NUTRIENTS: IMPLICATIONS FOR BAY AREA AGENCIES

BACWA 2012 Annual Members Meeting

Thomas Mumley
Assistant Executive Officer
San Francisco Bay
Regional Water Quality Control Board

CALIFORNIA Water Boards

Nutrient Implications

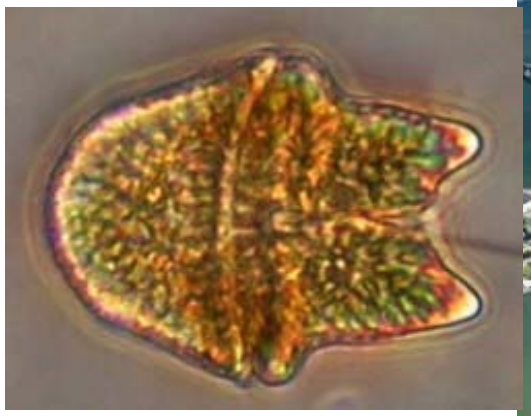
- New water quality standards
- Bay is losing its resilience
- New discharge requirements?
- Treatment improvements/upgrades?

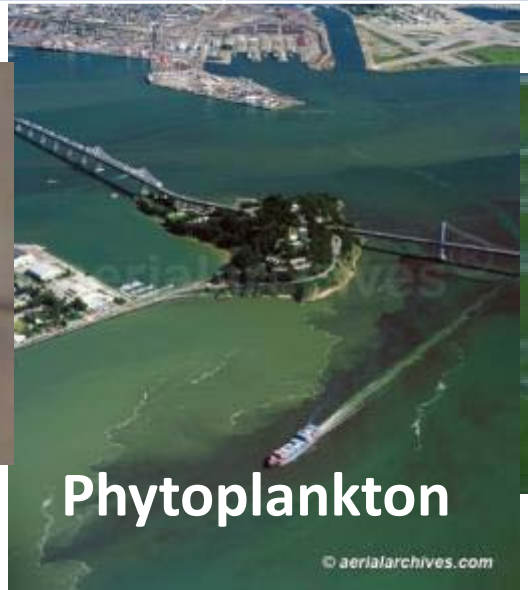
Nutrient Water Quality Standards

- Federal driver
- Our approach = narrative objective with numeric guidance
  - Nutrient Numeric Endpoint (NNE)
  - Ecological response endpoints
  - Use model(s) to link to nutrient loads

Recommended Indicators: Subtidal Habitat

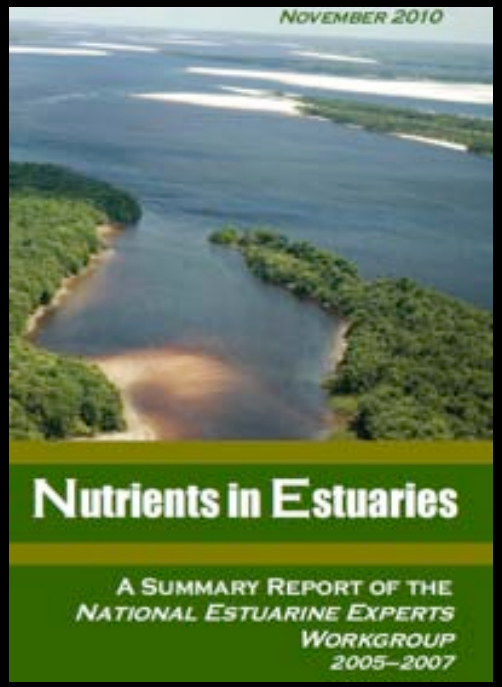
Primary Indicators	Secondary Indicators
• Phytoplankton Biomass and Assemblage • Cyanobacteria cell counts and toxin concentration • Dissolved oxygen	• Water column nutrient concentrations and forms (e.g. , ammonium) • Other HAB species cell counts and toxin concentrations HAB = Harmful Algal Bloom





