Preliminary Ammonia Results From An Ongoing Monitoring Program

Chris Foe, Adam Ballard, and Randy Dahlgren

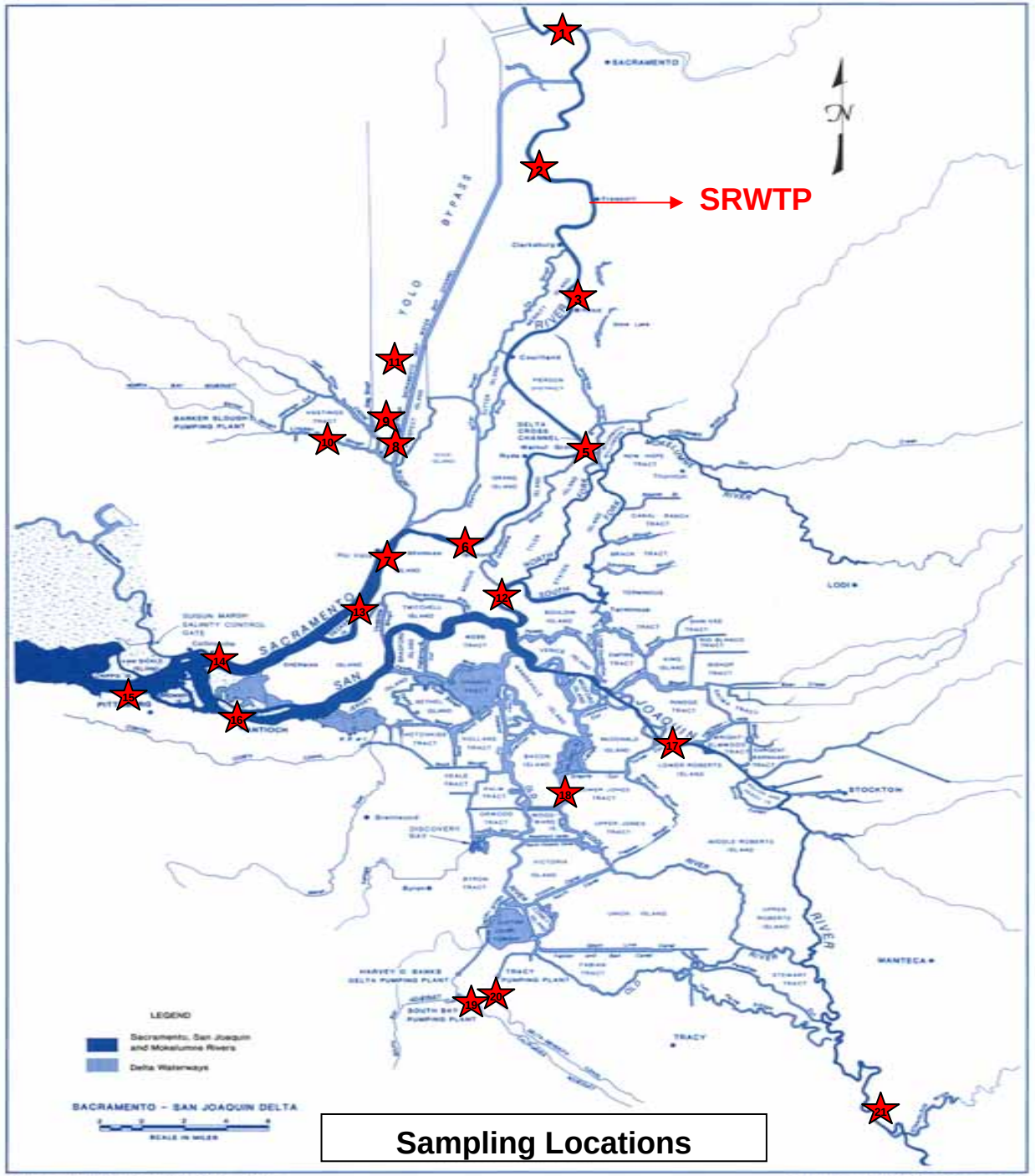
Outline

- Sampling Program
- Results

  ---Nitrogen and chlorophyll patterns in lower Sacramento River and Western Delta.

  ---High Frequency temporal sampling.

  ---Evaluate whether elevated ammonia levels causing a beneficial use impairments.
- Conclusions


SRWTP
Sampling Locations
Sacramento–San Joaquin Delta Atlas
Department of Water Resources

Analytes and their detection limits

Constituent	MDL	Responsible party
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	0.01mg/l	UC Davis
Total Phosphorus	0.005 mg/l	UC Davis
Total dissolved Phosphorus	0.005 mg/l	UC Davis
Orthophosphate	0.002 mg/l	UC Davis
Dissolved Organic Carbon	0.1 mg/l	UC Davis
Chlorophyll a	0.5 ug/l	UC Davis
Phaeophytin	0.5 ug/l	UC Davis
EC (25^0C)	1 s/cm	Regional Board
Temperature	0.1 ^{0}C	Regional Board
Turbidity	0.1 ntu	Regional Board
Dissolved Oxygen	0.1 mg/l	Regional Board
pH	0.1 pH units	Regional Board

