SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Lake Trafford Restoration Project

Post-dredge Water Quality Evaluation

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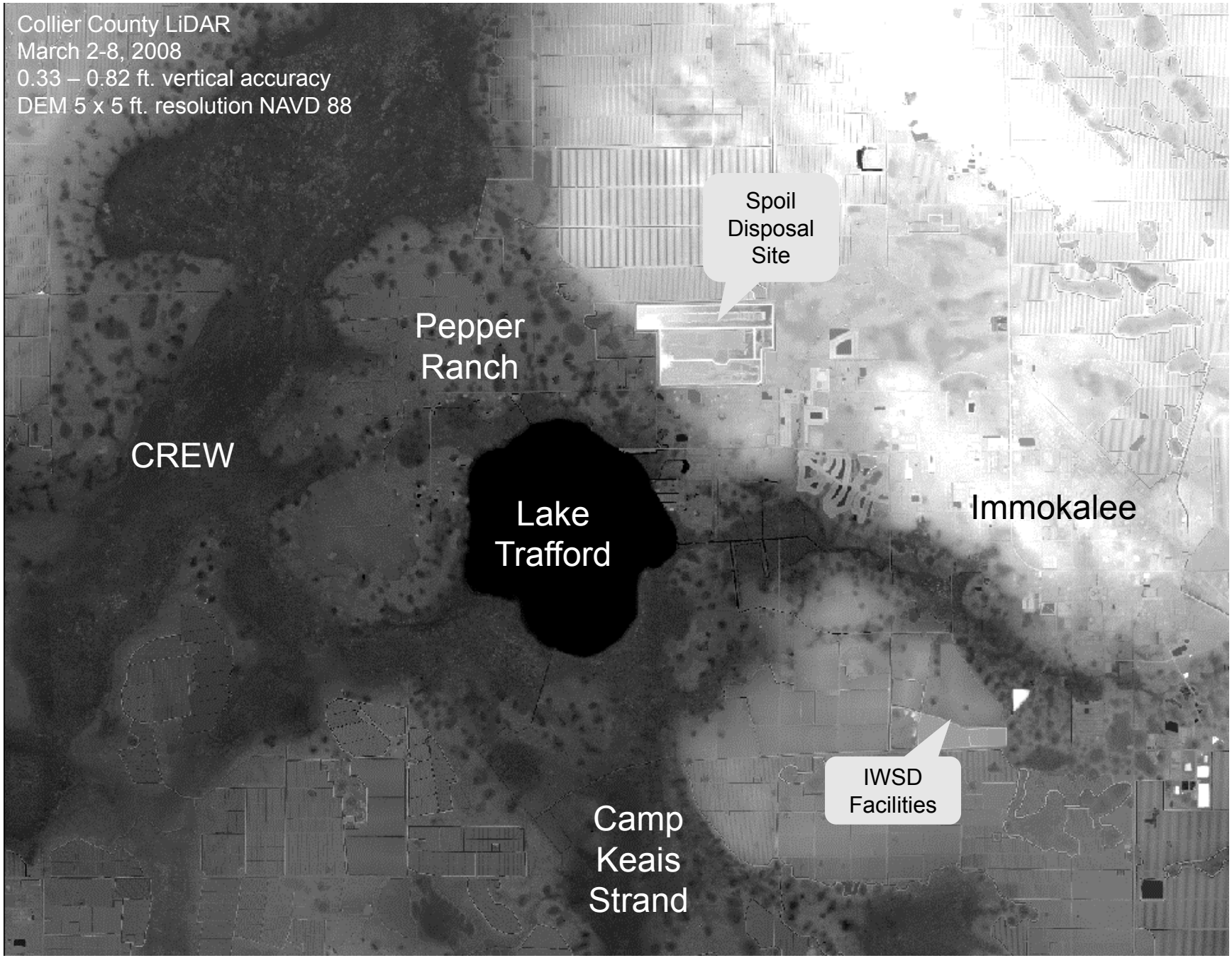
sfwmd.gov

Historical Context

- Natural depression lake within the greater Corkscrew Watershed
- Several inconsequential inlets and no defined outlets
- Predisposed for nutrient accumulation
- Classified as hypereutrophic with recurrent algal blooms and fish kills during mid 1990's
- Grassroots efforts by local citizens (Friends of Lake Trafford) prompted Collier County to establish Lake Trafford Task Force
- Lake Trafford Task Force ultimately led to development of Lake Trafford Restoration Project by USACE

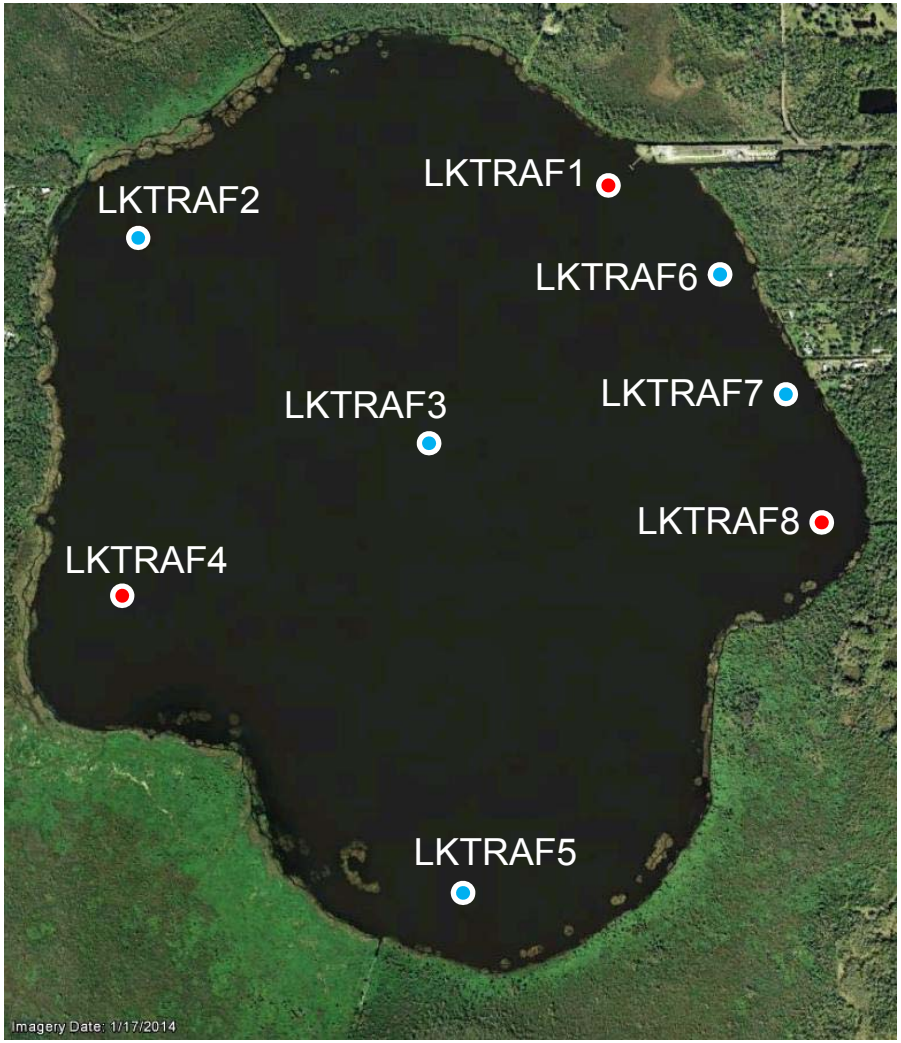
Historical Context (Cont.)

