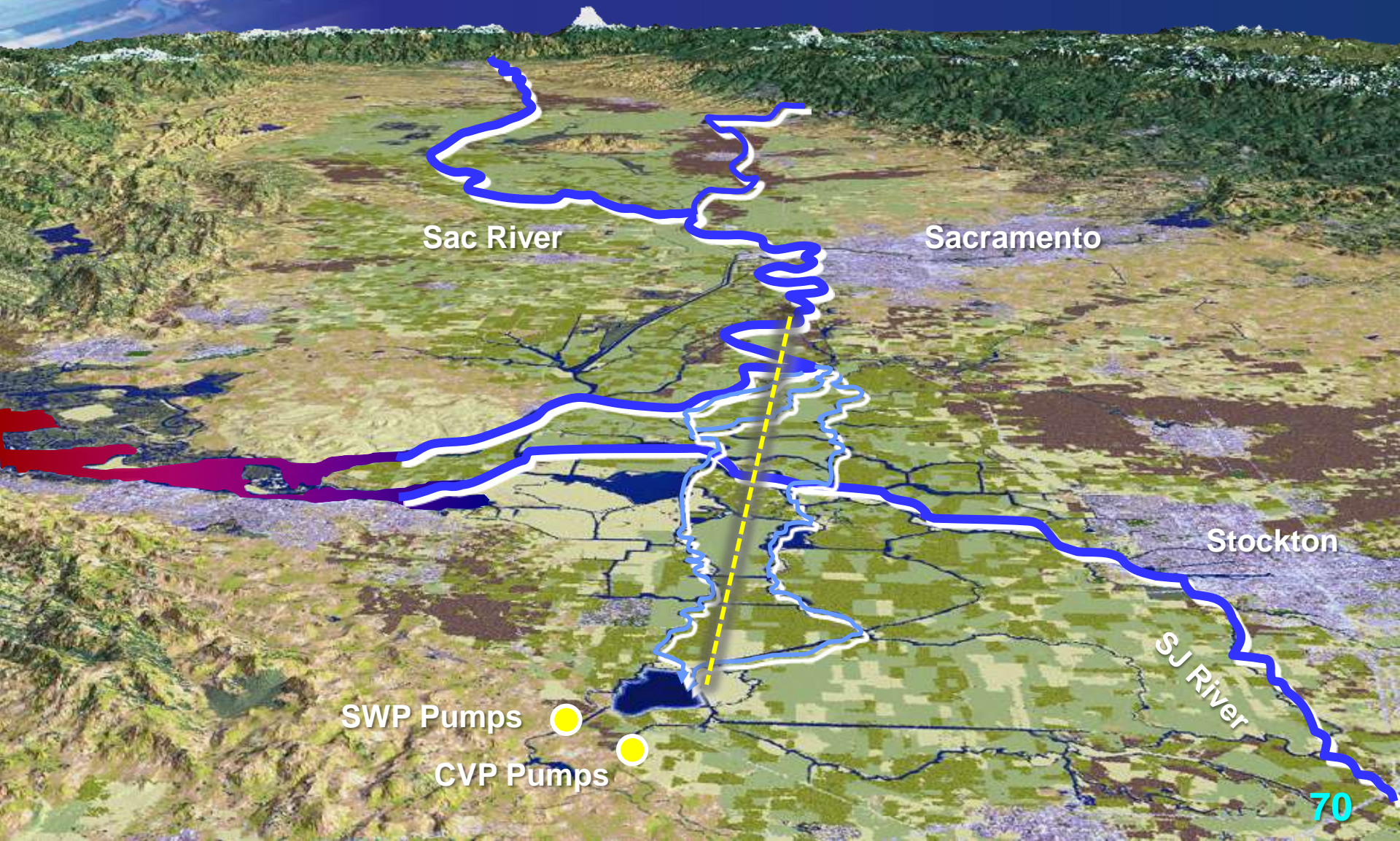
## Dual-Conveyance – West Alignment





# Bay-Delta Conservation