



### Water Quality of San Francisco Bay

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Since 1968, the USGS has sustained a research program to understand how coastal ecosystems function and how those functions are altered by human disturbances.

One component of this program is directed towards following and understanding changes in the

# WATER QUALITY OF SAN FRANCISCO BAY

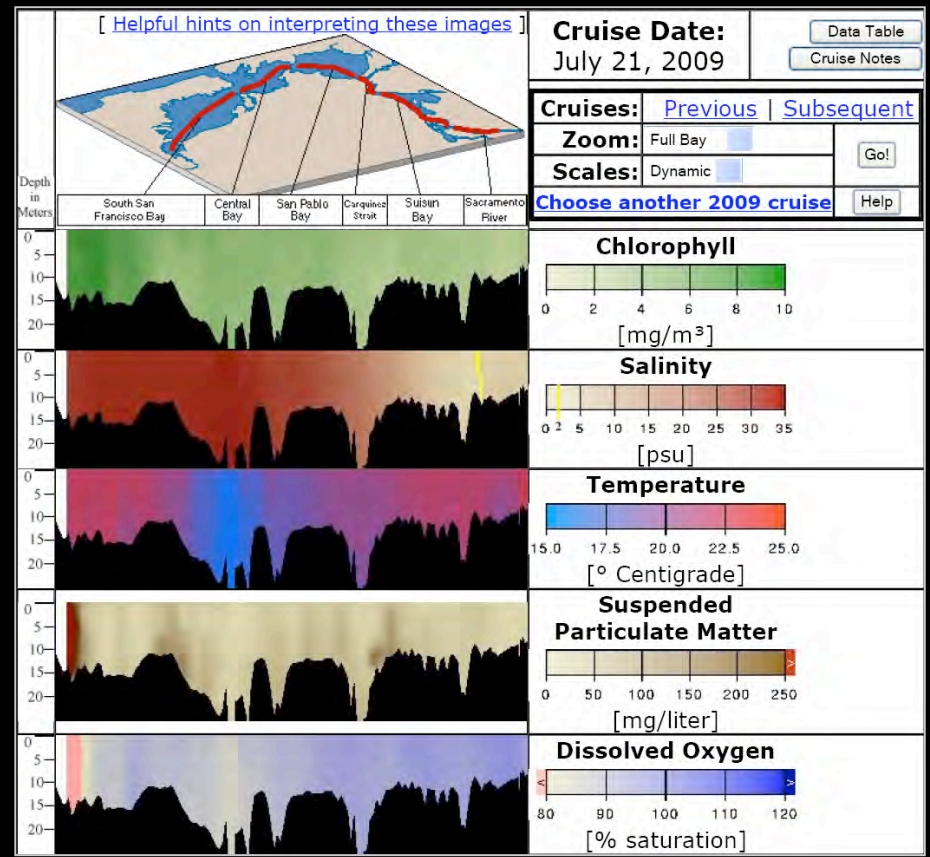
- Project Overview
- Long-term Data Visualization
- Query Data 1969-present
- X-Y Scatter Plots

Latest Cruise Data  
August 13, 2009



Tara Schraga  
Sarah Foster  
Cate Phillips

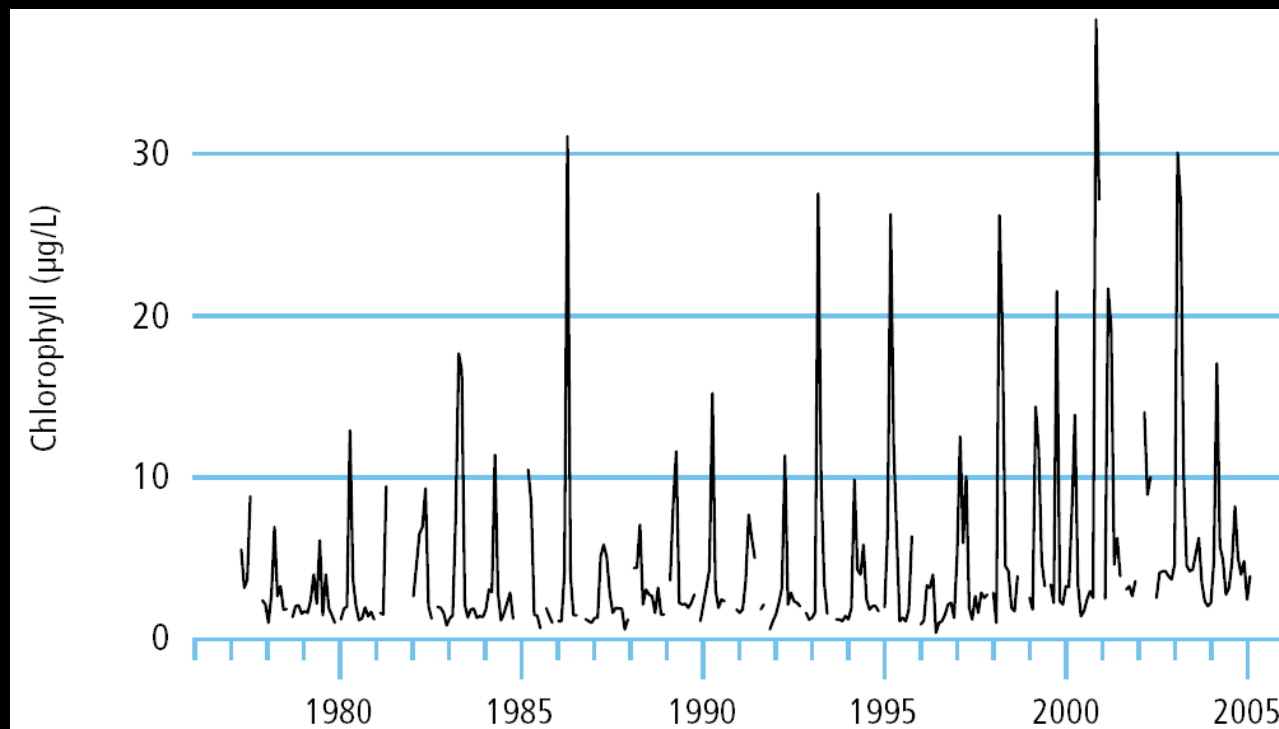
<http://sfbay.wr.usgs.gov/access/wqdata/index.html>