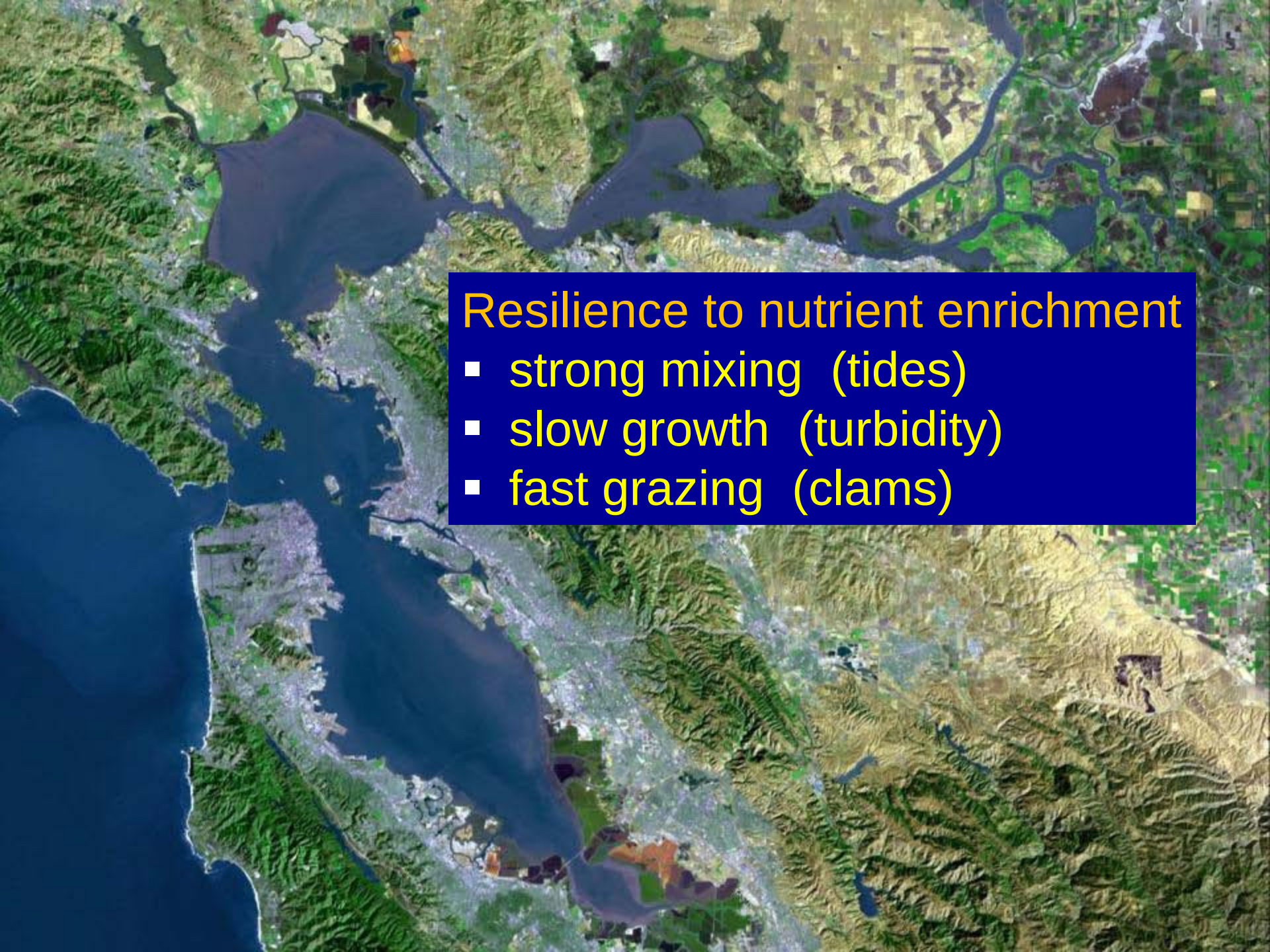
Nutrient Water Quality Standards

- Consideration of controllable factors
  - Sources; internal processes
- Implementation plan
  - TMDL(s)?
  - WQBELs



San Francisco Bay has high nutrient loads

Estuarine system	Nitrogen load ($gN\ m^{-2}\ y^{-1}$)	Approx. max NO_3^- (mM N)	Approx. max PO_4^{-3} (mM-P)
Narragansett Bay	28	20	4
Delaware Bay	26	175	6
Chesapeake Bay	21	100	1.5
Neuse River		300	2
San Francisco Bay	29	50	4
Yaquina Bay	100	100	3
Barnegat Bay	5	20	< 1
Coastal Bays	2–4	< 5	< 0.5
Florida Bay	10	10	< 1
Pensacola Bay	14	14	< 0.5


