

# Appendix B

## Water Quality Trends

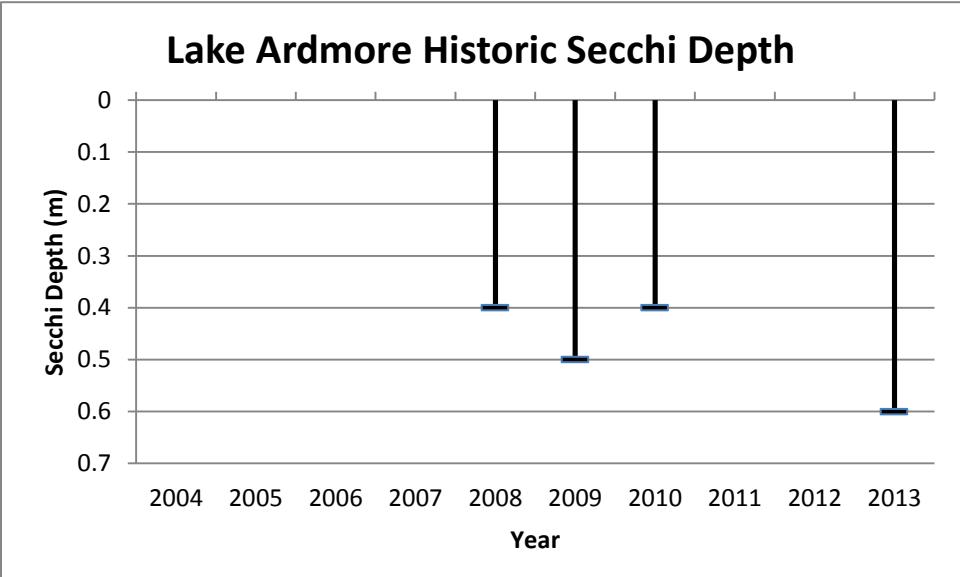
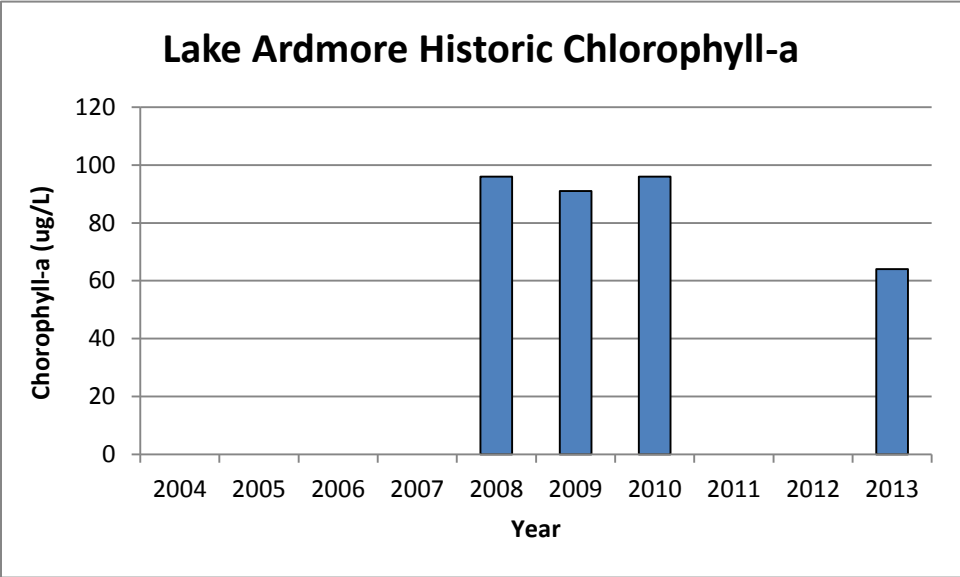
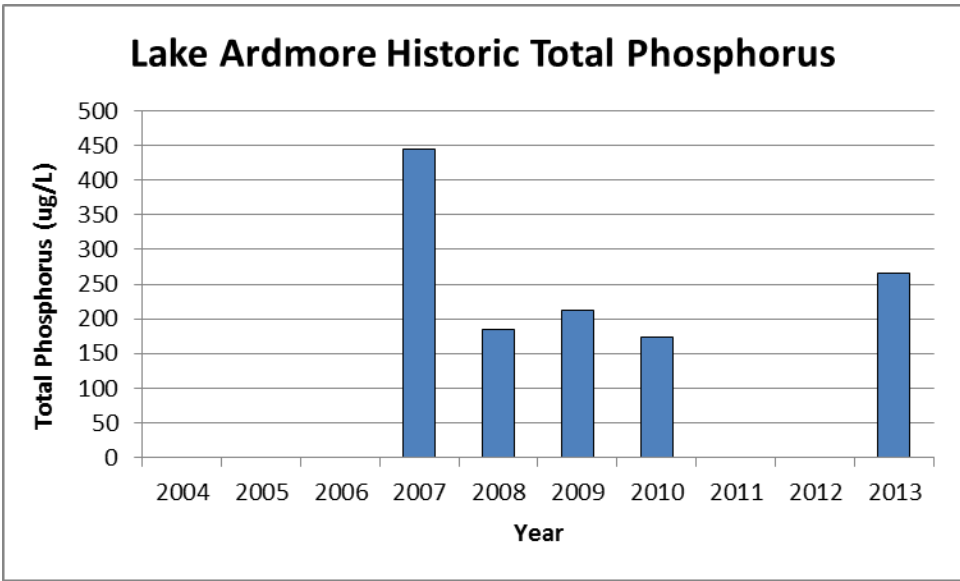
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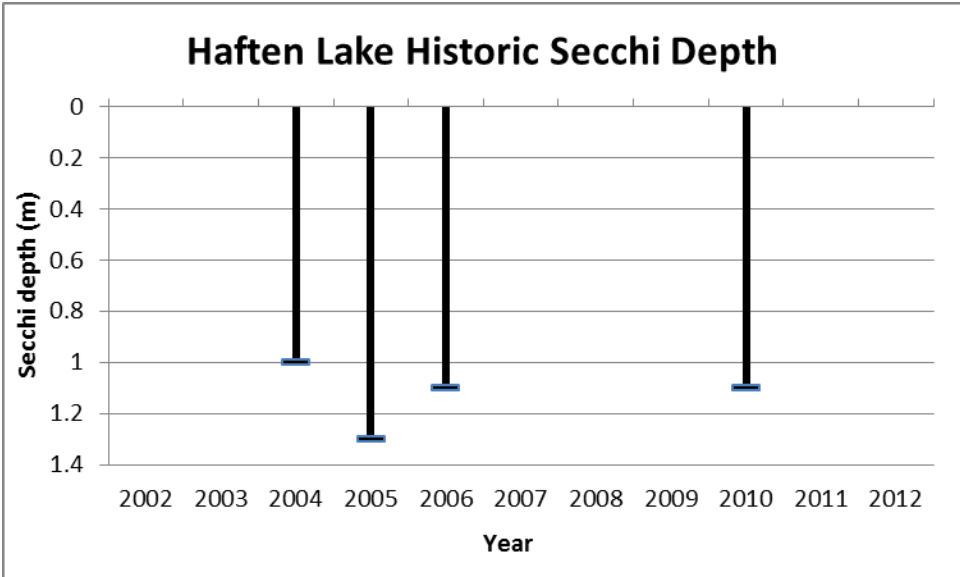
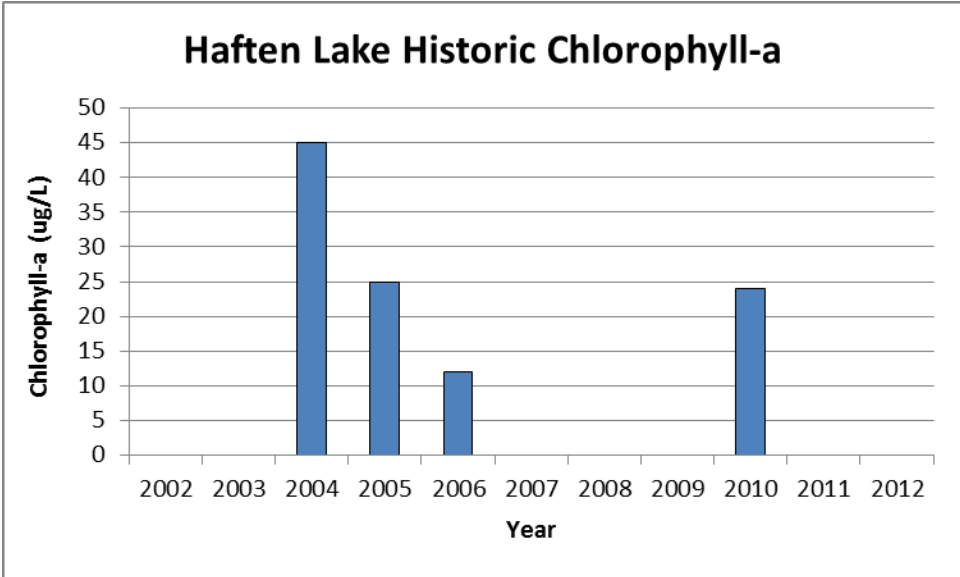
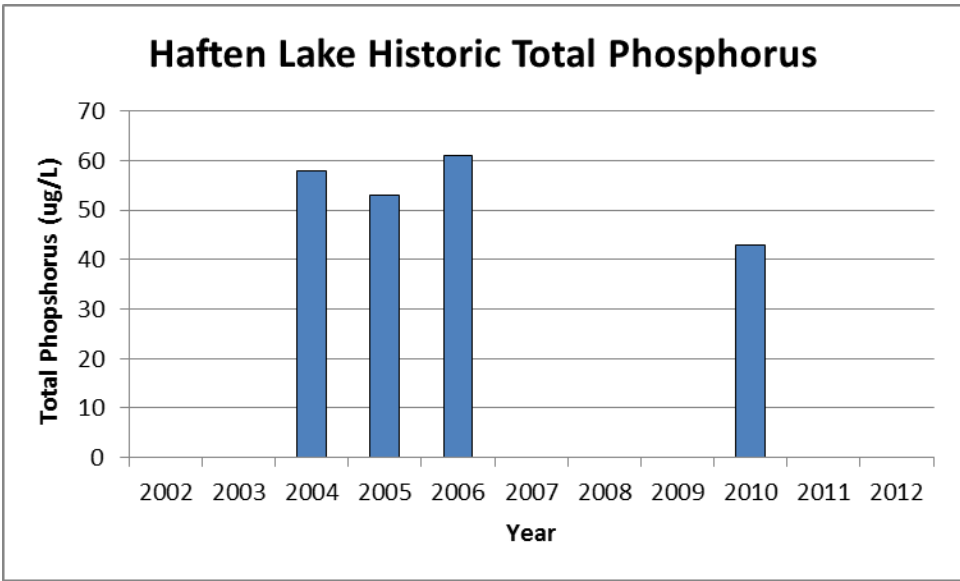
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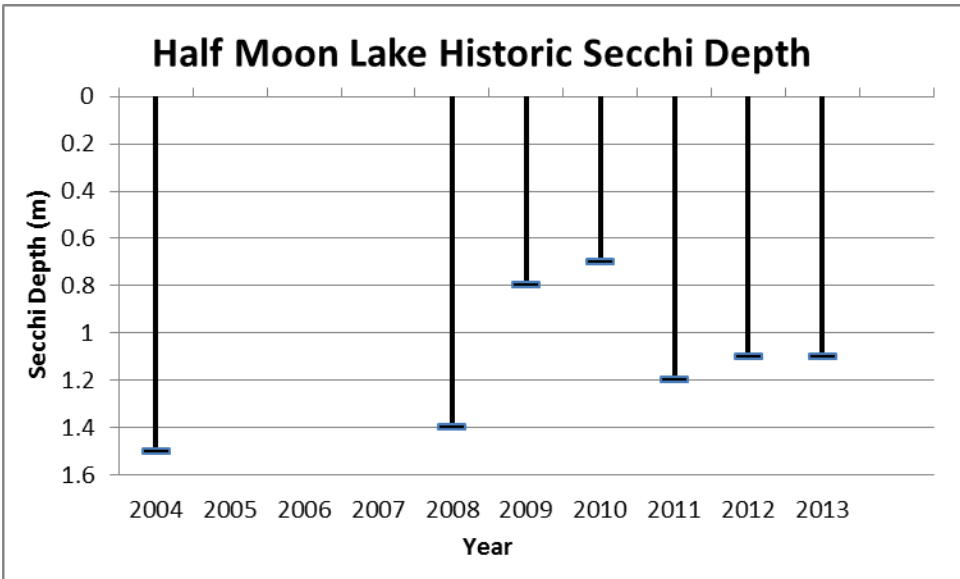
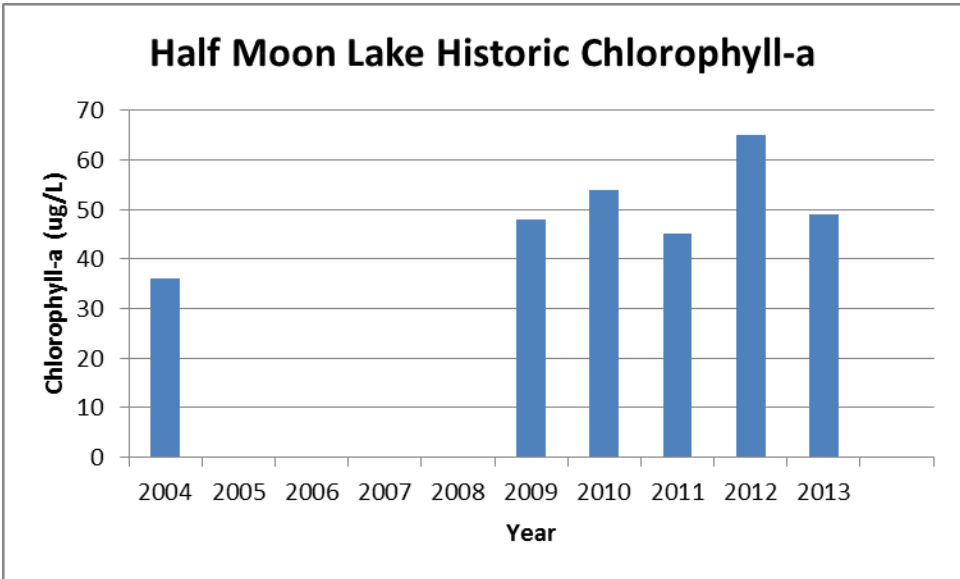
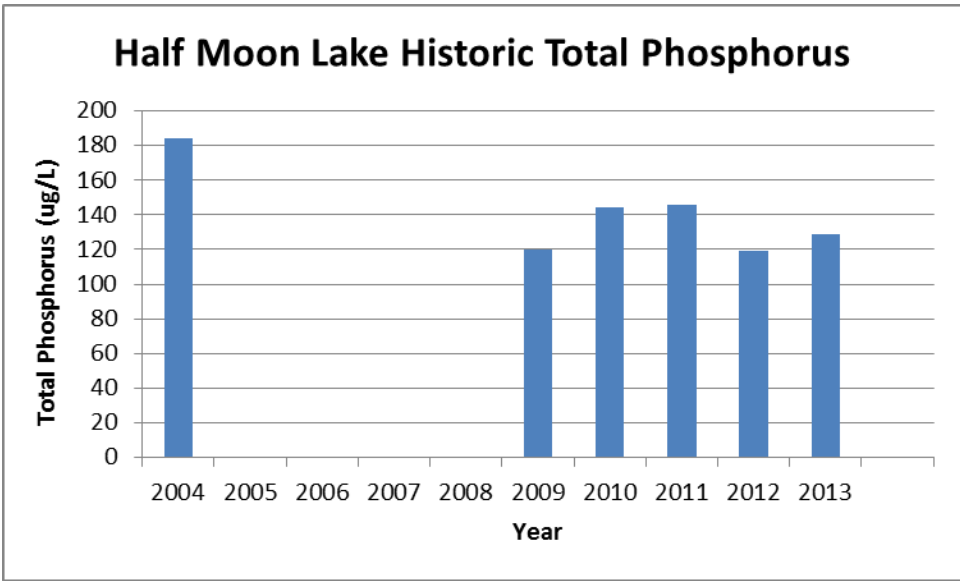
## Lakes

