Water Quality Trends and Effects of Sediment Removal in Lake Trafford

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BACKGROUND

Monthly water quality monitoring has been performed in Lake Trafford since December 1996, by Collier County Pollution Control (CCPC). Due to degrading water quality in the lake, a three-phased dredging project was initiated in November 2005 to improve water quality. A statistical review of water quality pre-, during and post-dredging is presented herein. Additionally, trend analyses of water quality data were performed and potential influences on water quality were identified.

Phase I Dredging 11/4/2005 – 4/25/2006

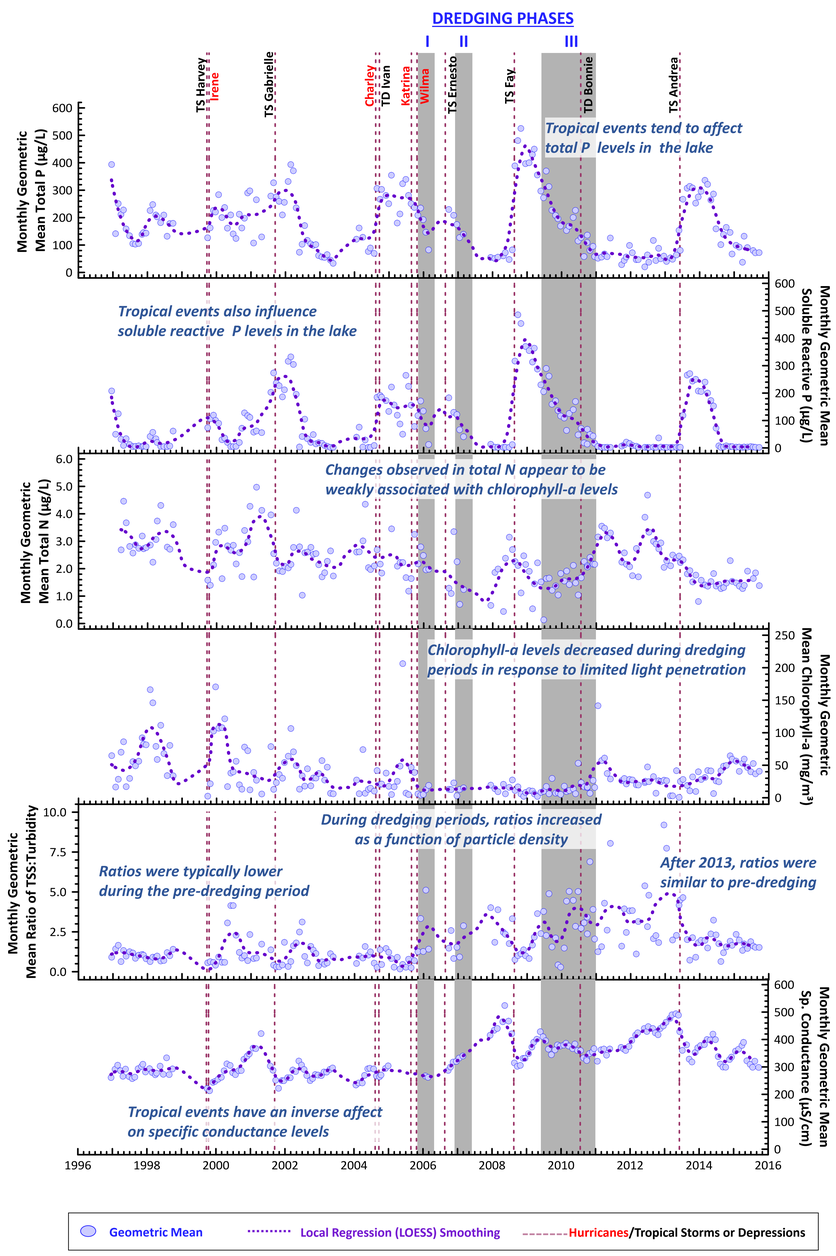
Phase II Dredging 12/1/2006 – 6/1/2007

Phase III Dredging 6/1/2009 – 12/28/2010

METHODS

- Created database from monthly water quality data reports generated by CCPC
- Reviewed all water quality data and qualified suspicious values based on cross-parameter comparisons
- Performed statistical summarization of water quality data and looked at inter-parameter ratios
- Determined trend analysis utilizing Seasonal Kendall-Tau test to identify if observed changes were statistically significant

INFLUENCE OF CLIMATIC EVENTS AND DREDGING ON WATER QUALITY IN LAKE TRAFFORD (1996 – 2015)