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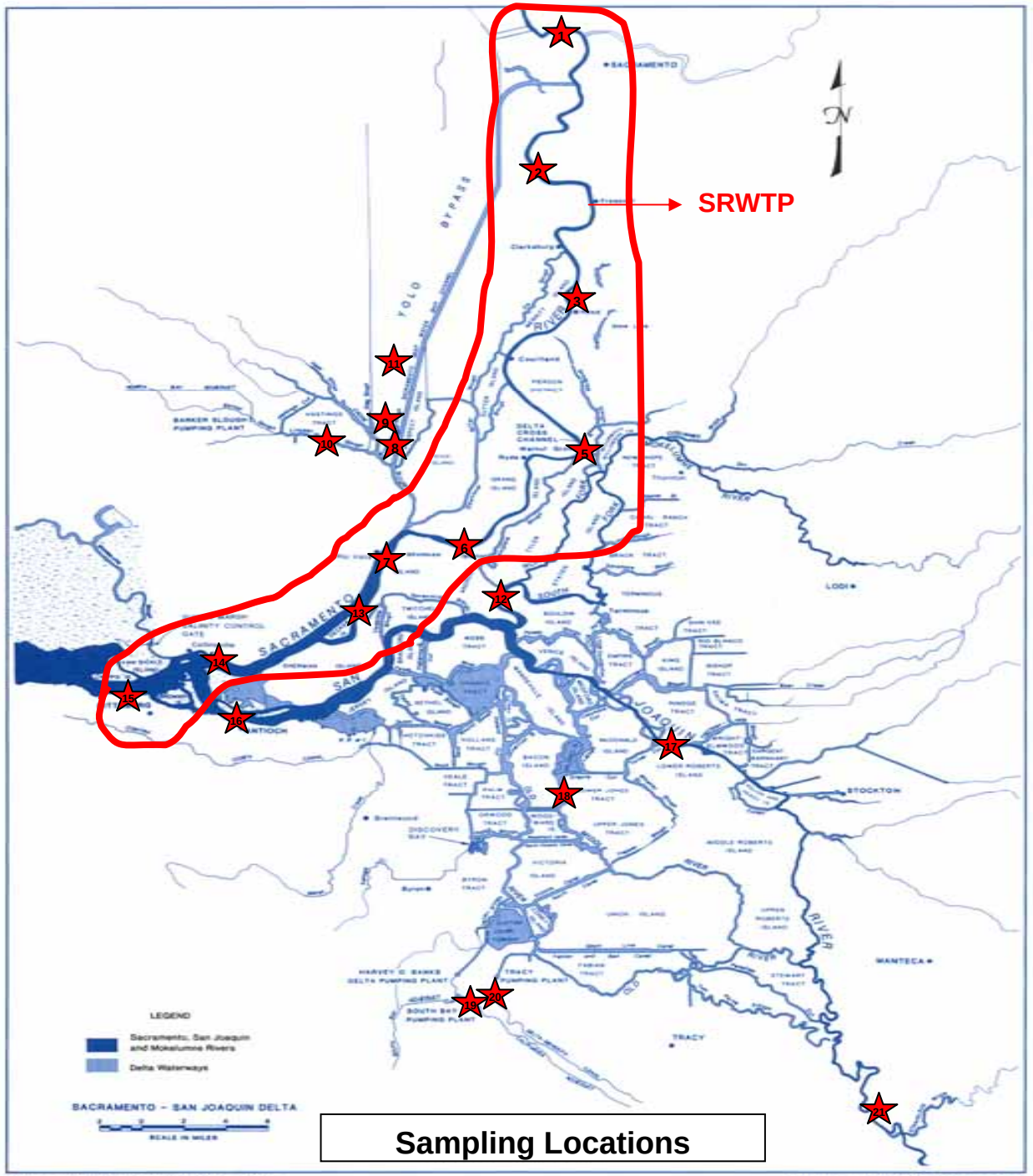
SRWTP
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LEGEND
Sacramento, San Joaquin and Mokelumne Rivers
