

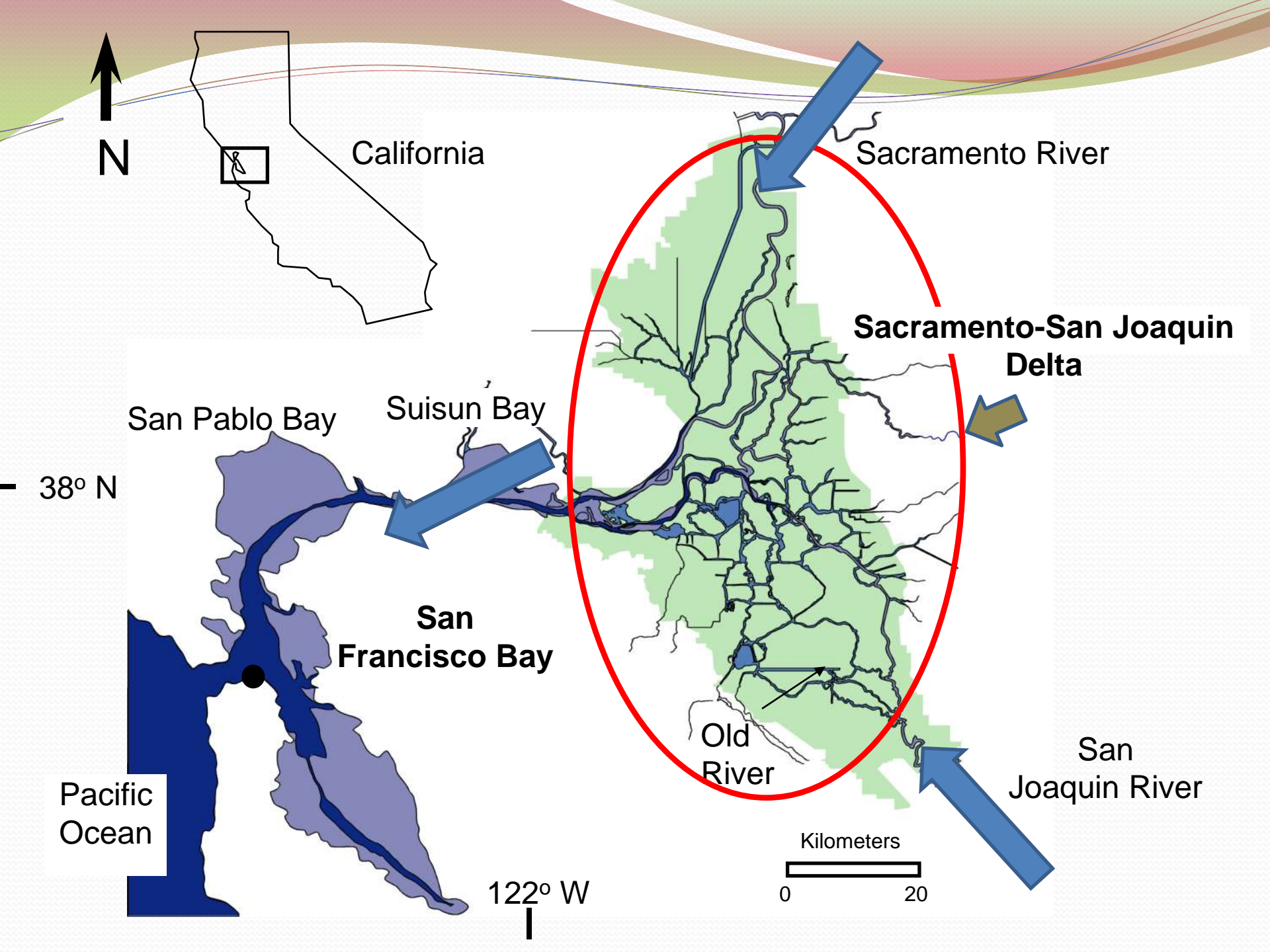
High frequency variability of phytoplankton and zooplankton in the San Francisco Estuary