Plan

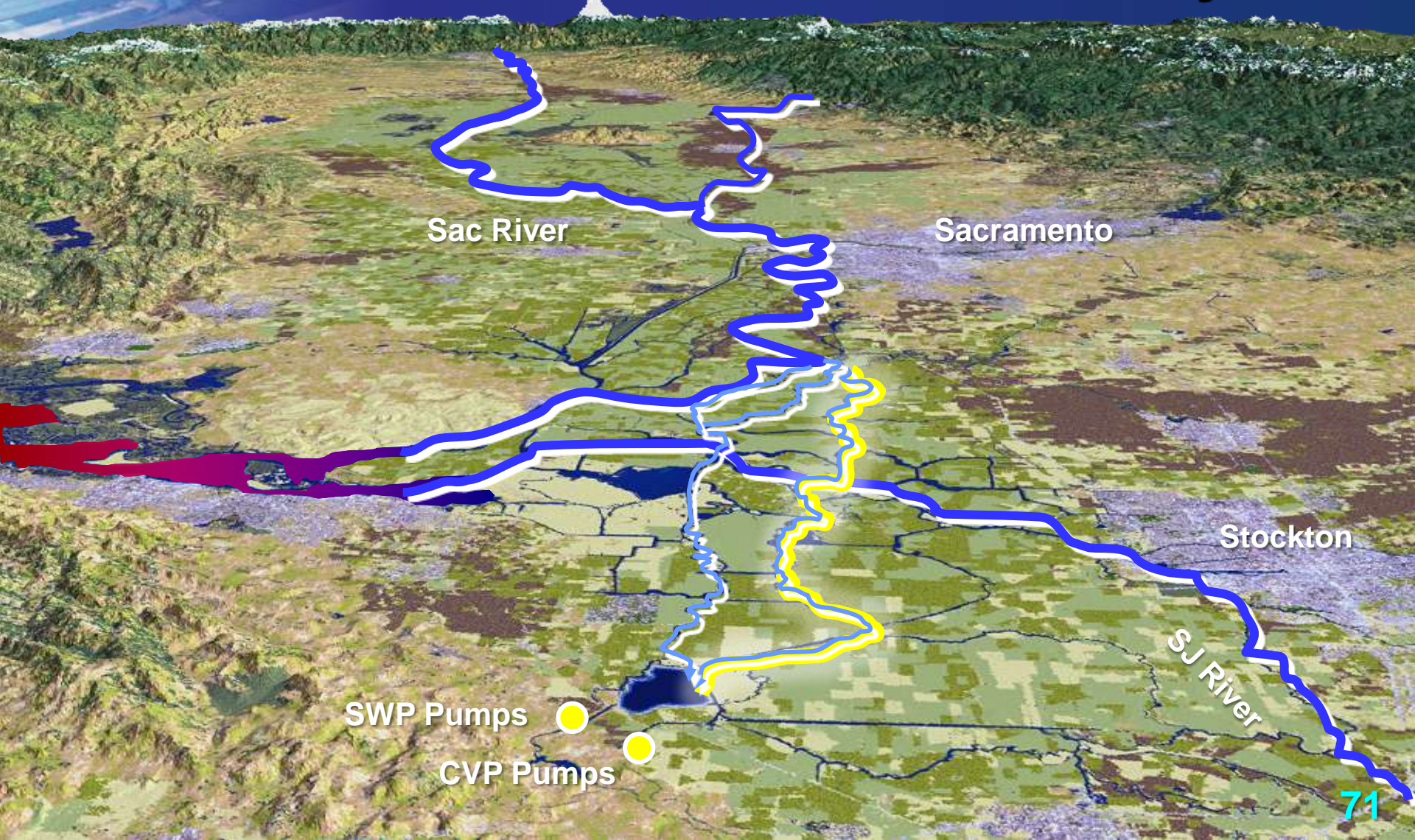
## Dual-Conveyance – Central Tunnel Alignment