- Purpose of project was to improve water quality and ecosystem functions through removal of nutrient-rich organic sediments (muck) from lake-bottom
- Project originally proposed as USACE-SFWMD partnership in 2000
- SFWMD proceeded with project independently in 2004 following refinement of project scope
- Project completed in 2010 for approx. $21 million
- Additional ecosystem restoration activities conducted per Lake Trafford Task Force Conceptual Plan


Collier County LiDAR
March 2-8, 2008
0.33 – 0.82 ft. vertical accuracy
DEM 5 x 5 ft. resolution NAVD 88
Spoil Disposal Site
Pepper Ranch
CREW
Lake Trafford
Immokalee
IWSD Facilities
Camp Keais Strand

Water Quality Monitoring

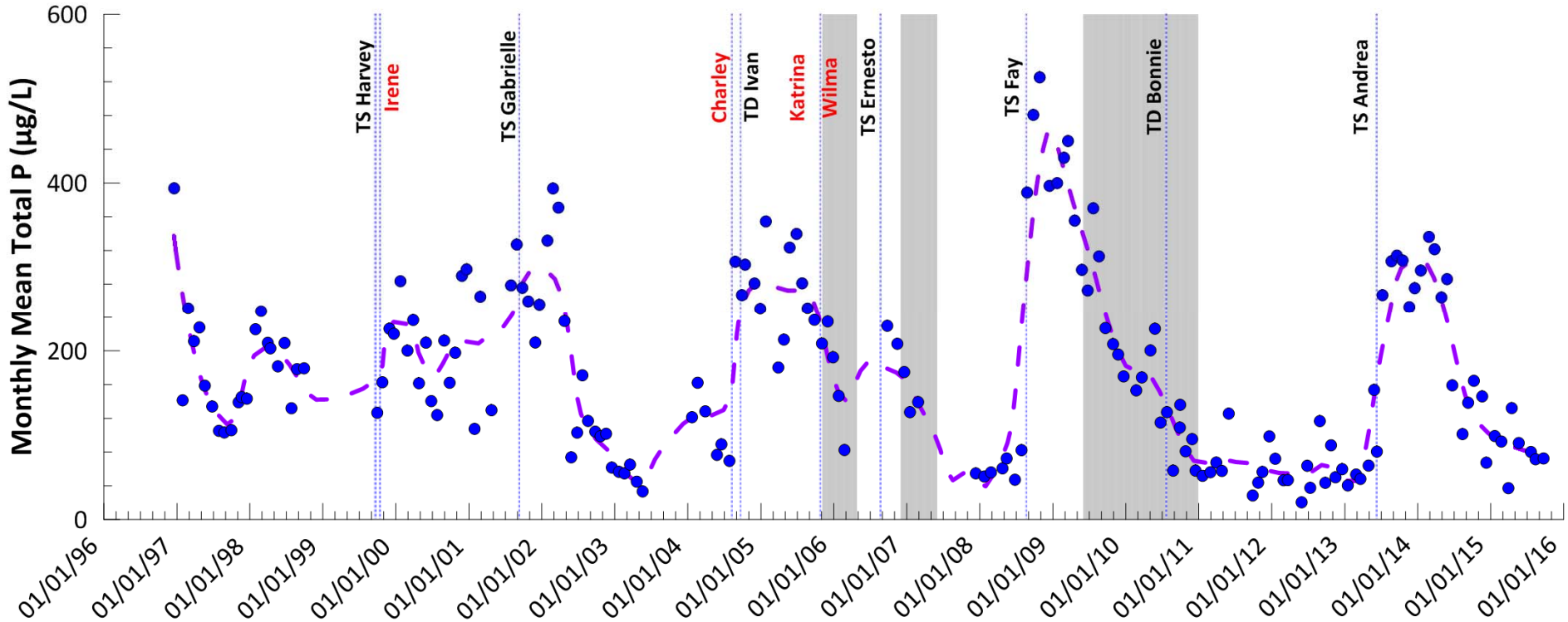
- Collier County obtains monthly samples from fixed stations within lake
- Dataset spans nearly 18 years (1997 – 2015)



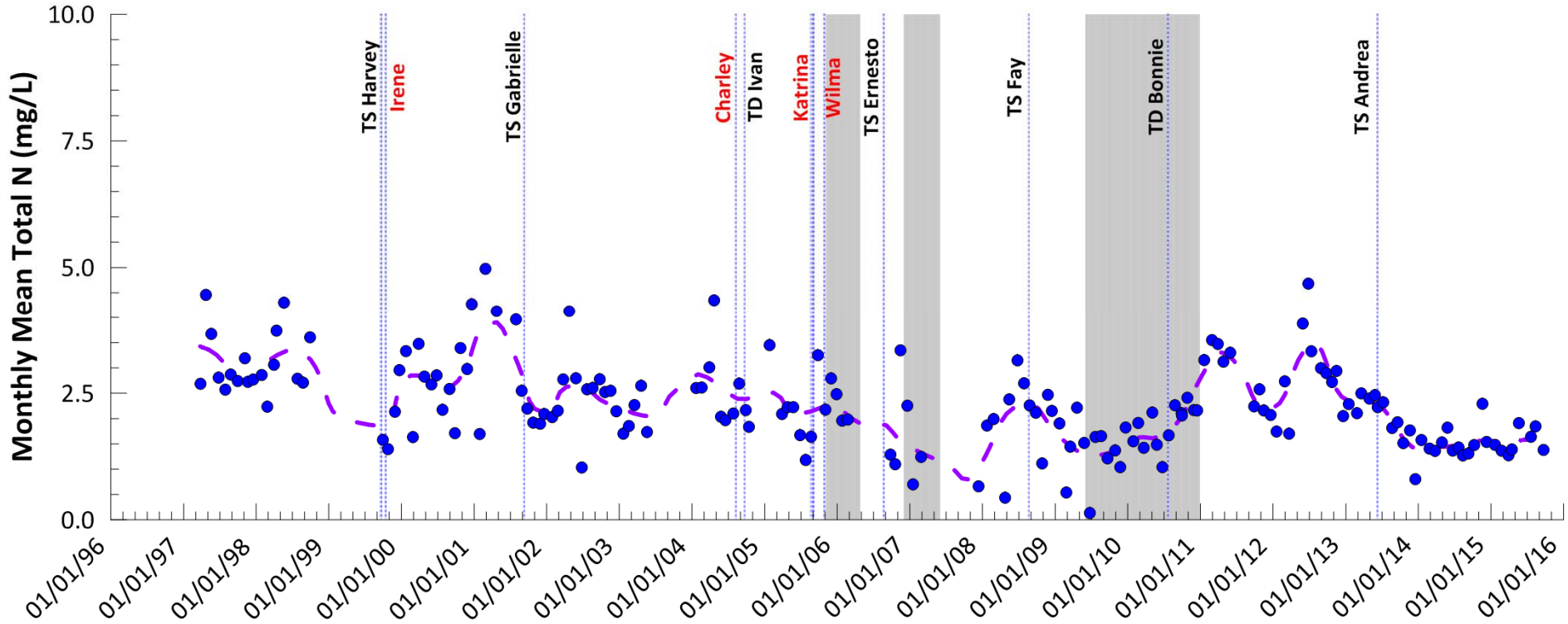
Water Quality Database and Analyses

- Standardization of field and laboratory data
- Development of the water quality database
- Statistical summarization of parameters of interest
  - Total P, soluble reactive P, particulate P, total N, chlorophyll a, sp. conductance, TSS, and turbidity
- Calculation of trophic state index
- Evaluation of trends
- Comparison of pre-dredge, dredge, and post-dredge water quality

