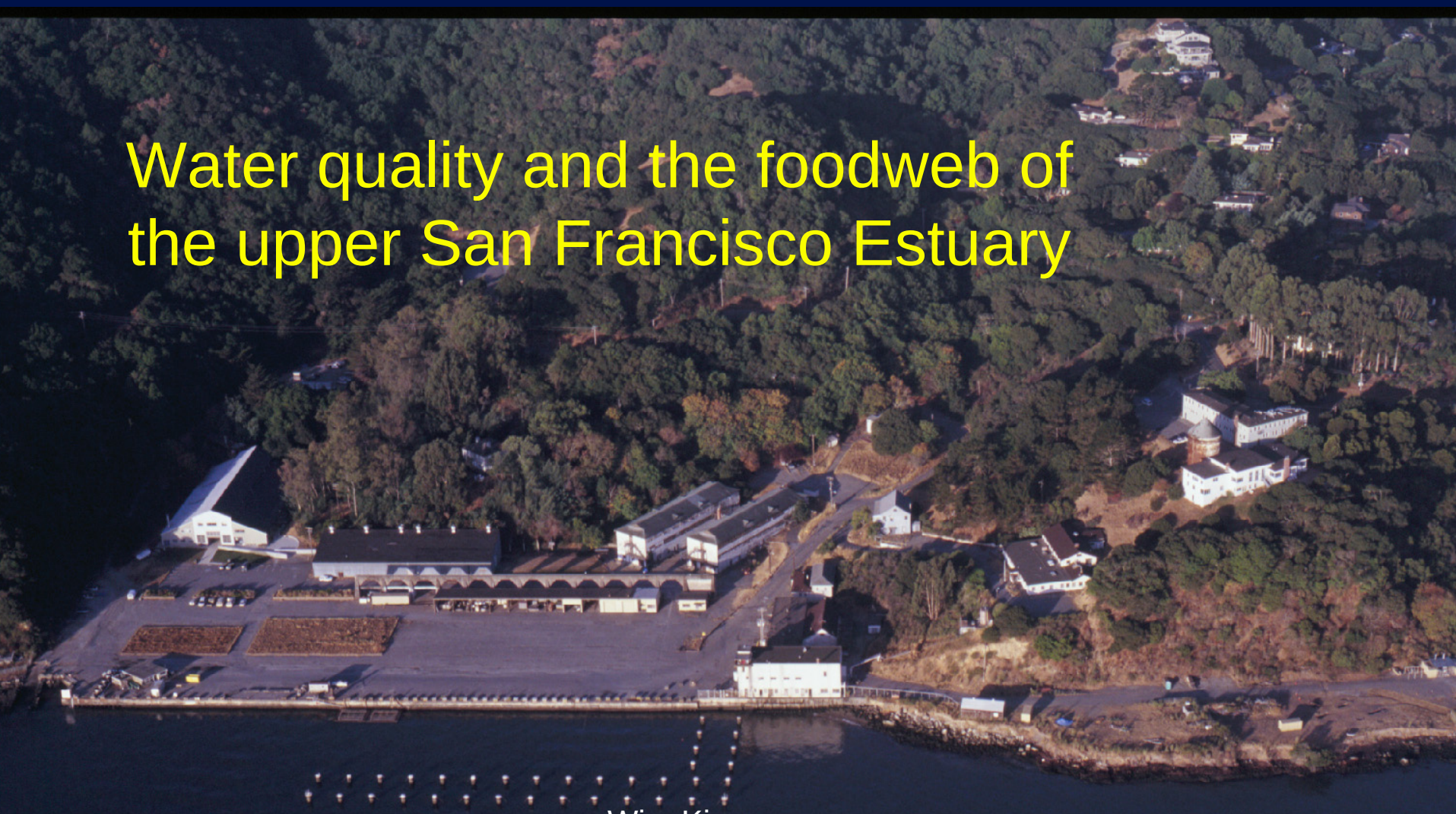
Water quality and the foodweb of the upper San Francisco Estuary