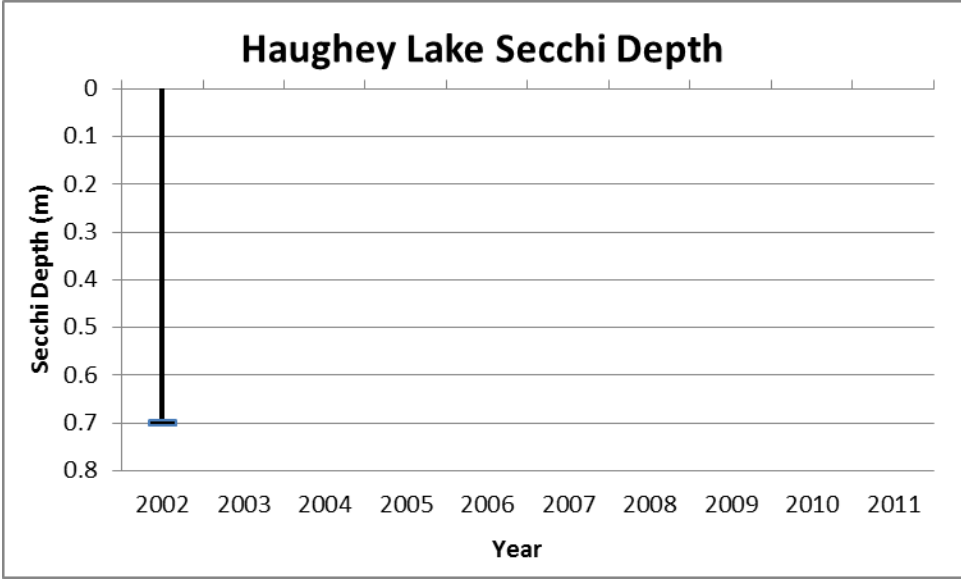
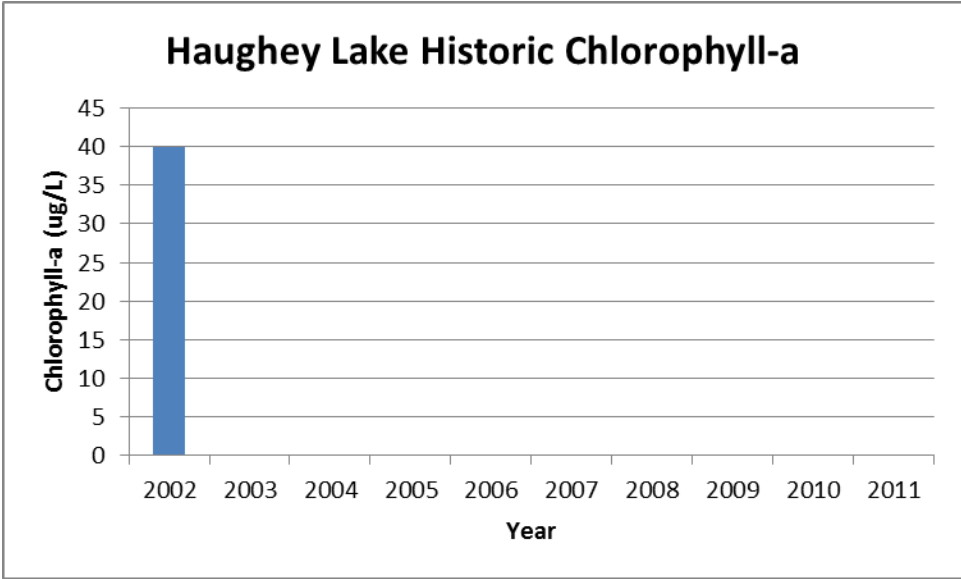
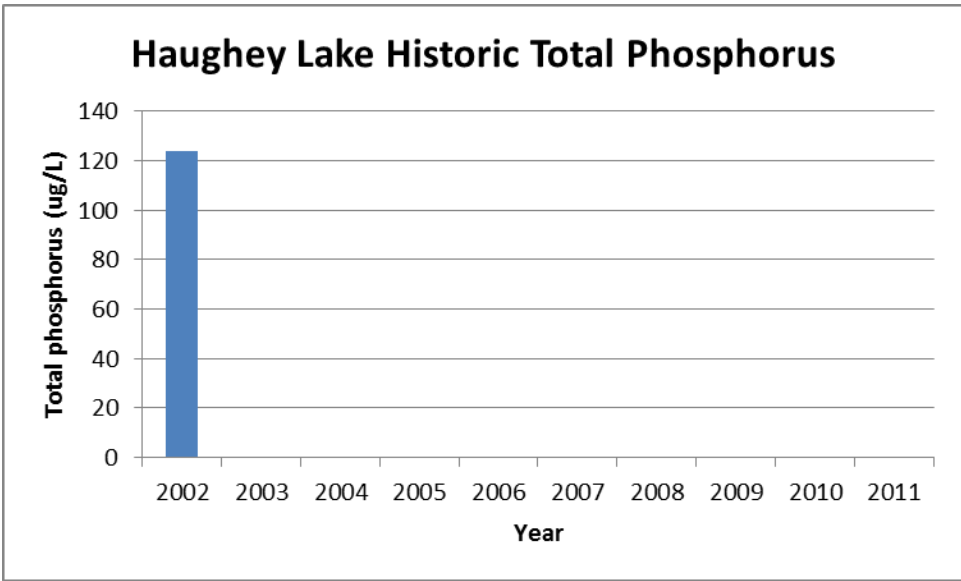
For many of the lakes in the Pioneer-Sarah Creek watershed, there is a limited amount of monitoring data, and annual variability masks water quality trends. Five lakes have nine to ten years of chemistry data during the period 2004-2013: Lake Independence, Lake Rebecca, Spurzem Lake, and Whaletail Lake, and two have a lengthy period of record of clarity as measured by Secchi disk.