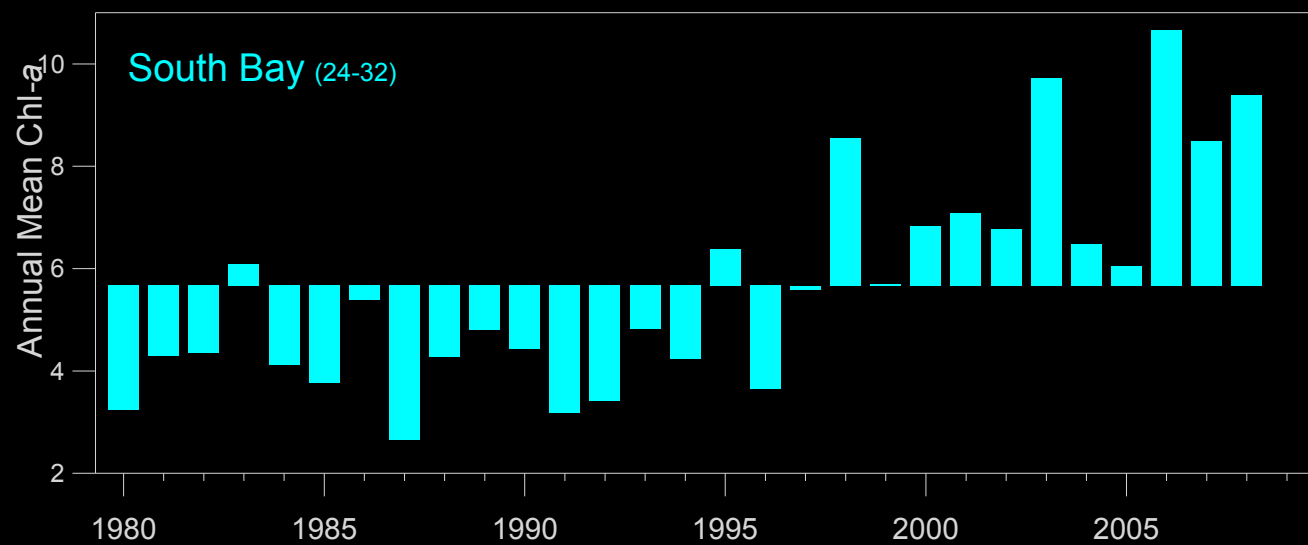
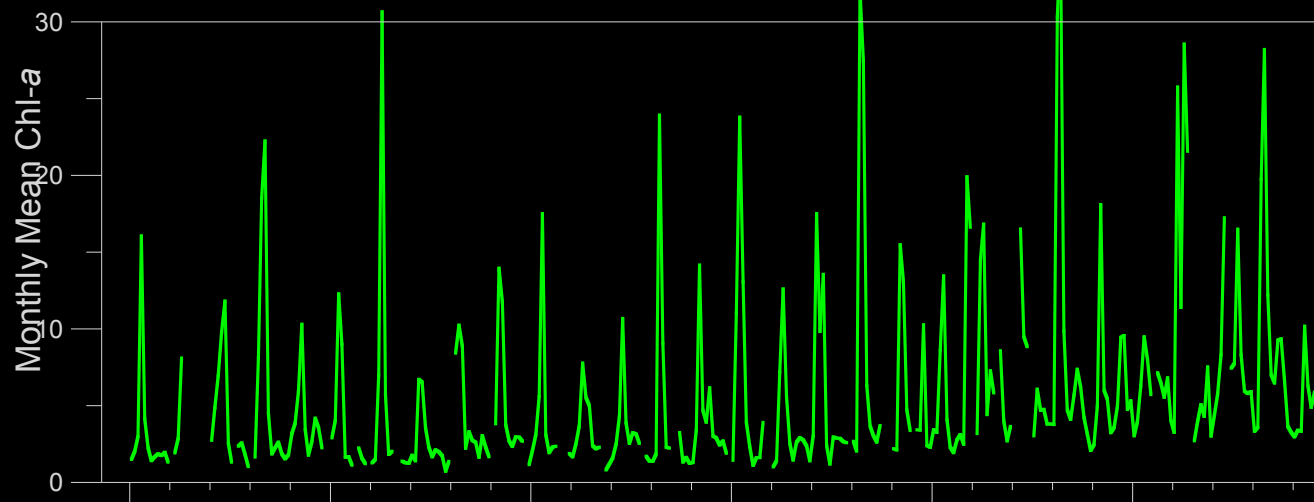
# What is Causing the Phytoplankton Increase in San Francisco Bay? *2006 Pulse of the Estuary*

James E. Cloern<sup>1</sup> (jcloern@usgs.gov), Alan D. Jassby<sup>2</sup>, Tara S. Schraga<sup>1</sup> and Kate L. Dallas<sup>1</sup>

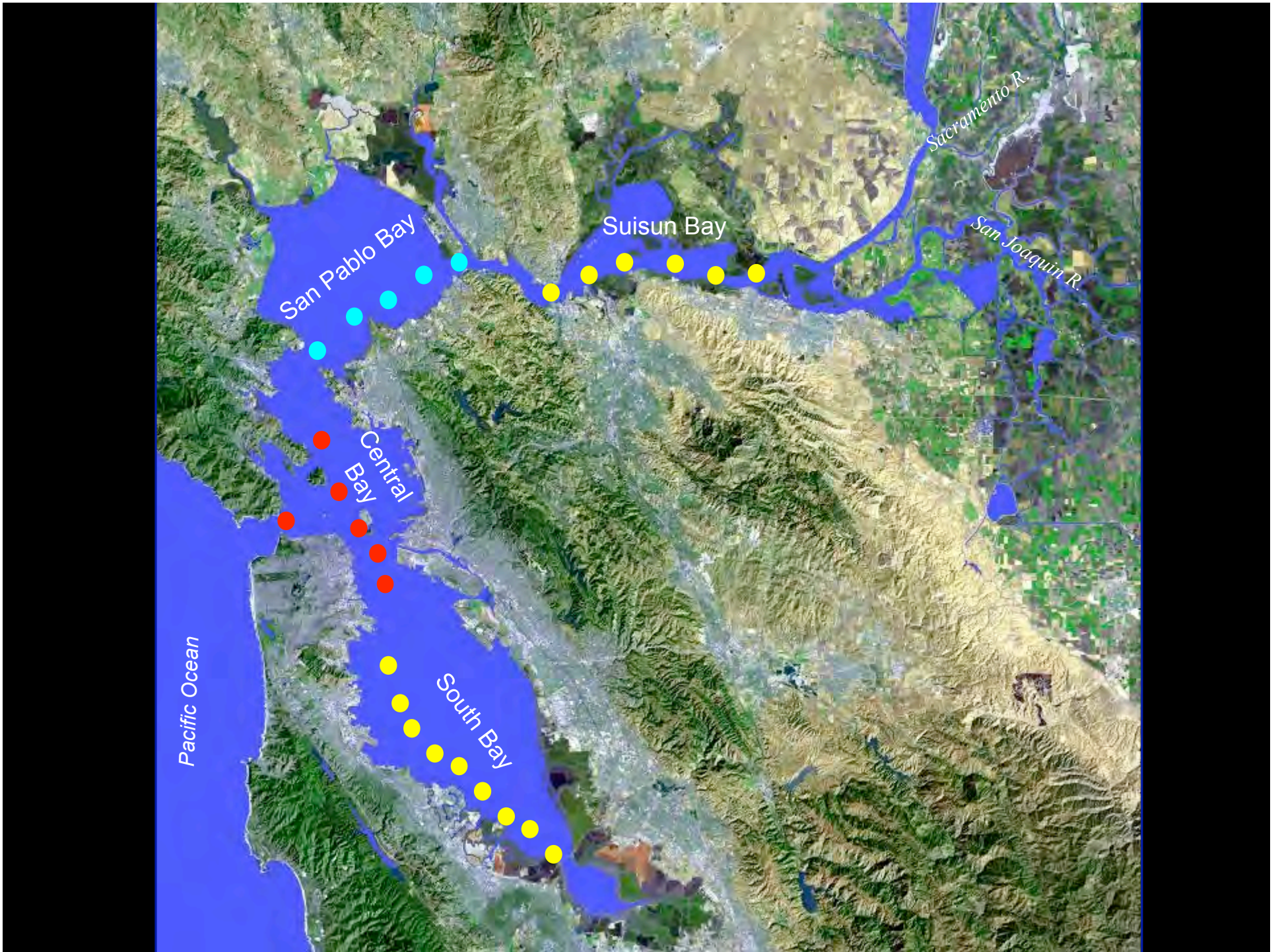
<sup>1</sup> U. S. Geological Survey, Menlo Park, CA. <sup>2</sup> Department of Environmental Science and Policy, University of California, Davis, CA



Update ....