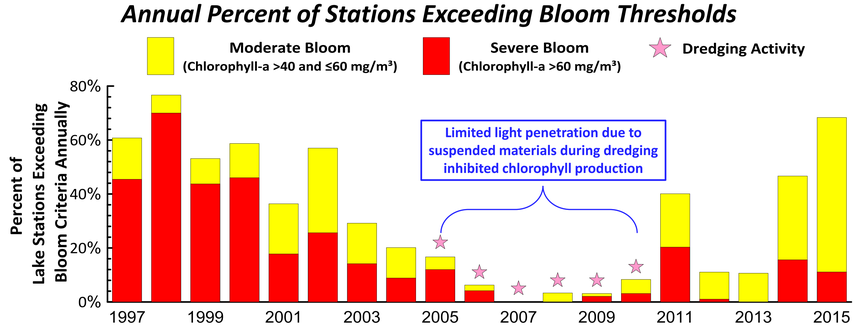


WATER QUALITY TRENDS AND PARAMETER RELATIONSHIPS IN LAKE TRAFFORD

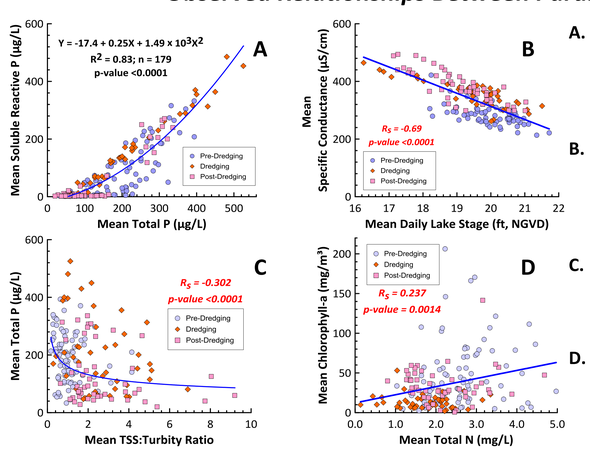
Parameters	Observed Trend	Statistical Trends
Total P	Decreasing	
Soluble Reactive P	Decreasing	
Total N	*Decreasing*	√
Chlorophyll-a*	Decreasing	
TSS:Turbidity	*Increasing*	√
Specific Conductance	*Increasing*	√

Two inverse trends were observed for chlorophyll-a:
Trend 1: 1997 -2005, a statistically significant decrease
Trend 2: 2006 – 2015, a statistically significant increase

Annual Percent of Stations Exceeding Bloom Thresholds



Observed Relationships Between Parameters



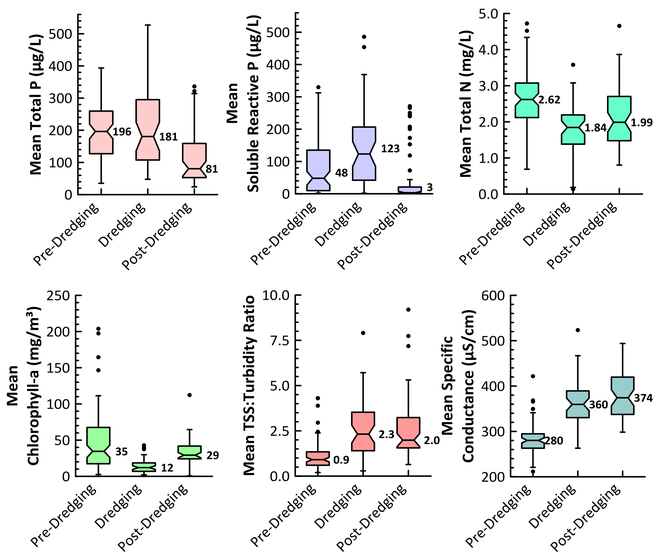
A. Strong relationship between total P and soluble reactive P. High total P (>200 µg/L) is mostly soluble reactive P.

B. Sp. conductance is inversely related to stage. As stage increases, sp. conductance decreases.

C. Lower TSS:Turbidity ratios are typically associated with higher total P concentrations

D. Total N is correlated with chlorophyll-a. As total N increases, chlorophyll-a levels tend to increase as well.

DREDGING IMPACTS ON WATER QUALITY IN LAKE TRAFFORD



CONCLUSIONS

- Weather/climatic events affected total P, soluble reactive P, and specific conductance levels in the lake.
- Dredging activities affected for chlorophyll-*a* and, total suspended solids.
- Significant changes were observed for total N (decreasing), specific conductance (increasing) and TSS:turbidity (increasing).
- Dredging activities provided a short-term improvement in water quality with respect to nutrients and algal blooms.
- Post-dredging data reflect increases in algal concentrations.
- TSS:turbidity ratios suggest that dredging activity influences on water quality were temporary.
- External nutrient loading is a primary factor in Lake Trafford water quality.
- A long-term water quality improvement could be attained if sources are identified and controlled.