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UCSC

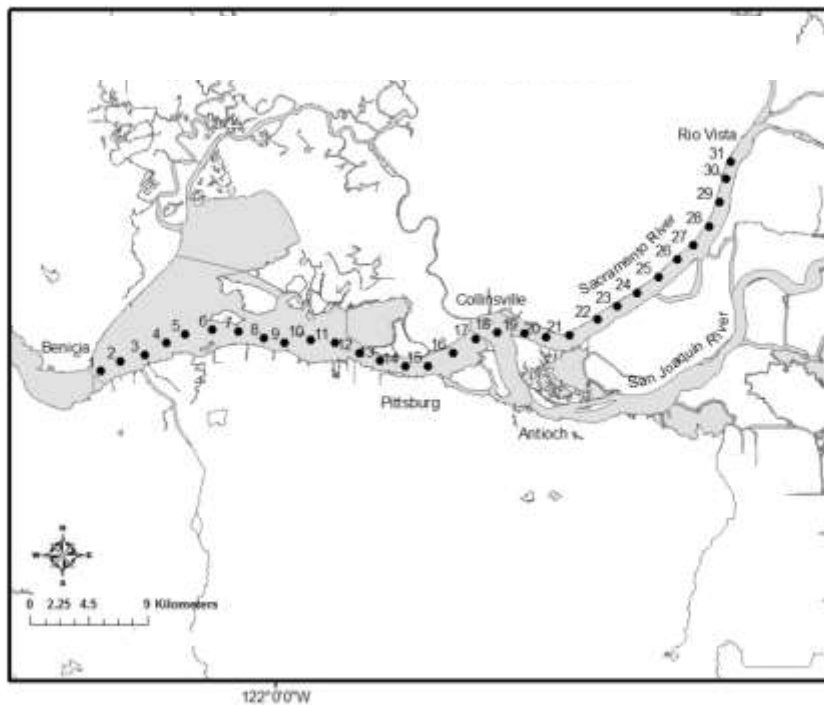


Hypotheses

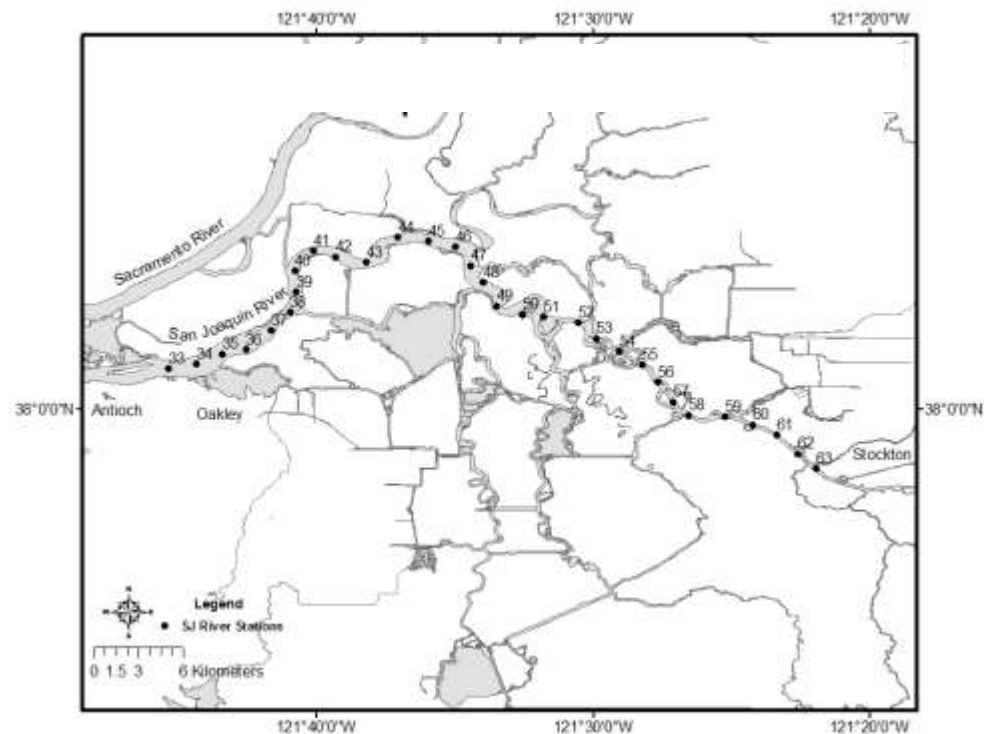
- Plankton in the lower food web and water quality conditions vary at high frequency spatial scales
- The high frequency spatial scale variation of plankton in the lower food web and water quality are correlated



Sacramento River



San Joaquin River



1.5 km between stations along 46 km transects



Sampling

- Monthly May through November
- Continuous sampling
 - Continuous water quality with YSI sonde
 - Continuous phytoplankton yield with Turner Phytoflash fluorometer
- Discrete sampling at 1.5 km intervals
 - Light regime with LiCOR light meter
 - Phytoplankton community composition
 - Cyanobacteria abundance by DNA
 - Phytoplankton and cyanobacteria toxins
 - Zooplankton abundance
 - Nutrient concentration every 7.5 km