Resilience to nutrient enrichment
strong mixing (tides)
slow growth (turbidity)
fast grazing (clams)

Total Measurements

159,462 chlorophyll a
126,599 dissolved oxygen
135,958 SPM
169,515 salinity
168,588 temperature
10,811 DIN
10,224 DIP

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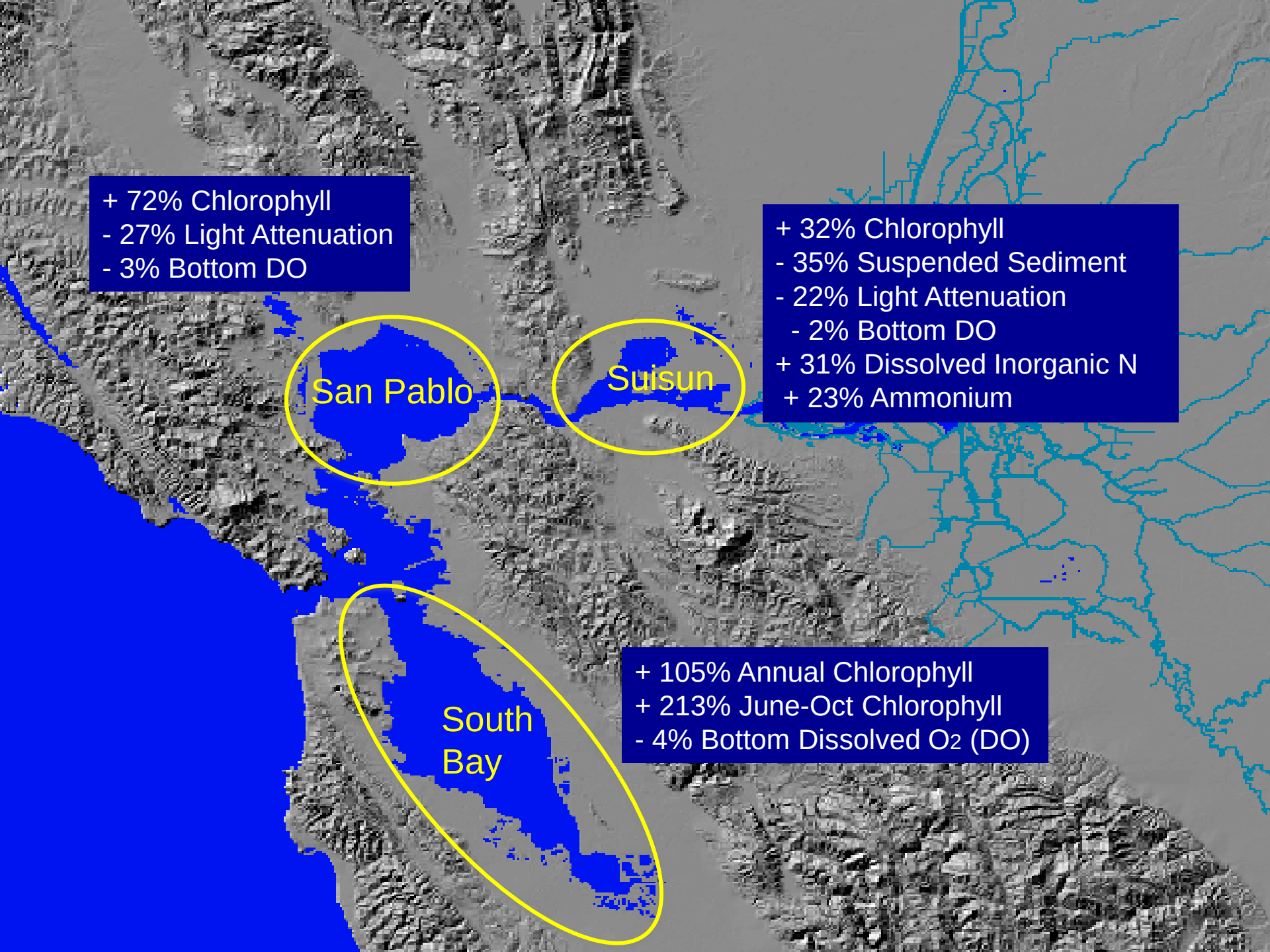
Resilience to nutrient enrichment is changing