Wim Kimmerer
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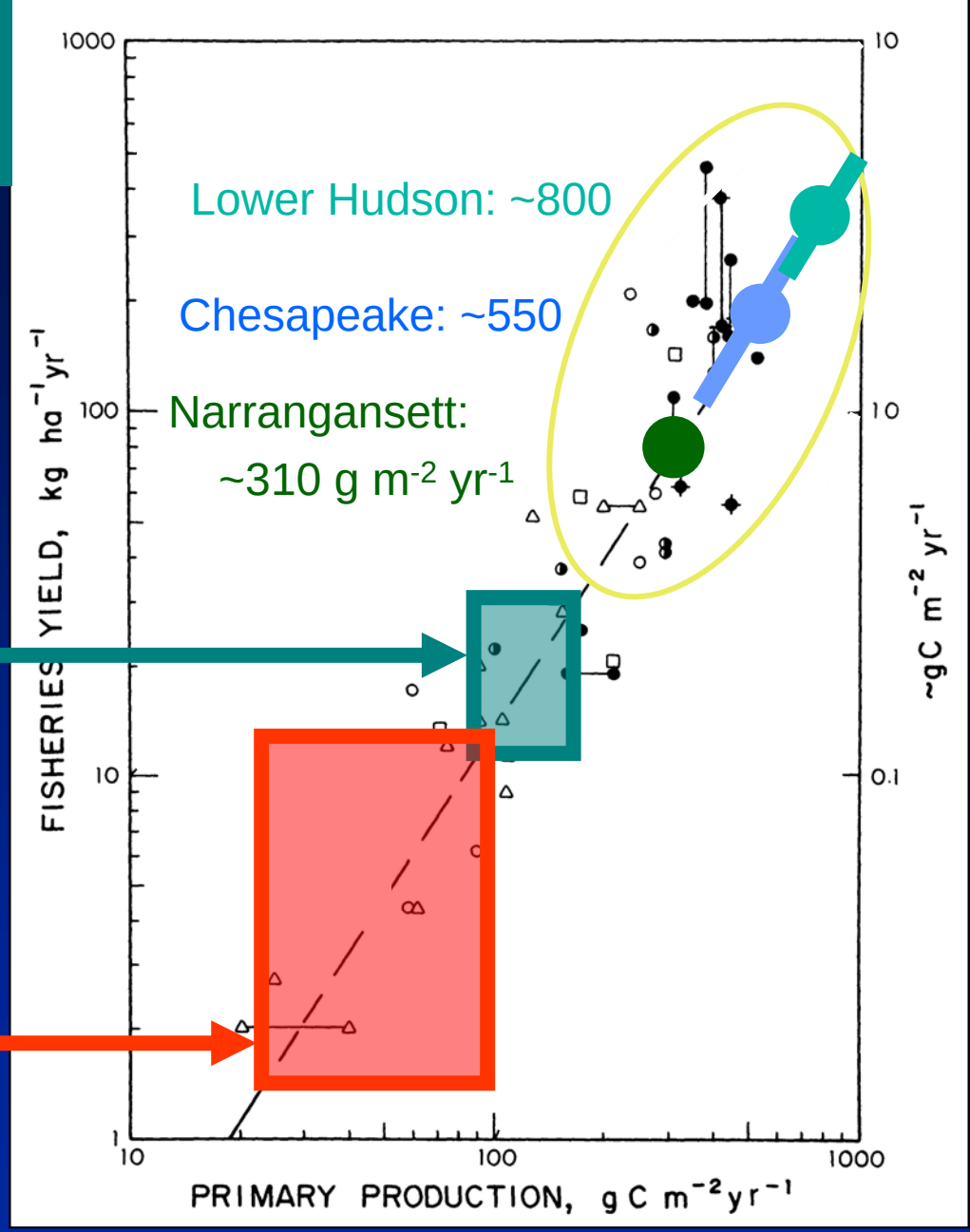
Topics

- What is water quality to an estuarine ecologist?
- Role(s) of nutrients
- Organic carbon sources
- Freshwater vs. brackish water
  - Importance of phytoplankton
  - The microbial foodweb
- How much of this can we control?