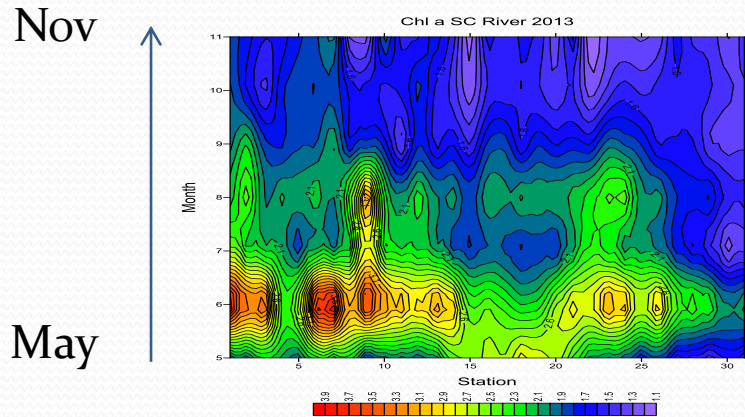


Results - Season



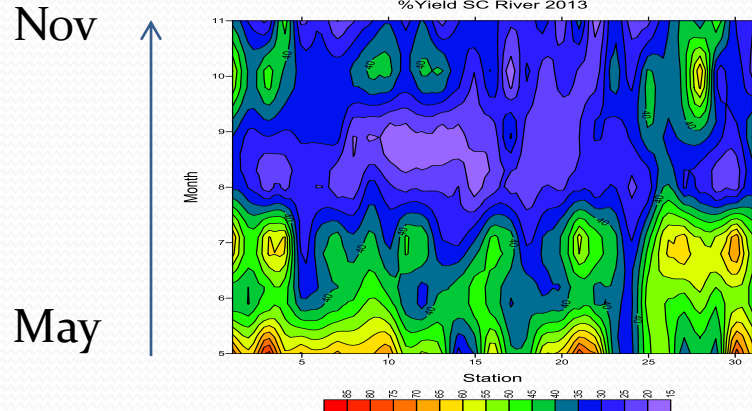
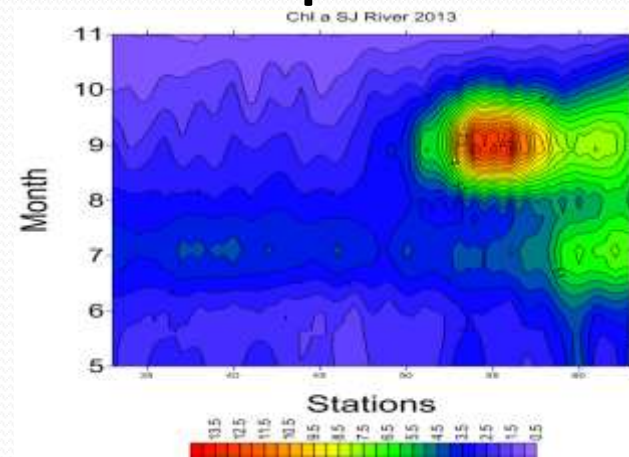
High variability but seasonal stability

Sacramento River

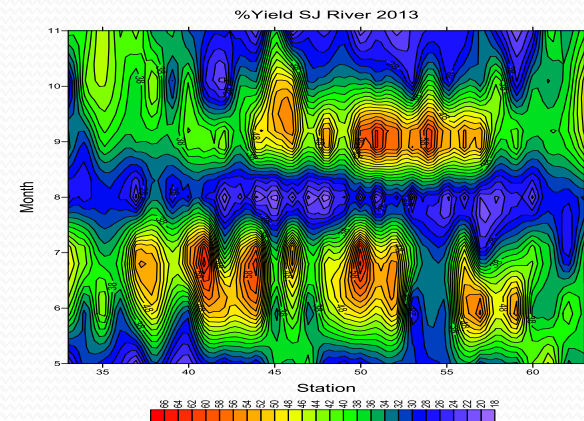


Chlorophyll

San Joaquin River



% Yield



Benicia

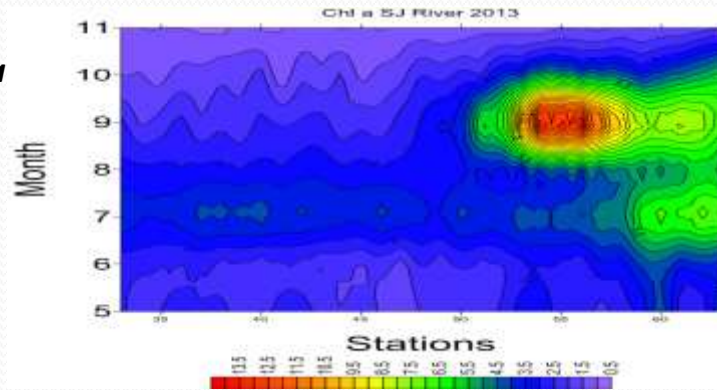
Rio Vista

Antioch

Rough and Ready Is.