Delta Waterways
SACRAMENTO – SAN JOAQUIN DELTA
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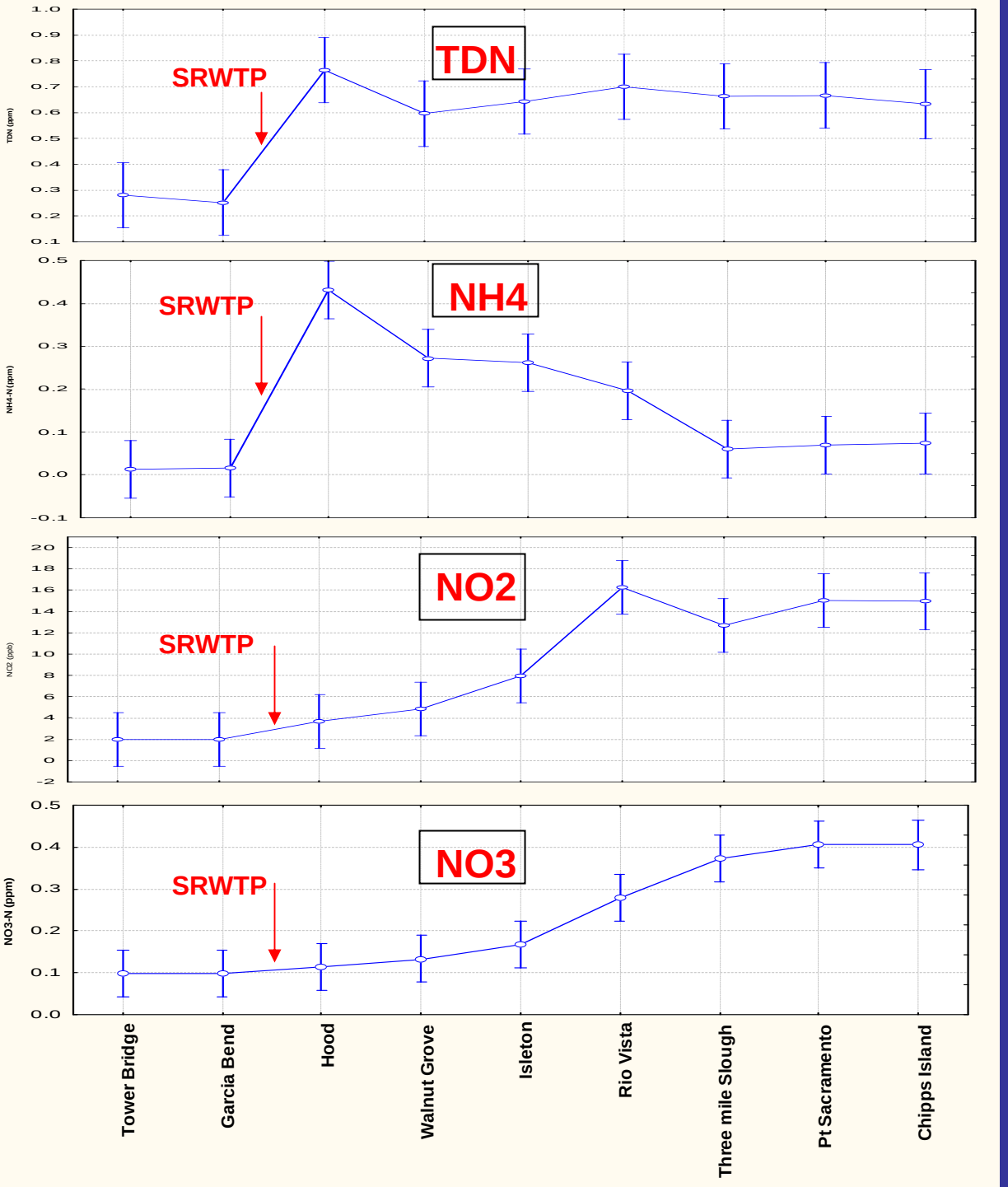
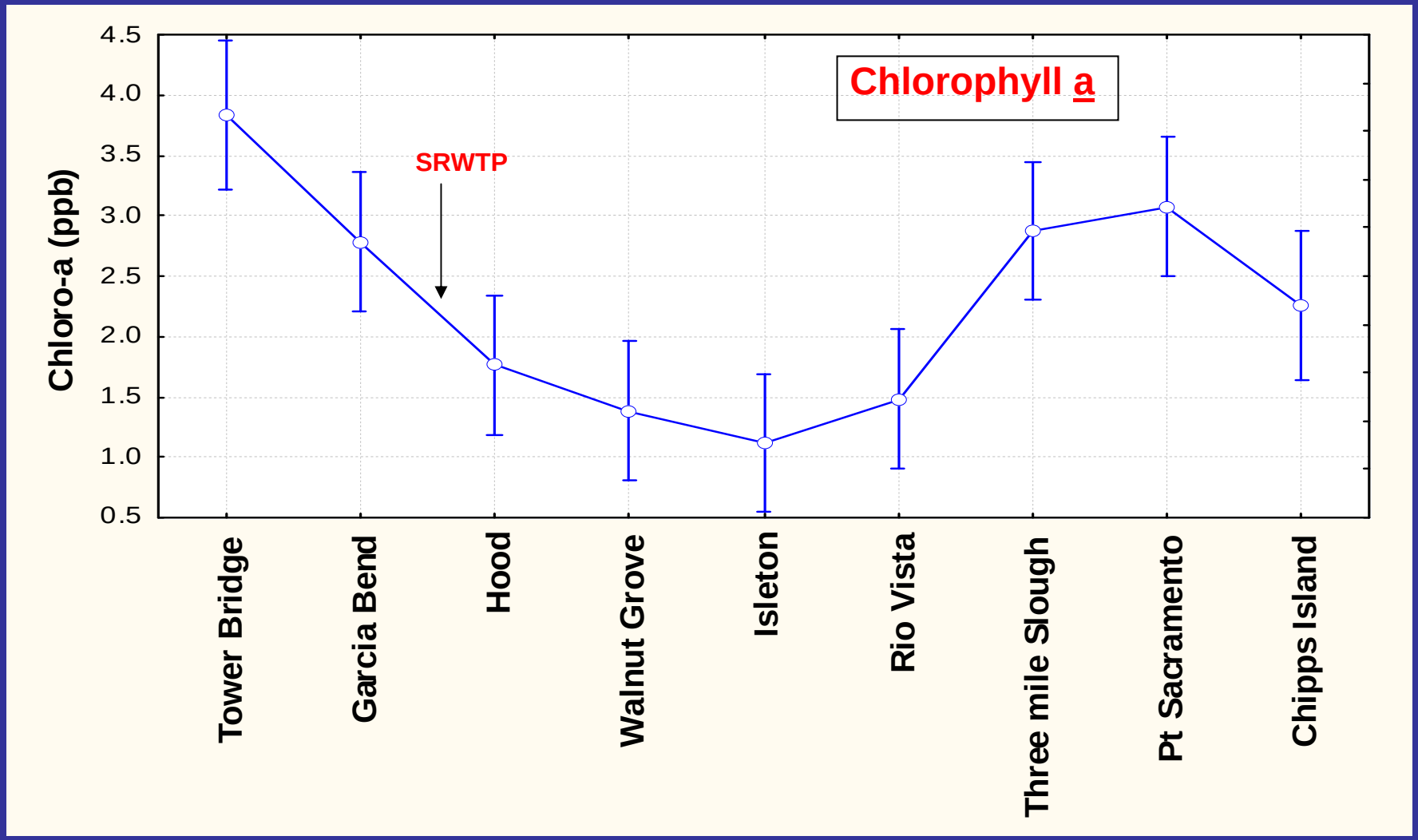