Water Quality

- Salinity sets species composition
- Temperature sets biological rates
- Nutrients may influence phytoplankton
- Turbidity controls light for phytoplankton
- Organic matter may influence foodweb
- Contaminants may impair foodweb

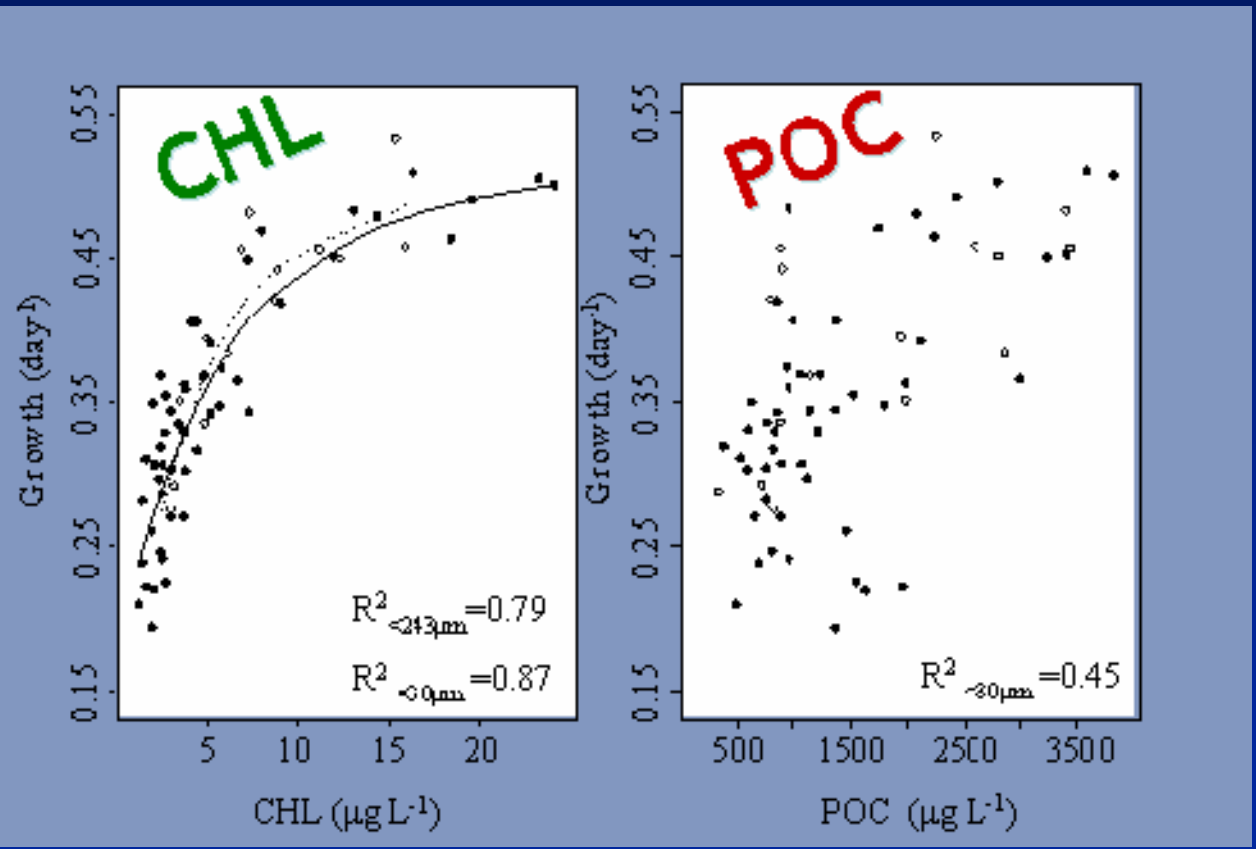
A Low-Productivity System gets Lower



Data: IEP data, Jassby et al. 2002, Limnol. Oceanogr.
Graph: Nixon 1988 Limnol. Oceanogr.