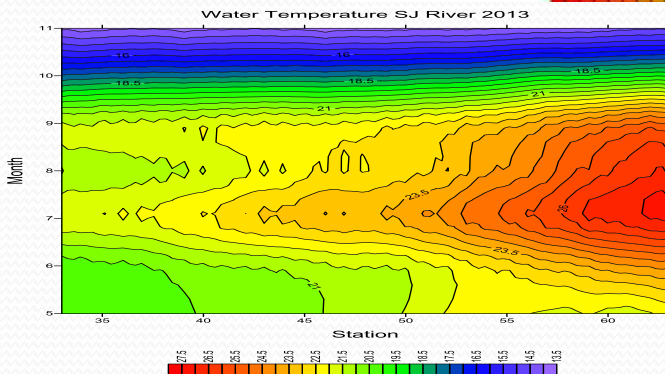
Chlorophyll varied with water quality

Chlorophyll a

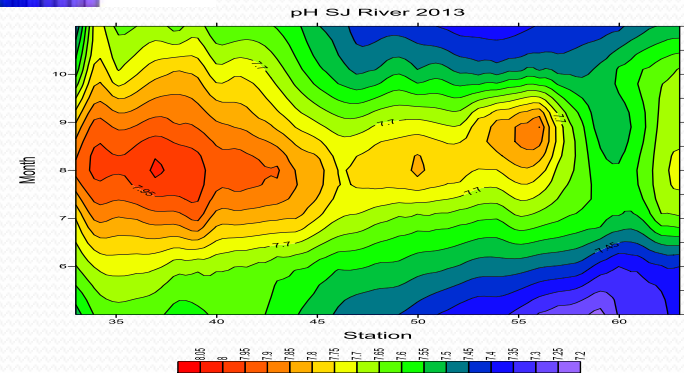


San Joaquin River
August

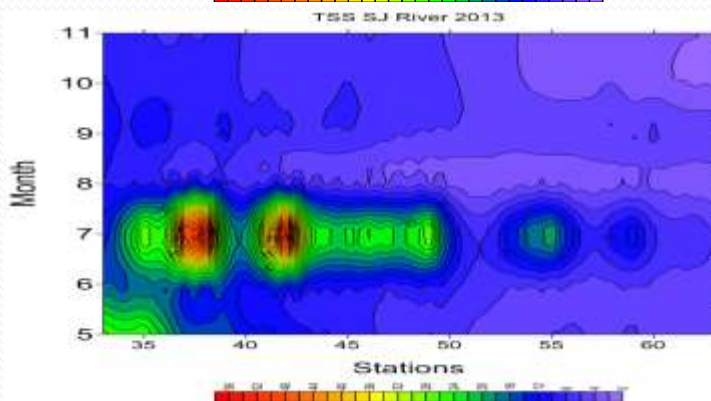
Water
temperature



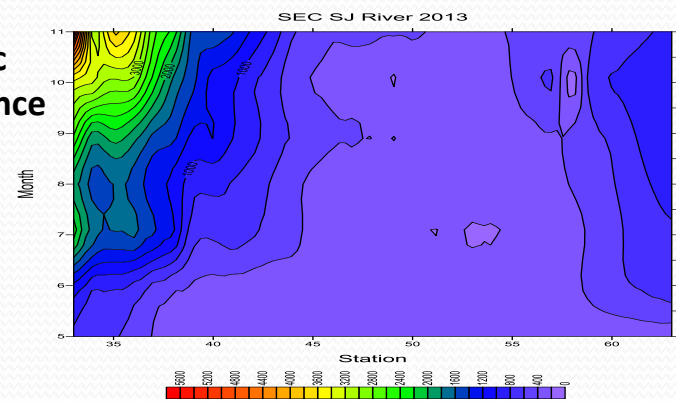
pH



Total
suspended