San Francisco Bay is Clearing (faster growth)

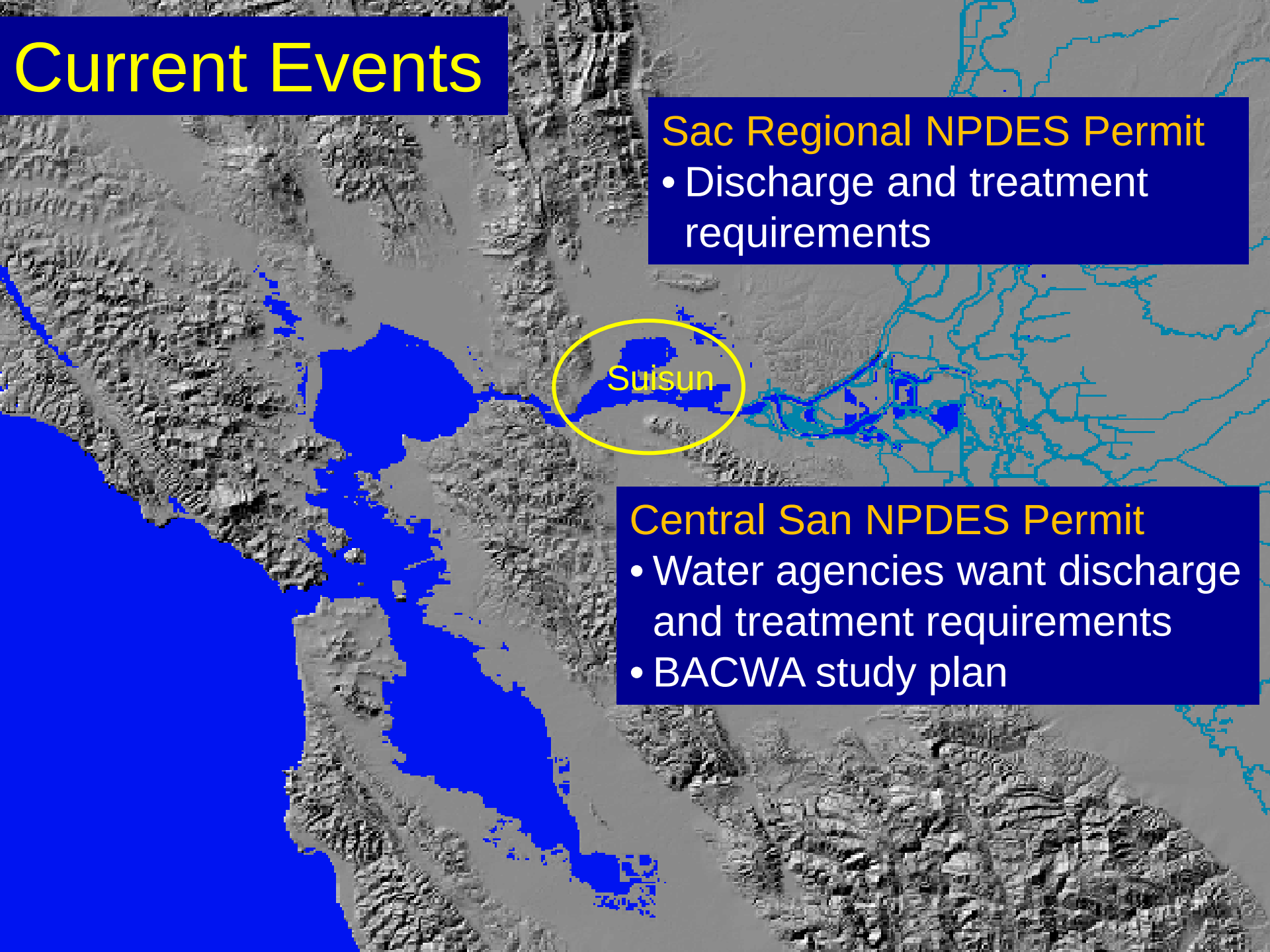
Schoellhamer (2009)