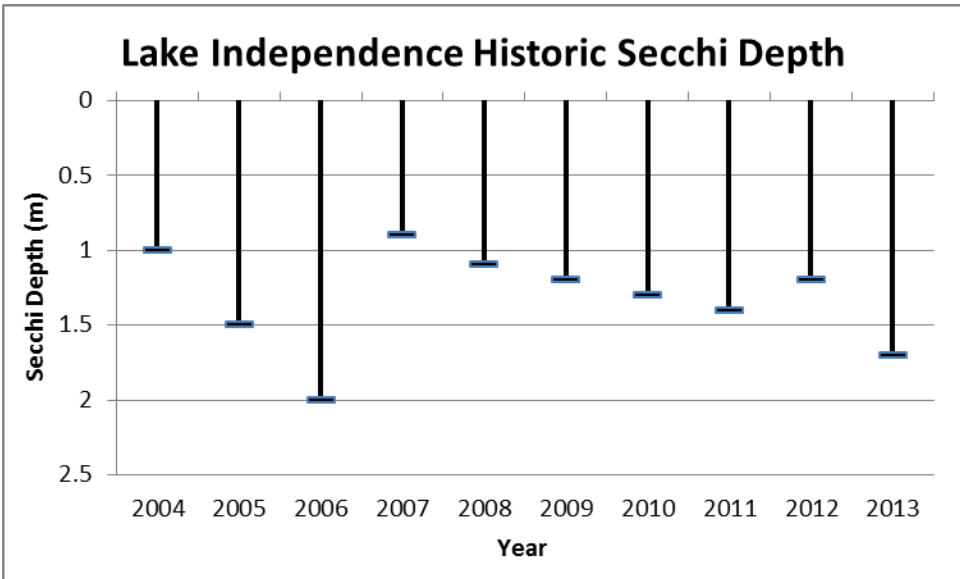
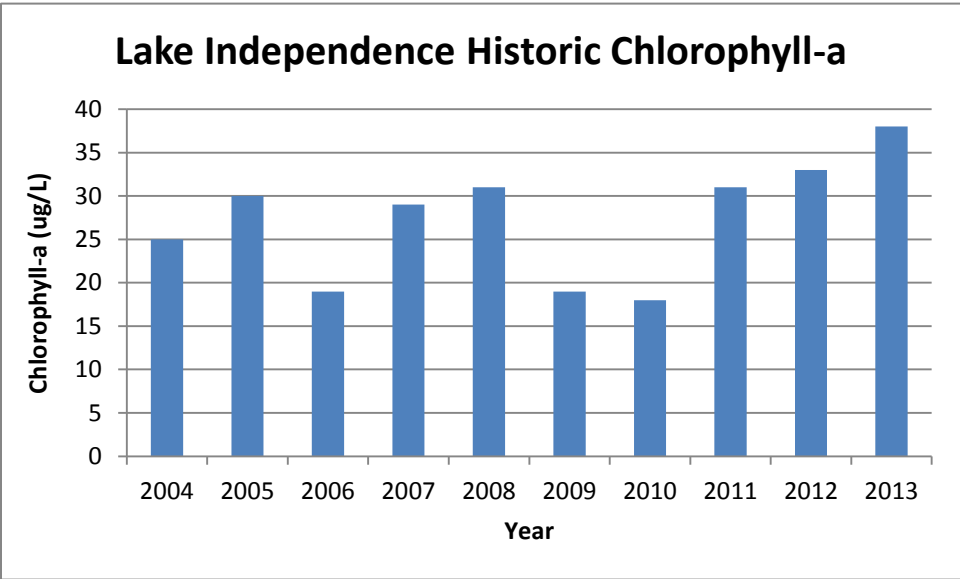
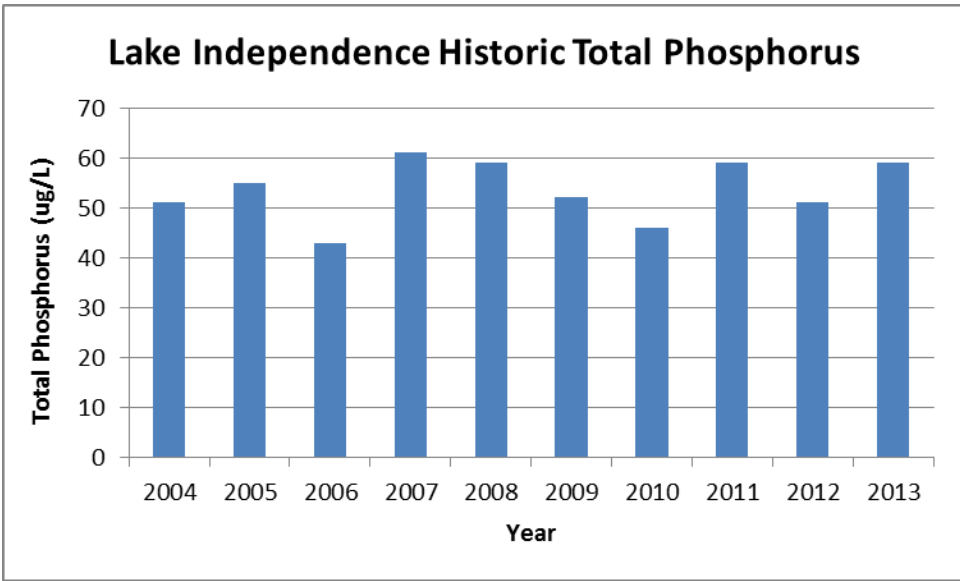
The only lake showing a clear trend is Lake Rebecca, which has improved considerably following completion of several improvement actions, including manure management upgrades at a large horse facility, curly-leaf pondweed treatment and alum applications. The summer average total phosphorus and chlorophyll-a concentrations dropped significantly, and clarity has improved.



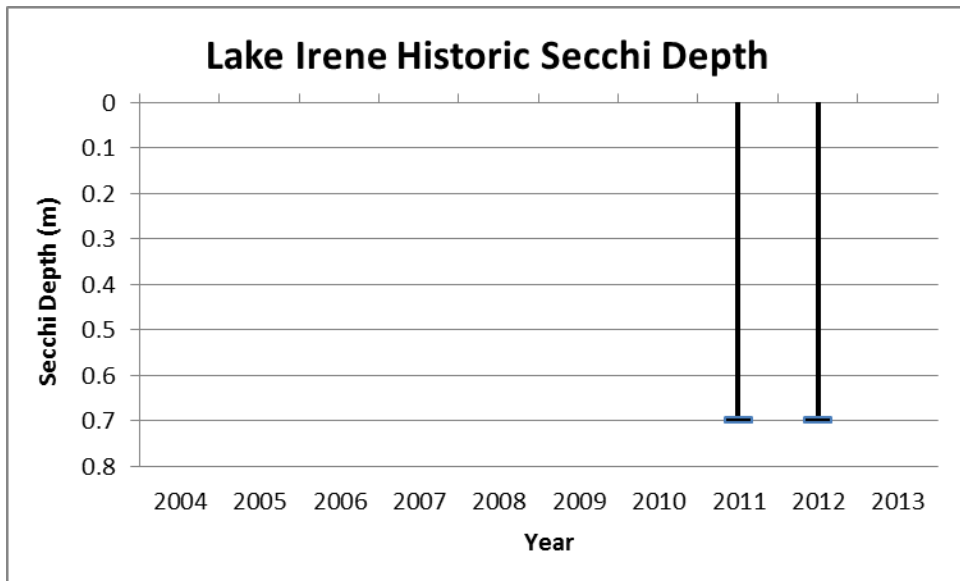
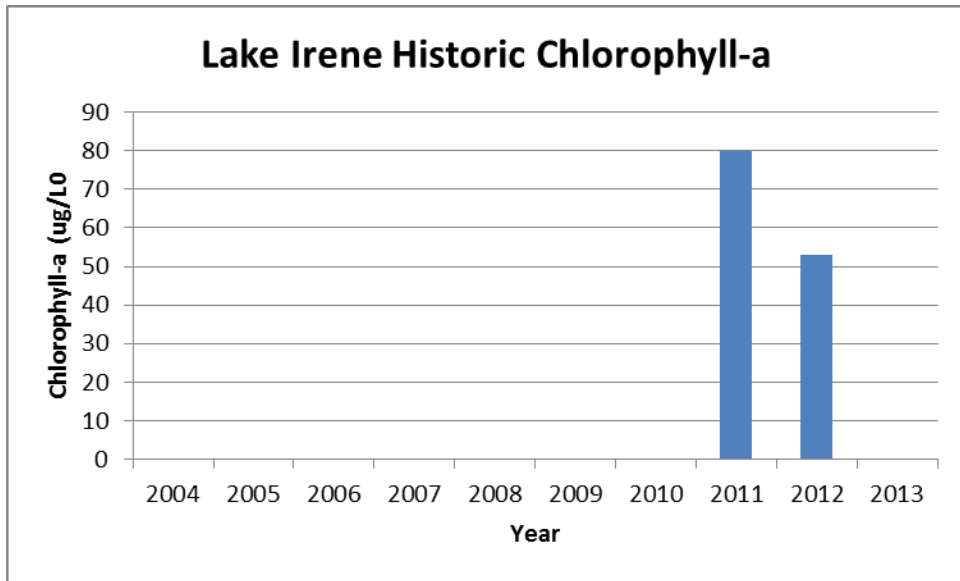
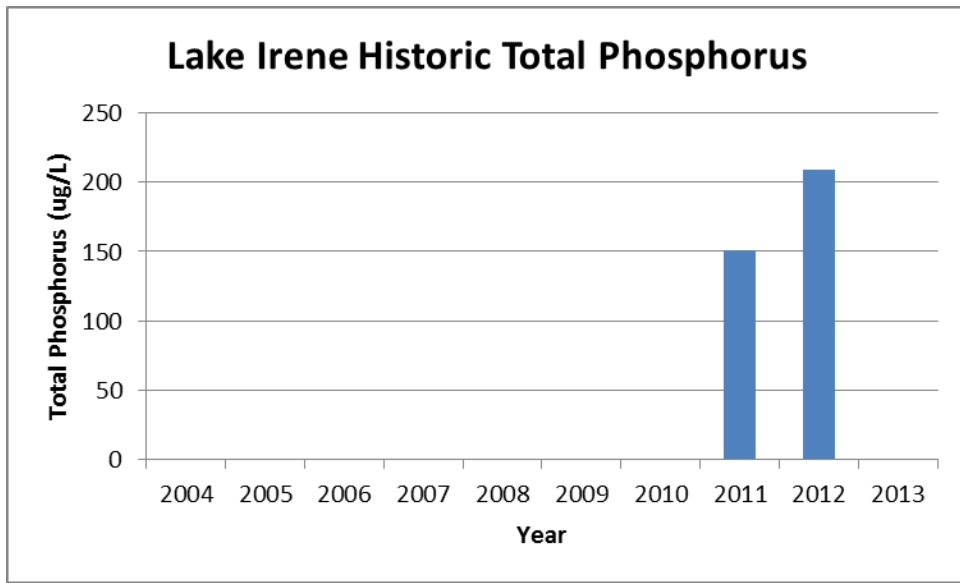