San Pablo Bay

Suisun Bay

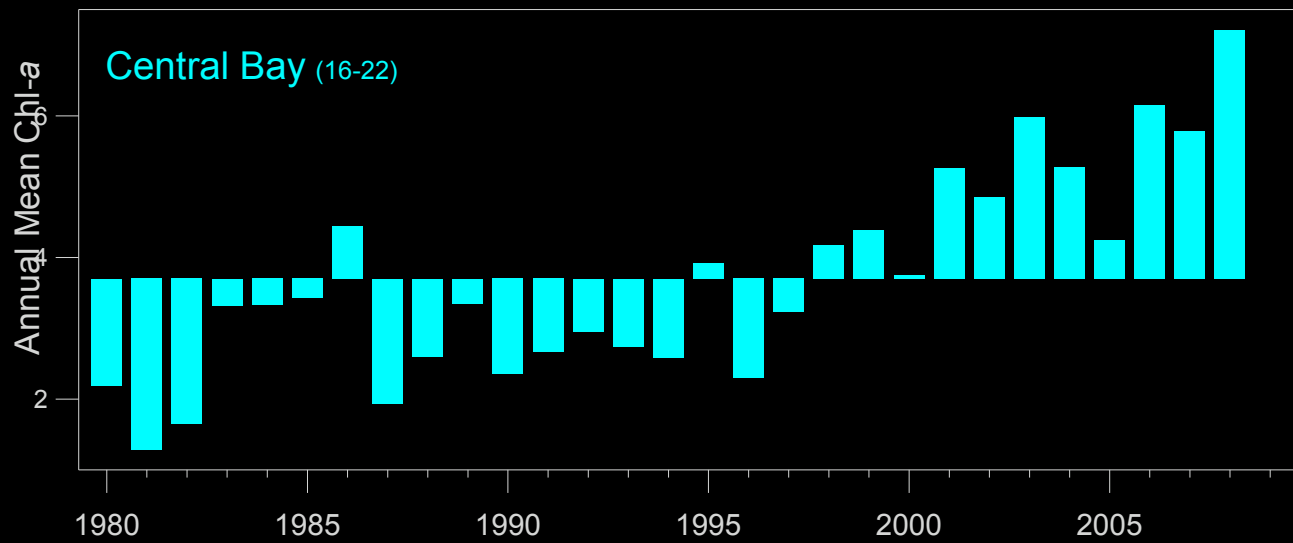
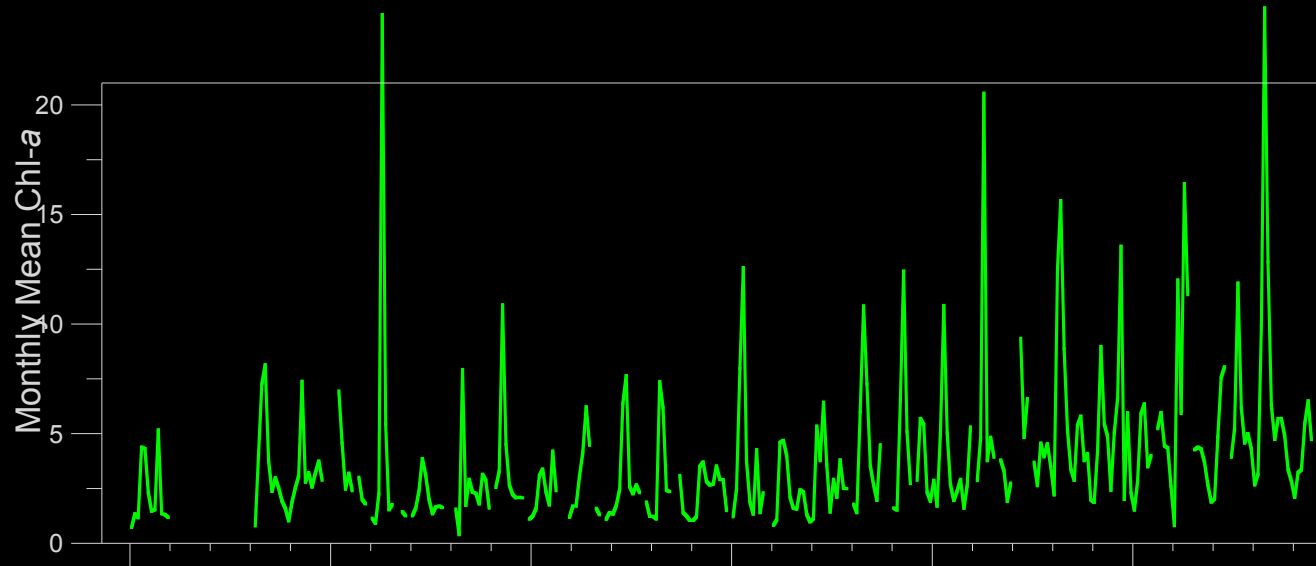
Central Bay

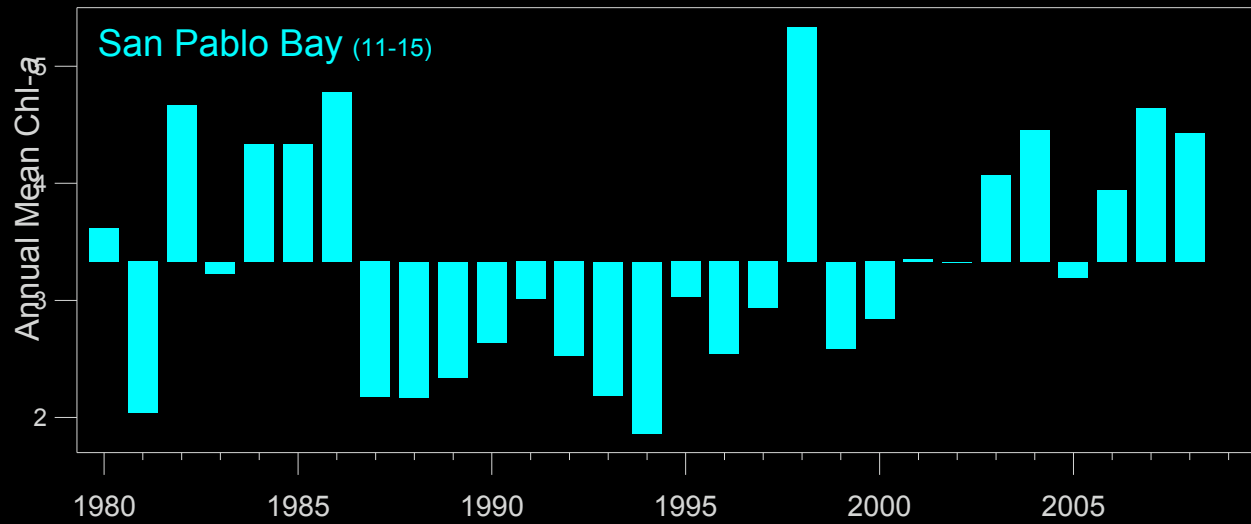
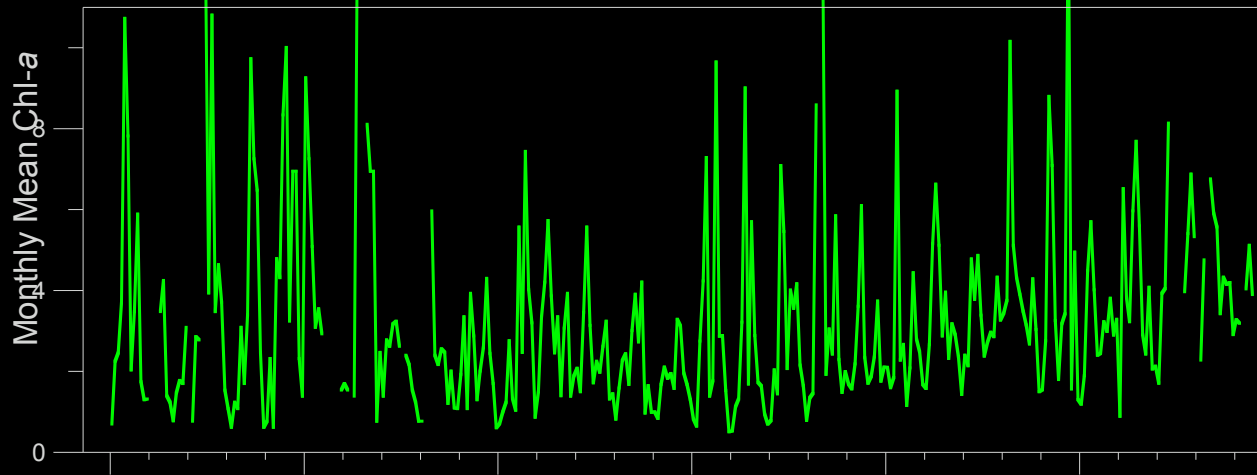
South Bay

