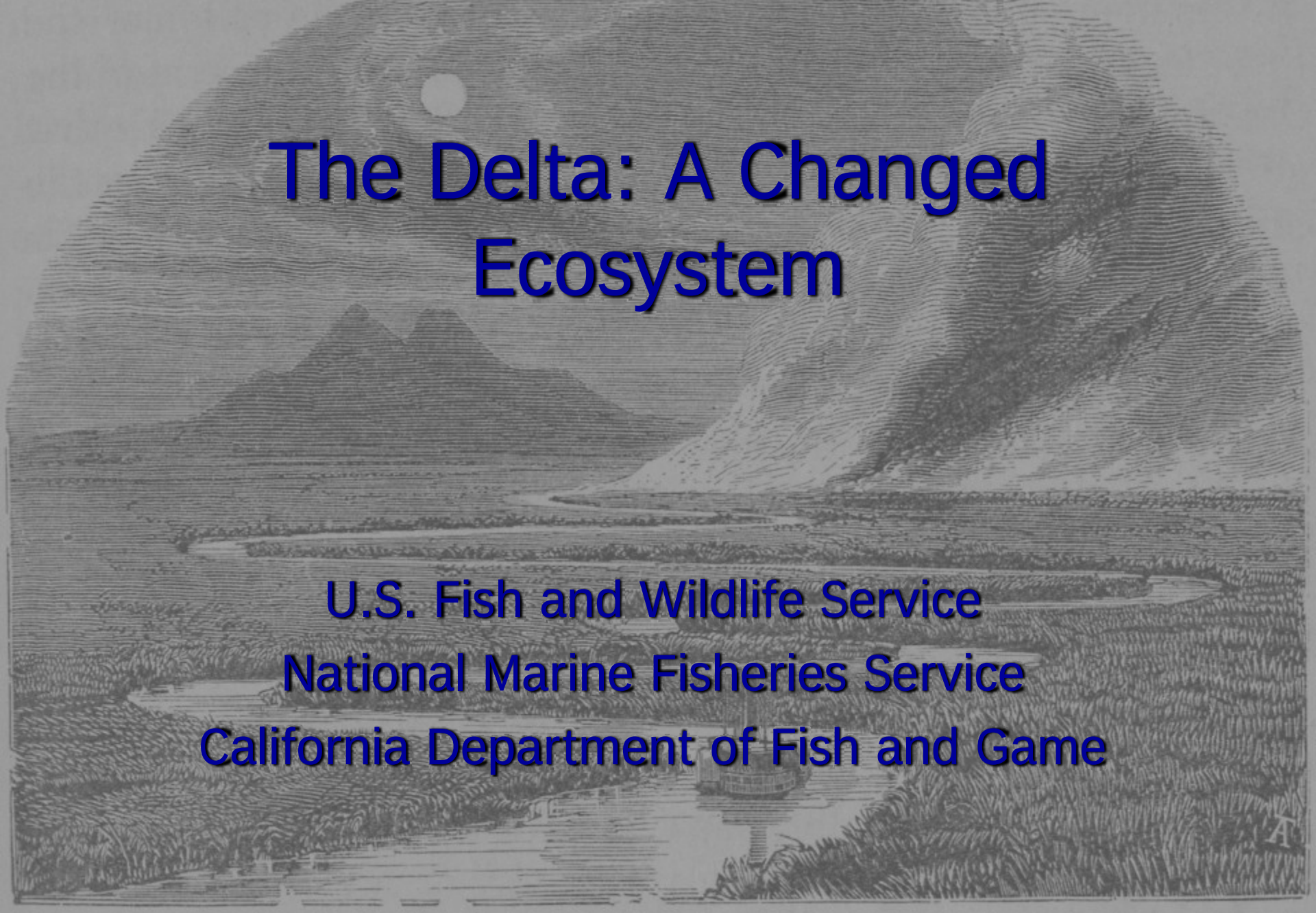
# The Delta: A Changed Ecosystem

U.S. Fish and Wildlife Service
National Marine Fisheries Service
California Department of Fish and Game