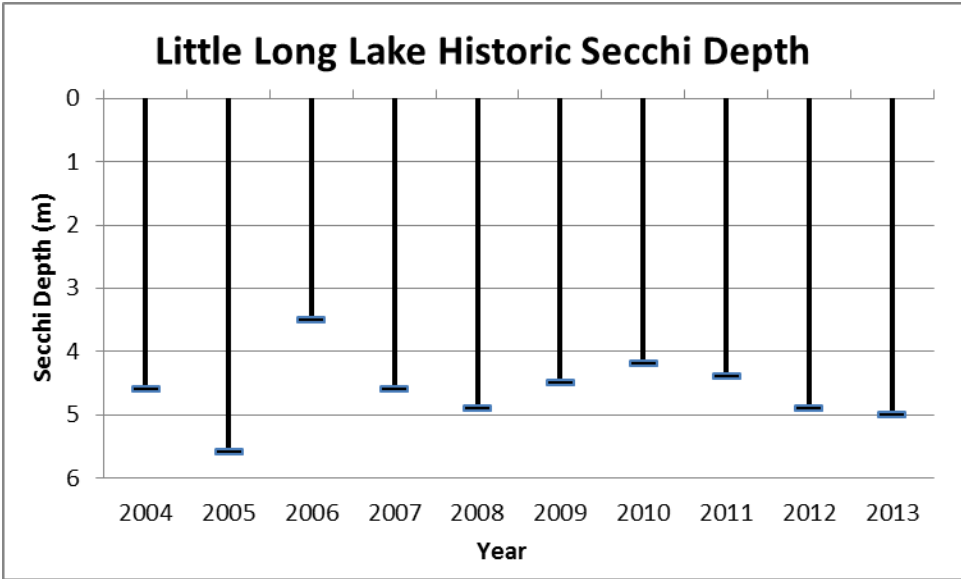
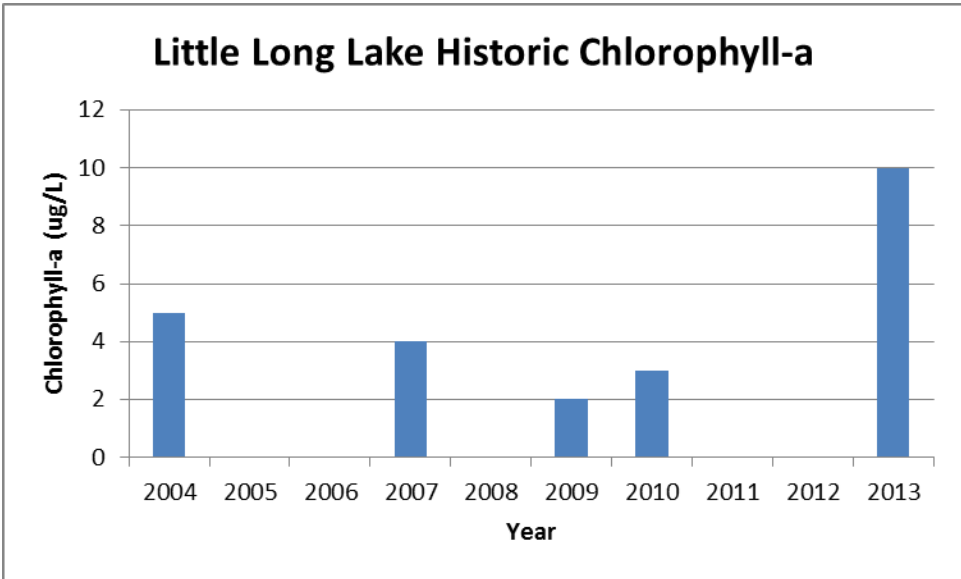
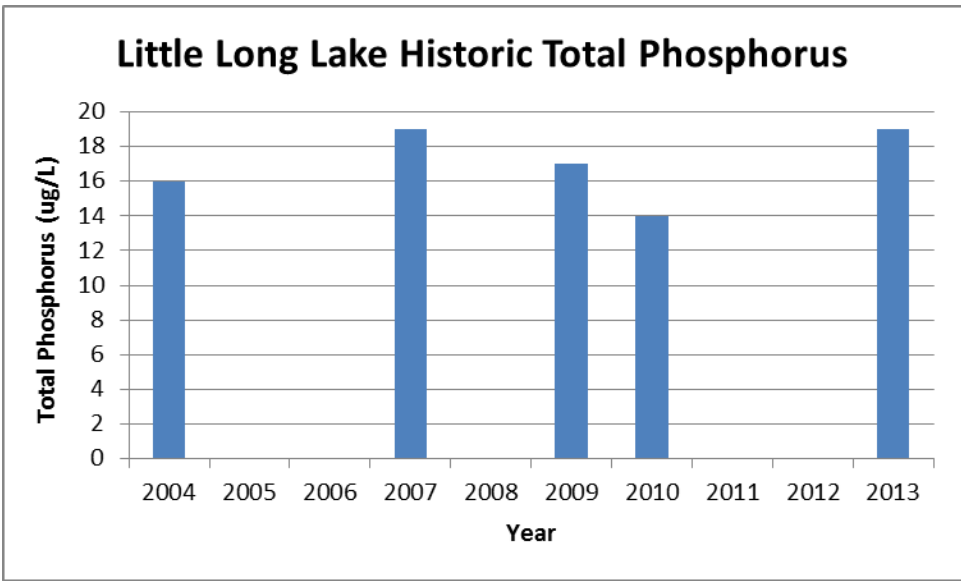


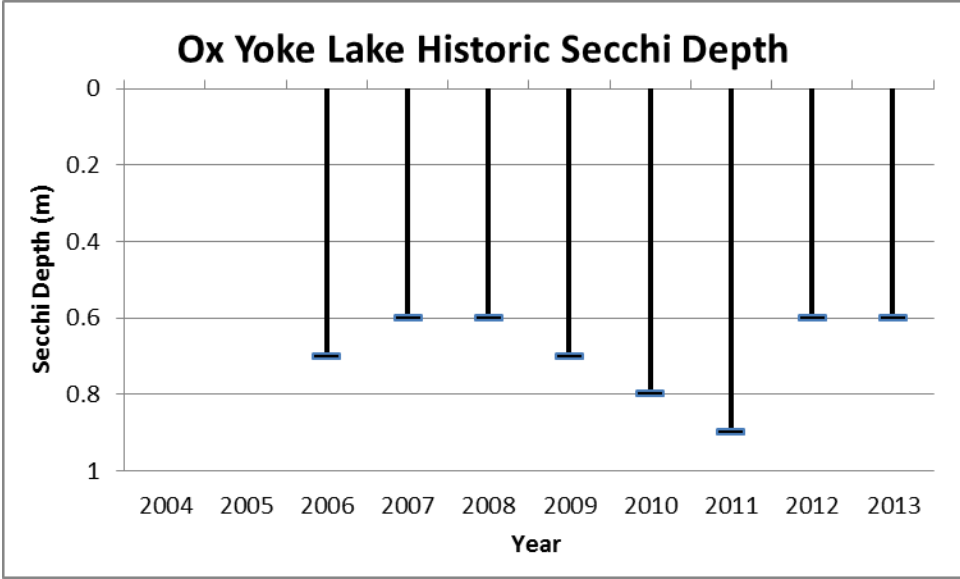
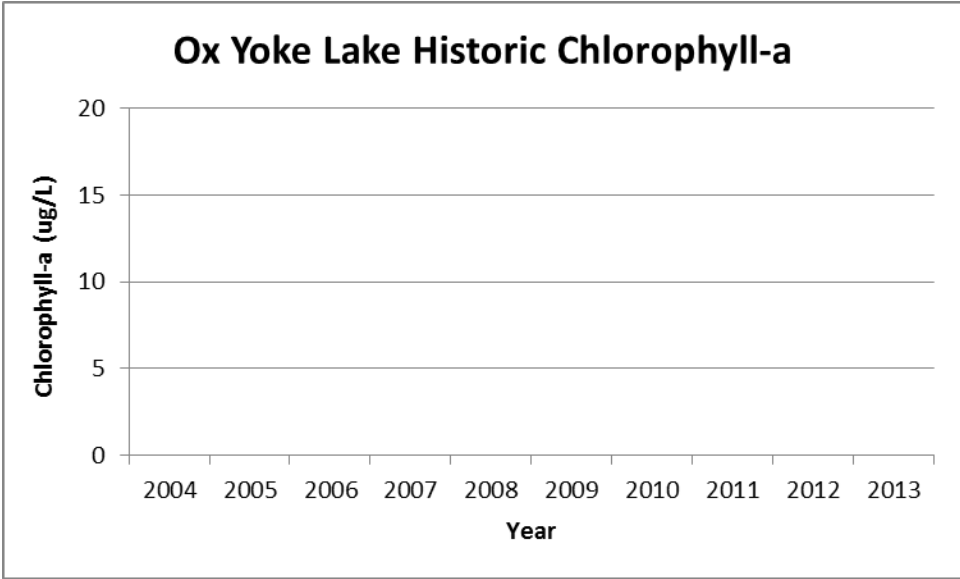
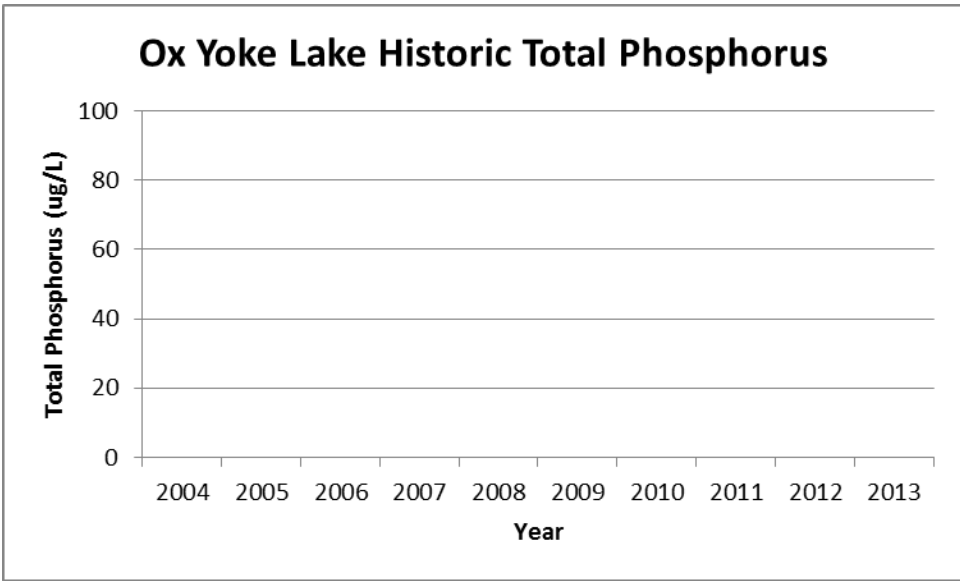