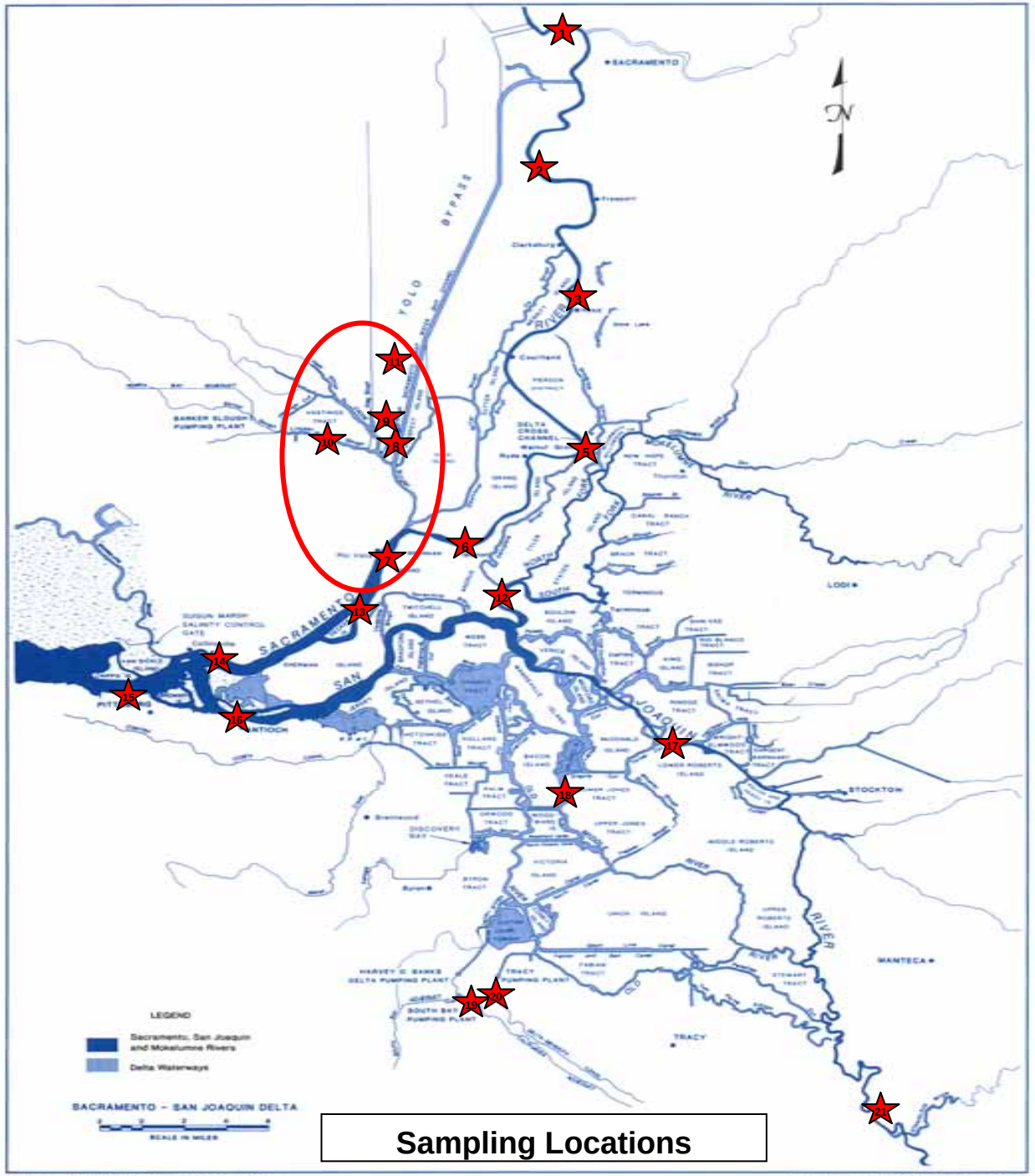
Change in average nitrogen concentrations between Tower Bridge on the Sacramento River and Chipps Island in the Delta





