

# Nutrients in the Delta—the role of ammonium

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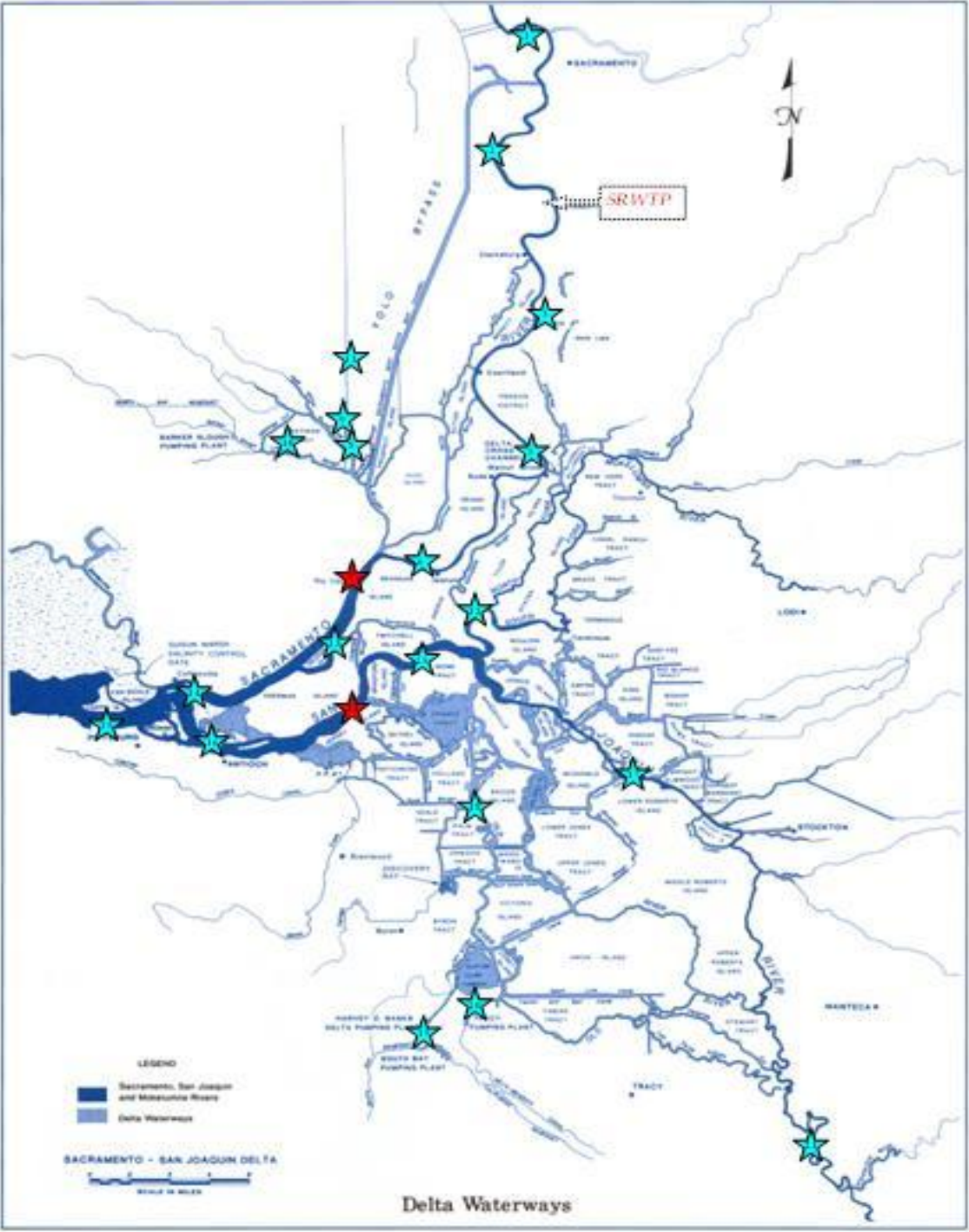
# Outline

- **Questions**
- **Study design**
- **Nitrogen and Phosphorus Patterns**
- **Answer Questions**
- **Conclusions**

# Questions

- Do ambient  $\text{NH}_4$  concentrations exceed U.S. EPA criteria?
- Are ambient  $\text{NH}_4$  concentrations at toxic levels to delta smelt?
- Are ambient  $\text{NH}_4$  concentrations at toxic levels to the copepod *Pseudodiaptomus forbesi*?
- Are ambient  $\text{NH}_4$  concentrations high enough to inhibit nitrate uptake and reduce diatom primary production rates in the Delta?