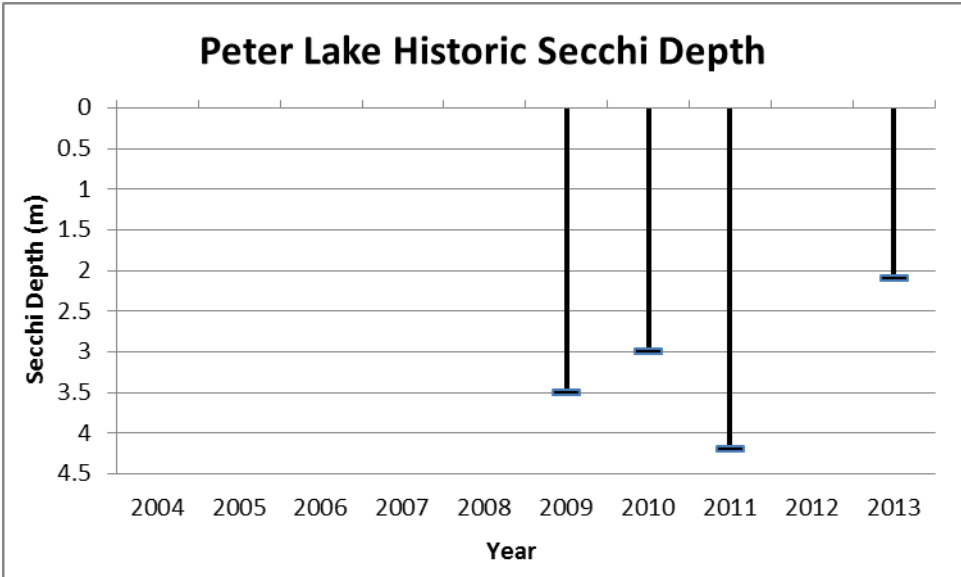
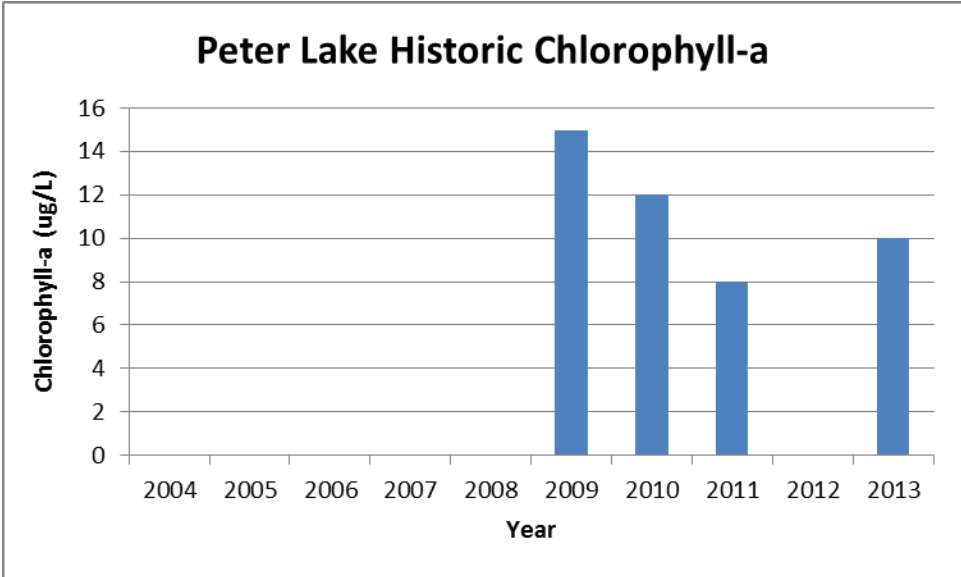
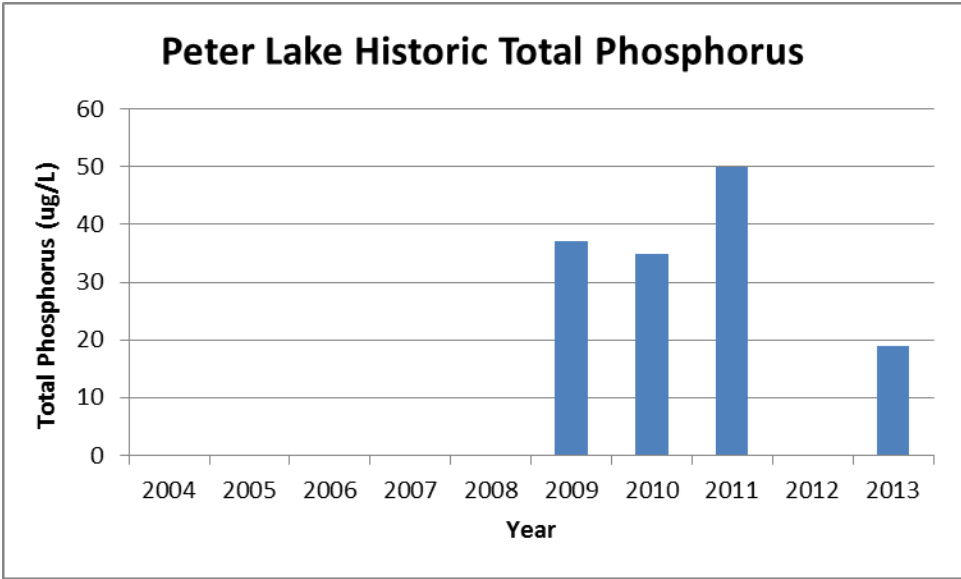


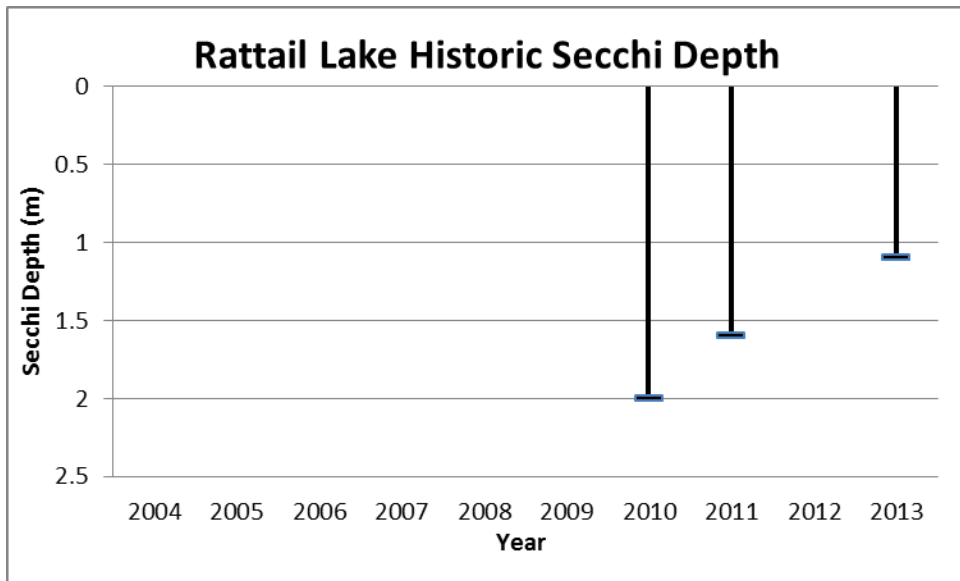
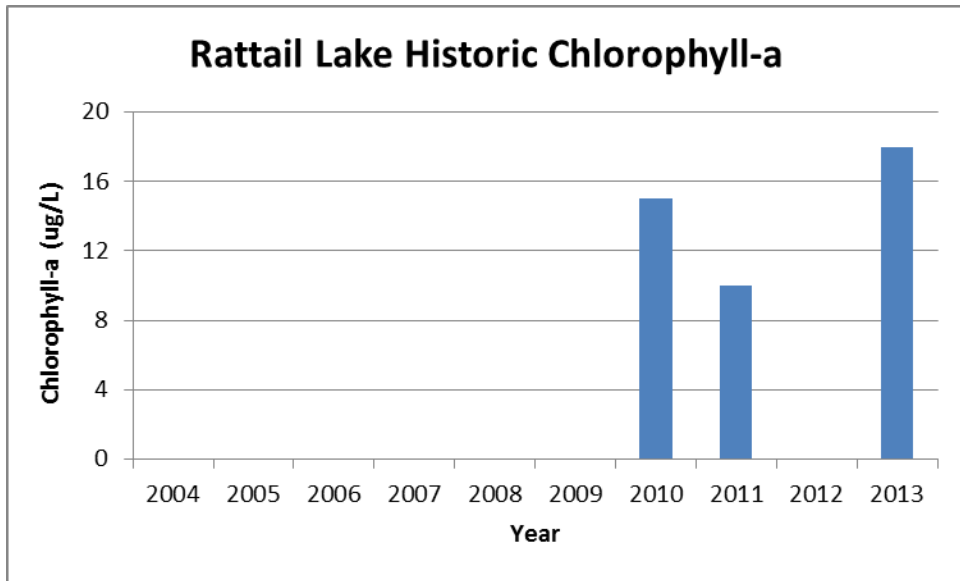
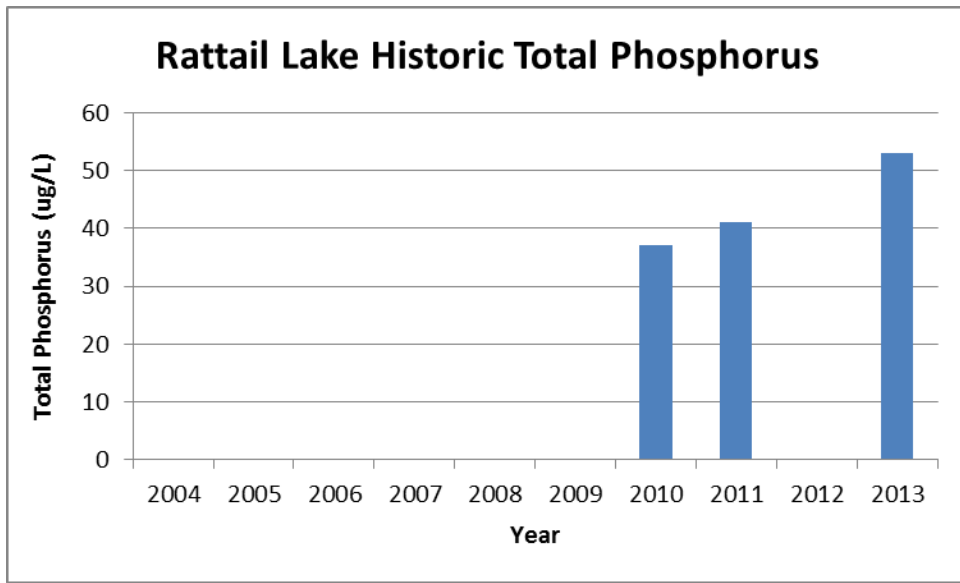