solids



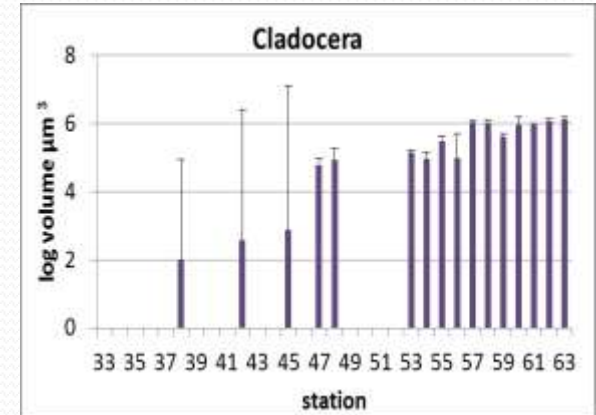
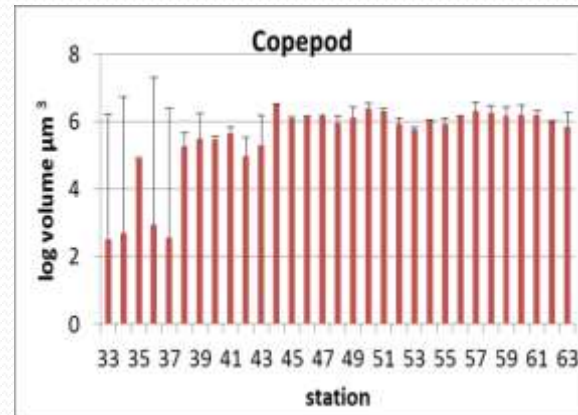
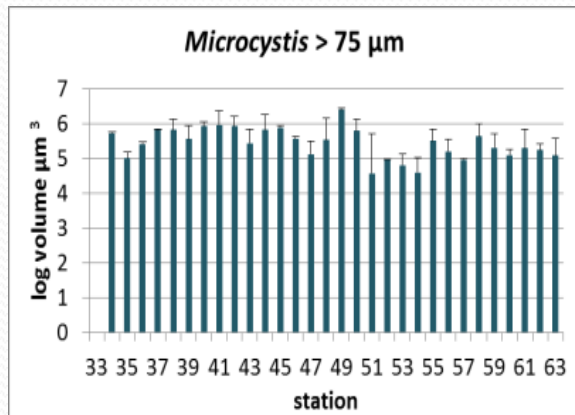
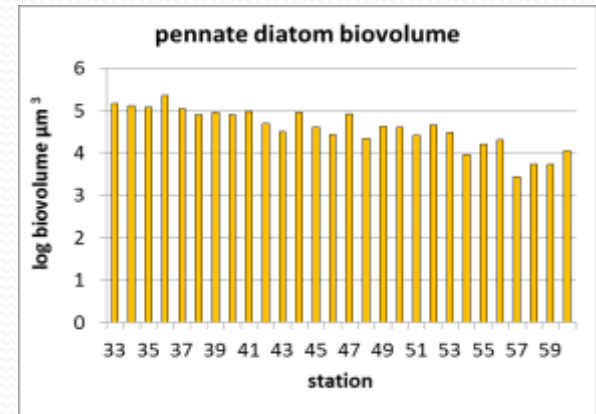
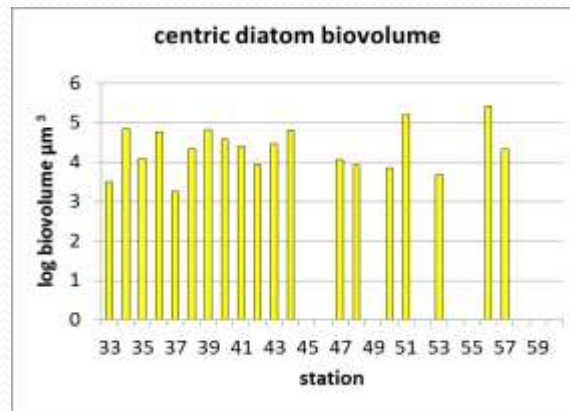
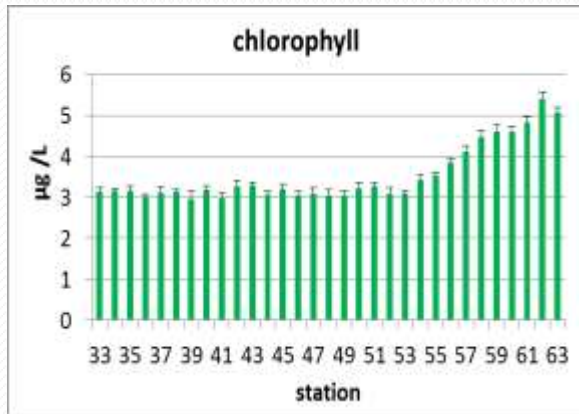
Specific
conductance