NIGHT SCENE ON THE SAN JOAQUIN RIVER—MONTE DIABLO IN THE DISTANCE
*- Hutchings 1862*

# Ecosystem conditions

- Rich ecosystem
- Changed ecosystem
- System in peril
- Resilient system

# Some native species of concern in the Delta

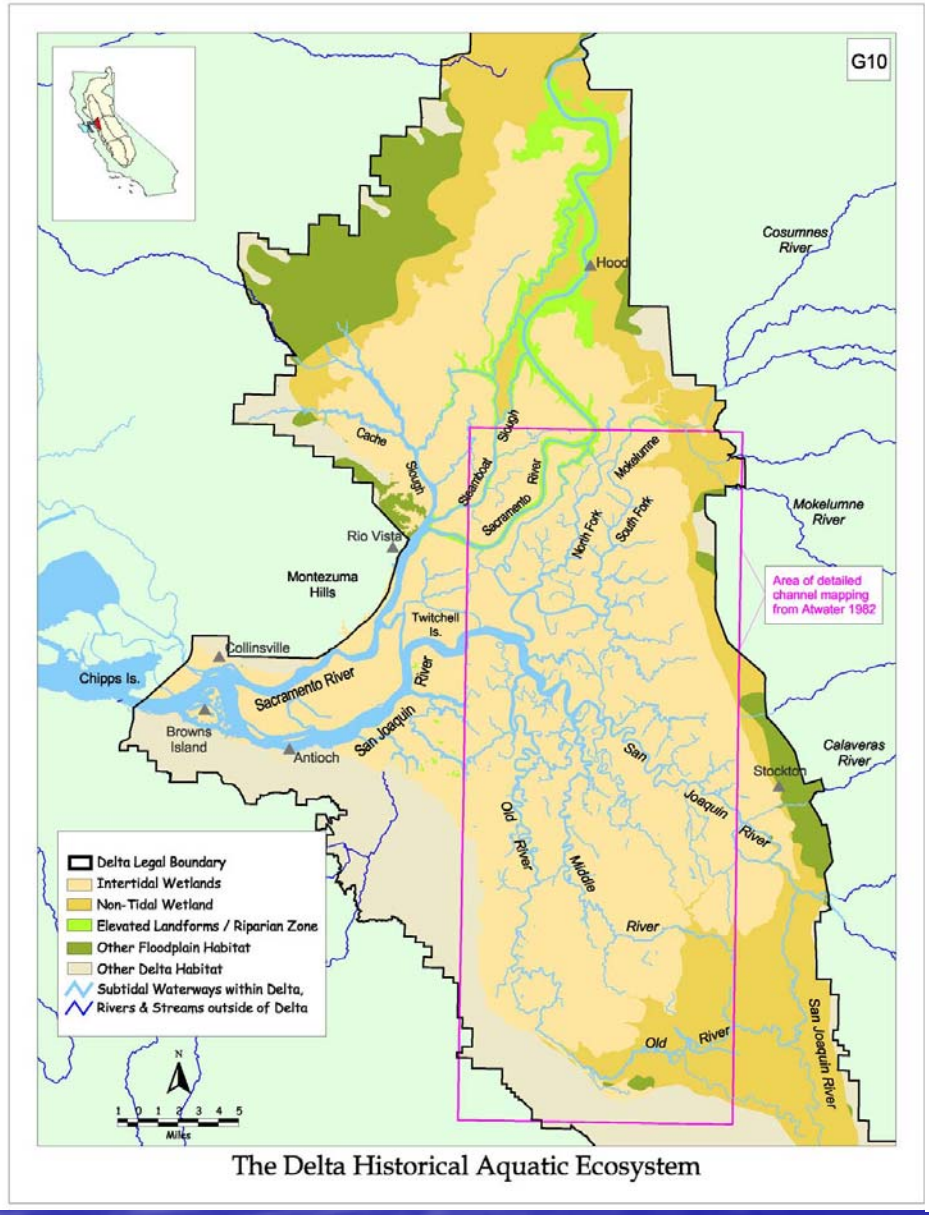
- Delta smelt
- Longfin smelt
- Splittail
- Winter-run Chinook
- Spring-run Chinook
- Fall-run Chinook
- Steelhead
- White sturgeon
- Green sturgeon
- Giant garter snake

- Swainson's hawk
- Sandhill cranes
- Neotropical migrant birds
- Clapper rail

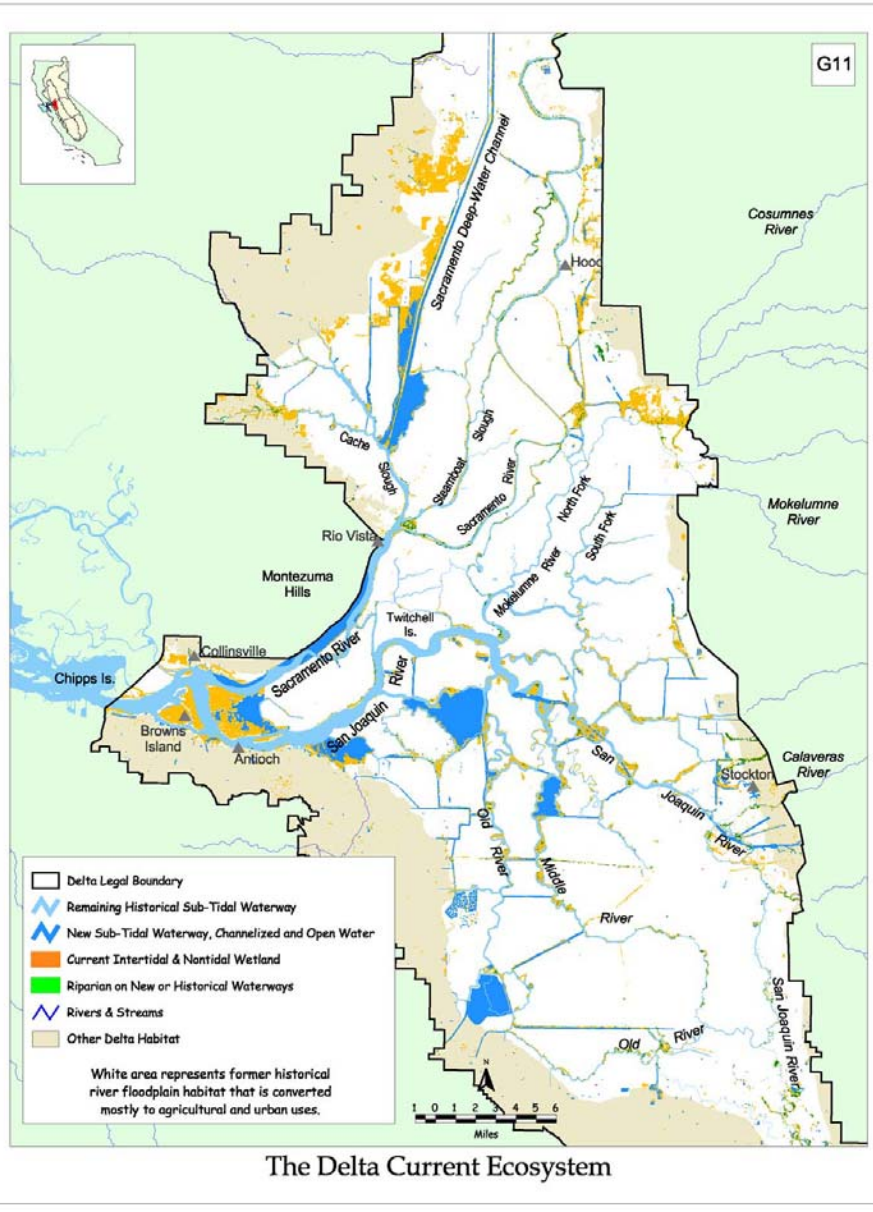
Historical Connected Waterways of the Central Valley