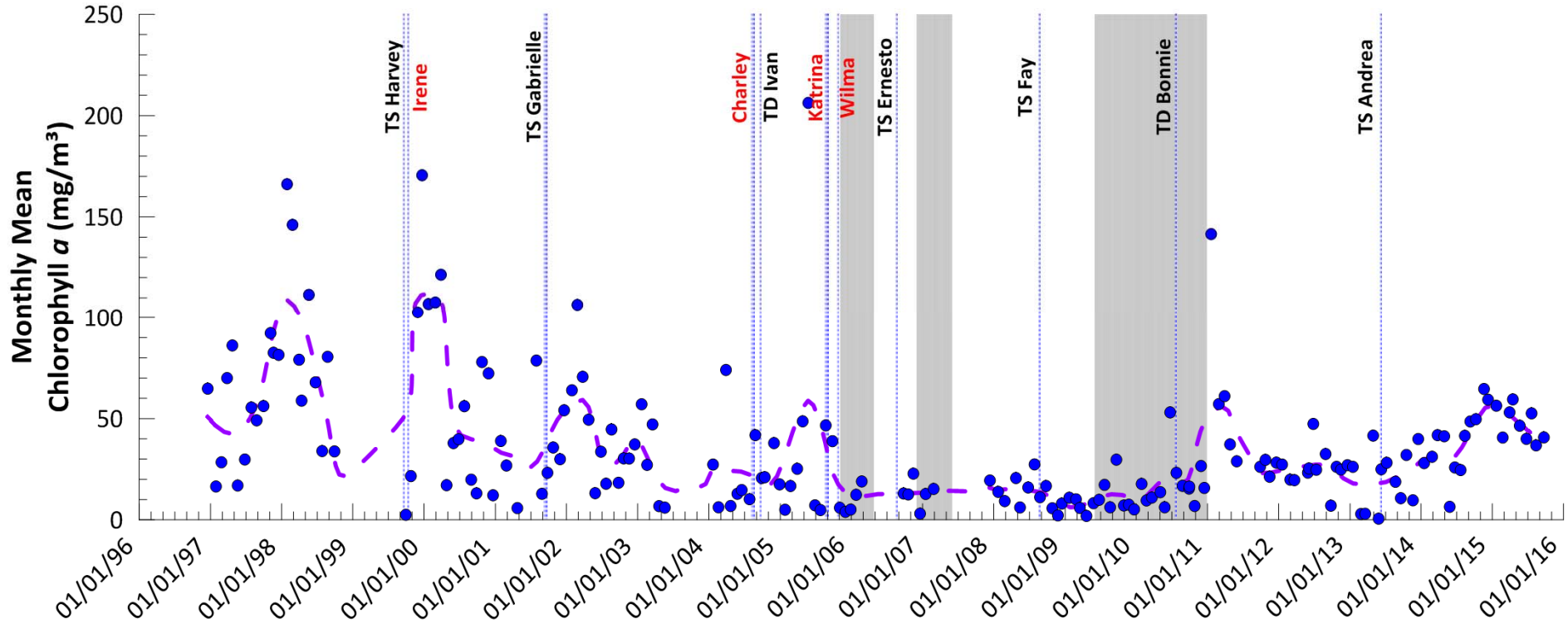
Plot of Mean Total P Concentrations



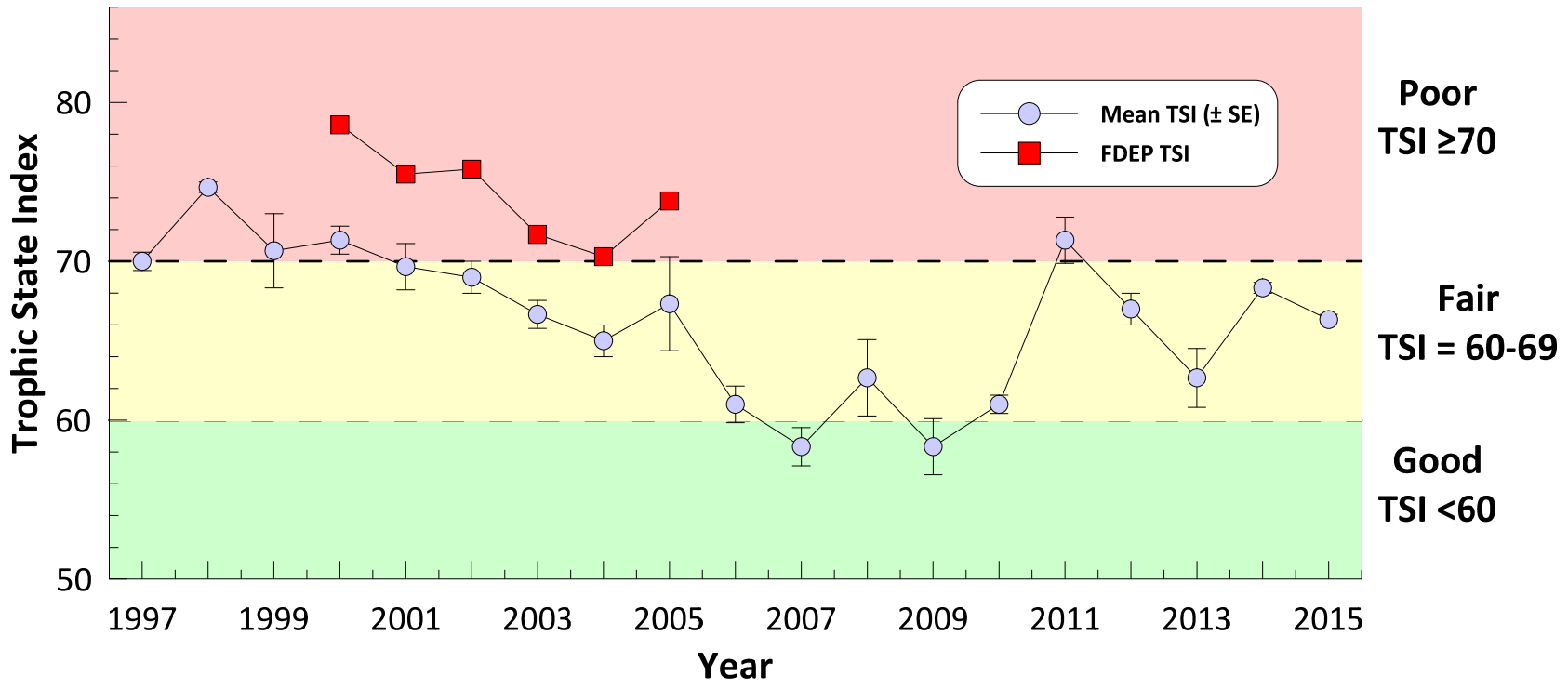
Plot of Mean Total N Concentrations



Plot of Mean Chlorophyll a Concentrations

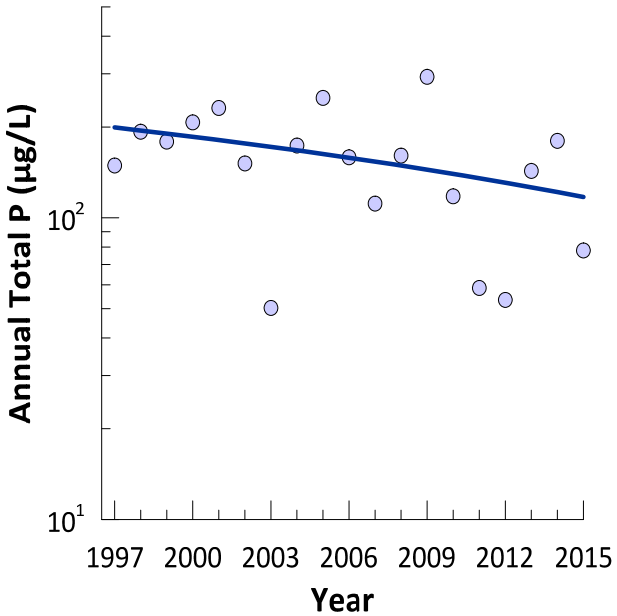


Calculation of Trophic State Index (TSI)

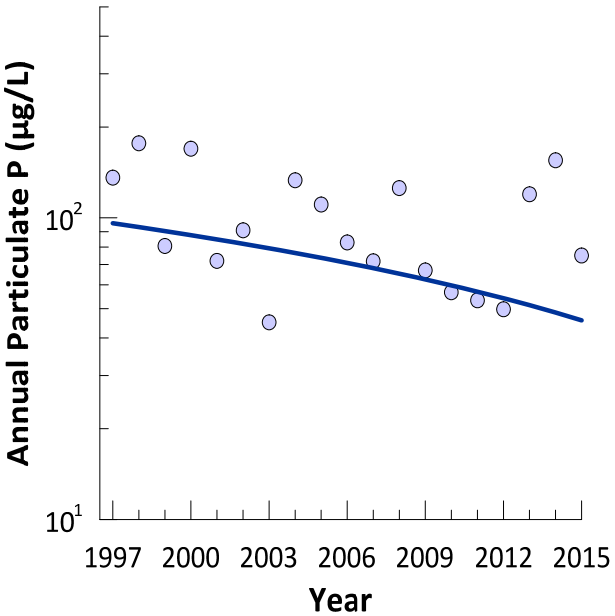


Plots of Annual Trends for Total P and Soluble Reactive P, and Particulate P

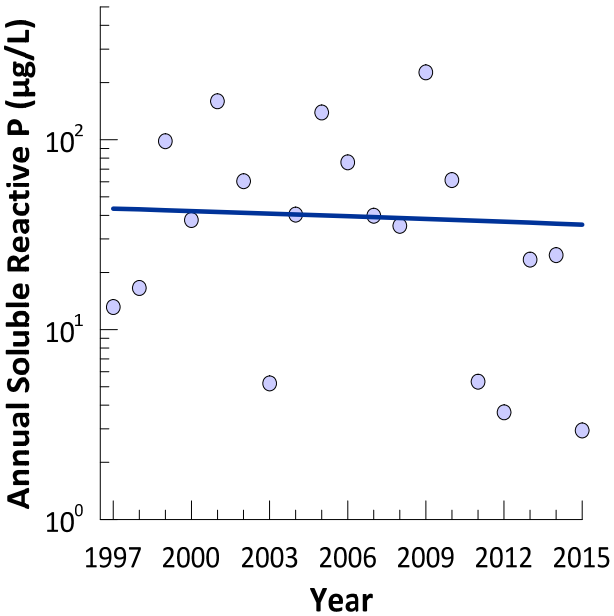
Seasonal Kendall-tau Results			