Food limitation: *Daphnia* bioassays

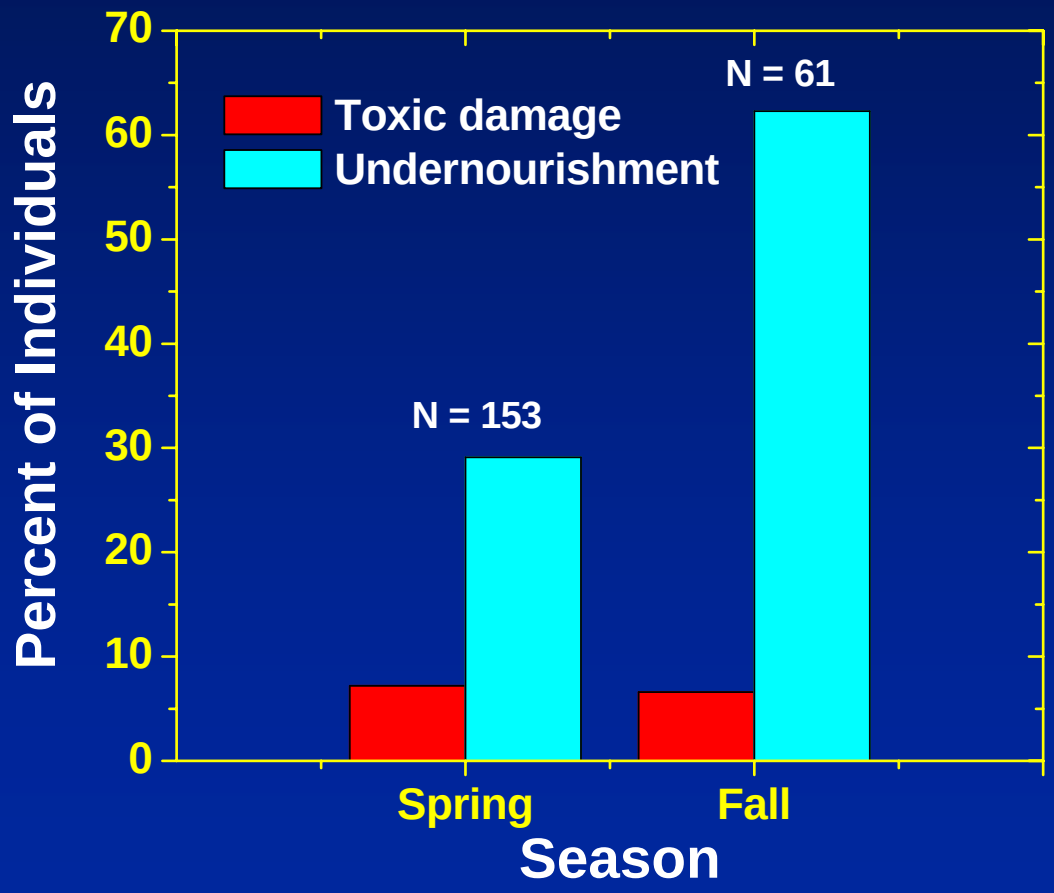
Sacramento - San Joaquin Delta



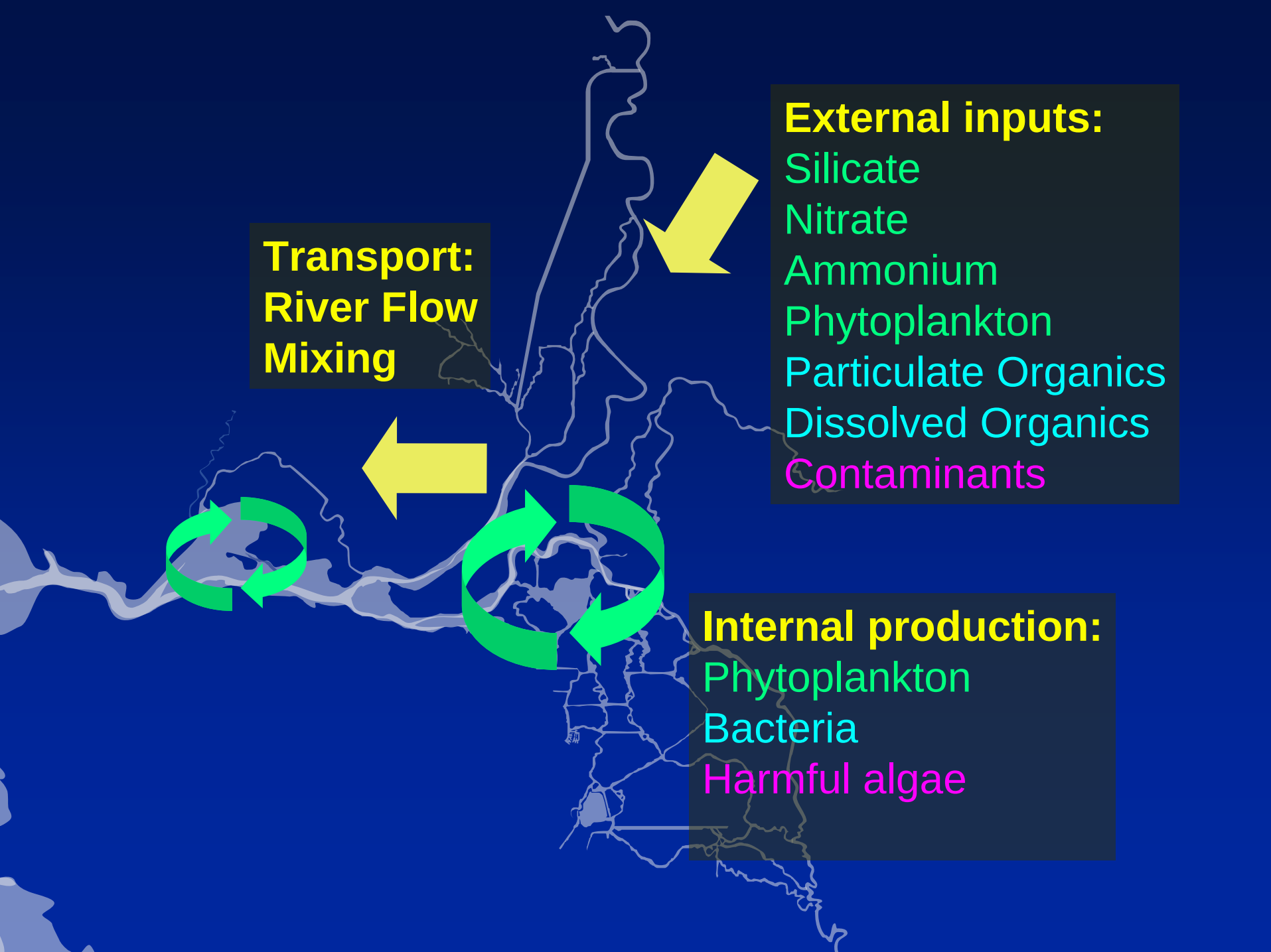
Müller-Solger et al. 2002