+ 72% Chlorophyll
- 27% Light Attenuation
- 3% Bottom DO
San Pablo
Suisun
+ 32% Chlorophyll
- 35% Suspended Sediment
- 22% Light Attenuation
- 2% Bottom DO
+ 31% Dissolved Inorganic N
+ 23% Ammonium
South Bay
+ 105% Annual Chlorophyll
+ 213% June-Oct Chlorophyll
- 4% Bottom Dissolved O2 (DO)

Current Events

Sac Regional NPDES Permit

- Discharge and treatment requirements



Central San NPDES Permit

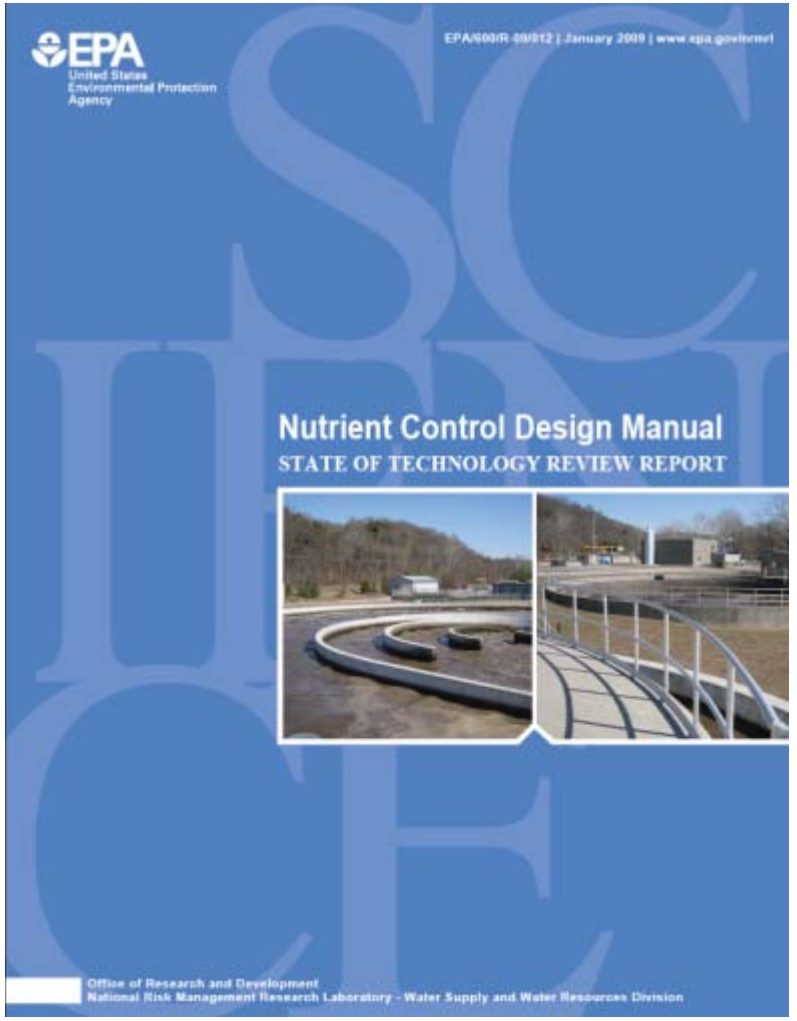
- Water agencies want discharge and treatment requirements
- BACWA study plan

New discharge requirements? Treatment improvements/upgrades?

- Not if, but when and what
- Begin alternatives evaluation now
  - Need for evaluation of NNEs
  - Need for evaluation of future scenarios
  - Need for “friendly” discharge requirements

Treatment Option Factors

- Which nutrient(s)
- Energy / emissions
- Emerging technology
  e.g., Anammox
- Removal of emerging contaminants
- Recycled water options



Nutrient Strategy

- Collect information to inform management decisions
  - Water quality standards
  - Controllable factors
- Collaborative approach
  - Joint fact finding
  - Get the loads and processes right
  - “Friendly” 13267 letters