τ-statistic	-0.186	Sen Slope	-4.6
Intercept	199	p-value	0.176



Seasonal Kendall-tau Results			
τ-statistic	-0.259	Sen Slope	-2.79
Intercept	96	p-value	0.054

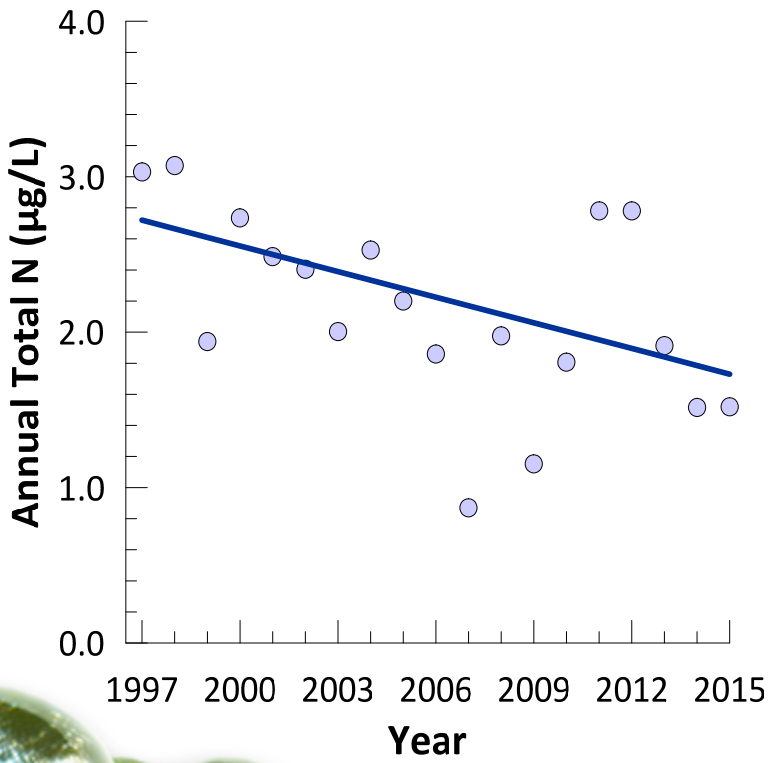


Seasonal Kendall-tau Results			
τ-statistic	-0.13	Sen Slope	-0.43
Intercept	43.4	p-value	0.346

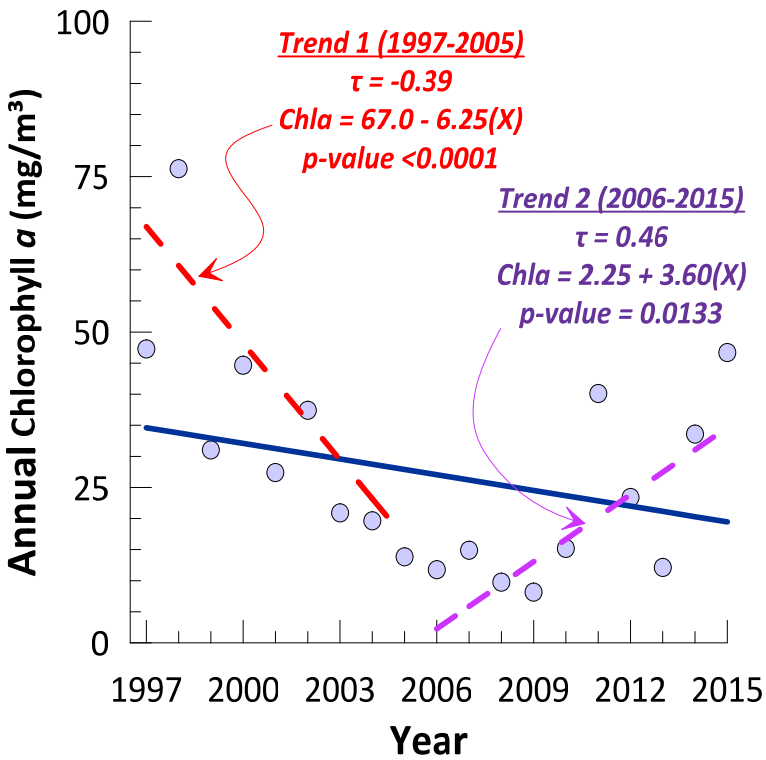


Plots of Annual Trends for Total N and Chlorophyll a

Seasonal Kendall-tau Results			
τ-statistic	-0.29	Sen Slope	-0.06
Intercept	2.7	p-value	**0.017**