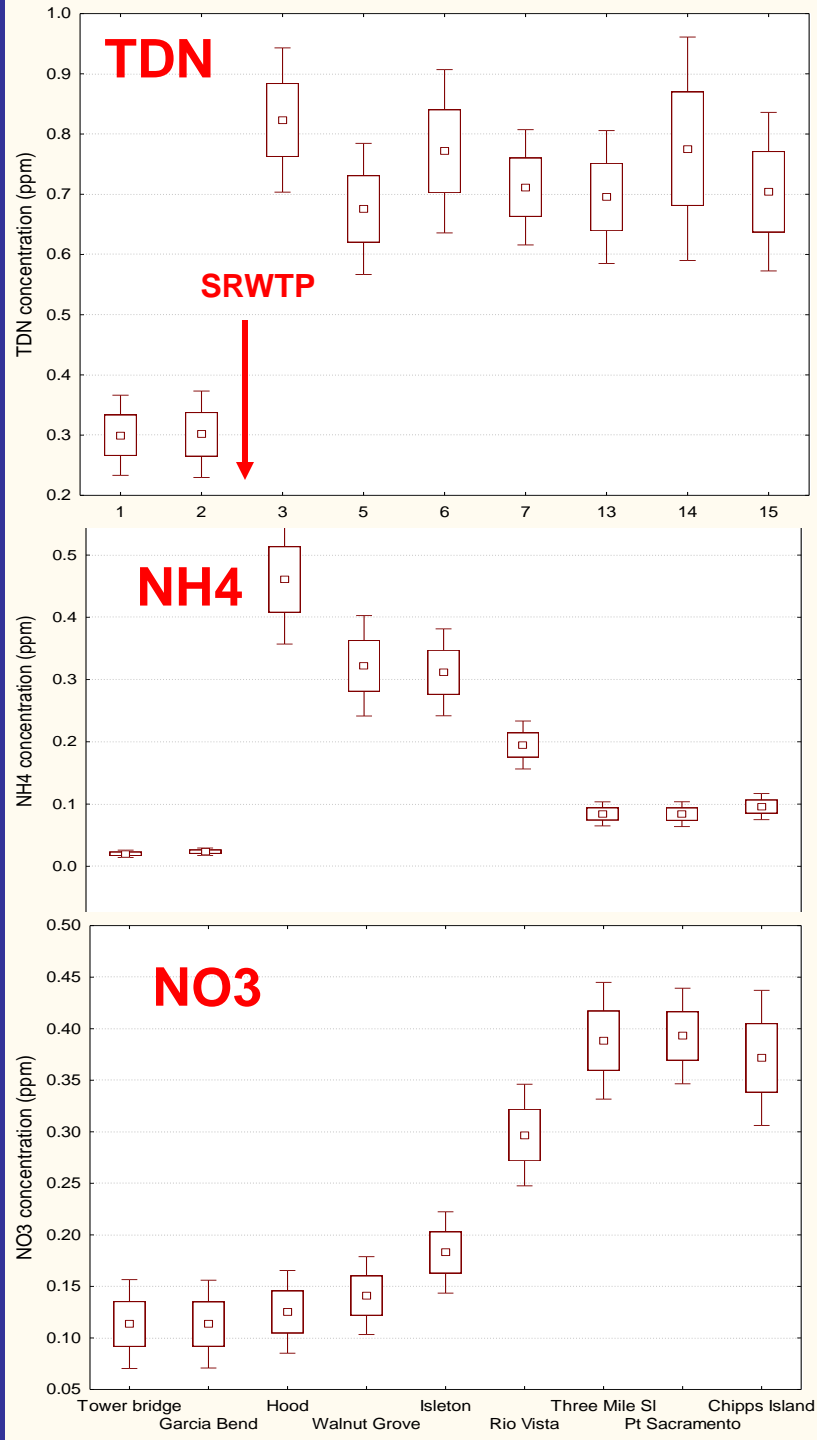
# Map of Delta



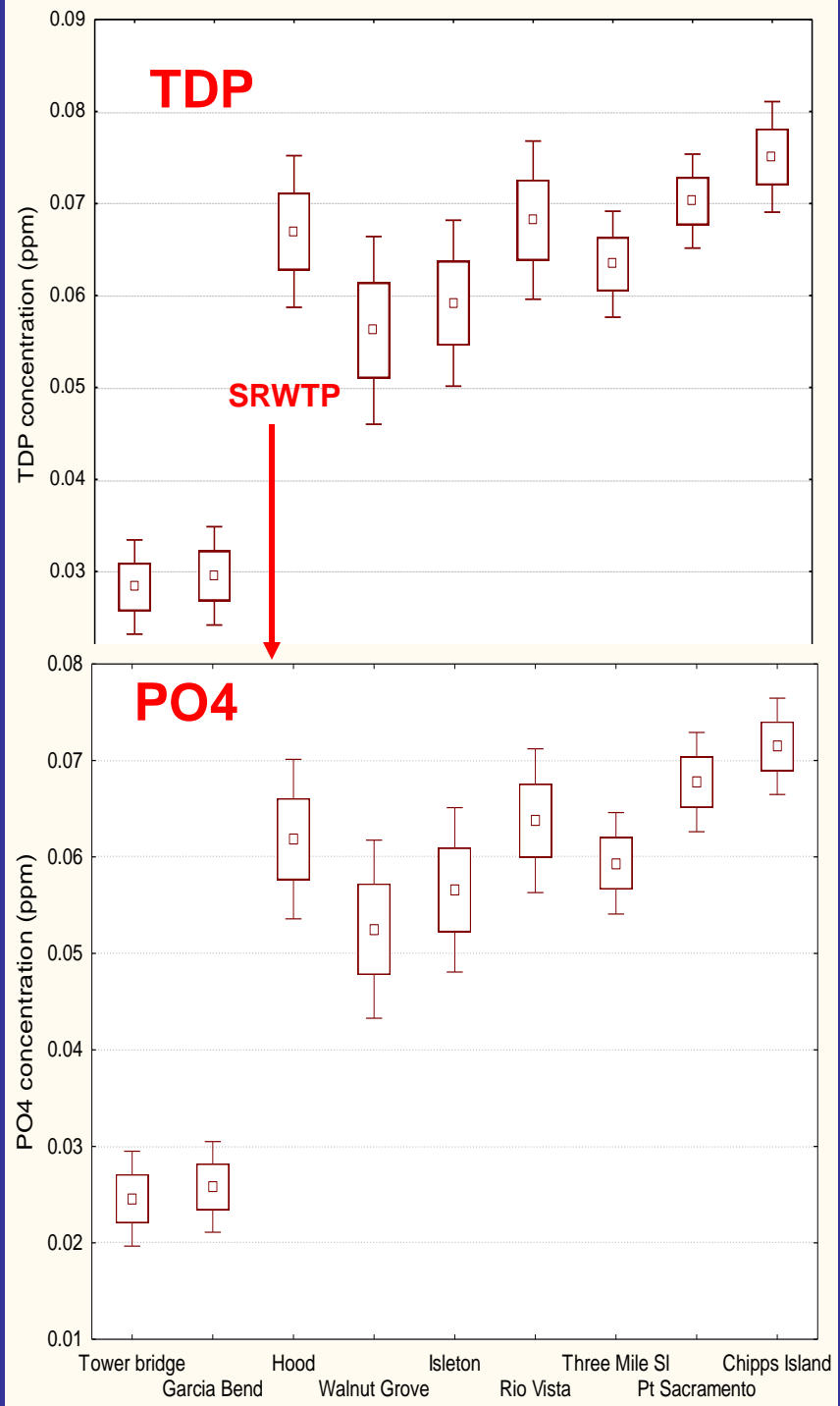
# Chemicals Monitored

<b>Constituent</b>	<b>MDL</b>	<b>Responsible party</b>
Total Nitrogen	0.01 mg/l	UC Davis
Total Dissolved Nitrogen	0.01 mg/l	UC Davis
Ammonia	0.005 mg/l	UC Davis
Nitrite	0.01 mg/l	UC Davis
Nitrate	0.01 mg/l	UC Davis
Dissolved Organic nitrogen	0.01 mg/l	UC Davis
Total Phosphorus	0.005 mg/l	UC Davis
Total dissolved Phosphorus	0.005 mg/l	UC Davis
Soluble Reactive Phosphorus	0.002 mg/l	UC Davis
Dissolved Organic Carbon	0.1 mg/l	UC Davis
Chlorophyll <u>a</u>	0.5 ug/l	UC Davis
Phaeophytin	0.5 ug/l	UC Davis
EC (25°C)	1 s/cm	Regional Board
Temperature	0.1 °C	Regional Board
Turbidity	0.1 ntu	Regional Board
Dissolved Oxygen	0.1 mg/l	Regional Board
pH	0.1 pH units	Regional Board