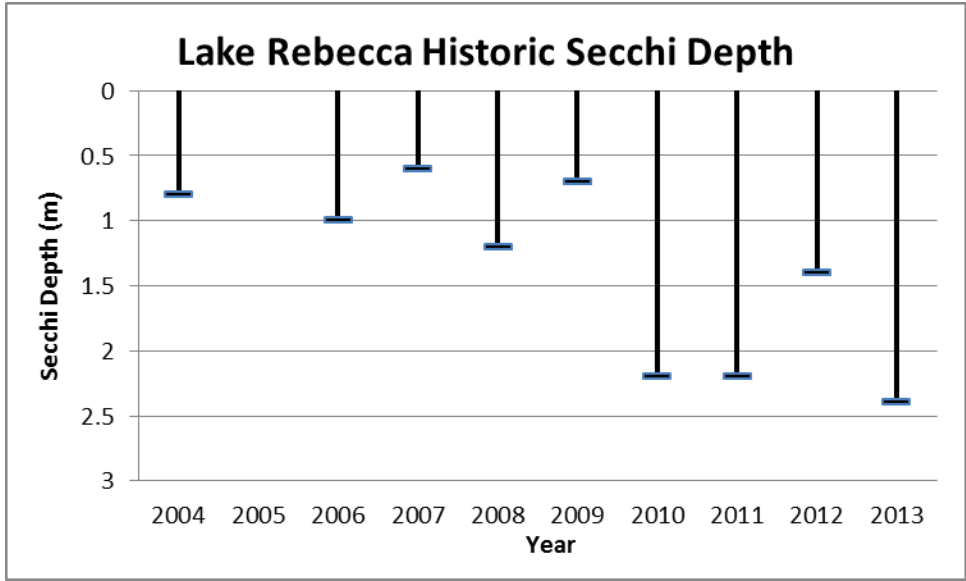
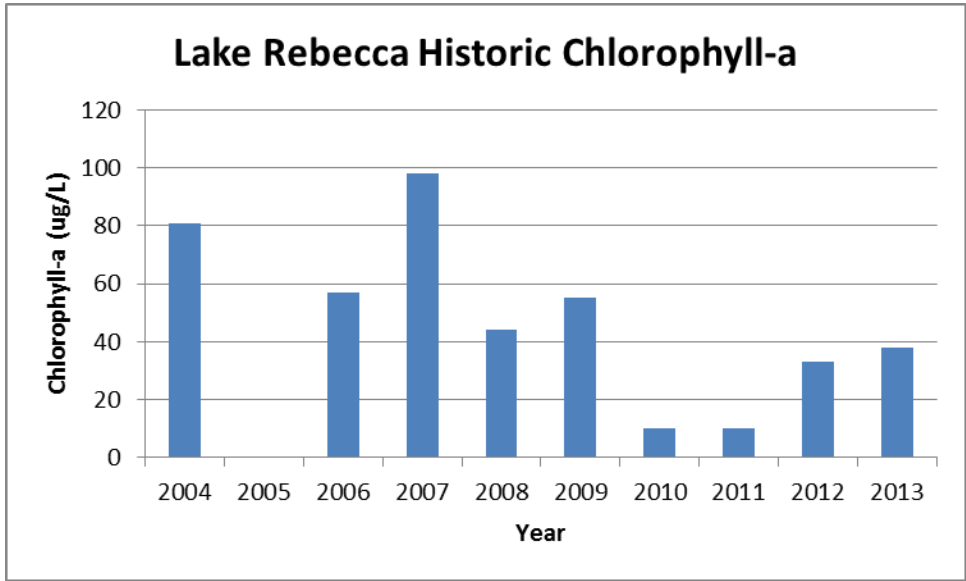
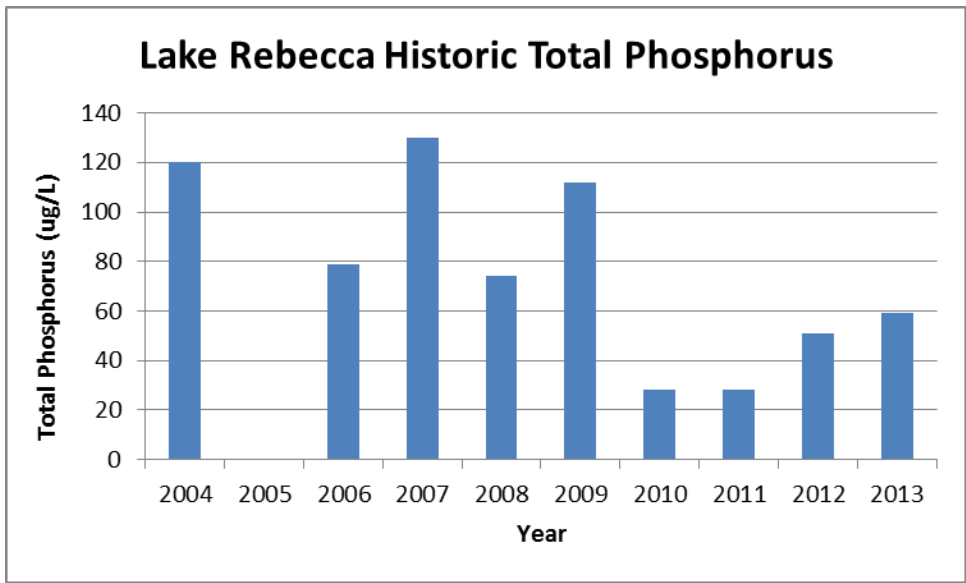