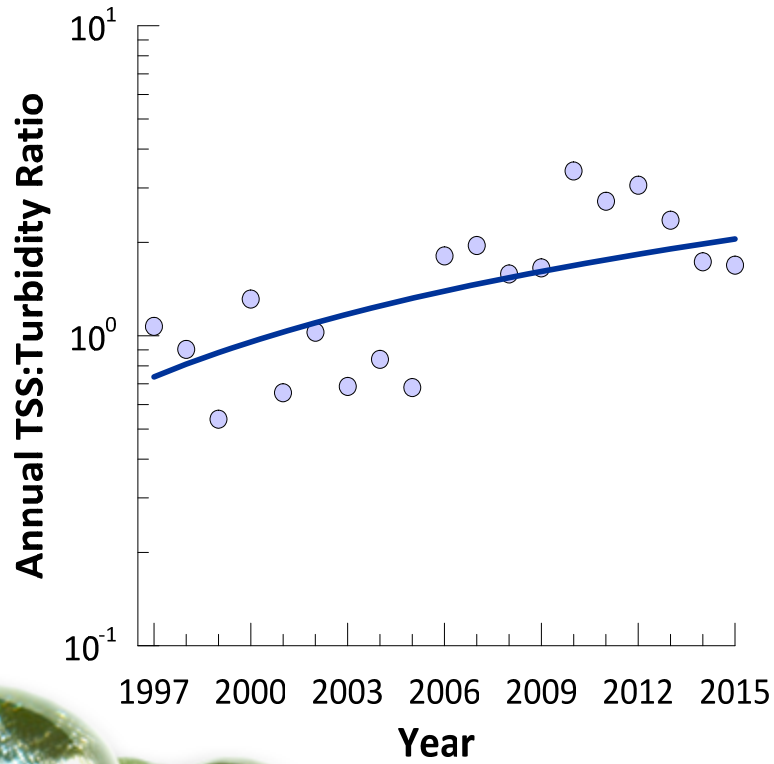


Seasonal Kendall-tau Results			
τ-statistic	-0.15	Sen Slope	-0.84
Intercept	34.6	p-value	0.22

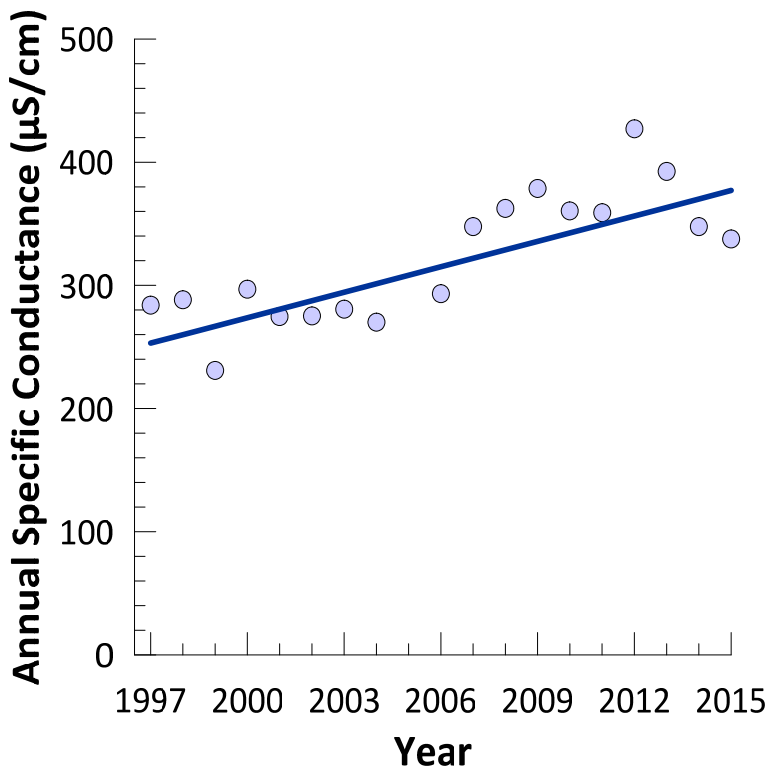


Plots of Annual Trends for Sp. Conductance and TSS:Turbidity Ratio

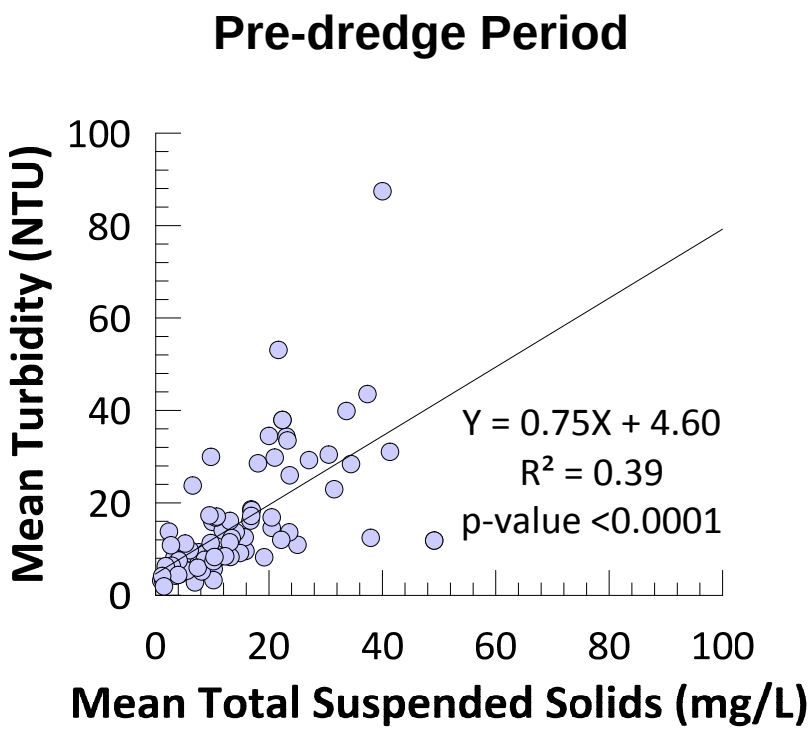
Seasonal Kendall-tau Results			
τ-statistic	0.32	Sen Slope	0.073
Intercept	0.74	p-value	**0.008**