The Transformed Watershed

Source: The Bay Institute (1998)




The Delta Historical Aquatic Ecosystem




The Delta Current Ecosystem

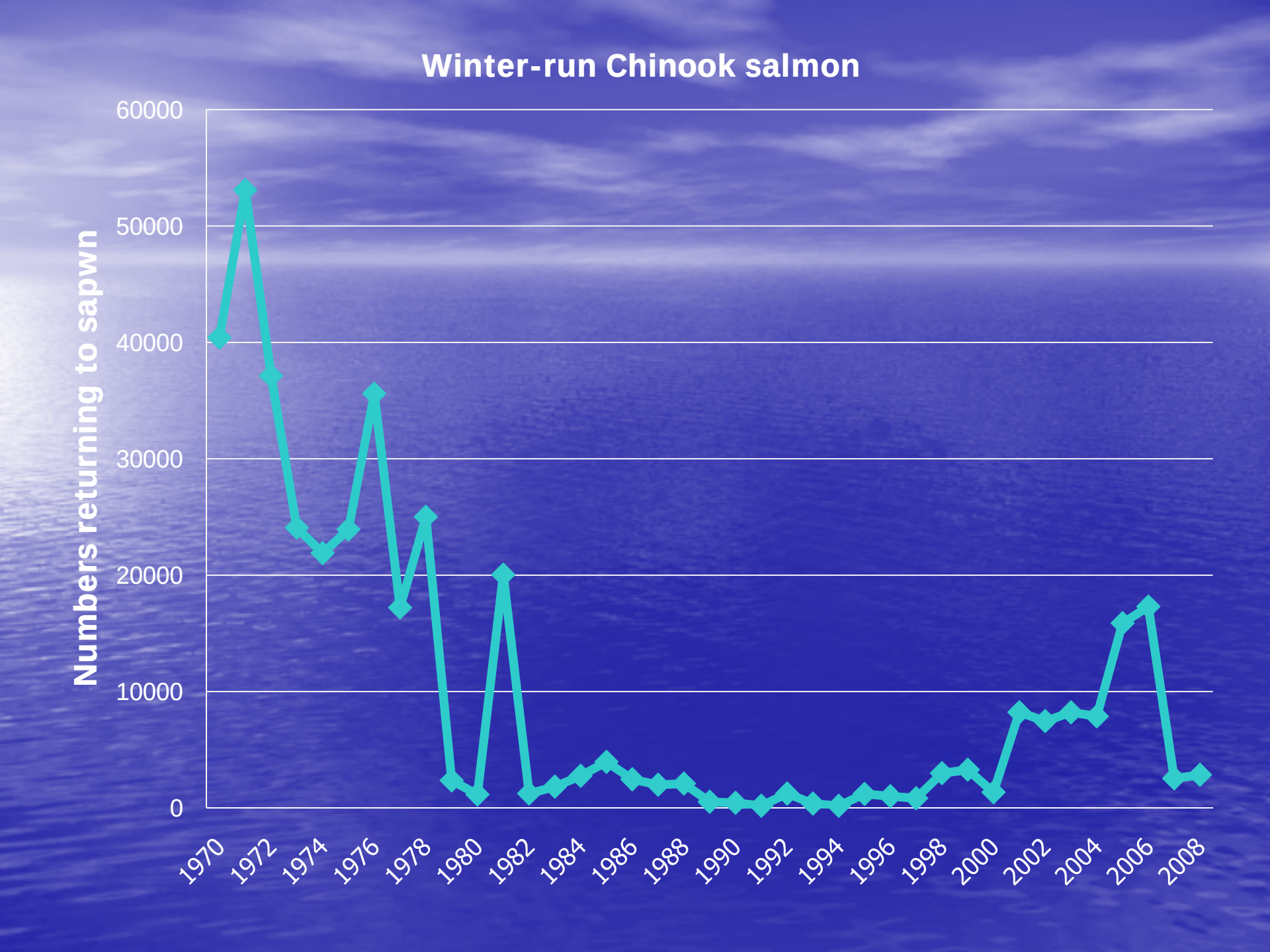
Source: The Bay Institute (1998)