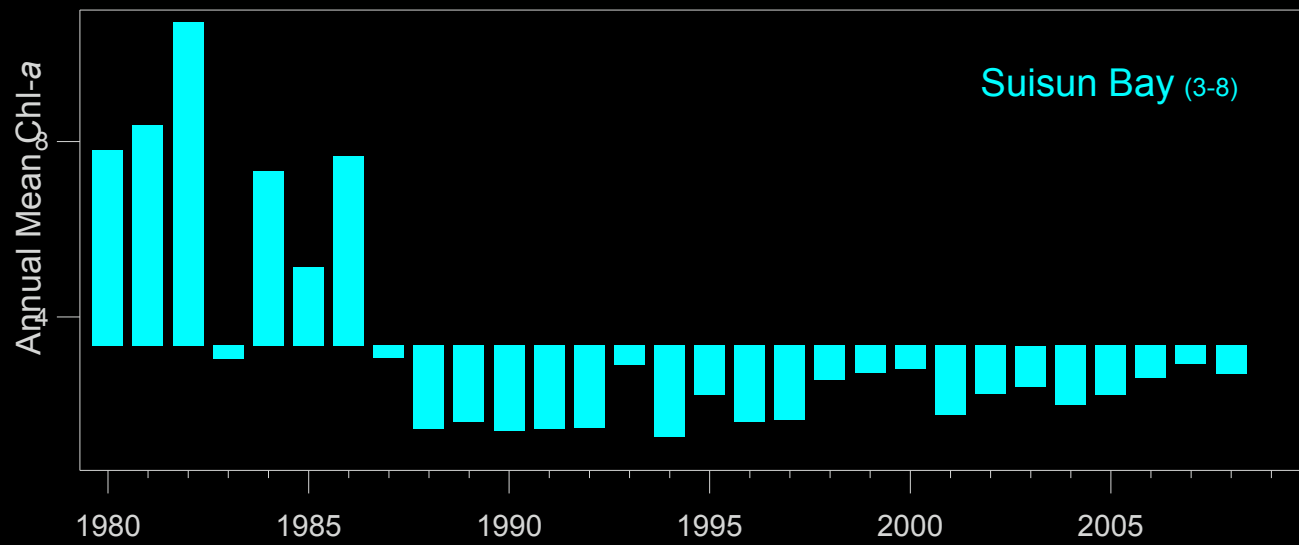
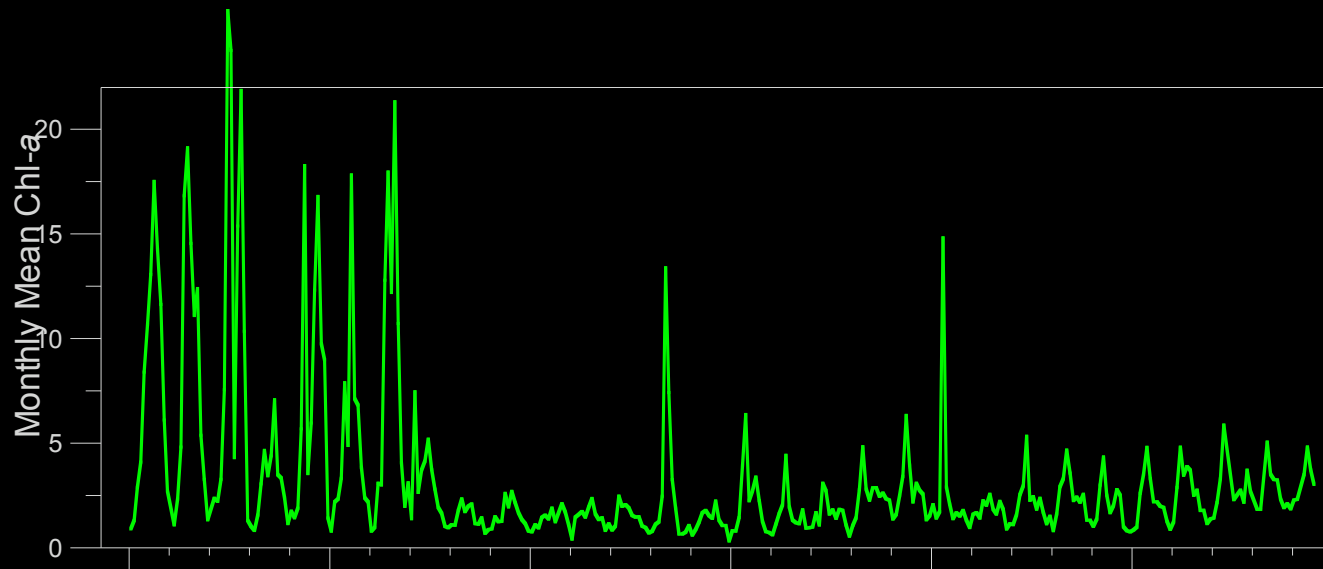
Sacramento R.

San Joaquin R.