Average chlorophyll a concentrations between Tower Bridge on the Sacramento River and Chipps Island in the Delta.


SACRAMENTO
YOLO BYPASS
RIVER
DELTA CROSS CHANNEL
SACRAMENTO
SAN JOAQUIN
LODI
STOCKTON
MANTECA
TRACY
RIVER
LEGEND
Sacramento, San Joaquin and Mokelumne Rivers
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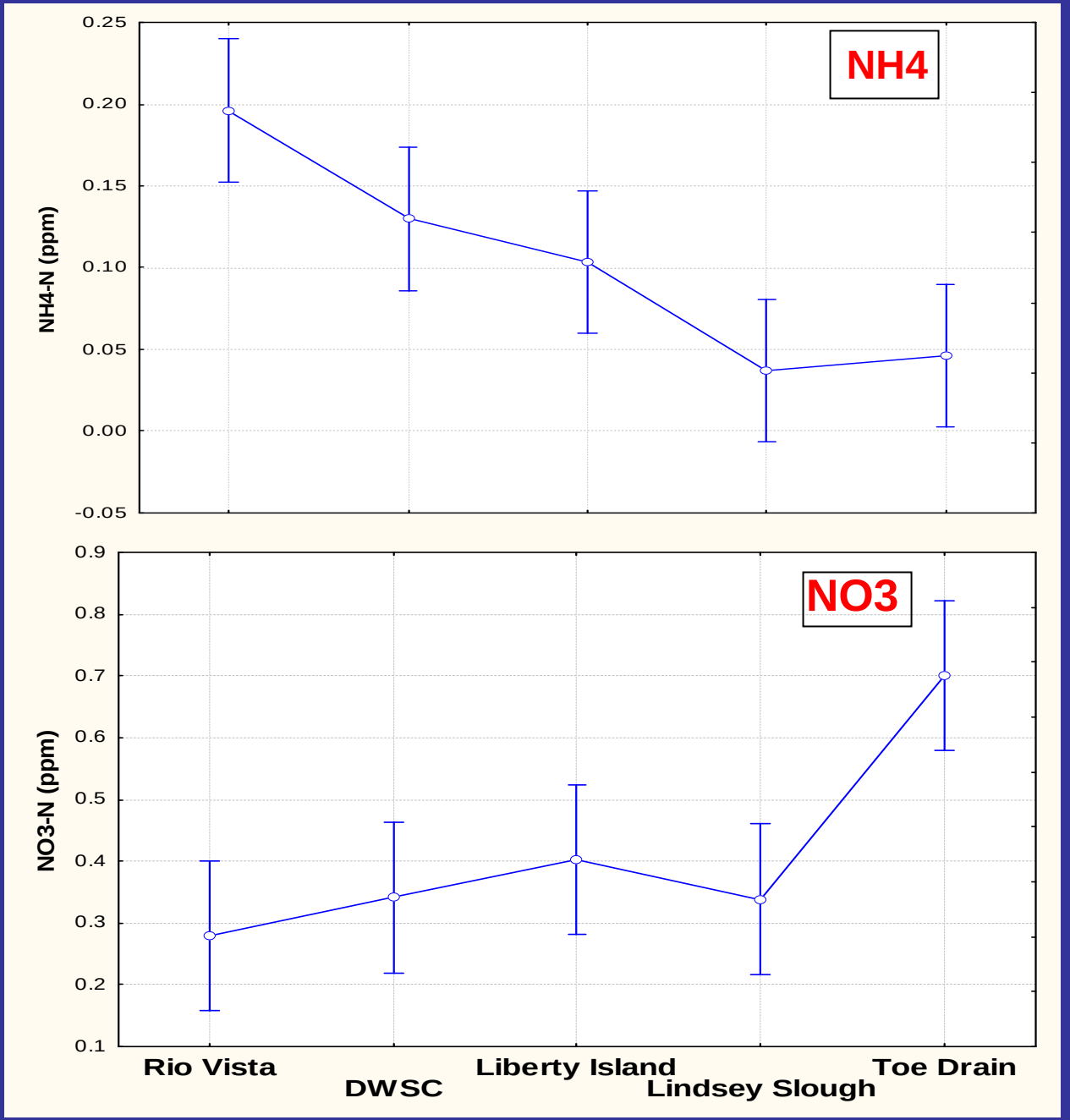
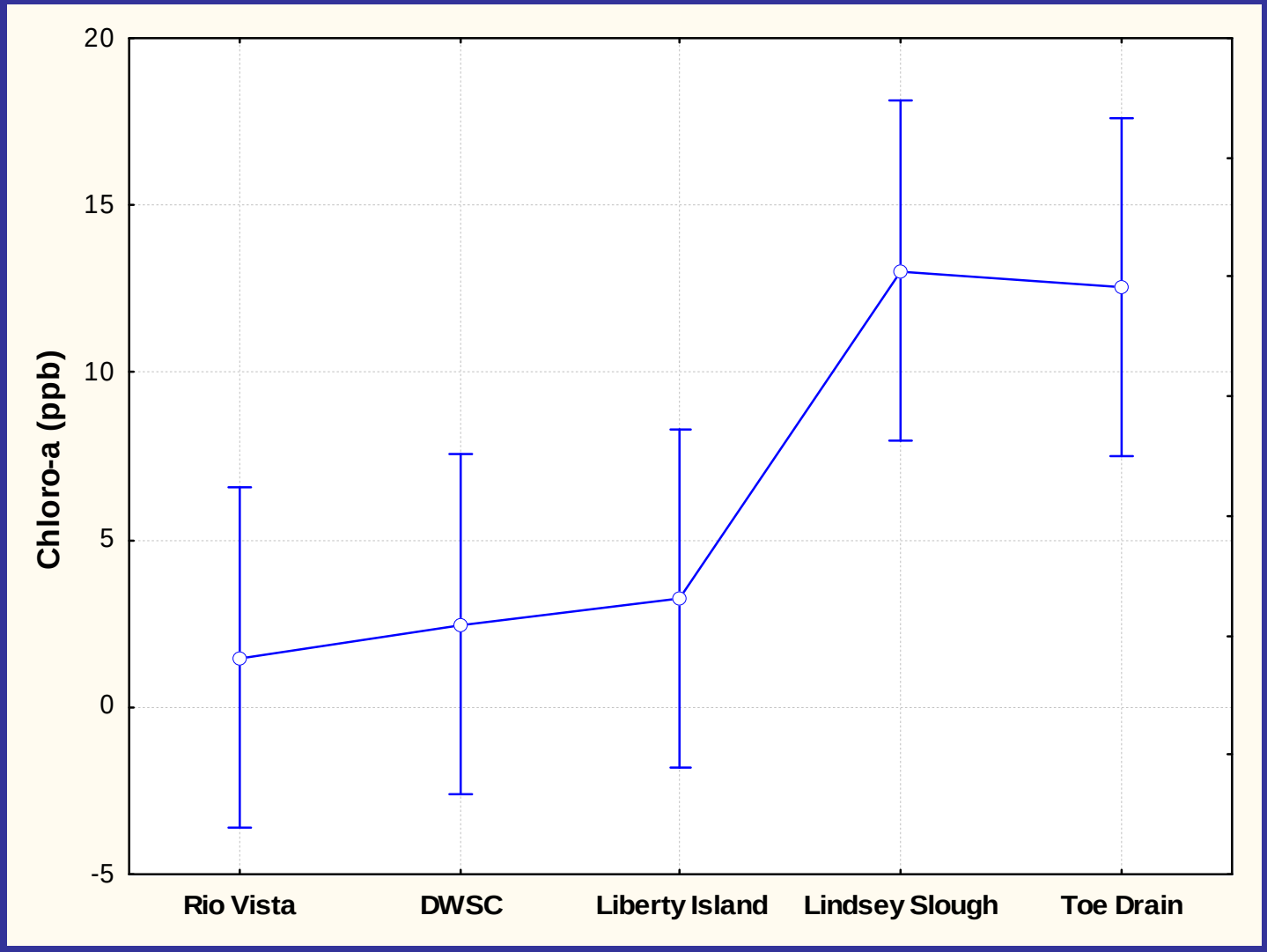
SACRAMENTO – SAN JOAQUIN DELTA
Sampling Locations