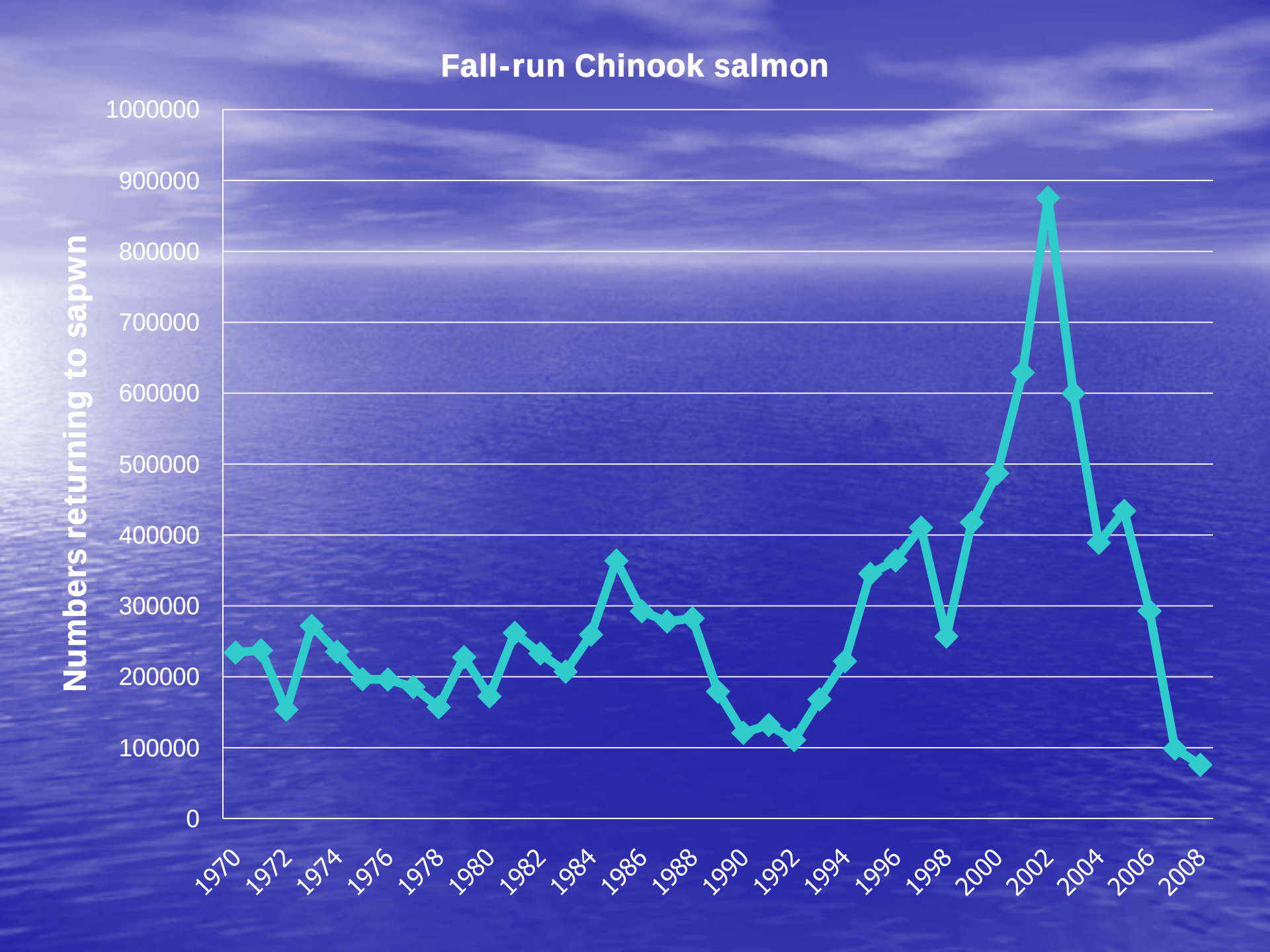
## Historical Delta

- Vast tidal wetlands
- Dendritic channels
- Seasonal flooding
- Fluctuating salinity
- Connected to floodplains and upper watersheds