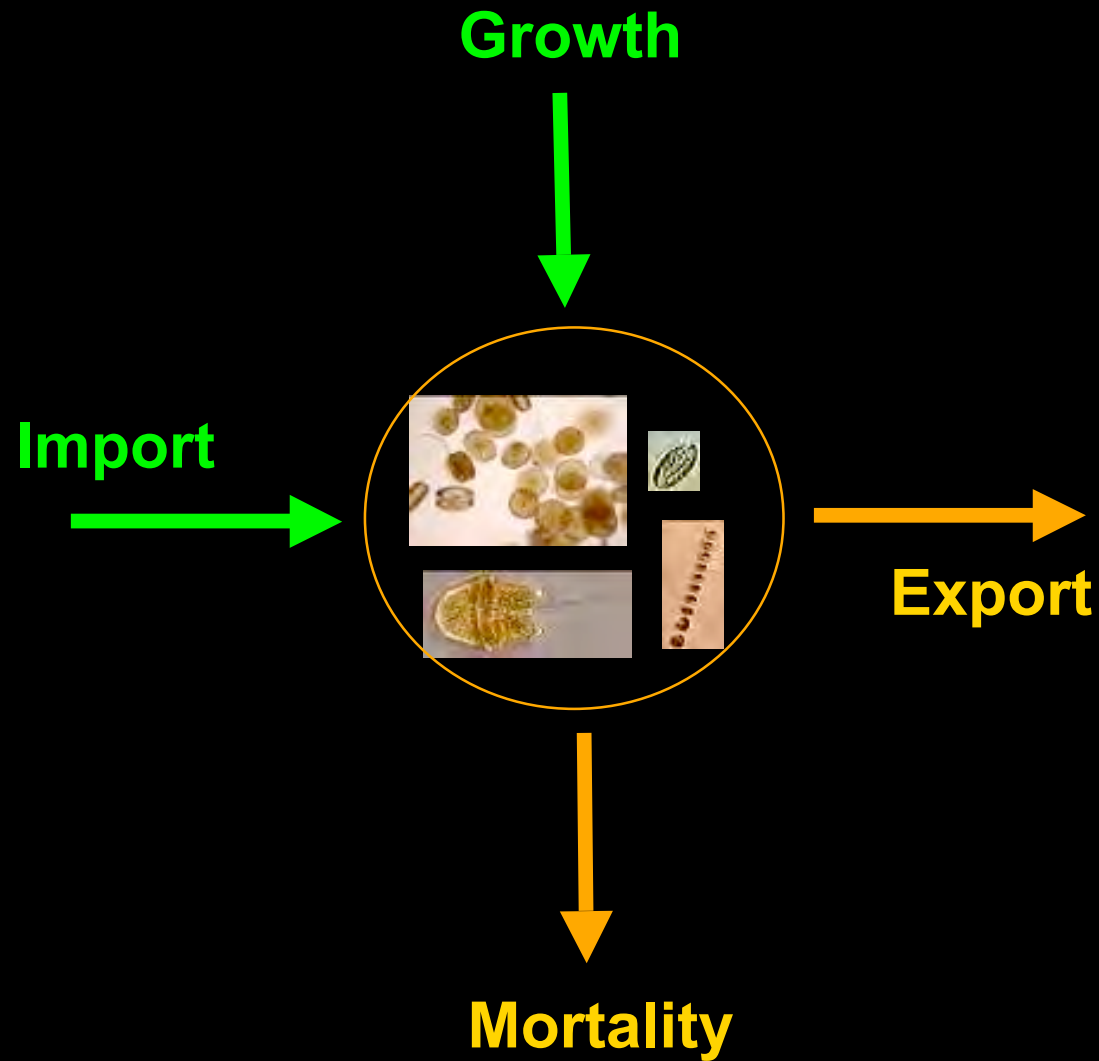
Pacific Ocean





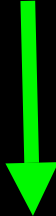


# Why is Chl-a increasing?





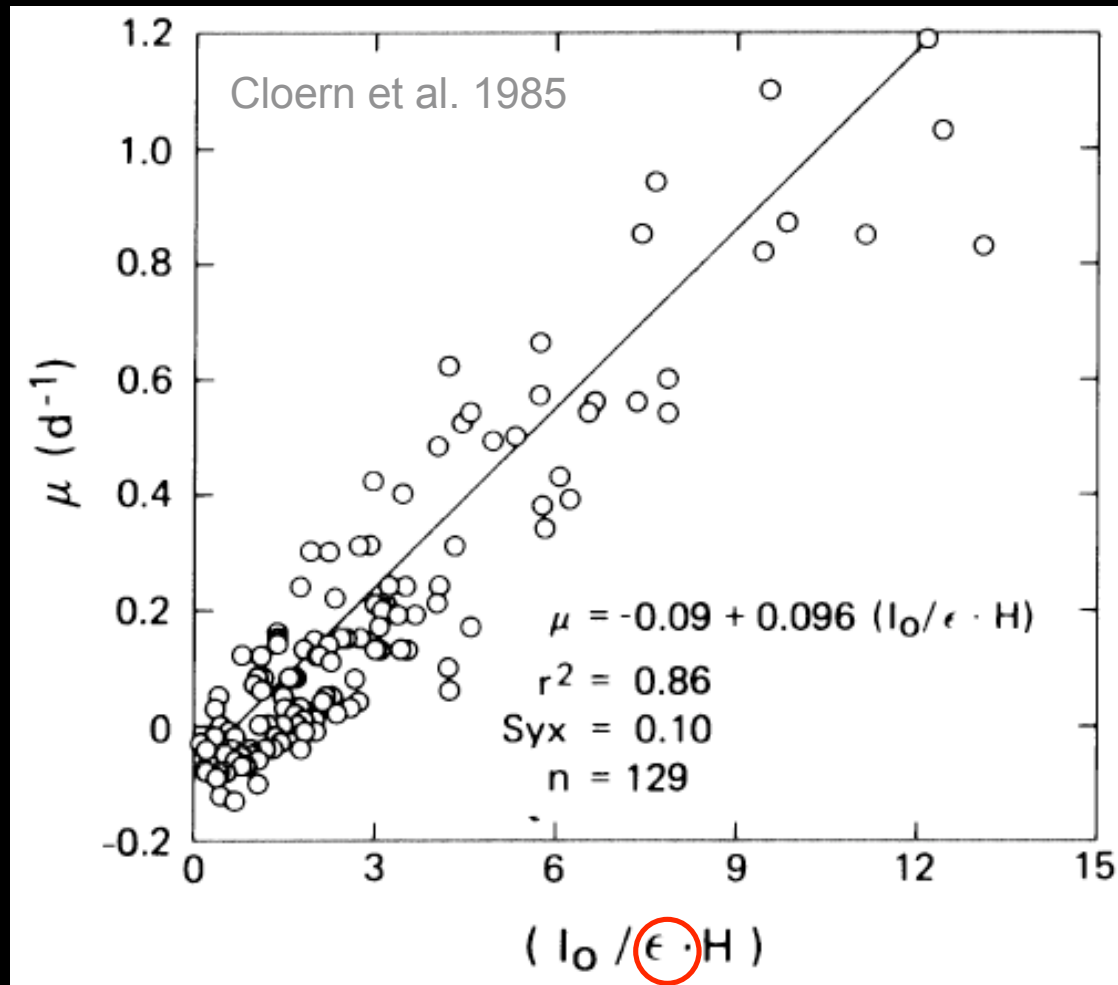
# Growth



# Clearing of the Bay

Suspended Sediment in the Bay:  
Past a Tipping Point

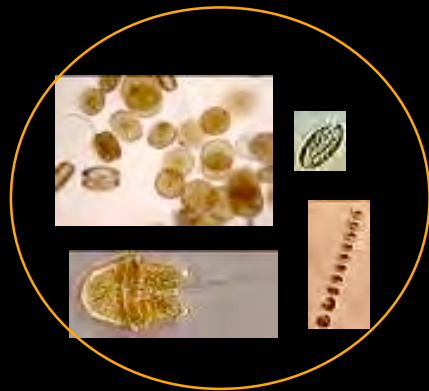
DAVID H. SCHOELLHAMER  
U.S. Geological Survey  
dschoell@usgs.gov