Average nitrogen concentrations in Yolo Bypass complex





Average chlorophyll a concentrations in the Yolo Bypass complex

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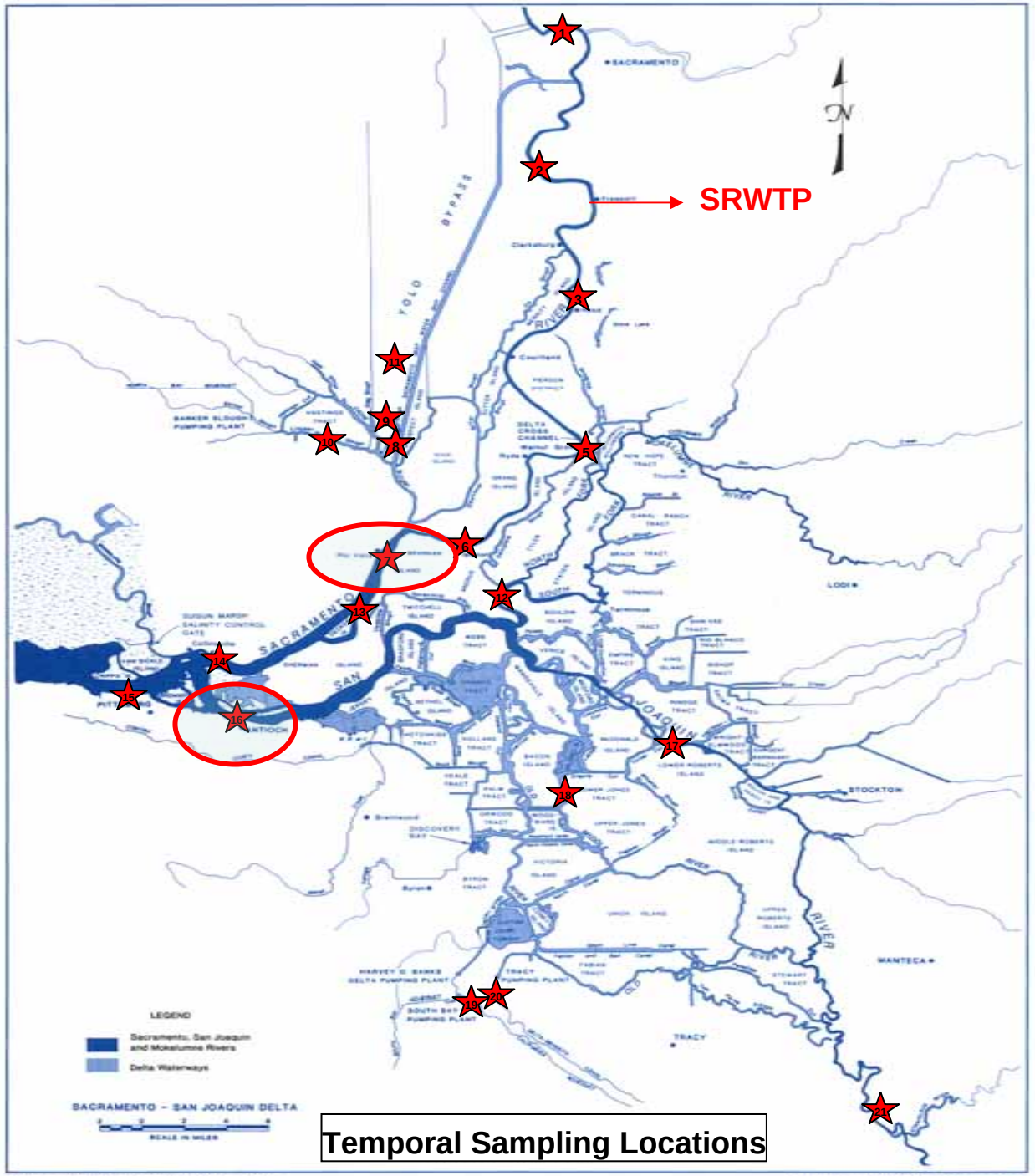
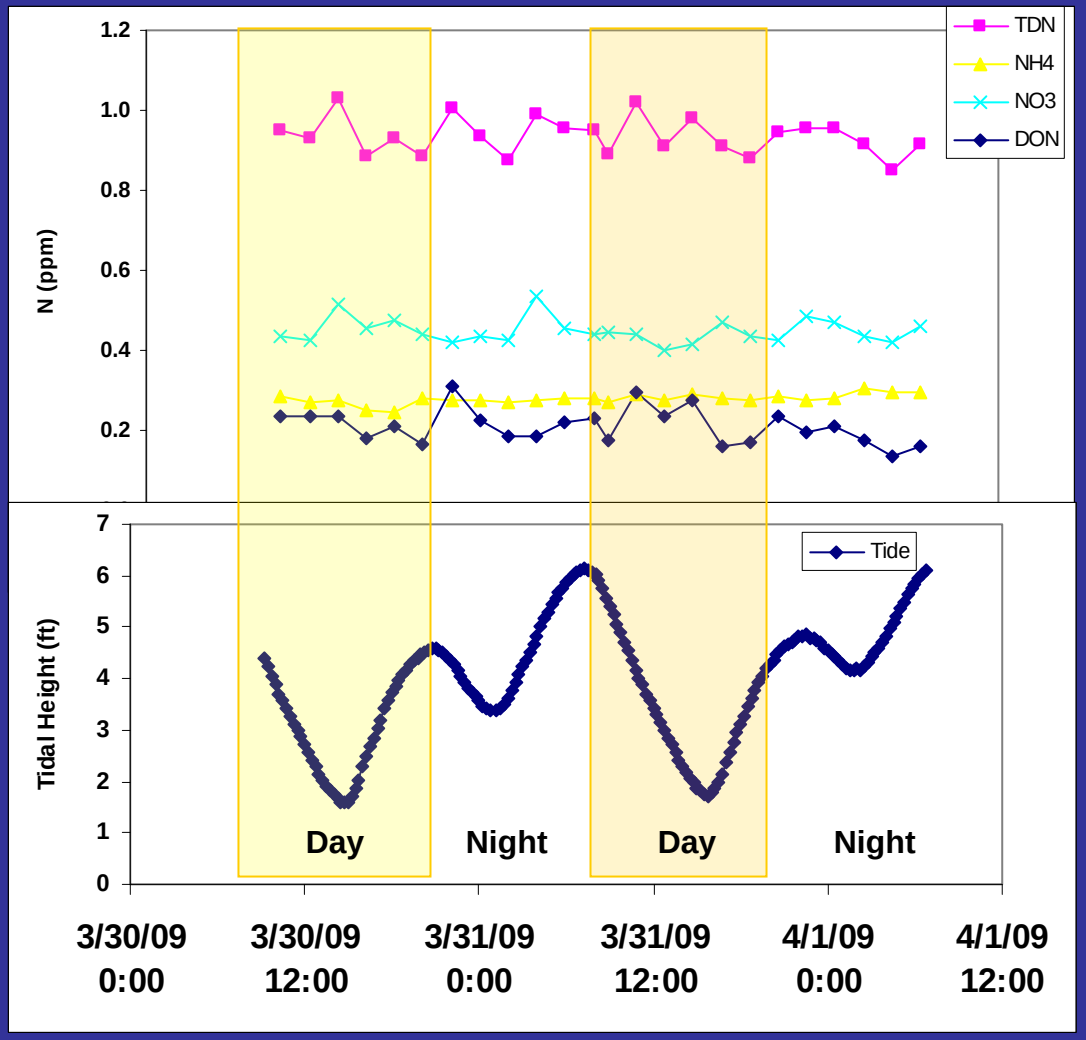


Sacramento–San Joaquin Delta Atlas *Department of Water Resources*

Rio Vista



Change in nitrogen concentrations as a function of tidal cycle and diurnal pattern