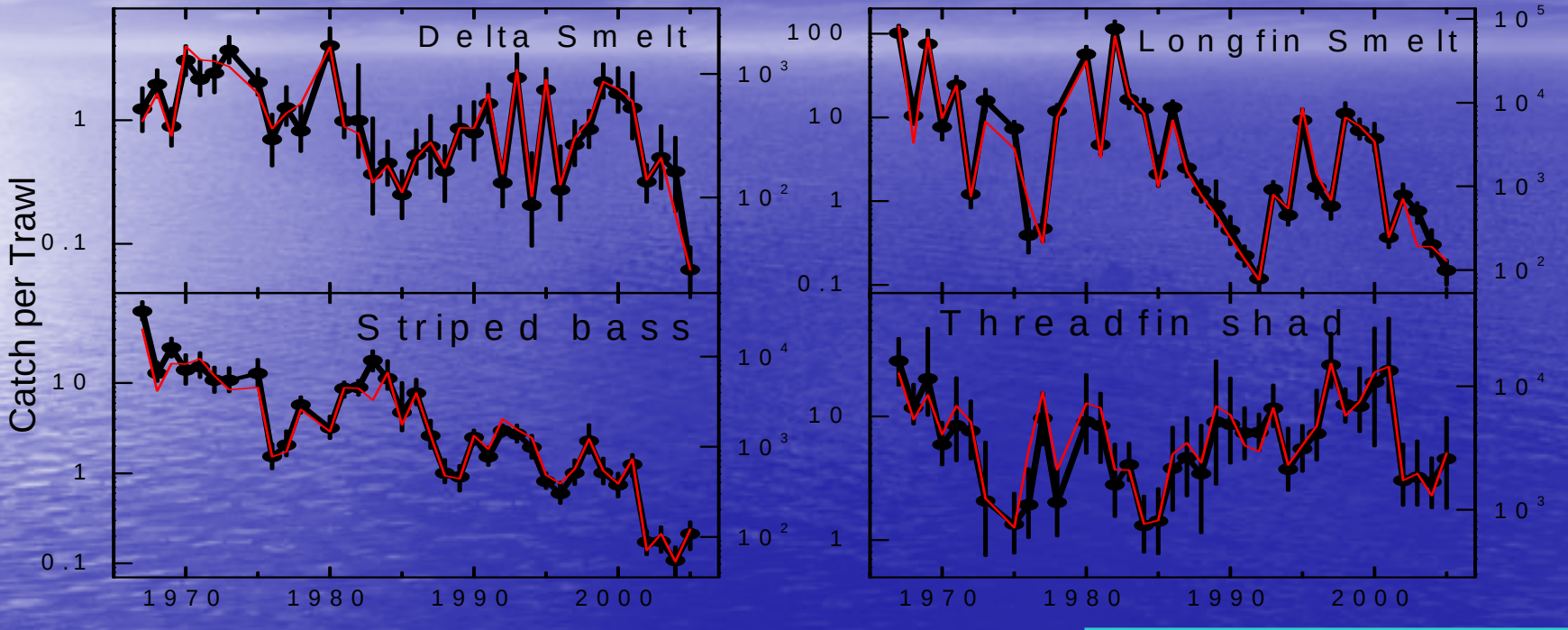
## Present Delta

- Levied islands
- Simplified channels
- Managed inflows
- Consistently freshwater
- Contained within levies and interrupted by dams


Winter-run Chinook salmon
Numbers returning to sapwn
60000
50000
40000
30000
20000
10000
0
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008


Fall-run Chinook salmon
Numbers returning to sapwn
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008