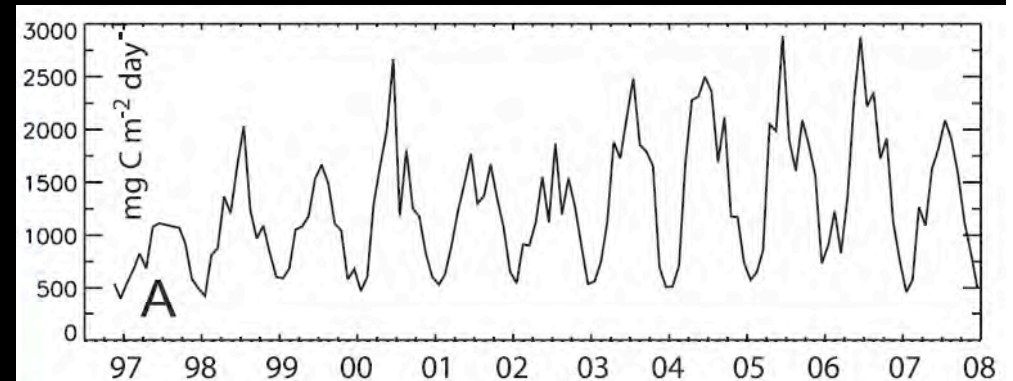
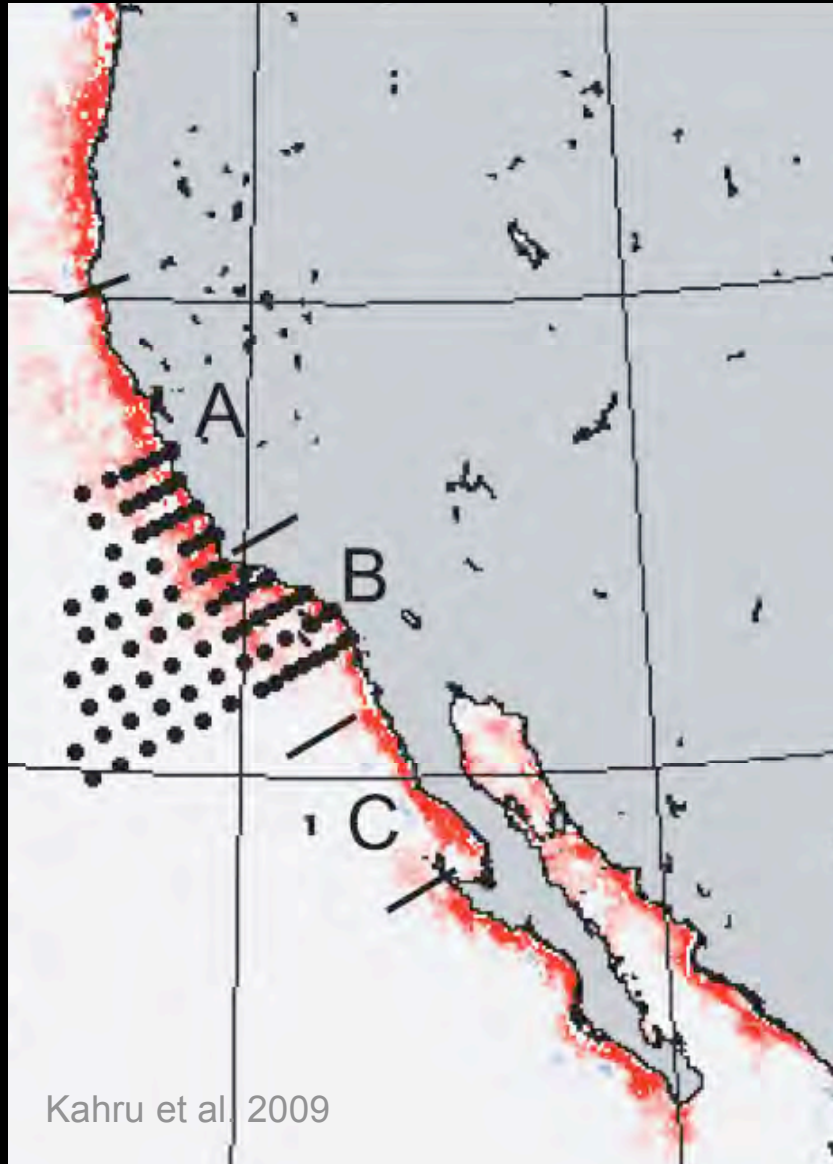
Growth Rate Increases 