L&O 47

Food limitation: Condition of Delta smelt

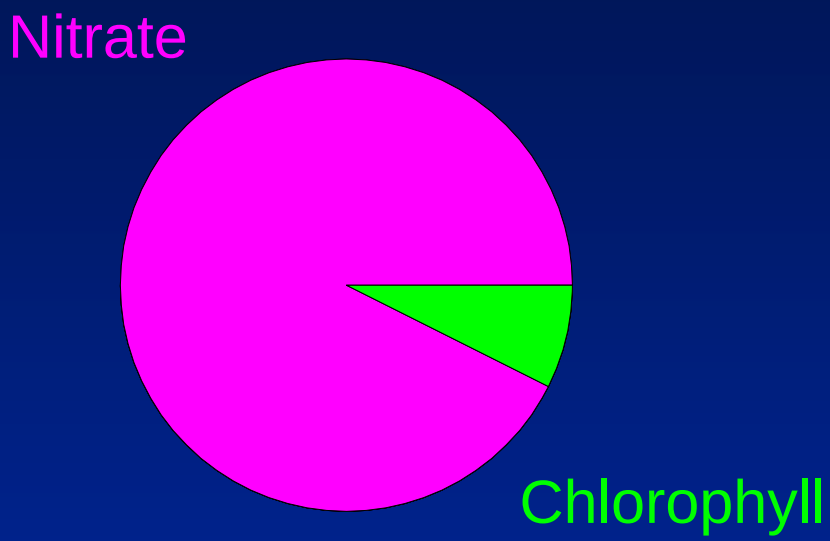
Suisun Bay, 1999



W.A. Bennett 2005
San Francisco Estuary and Watershed Science 3(2)