# Bay-Delta Conservation Plan

## Thru-Delta Conveyance









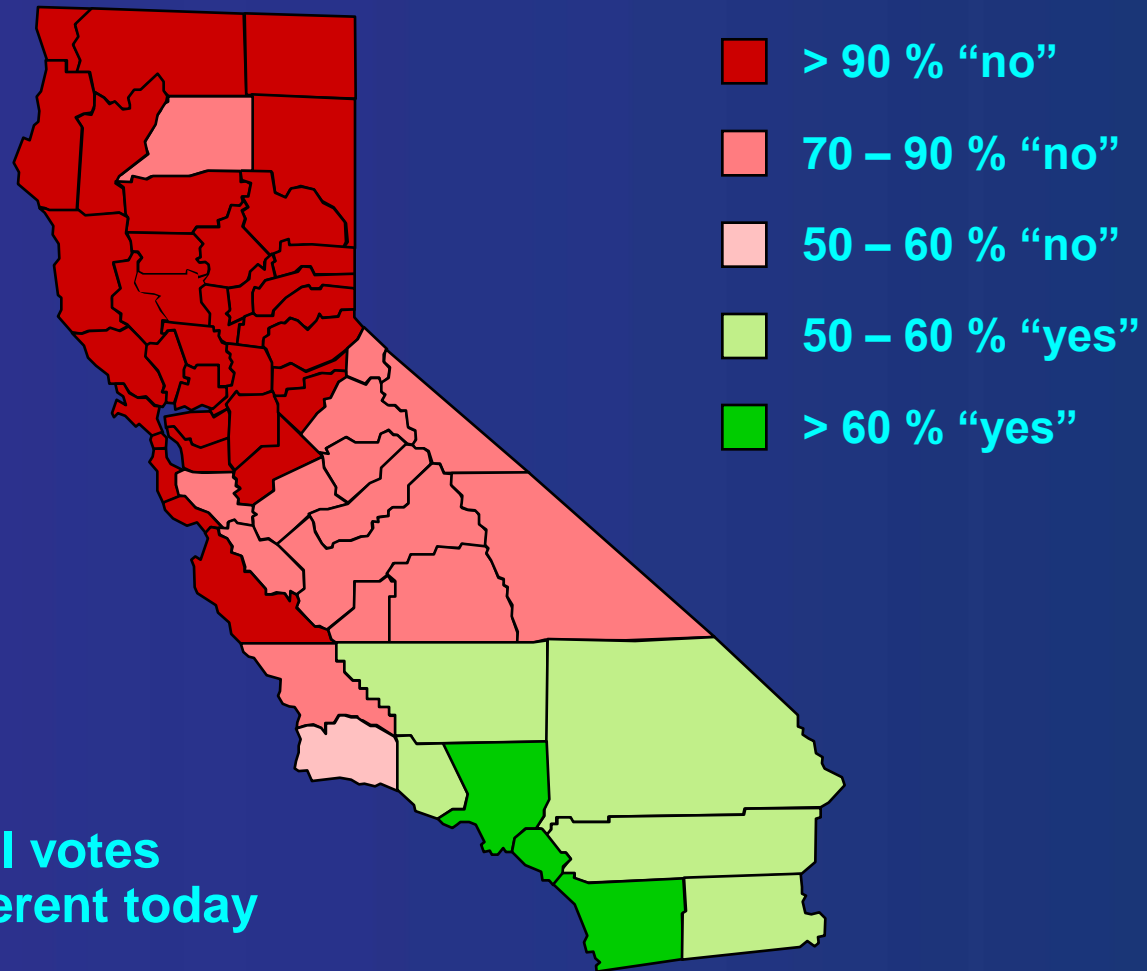
# Bay-Delta Conservation Plan

## Plan Elements under Development





# County Voting Patterns Proposition 9 in June 1982



Peripheral Canal votes  
would likely be different today



# Managing the System Over the Next Decade





# The Delta's Current Course is Non-sustainable

**Suisun Bay**

**State & Federal  
Pumping Plants**

- Subsidence
- Salinity Intrusion
- Sea level rise
- Earthquakes
- Fish Conflicts
- Carbon
- Urbanization
- Non-native Species
- Loss of Habitat

*California's Bay-Delta*





Photo courtesy of Center for Sacramento History, Don Rivett Collection

**A streetcar turns from Seventh Street onto M Street** on its way to the City Wharf in the early 1920s. The M Street neighborhood from the Capitol to the river was torn out to make way for the Capitol Mall as part of an urban renewal project.







A sunset scene over a body of water. The sun is low on the horizon, creating a bright orange glow. In the foreground, there are silhouettes of palm trees and a pier structure. The sky is filled with soft, orange clouds.

**Metropolitan Water District of Southern California**

**Curt Schmutte**

(916) 650-2626

CSchmutte@mwdh2o.com