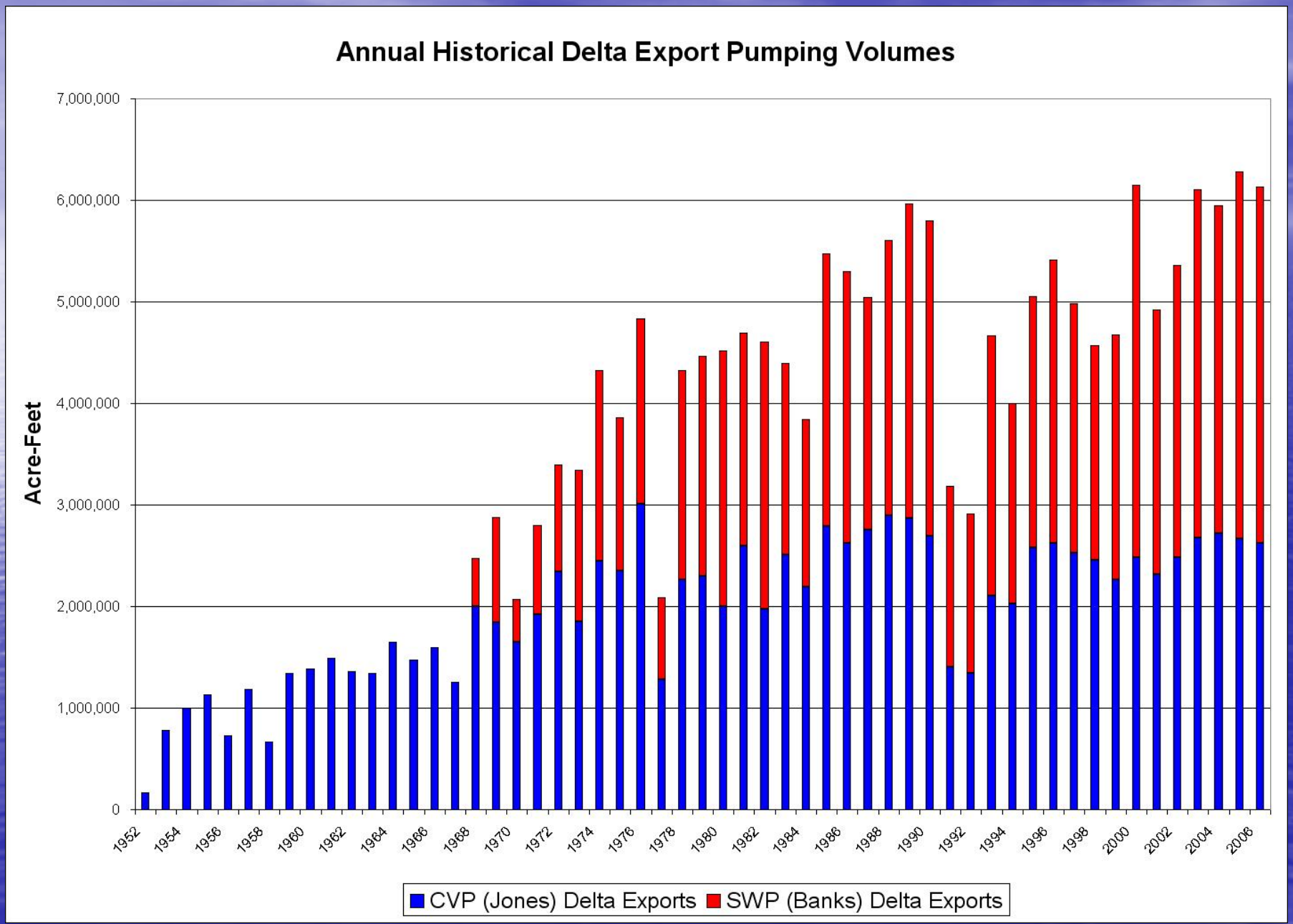
# Pelagic fishes decline in the Delta



Source: Kimmerer and Nobriga (2005); Sommer et al. (2007)

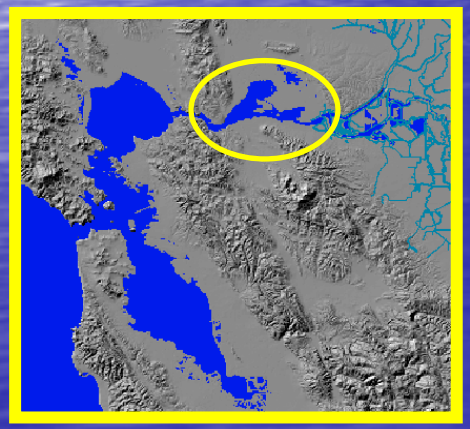
# Pelagic organism decline causes under investigation

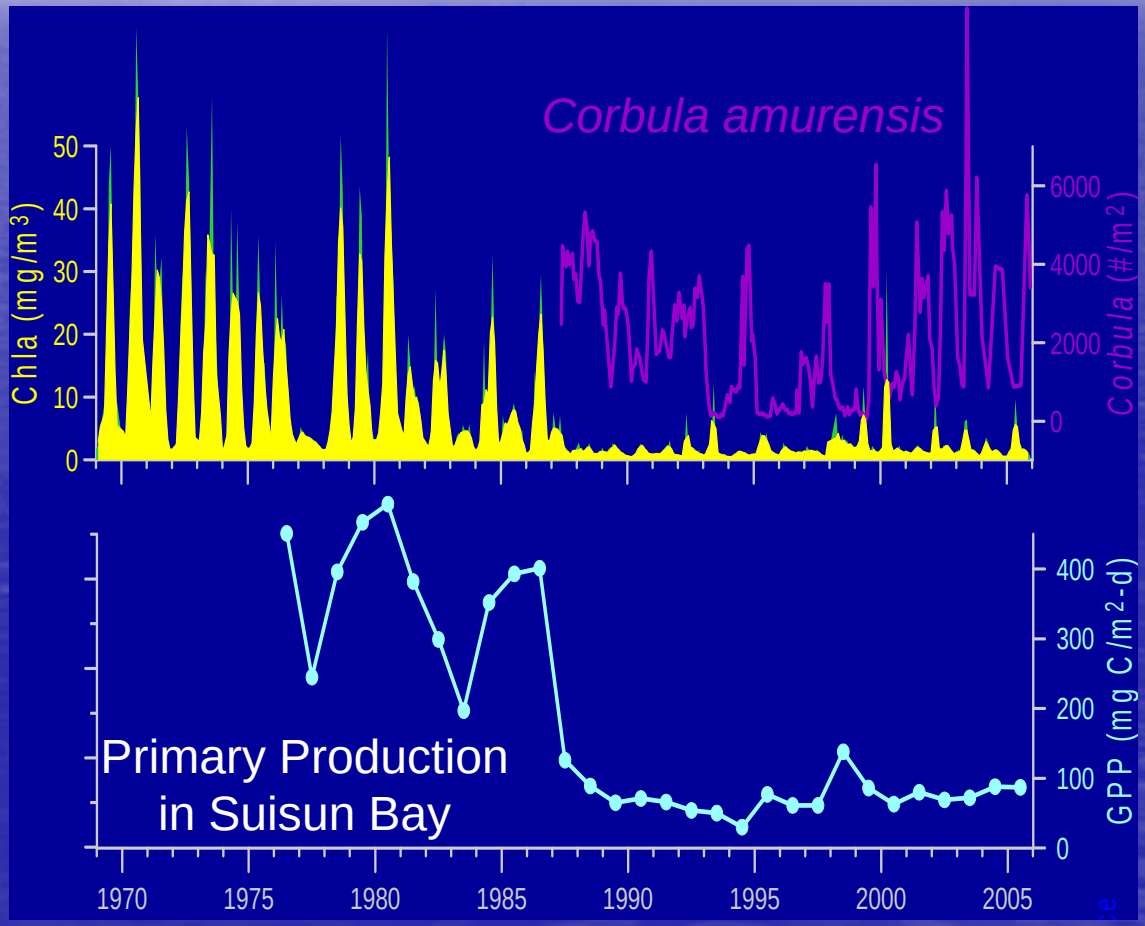
- Stock recruitment effects
- Decline in habitat quality
- Increased mortality rates
- Reduced food availability