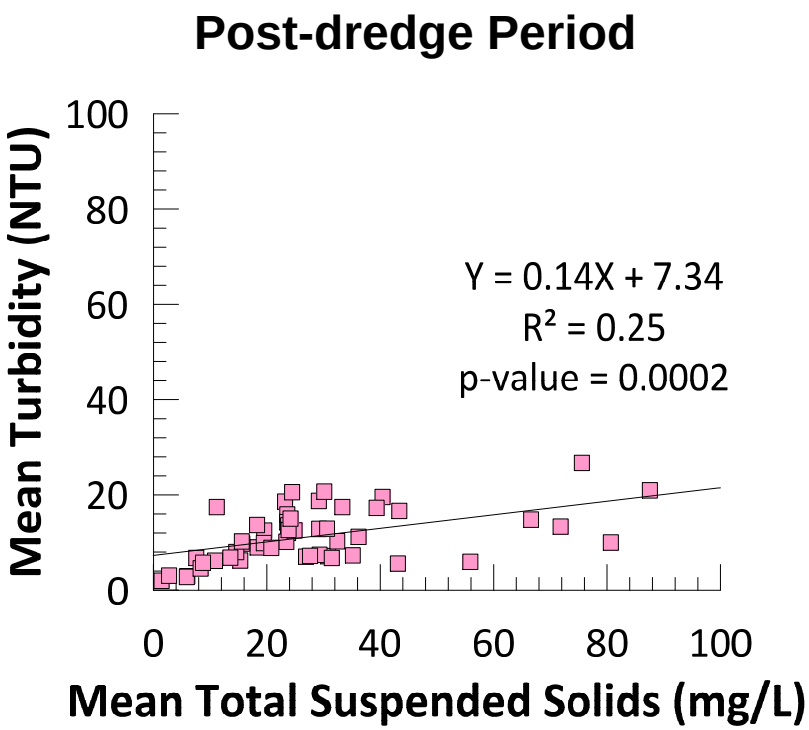


Seasonal Kendall-tau Results			
τ-statistic	0.46	Sen Slope	6.89
Intercept	253	p-value	**0.006**

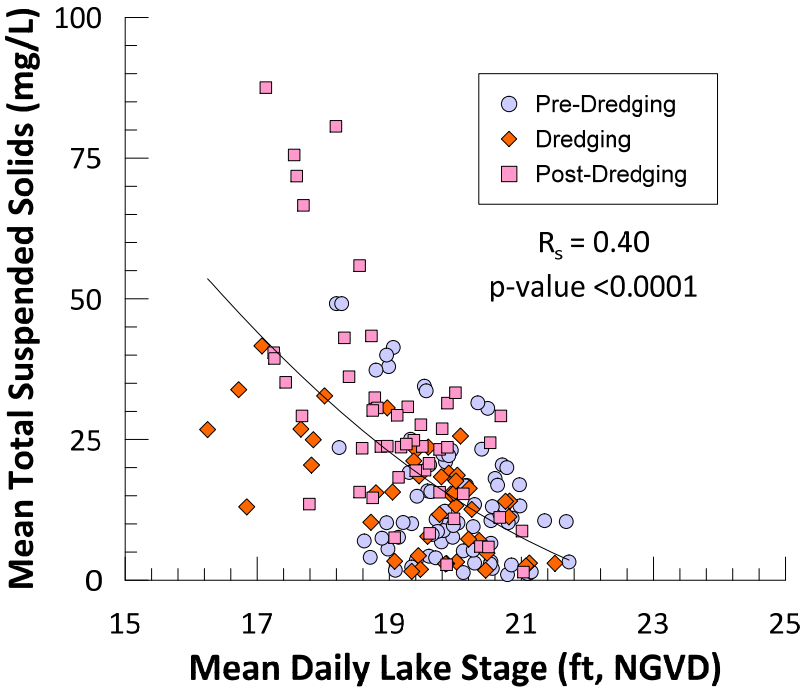


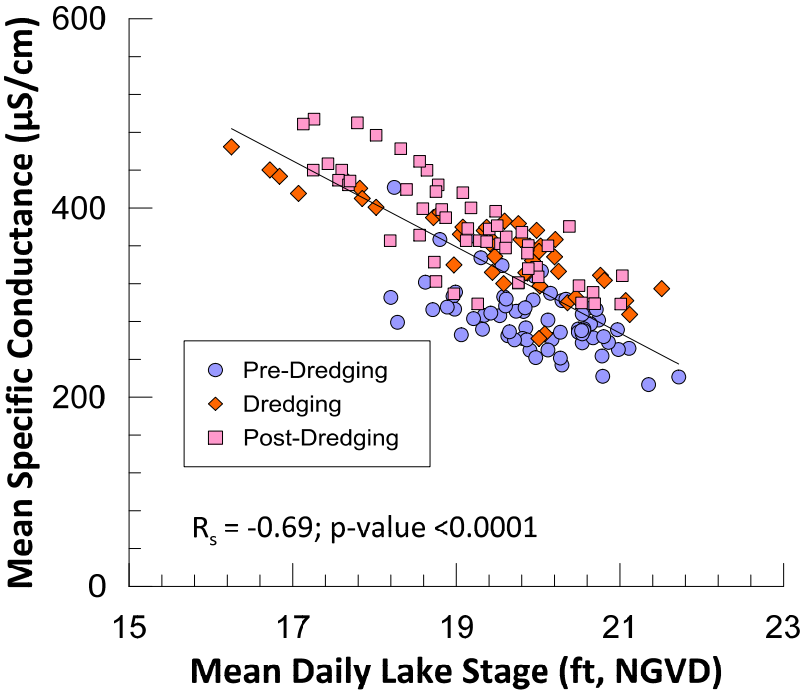
Changing Relationship Between Mean TSS and Turbidity