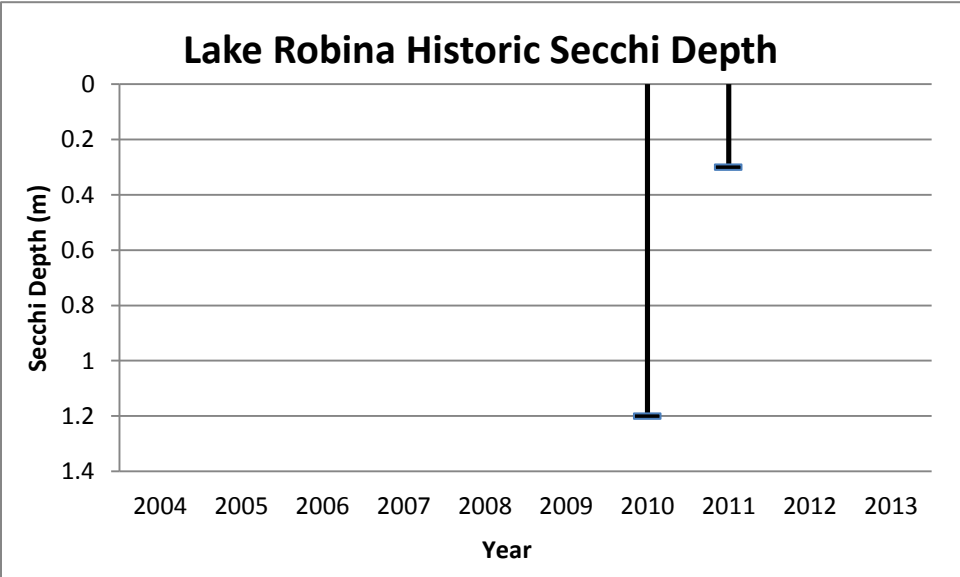
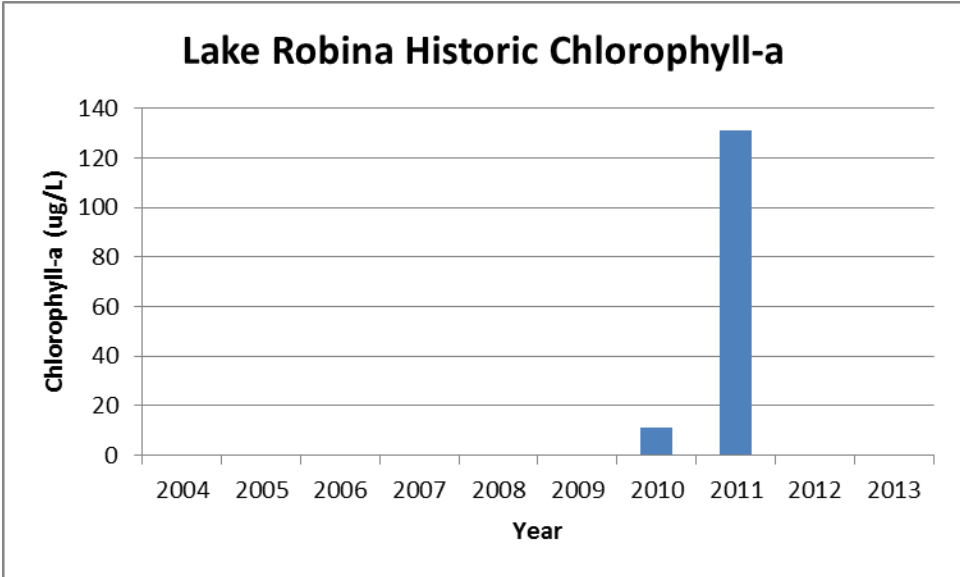
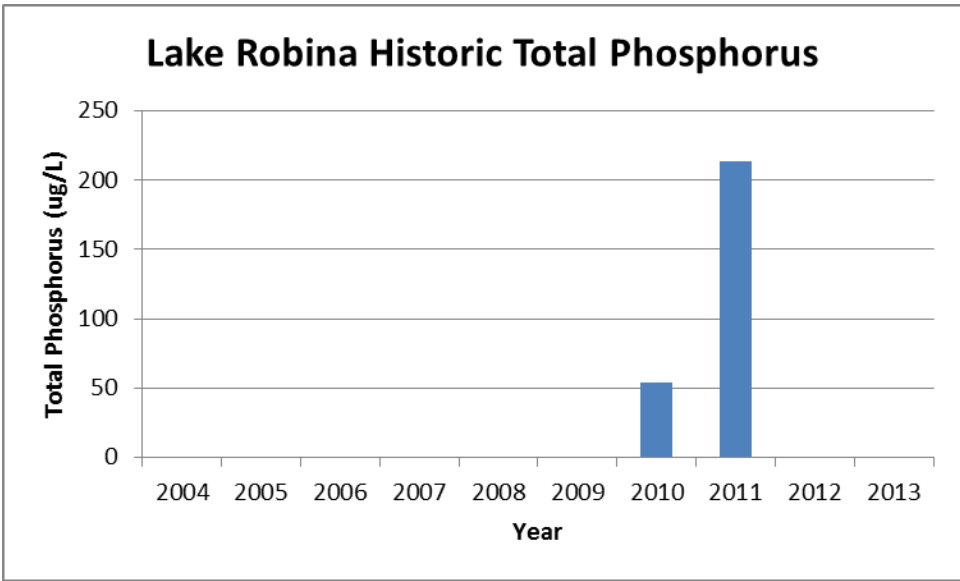


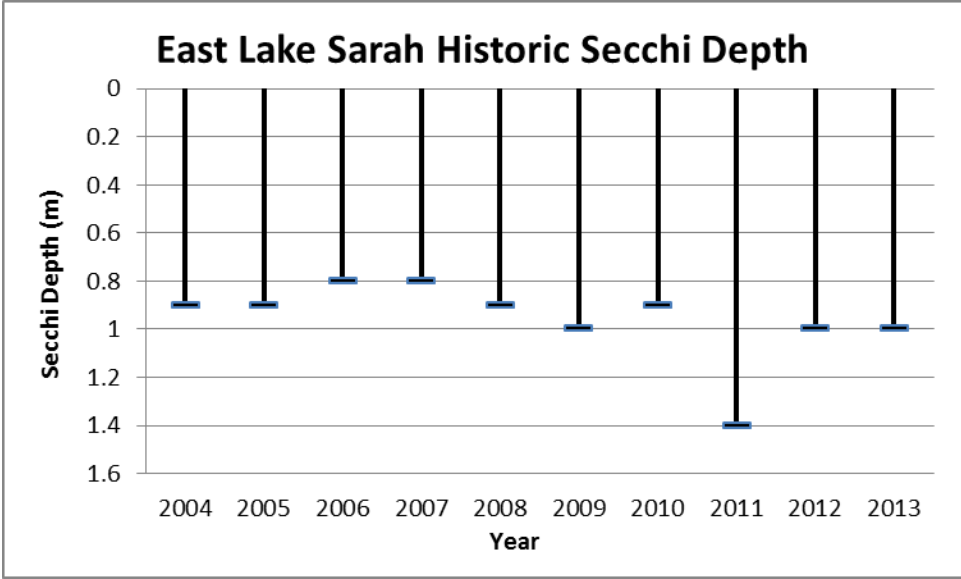
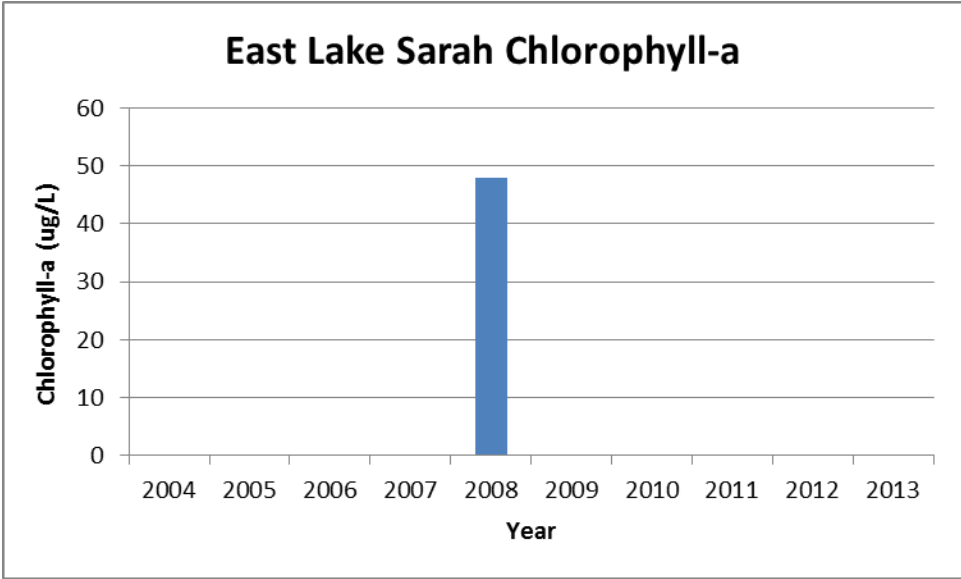
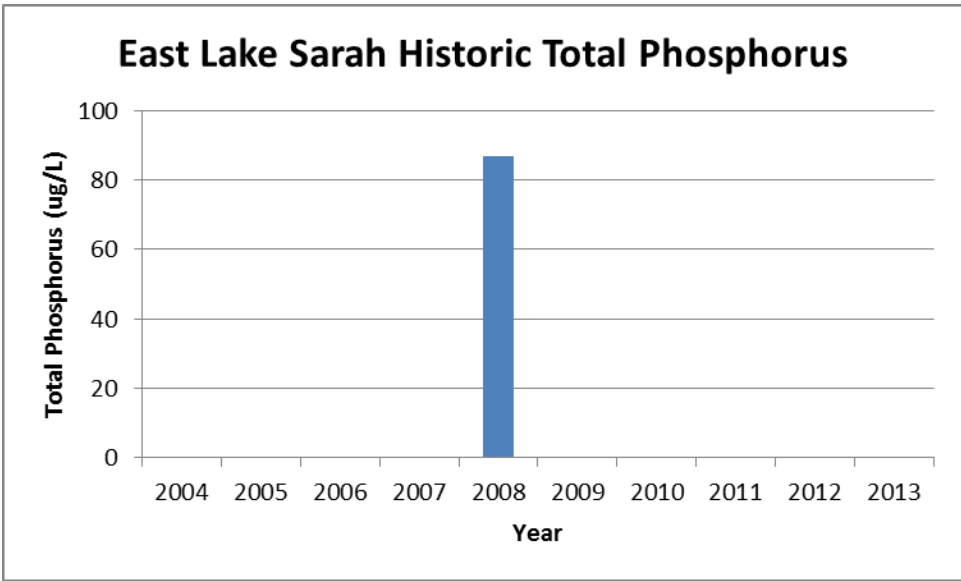