Annual Historical Delta Export Pumping Volumes
Acre-Feet
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
CVP (Jones) Delta Exports
SWP (Banks) Delta Exports

# Phytoplankton Primary Production

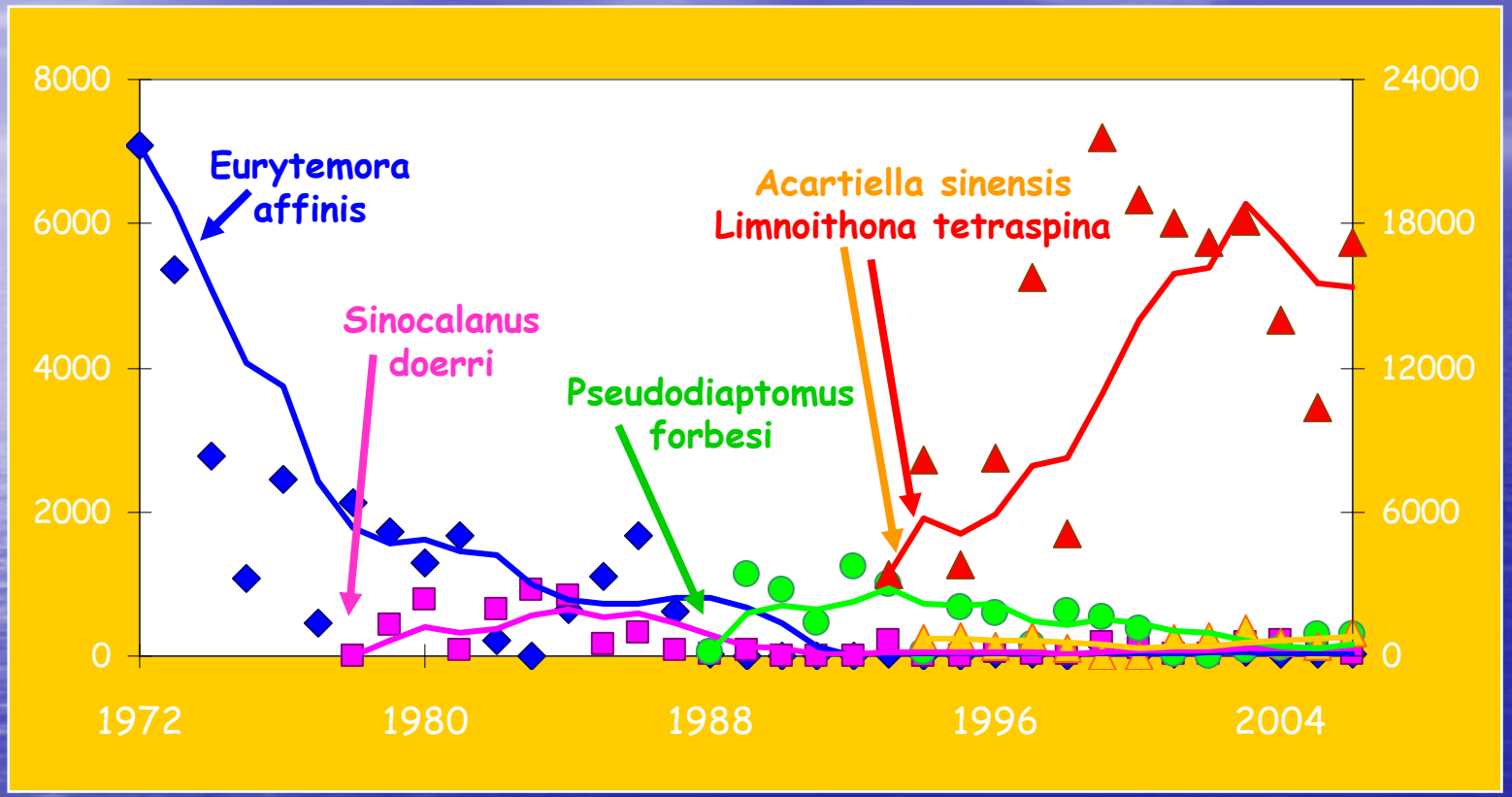
… CRASHED in Suisun Bay right after the 1987 *Corbula* invasion