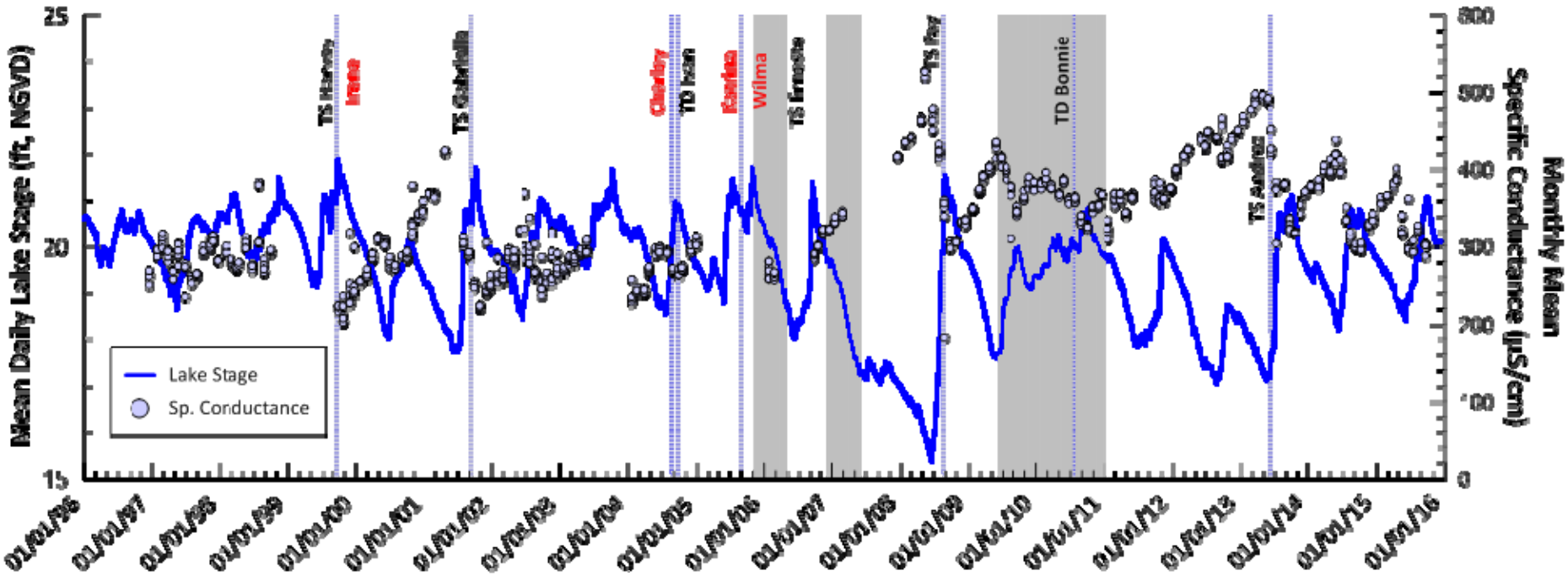


Relationship between Mean TSS and Sp. Conductance with Mean Daily Lake Stage





Plot of Mean Daily Stage and Sp. Conductance



Conclusions

- Measureable water quality improvements appear to be result of Lake Trafford Restoration Project
  - Statistically significant decrease in total N concentrations for entire period of record
  - Statistically significant differences between pre-dredge and post-dredge periods (lower concentrations of nutrients)
- Post-dredge concentrations of chlorophyll a similar to pre-dredge concentrations
  - Statistically significant increase since 2006
- High total P concentrations associated with major tropical events and predominately present as soluble reactive P (indicative of loading from watershed)

Discussion

- Project objectives met
  - Nutrient-laden sediment (muck) removed and water quality improving
- Need to address management of watershed and sources contributing nutrients to lake
  - Factors for accumulation of nutrients and/or suspension of sediments still remain
- Next Steps
  - Continue water quality monitoring
  - Complete watershed delineation study and continue nutrient budget study
  - Develop and implement work plan for Lake Trafford Management Team

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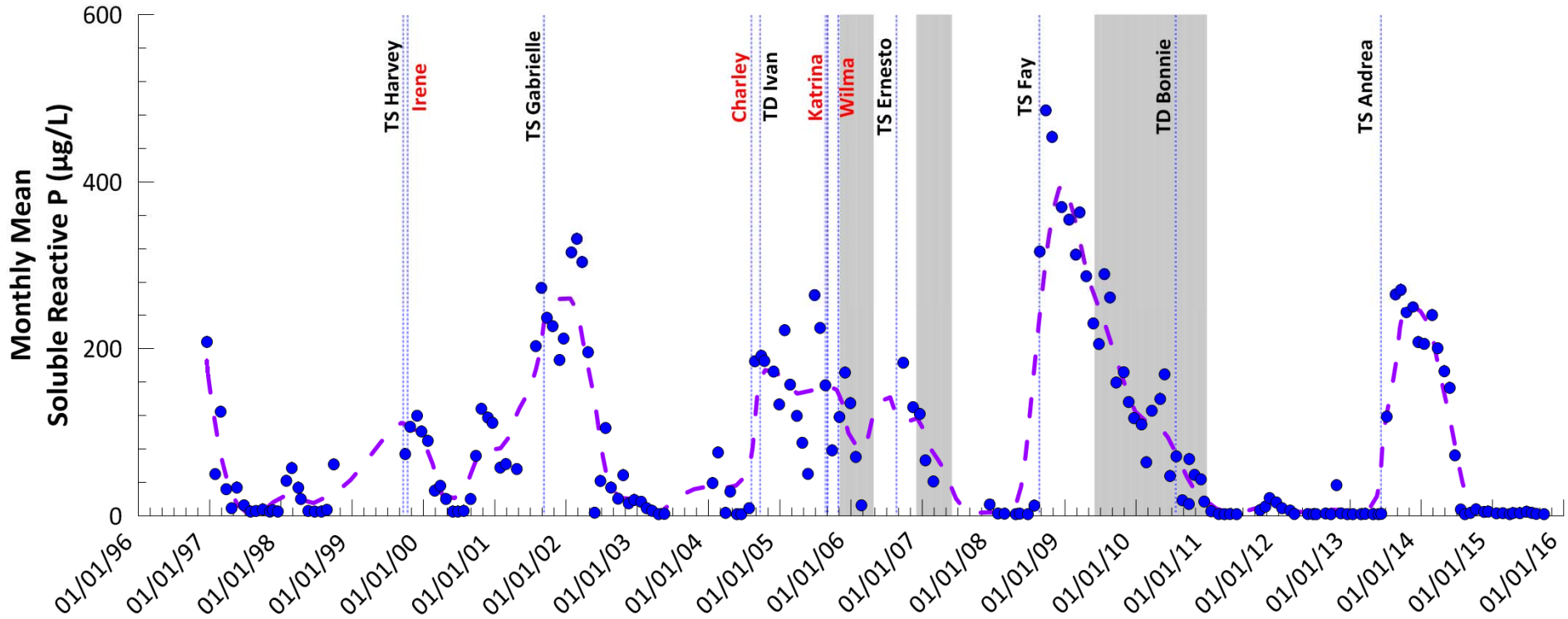
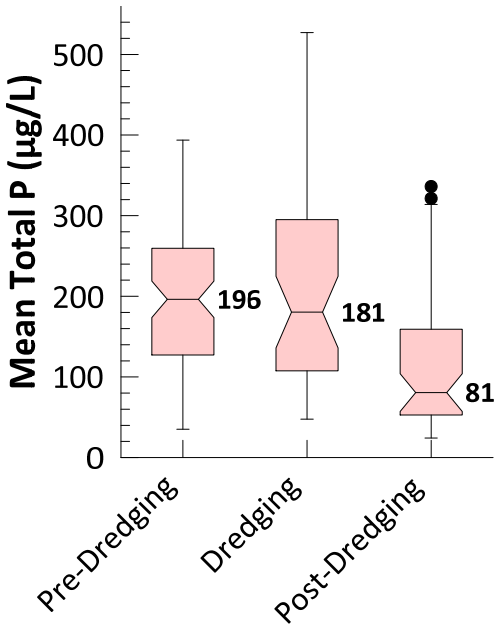
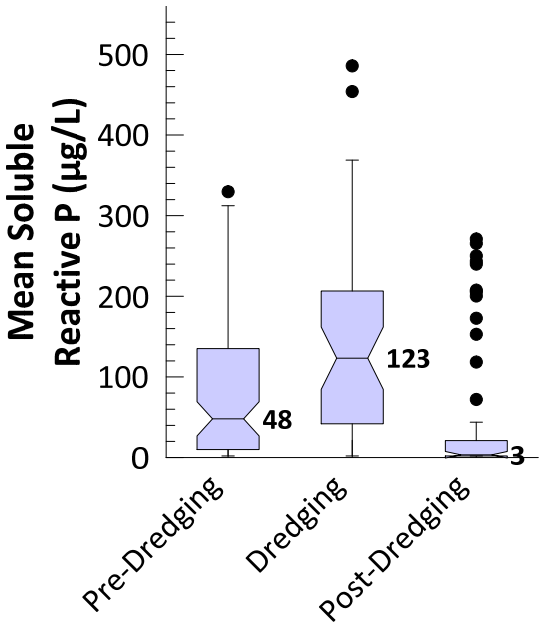
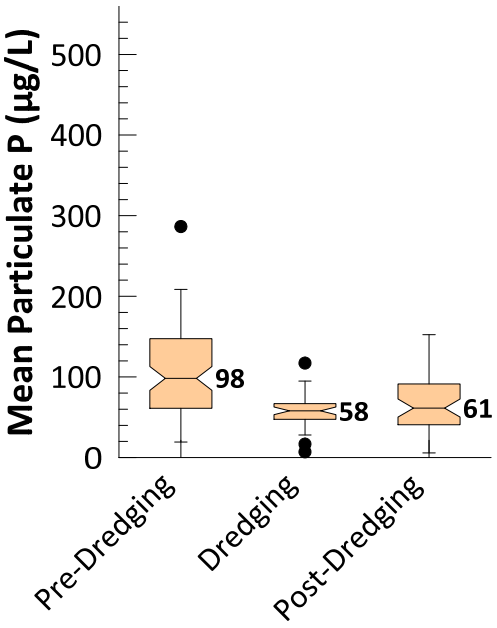
Plot of Mean Soluble Reactive P Concentrations