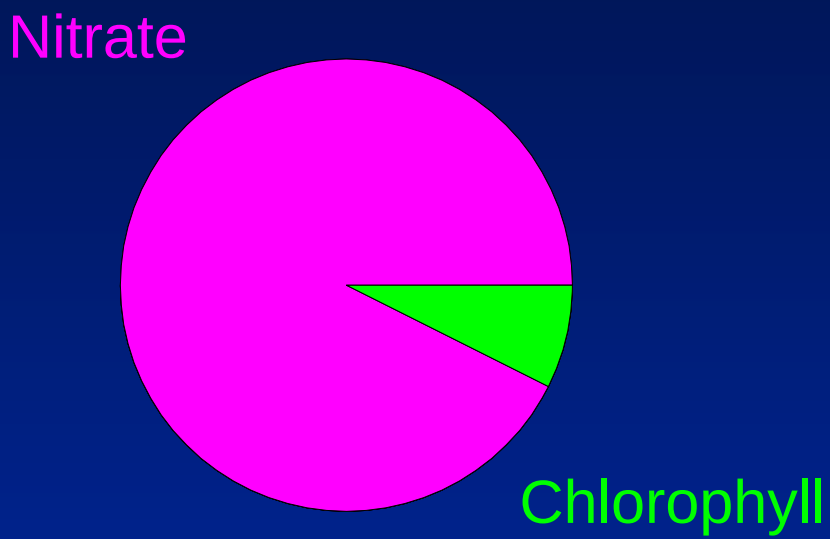

External inputs:
Silicate
Nitrate
Ammonium
Phytoplankton
Particulate Organics
Dissolved Organics
Contaminants
Transport:
River Flow
Mixing
Internal production:
Phytoplankton
Bacteria
Harmful algae

Nutrients in the Delta



Why is the nitrate not converted?