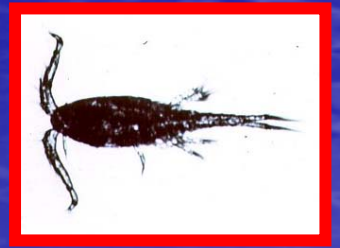



Source: J. Cloern (USGS), IEP data

# Zooplankton species trends




Adult copepods at Chipps Island, yearly averages with 5-year moving average lines



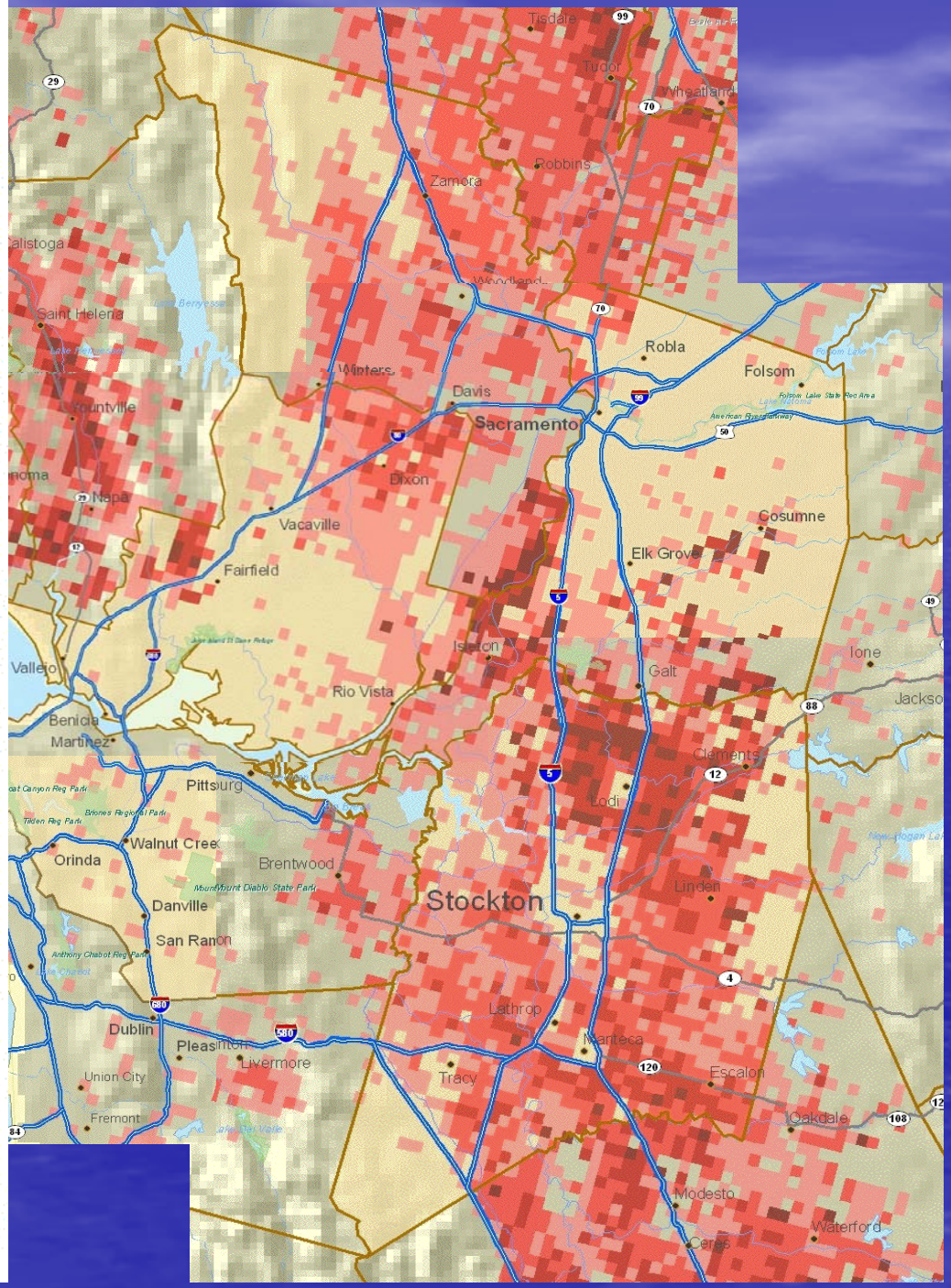
Pesticide Action Network
NORTH AMERICA

## 2002 Pesticide Use
### lbs / square mile

- 0 - 2,000
- 2,001 - 10,000
- 10,001 - 30,000
- 30,001 - 120,000 +

### Highways

- Freeway
- Major Hwy
- Hydrography




**Data Sources:**
**ESRI Data**
**CA DPR Pesticide Use Report 2002**
**Public Land Survey, DPR 1999**
**Produced with**
**ESRI Arcview 9.0**

**www.MapItOut.com**

MapItOut

0 2.5 5 10 Miles

# Changes

- Flows (altered magnitude and frequency)
- Reduced productivity
- Phosphorus (lower concentrations)
- Ammonia (higher concentrations)
- Water temperature (warmer)
- Contaminants (higher concentrations, more possible synergies)
- Mortality (multiple sources)
- Turbidity (lower concentrations)
- Non-native invasive species
- Ocean conditions

# Sustainable Delta ecosystem

- Reduce threats
- Restore habitats
- Balance uses
- Increase understanding