Results: transects



High taxonomic variation

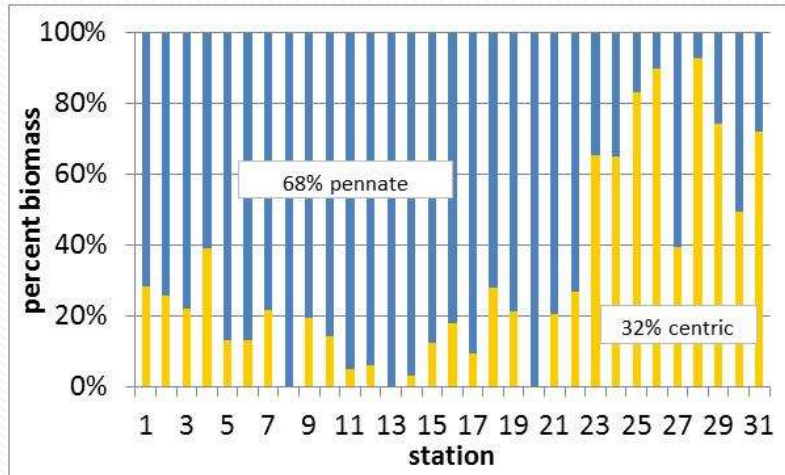


San Joaquin River: August

All stations 1.5 km apart

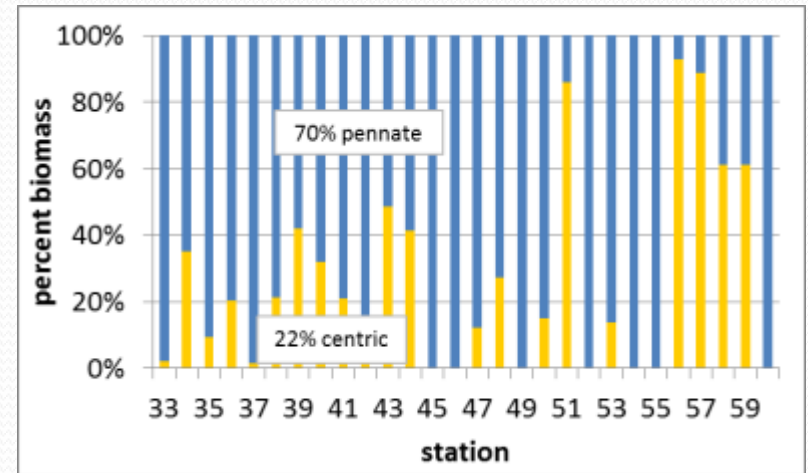
Sacramento River

Diatom

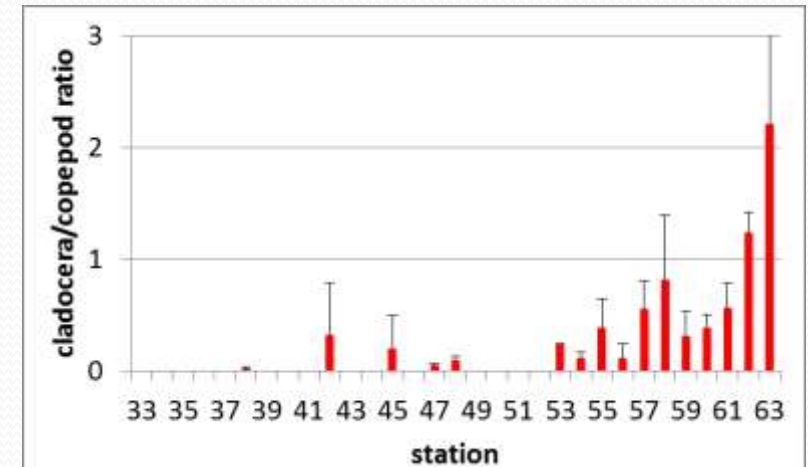
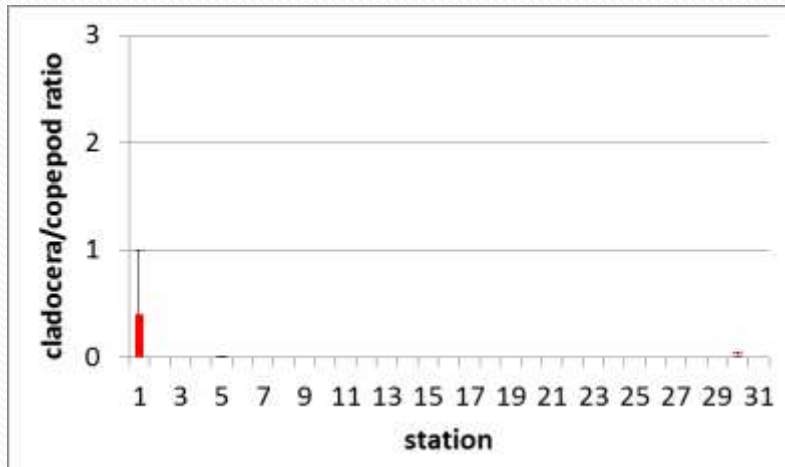