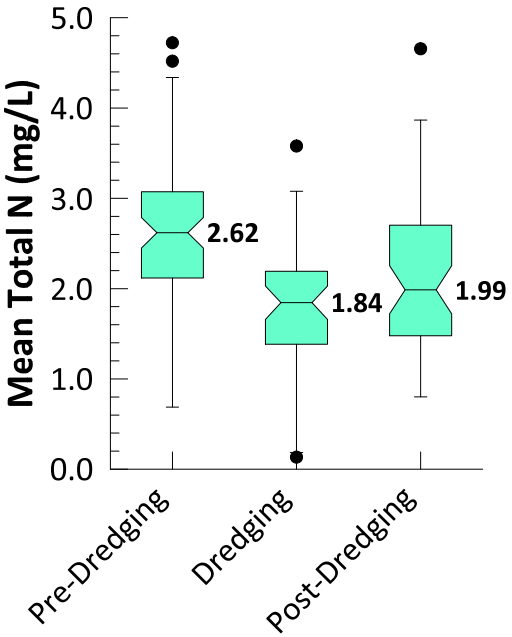
Notched Box Plots of Parameter Means per Period

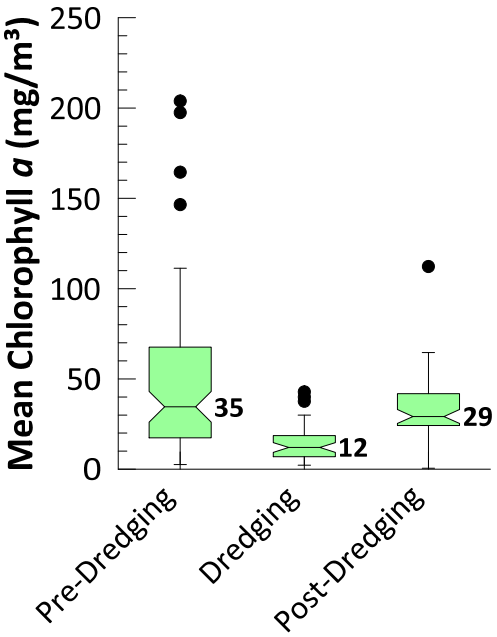


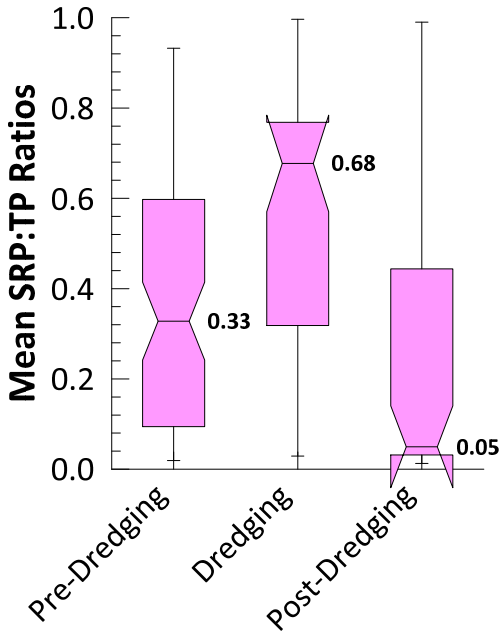
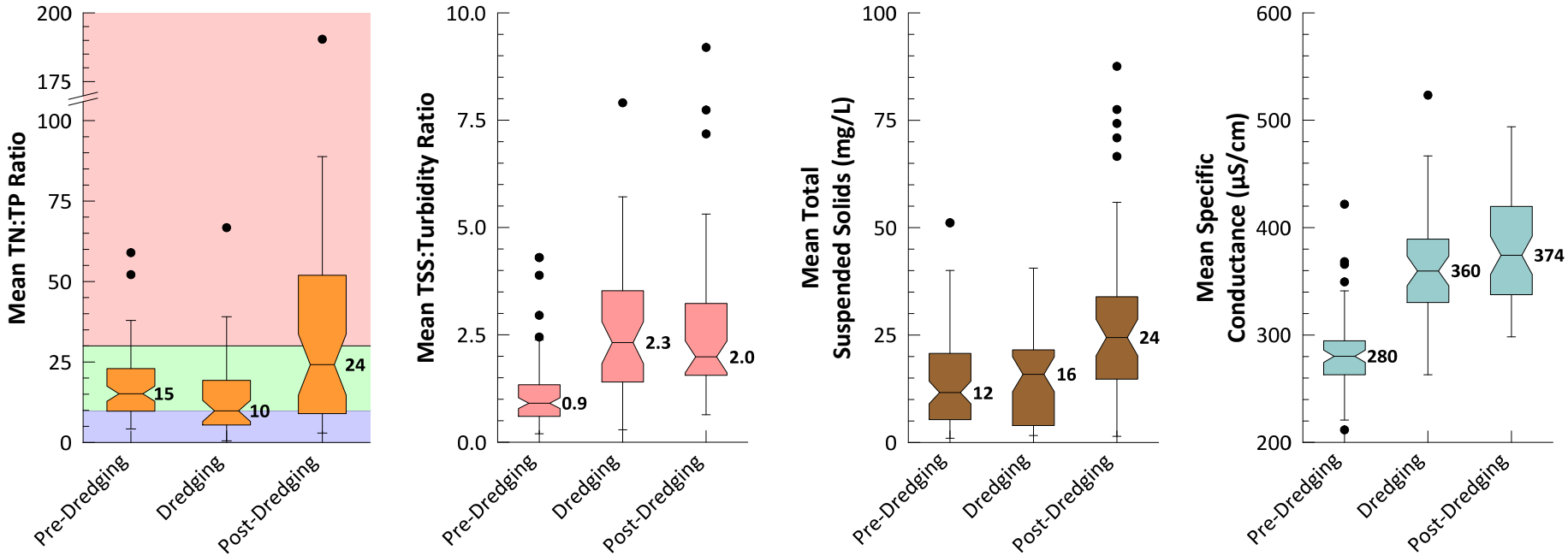




Notched Box Plots of Parameter Means per Period (Cont.)







Notched Box Plots of Parameter Means per Period (Cont.)