Turbidity Decreases 

**Import**

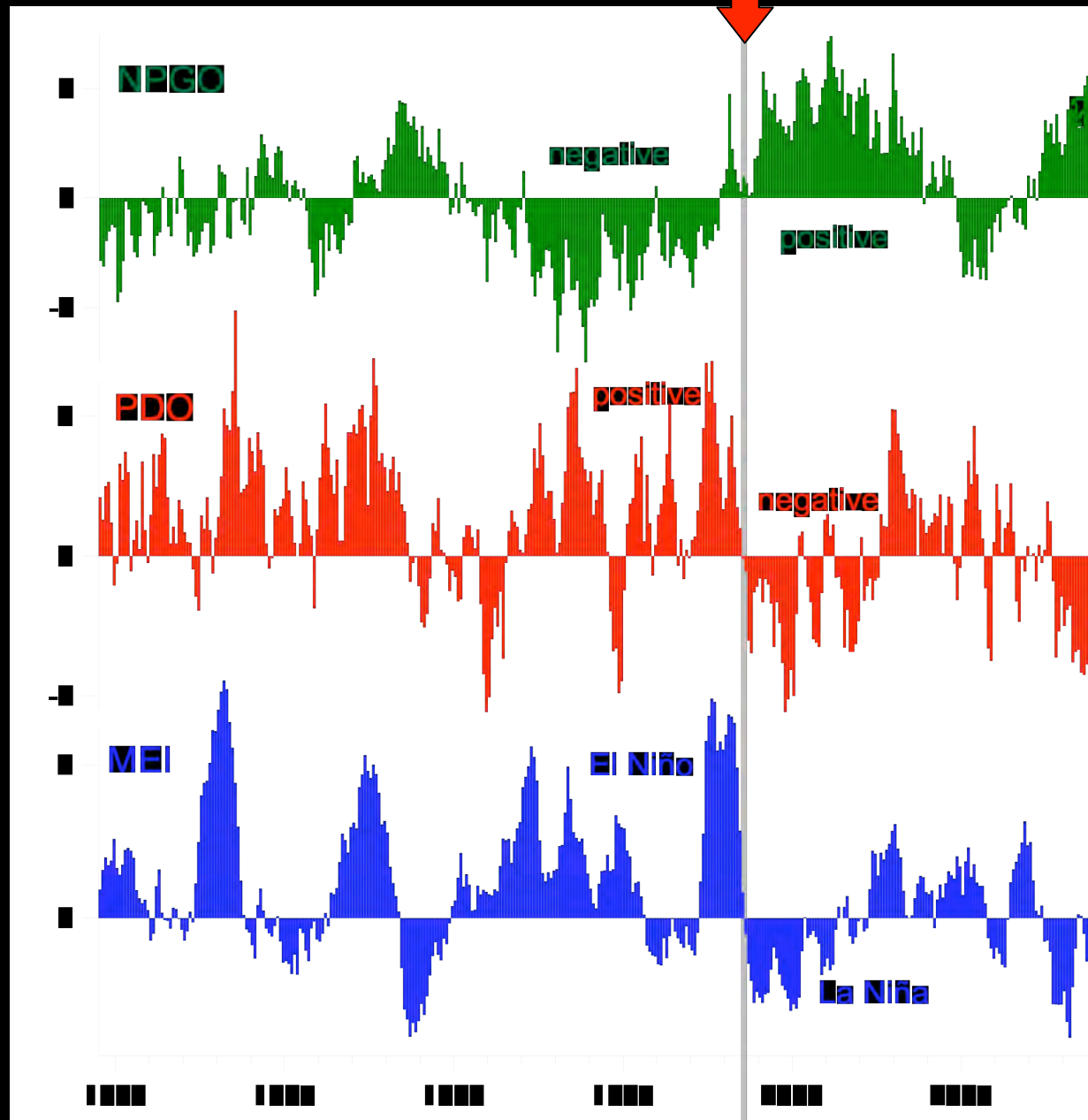


# Increasing Chl-a in Coastal Pacific



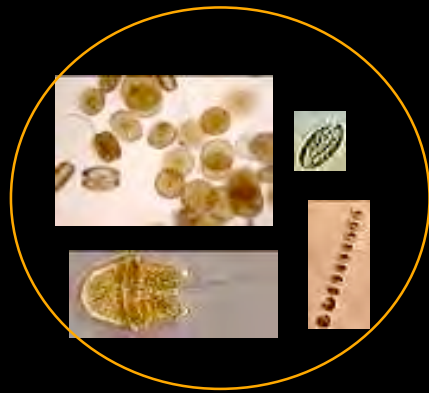
Kahru et al. 2009

# Climate Shift 1998-99

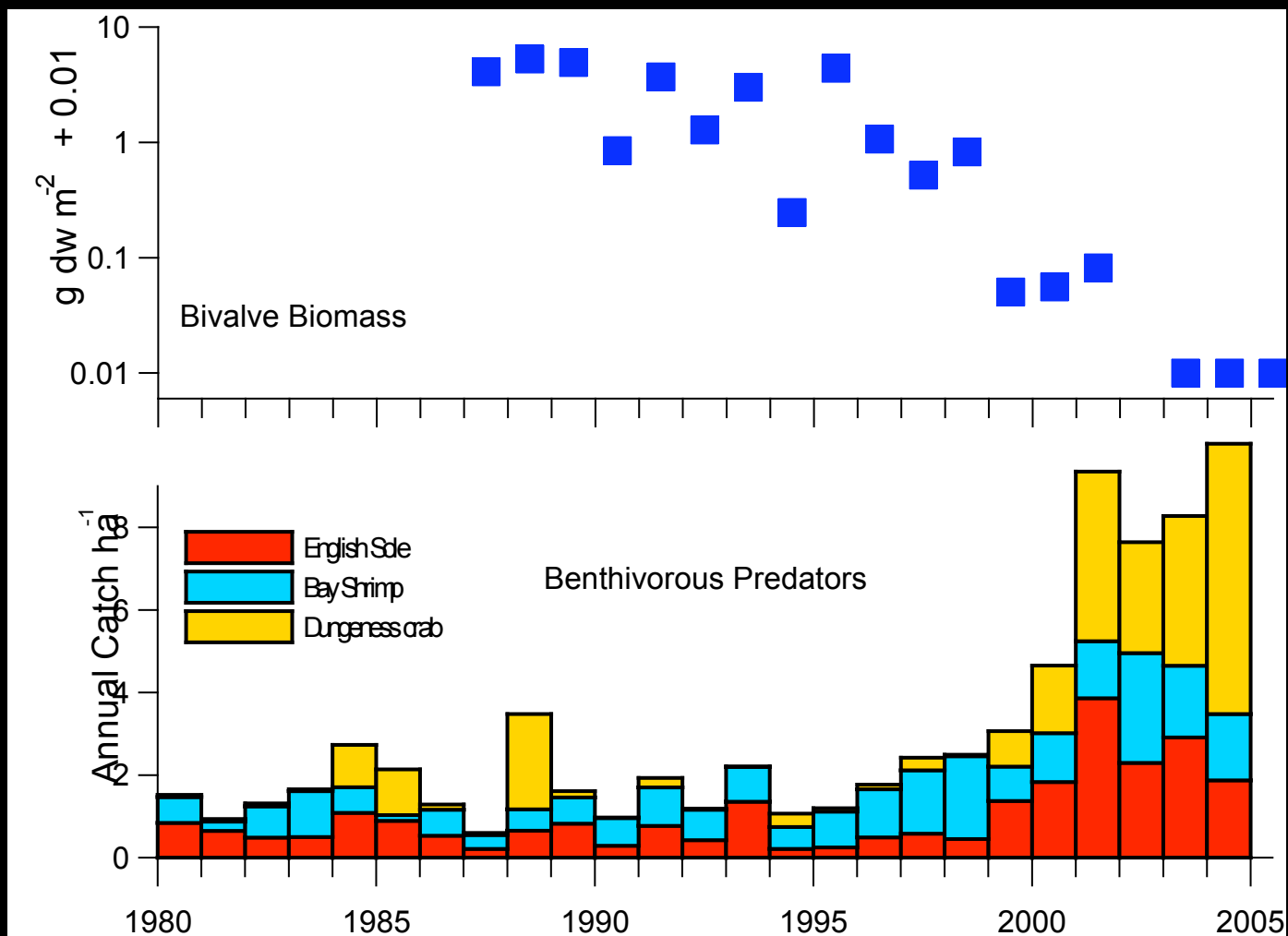




# Disappearance of Clams



**Mortality**

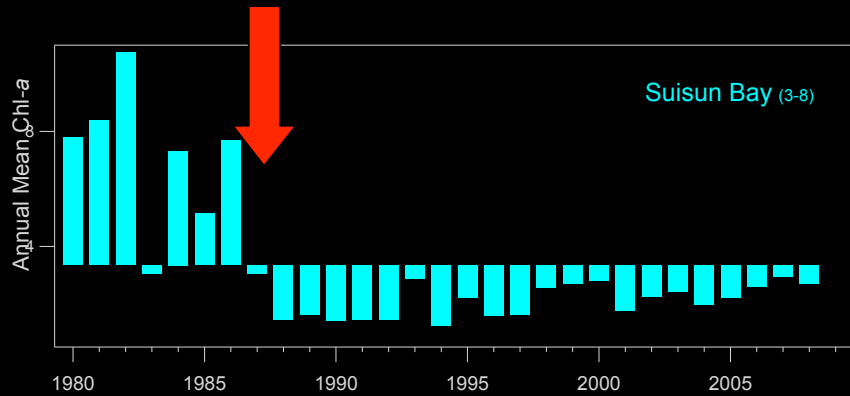


## A cold phase of the East Pacific triggers new phytoplankton blooms in San Francisco Bay

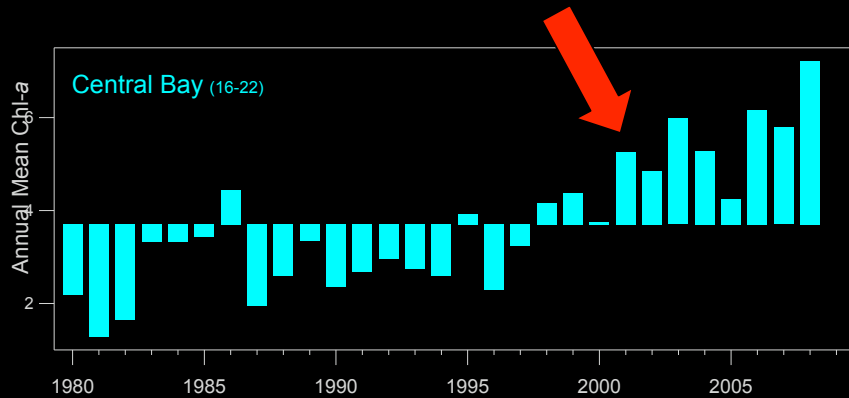
James E. Cloern<sup>\*†</sup>, Alan D. Jassby<sup>‡</sup>, Janet K. Thompson<sup>\*</sup>, and Kathryn A. Hieb<sup>§</sup>