San Joaquin River

Diatom



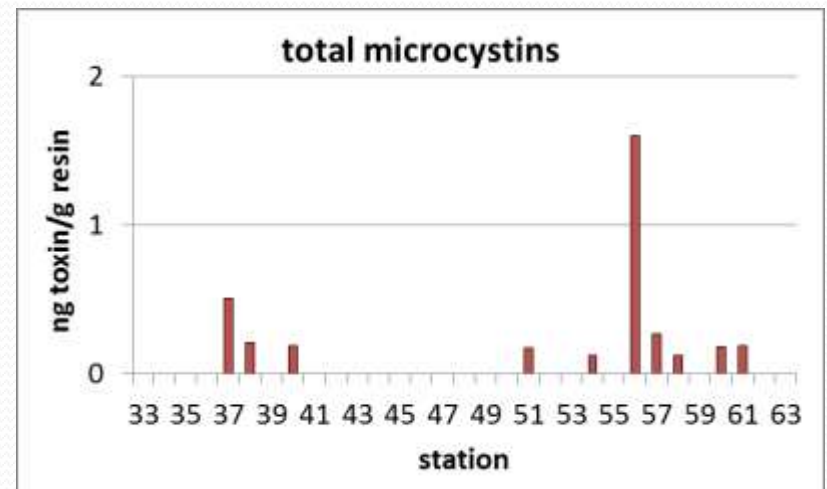
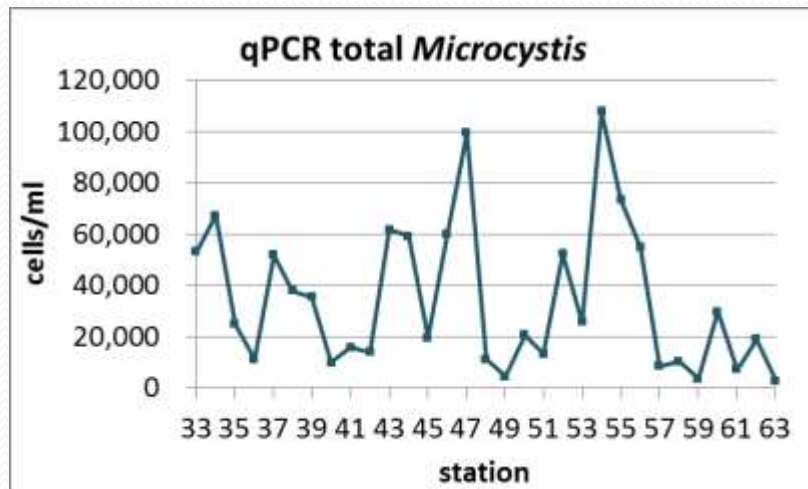
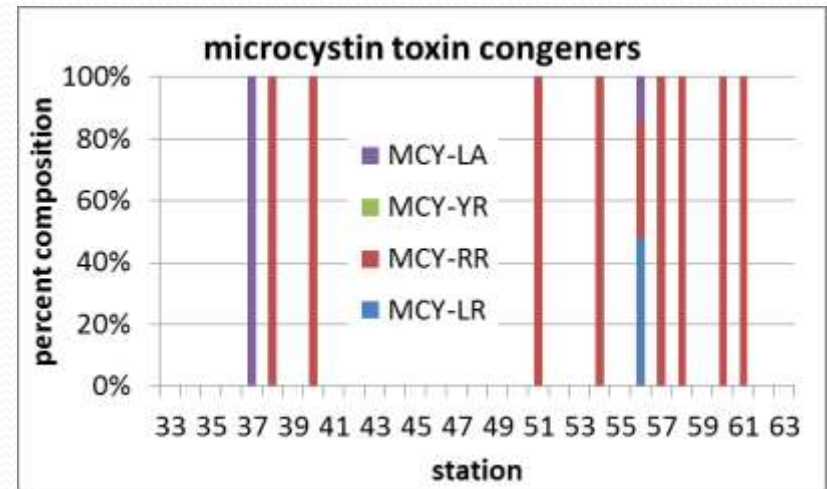
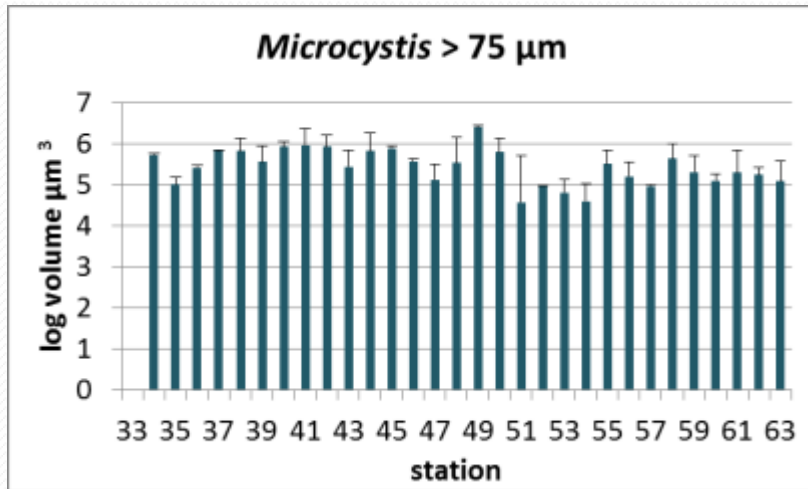
Zooplankton



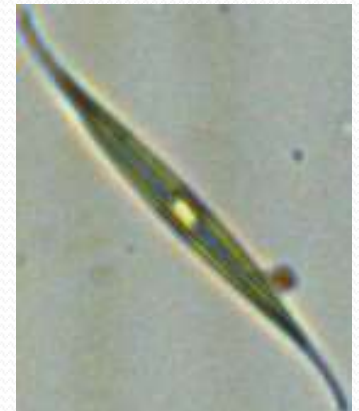
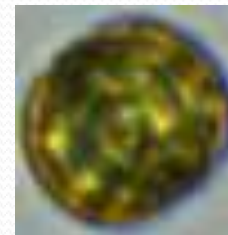
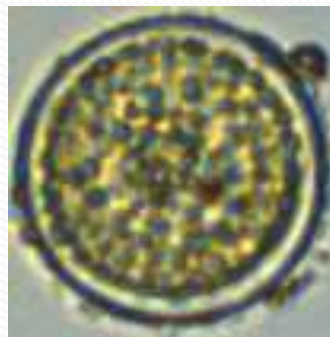
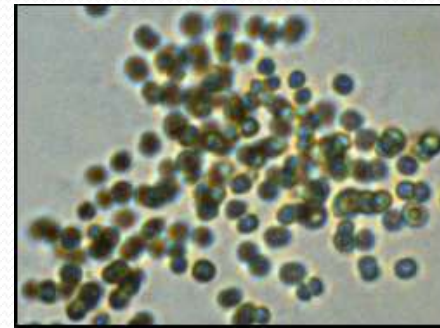
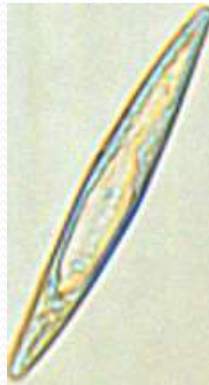
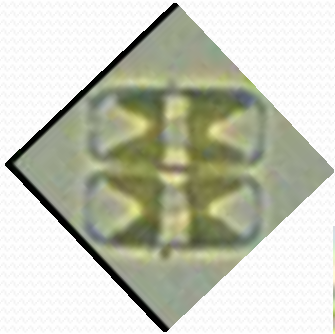
August