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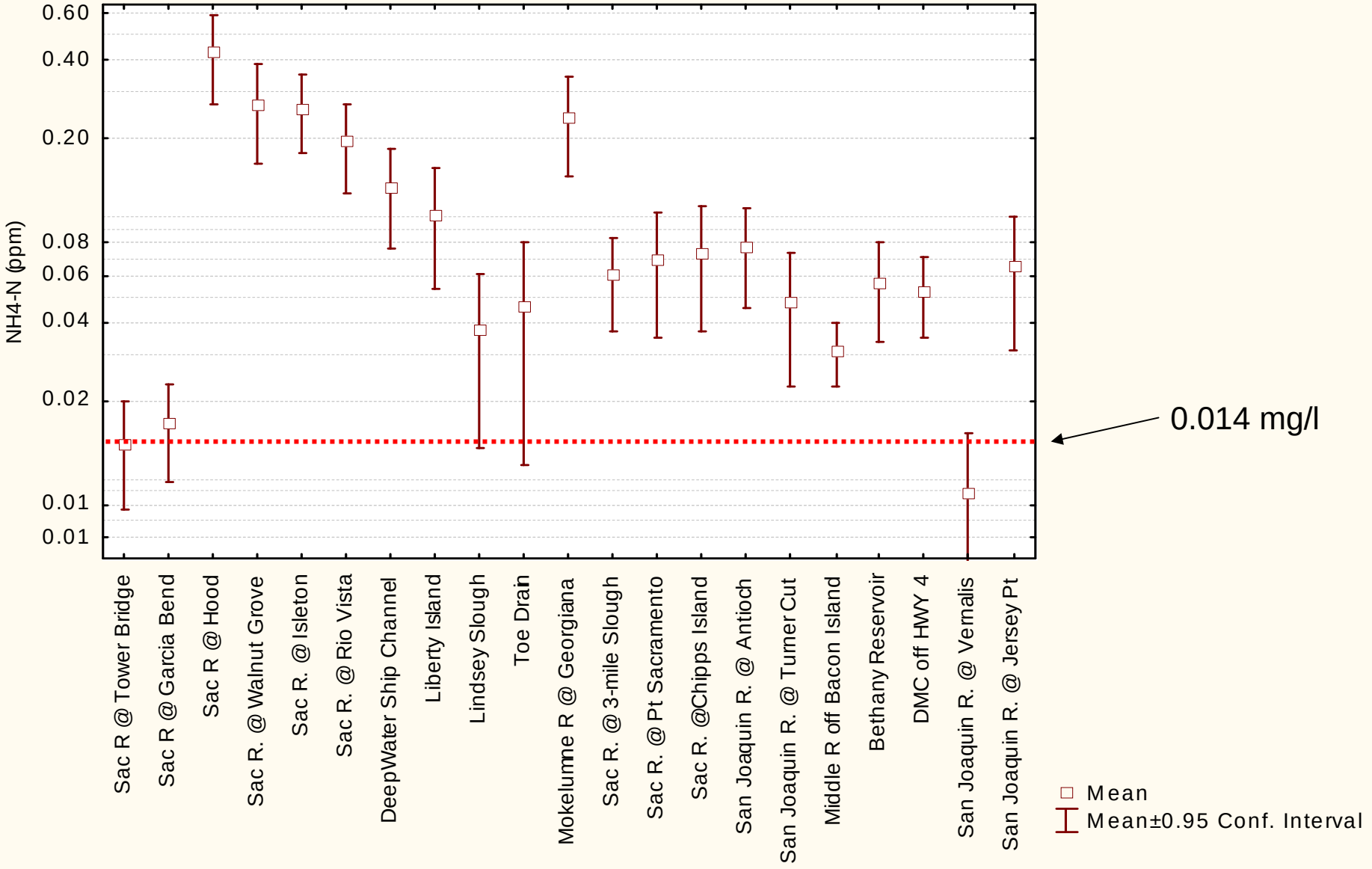
Compared ambient data against chronic U.S. EPA freshwater criteria (early life stages of fish present)

Result:

- **1/184 ambient samples exceed criteria**

- **Smallest safety factor was in Sacramento River below the SRWTP outfall. The lower River had a 5-10 fold safety factor**



Ambient ammonia levels compared against Alex Parker's nitrogen inhibition uptake value of 0.014 mg/l-N ammonium

Conclusions

The Regional Board has been measuring nutrients, including ammonia, in the Delta monthly since March 2009.

Average total dissolved nitrogen concentrations increase in the Sacramento River below the SRWTP from 0.25 to 0.75 mg/l. Ammonia is the most common species.

Ammonia concentrations progressively decrease in a transect down the Sacramento River between Hood and Chipps Island. Most of the decline occurs before Three Mile Slough. Ambient nitrite and nitrate concentrations are the mirror image of ammonia suggesting that most of the loss of ammonia is due to microbial nitrification.

Chlorophyll concentrations decrease down the River between Tower Bridge and Rio Vista. The cause of the decline is not known. Concentrations increase between Rio Vista and Point Sacramento before commencing to decline again.

The Yolo Bypass complex appears to be a sink for ammonia but a possible source of nitrate and chlorophyll.

Conclusions (continued)

High frequency diurnal sampling at Rio Vista and Antioch suggested that nitrogen concentrations were not changing as a function of either the day/night or tidal cycle.

Ambient ammonia levels were compared with the US EPA chronic criteria after adjusting for temperature and pH. Only 1 of 184 samples exceeded the criteria suggesting that the chronic criteria is being met in the lower Sacramento River and Delta.