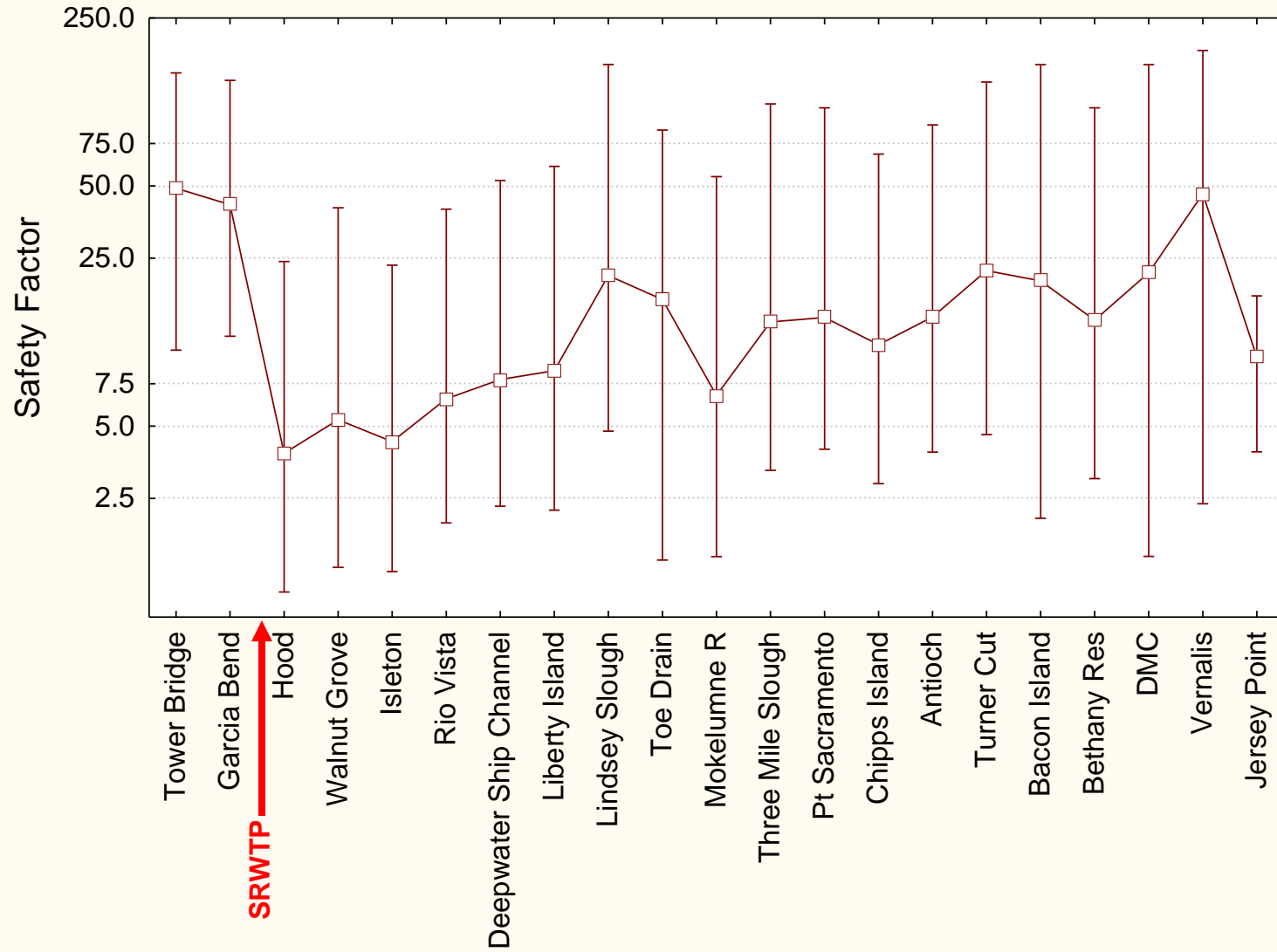
# Nitrogen