High toxin variation

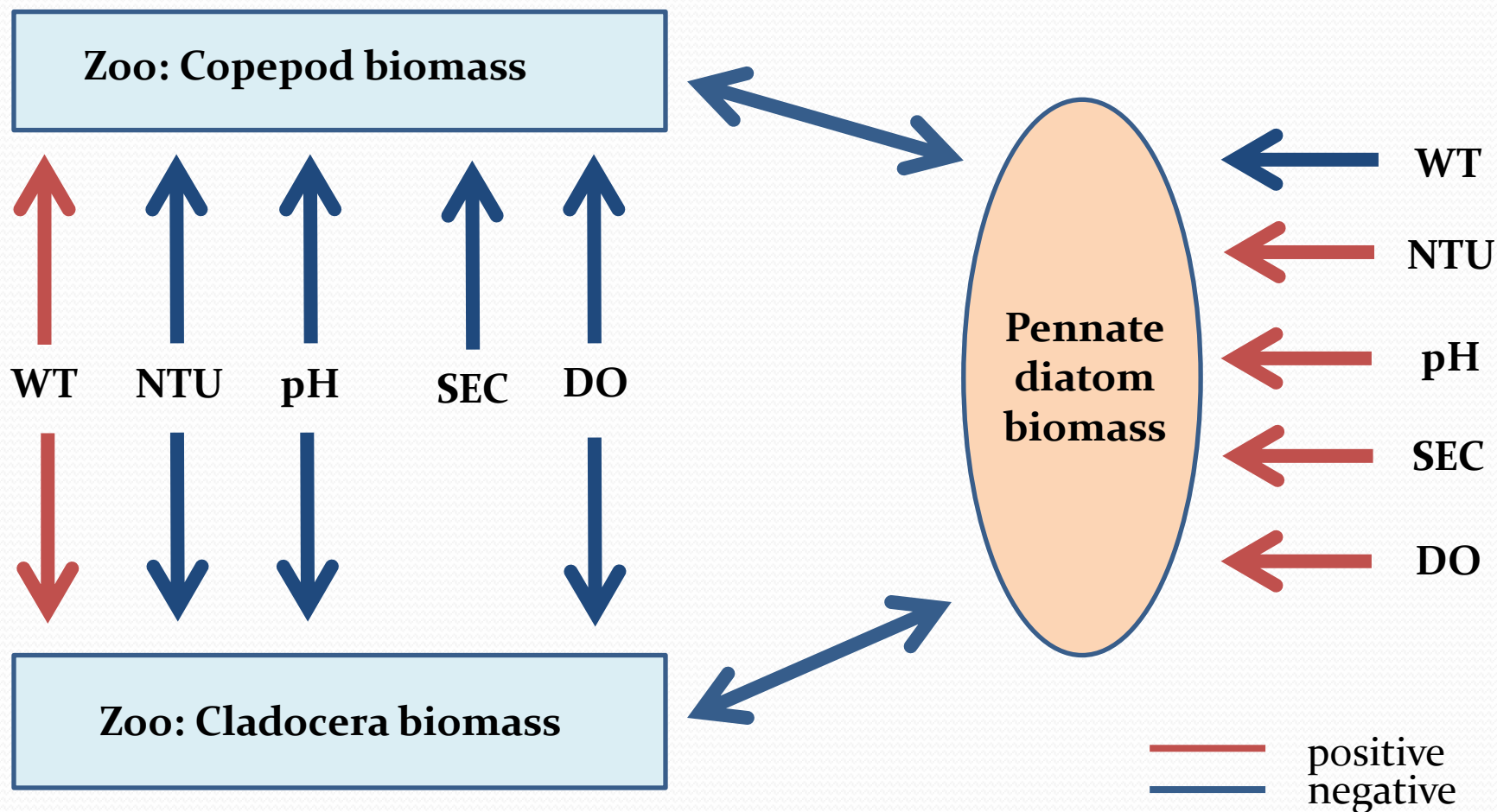
San Joaquin River August



Results: Correlation



San Joaquin River : August



Spearman $r = 0.57$ to 0.91 , $p < 0.01$



Summary

- Plankton and water quality vary by orders of magnitude at spatial scales as small as 1.5 km in the Delta
- The Delta has “hot spots” of lower food web production that span the seasons
- High frequency spatial changes in plankton and environmental variables are correlated



Conclusion

- **High frequency spatial scale measurements are needed to gain a full understanding of the quantity and quality of lower food web production in the estuary and their controlling factors**