Nutrients in the Delta

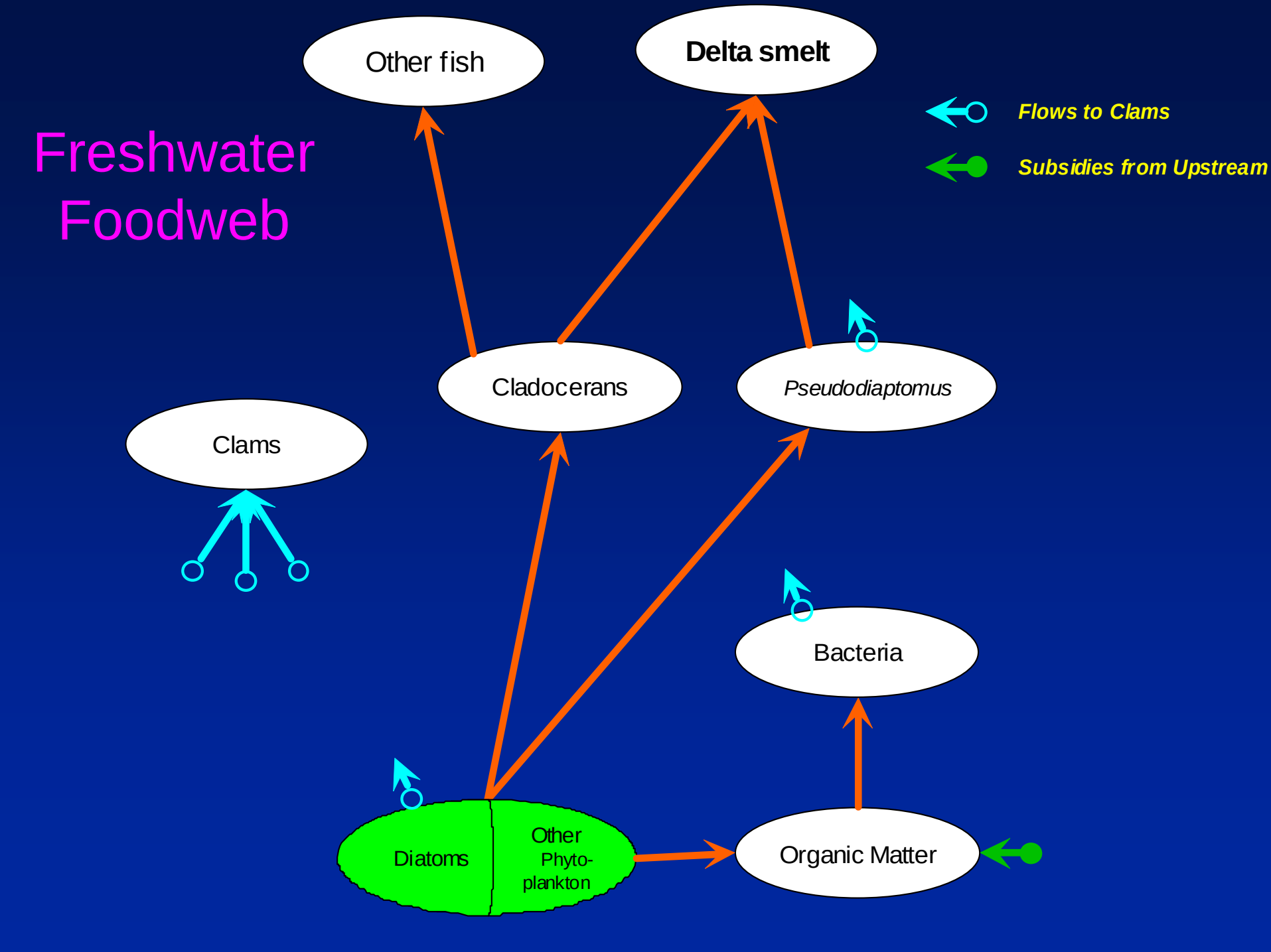


Why is the nitrate not converted?

Light (turbidity)

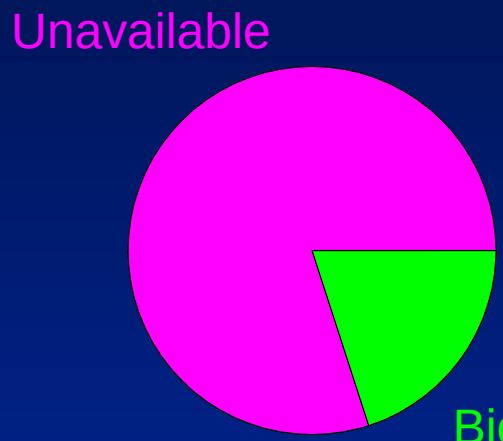
Clams

Ammonium

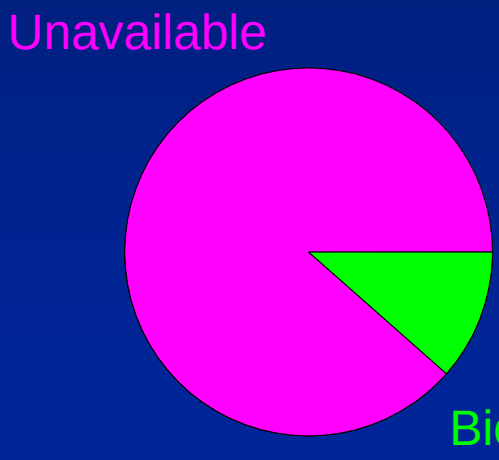

Freshwater Foodweb
Other fish
Delta smelt
Flows to Clams
Subsidies from Upstream
Cladocerans
Pseudodiaptomus
Clams
Bacteria
Diatoms
Other Phyto-plankton
Organic Matter

How much organic carbon is available?

Particles



Dissolved Carbon



Source: Sobczak et al. 2002 PNAS

Summary

- Things are different when there is salt
- Nutrient inputs may be important but not in traditional ways
- Brackish and freshwater foodwebs are differen
- We are still figuring out the organic carbon bal