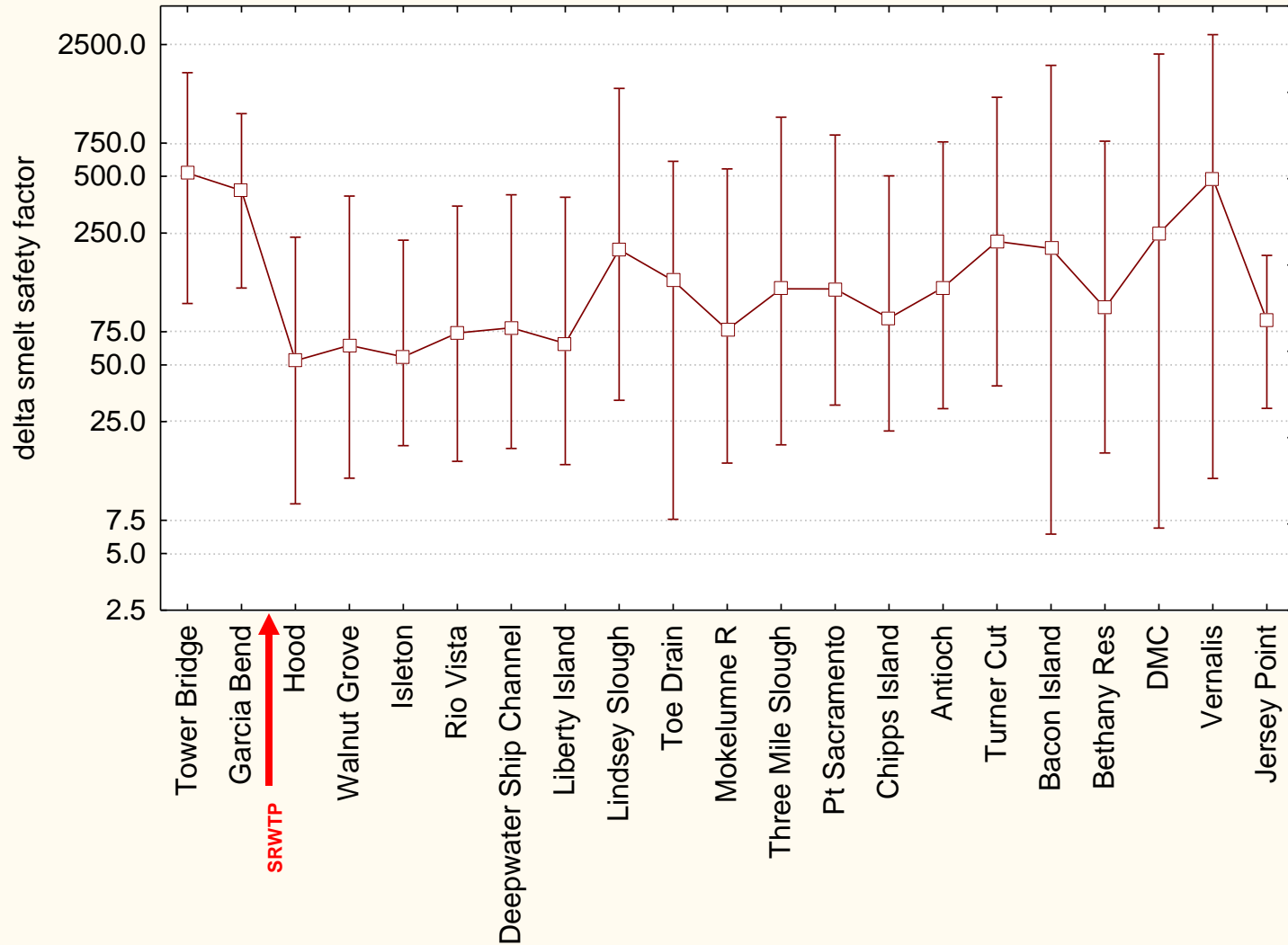
# Phosphorus



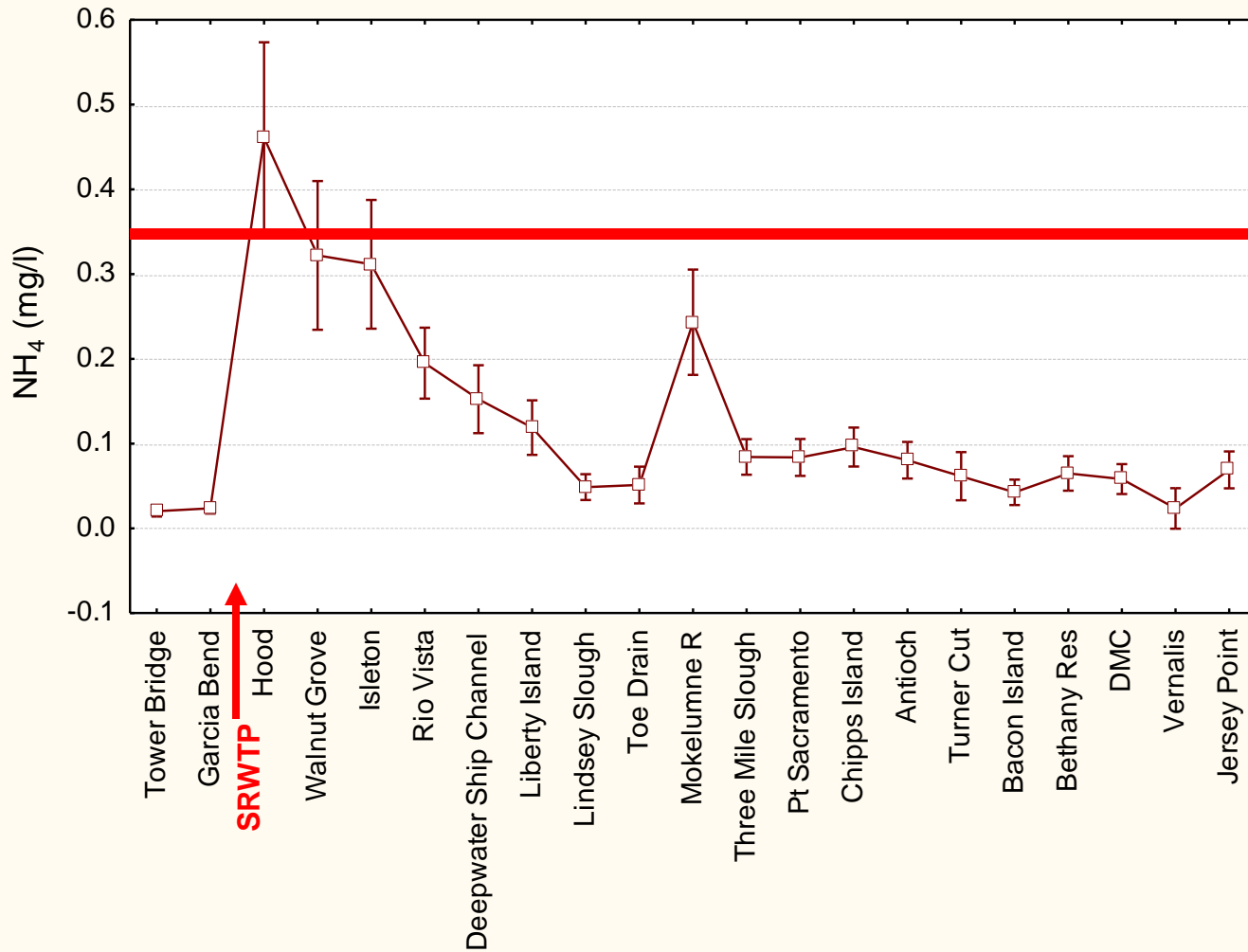
# Draft US EPA NH4 criterion for mussels present