# Complex Patterns of Variability

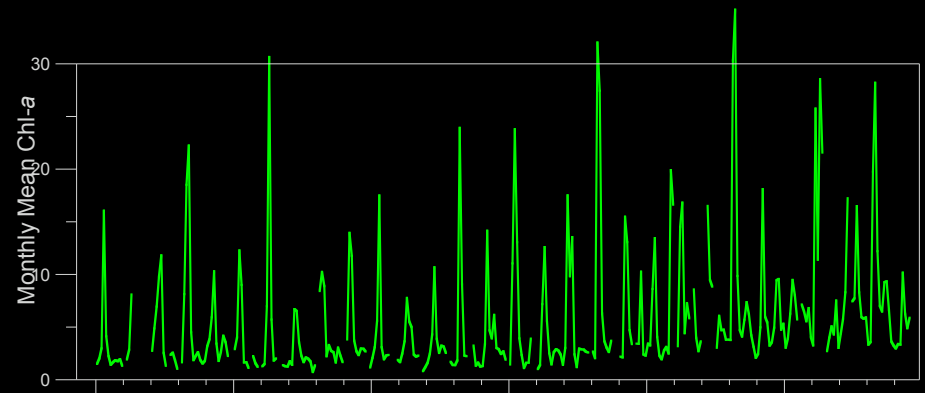
Abrupt shifts



Trends



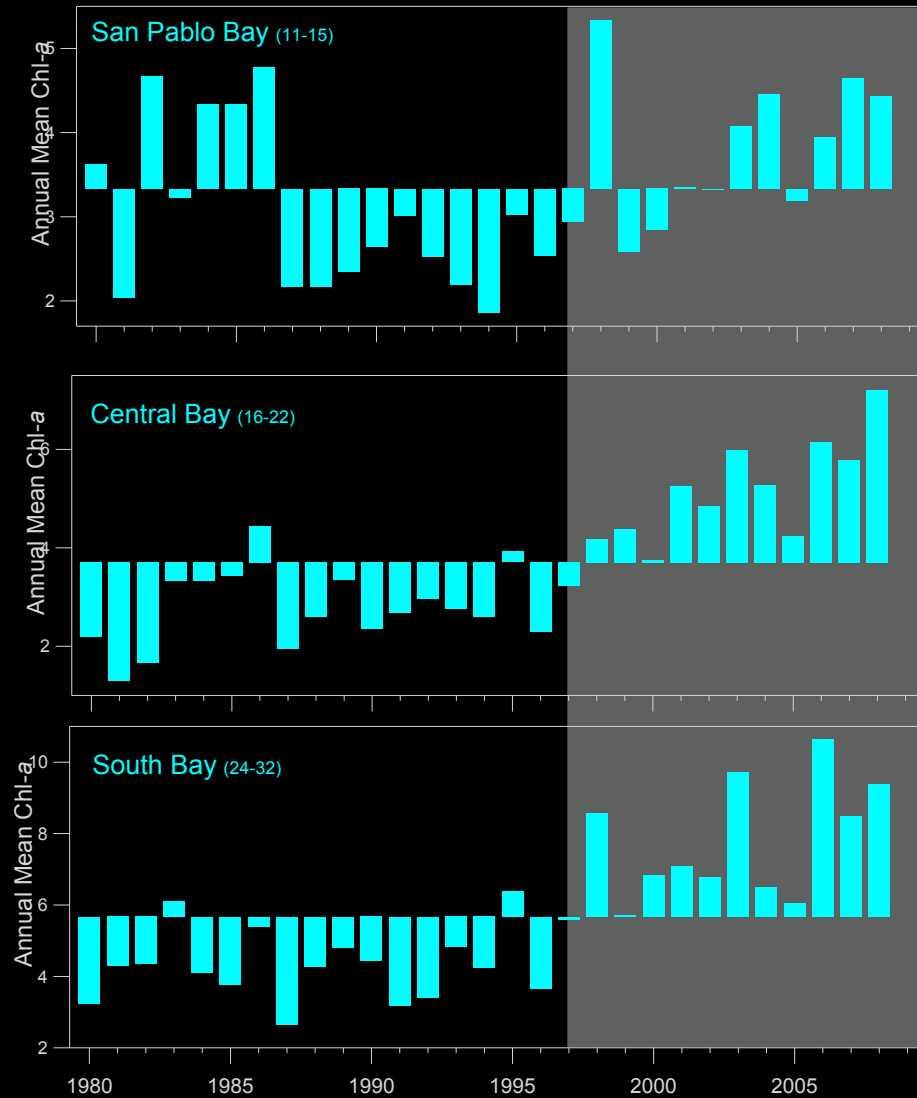
Large seasonal oscillations



# Will the trends continue?

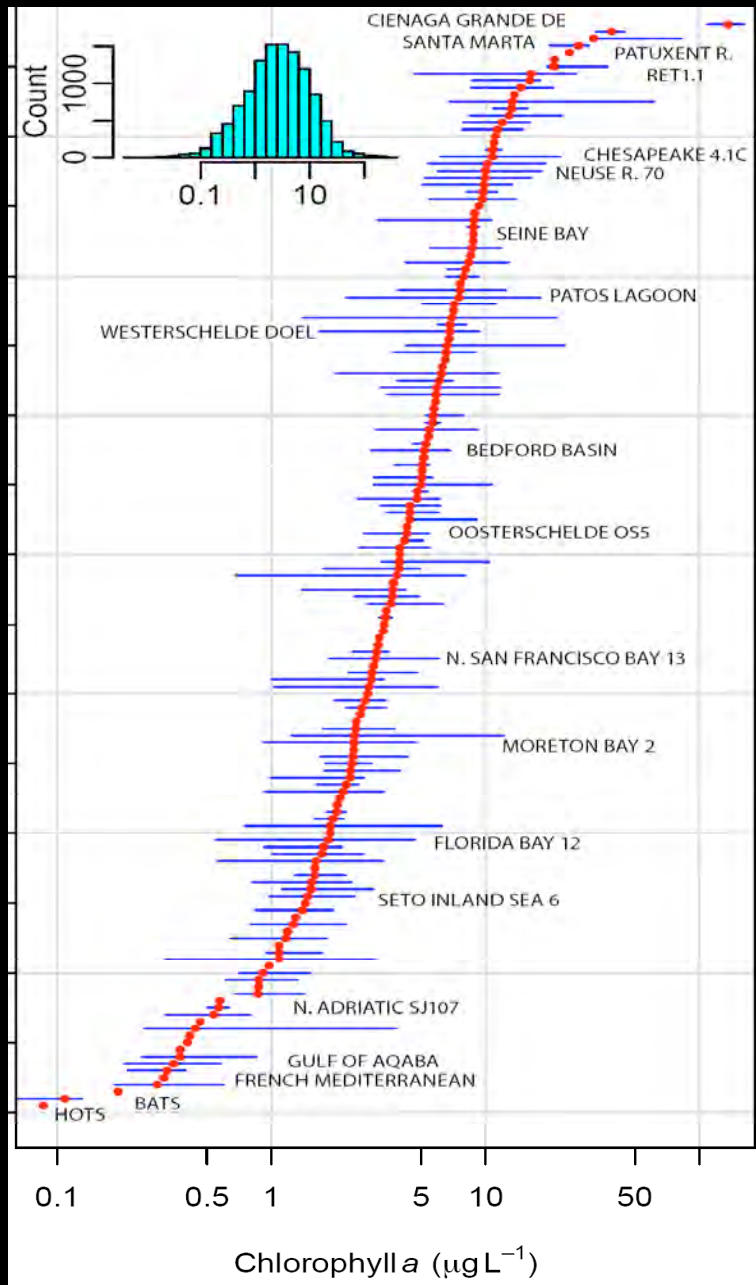
## Suspended Sediment in the Bay: Past a Tipping Point

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## *Eutrophication*