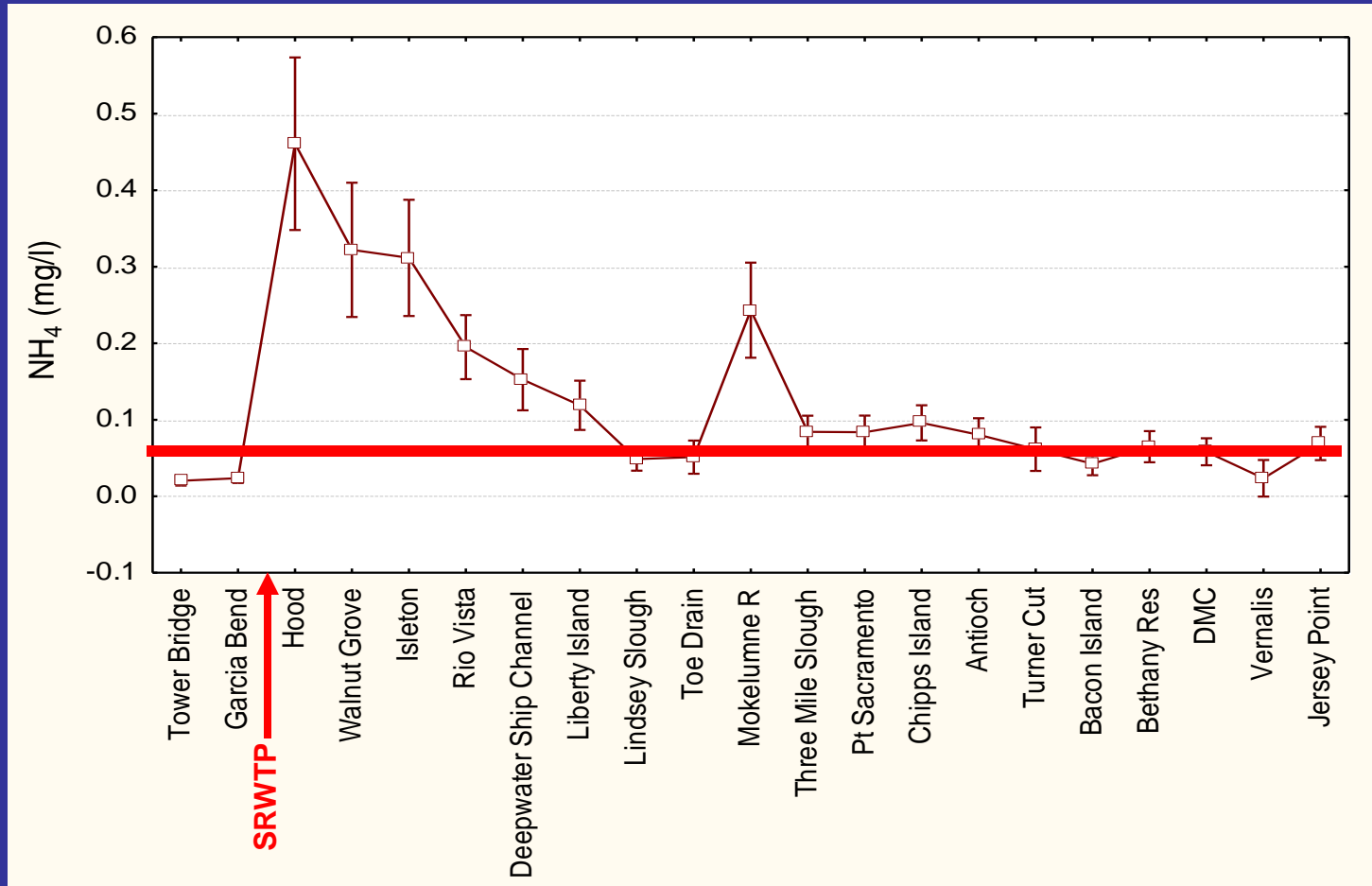
# Delta Smelt Acute Safety Factor



# *Pseudodiaptomus* Toxicity



# Inhibition of Nitrate Uptake by Diatoms



# **New Permit for SRWTP**

- **Ammonia limit of 1.8-mg N/l**
- **Nitrate limit of 10-mg N/l**
- **Filtration**

# Conclusions (1)

- **The SRWTP increases N and P levels in the Delta 2 to 2.5-fold.**
- **Ammonia is the major form of nitrogen. Concentrations increase about 11-fold.**
- **Ammonia and nitrate/nitrite are the mirror image of each other suggesting that nitrification is the major biological process.**
- **New permit adopted for the SRWTP requiring both nitrification and denitrification.**

# Conclusions (2)

- Do ambient NH<sub>4</sub> concentrations exceed U.S. EPA criteria? **NO**
- Are ambient NH<sub>4</sub> concentrations at toxic levels to delta smelt? **NO**
- Are ambient NH<sub>4</sub> concentrations at toxic levels to the copepod *P. forbesi*? **Yes**
- Are ambient NH<sub>4</sub> concentrations high enough to inhibit nitrate uptake and reduce diatom primary production? **Yes**