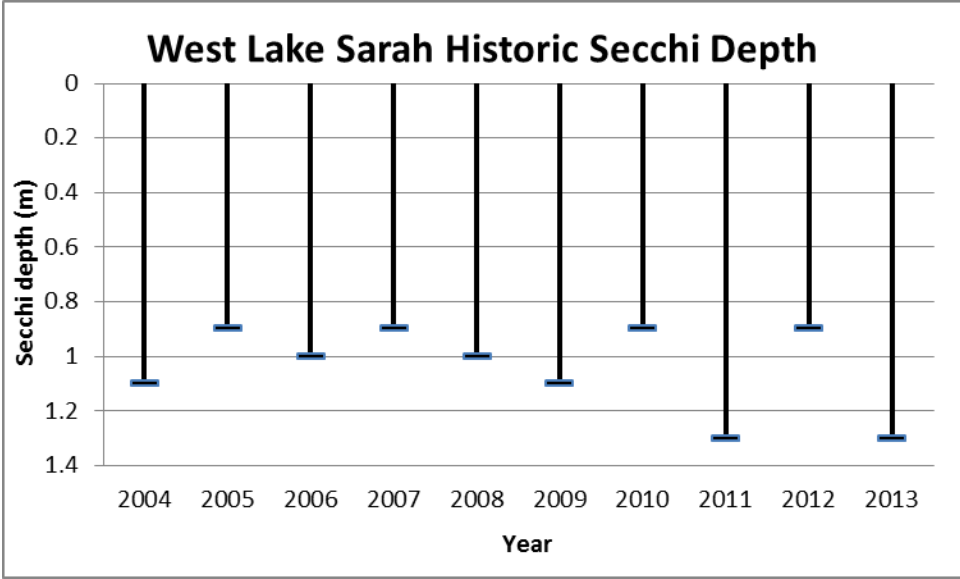
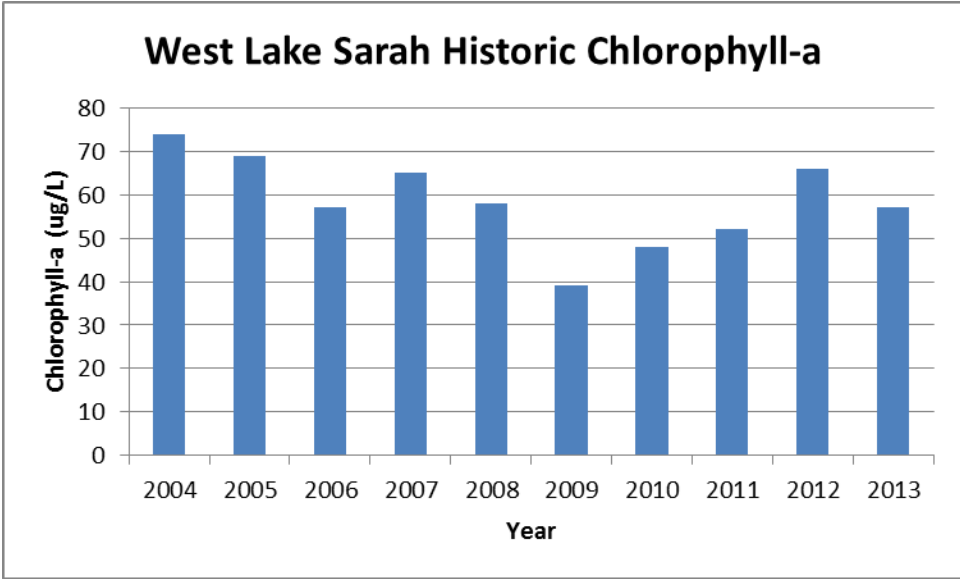
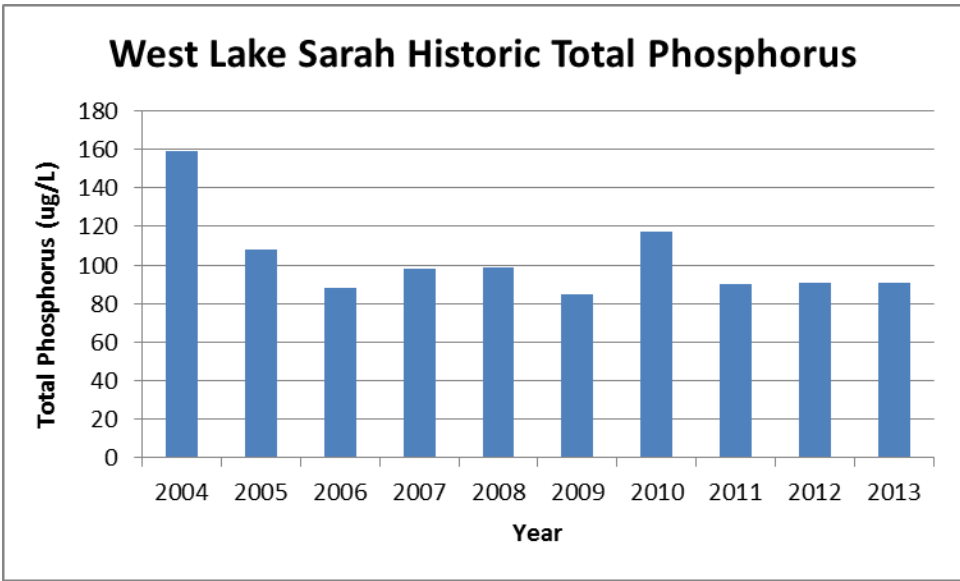


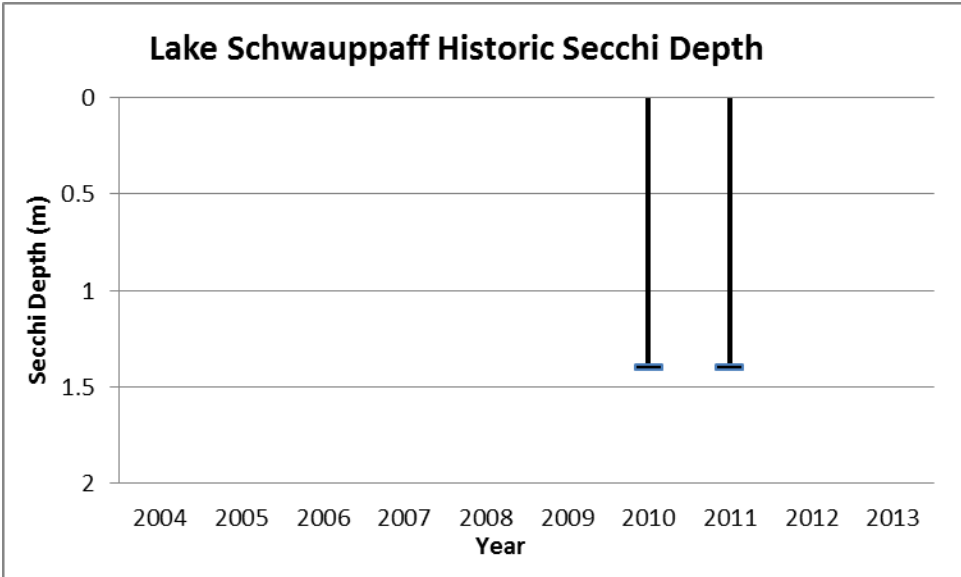
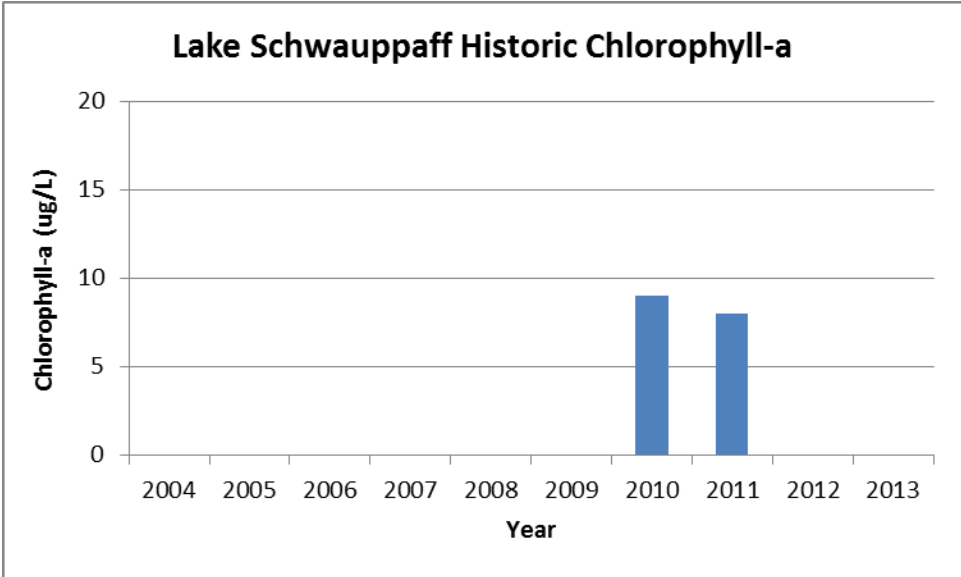
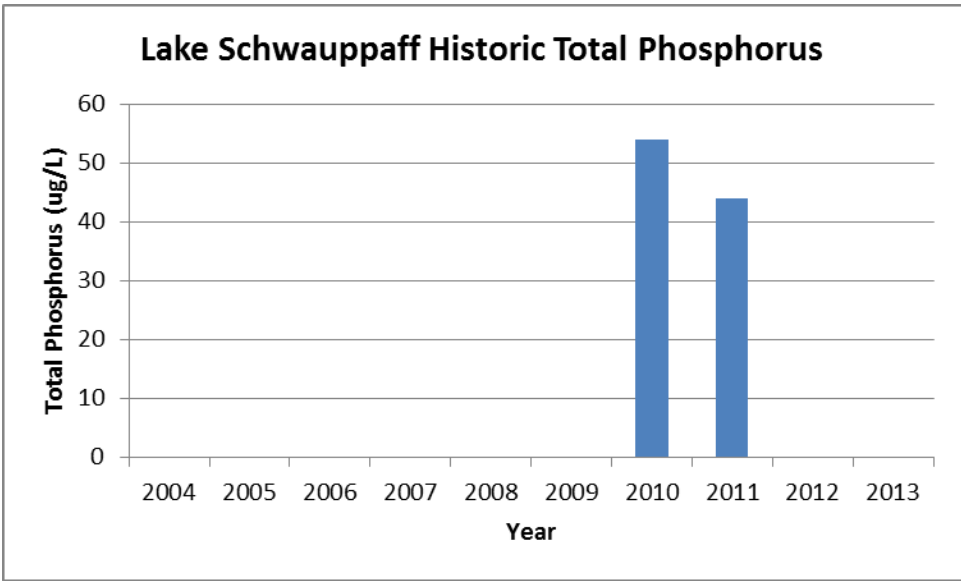


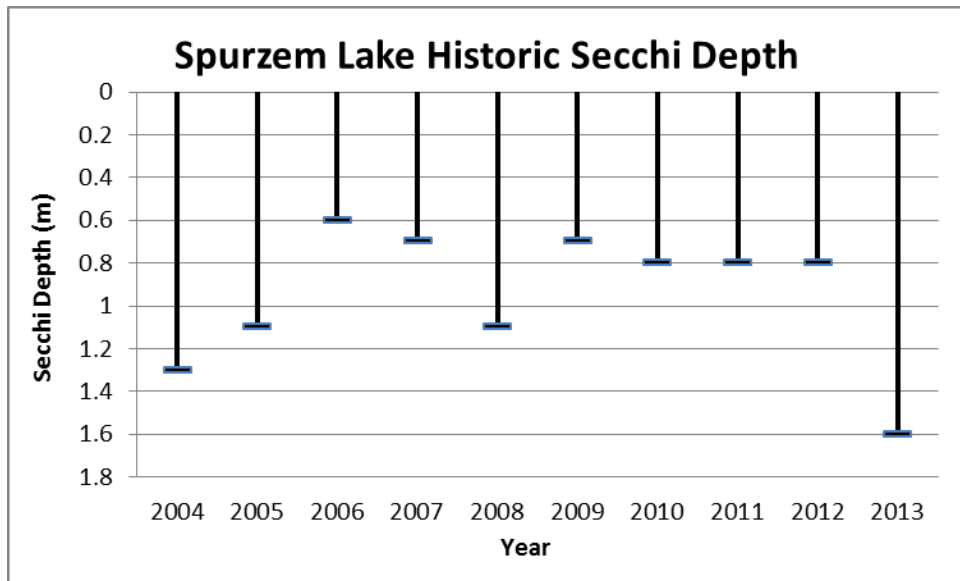
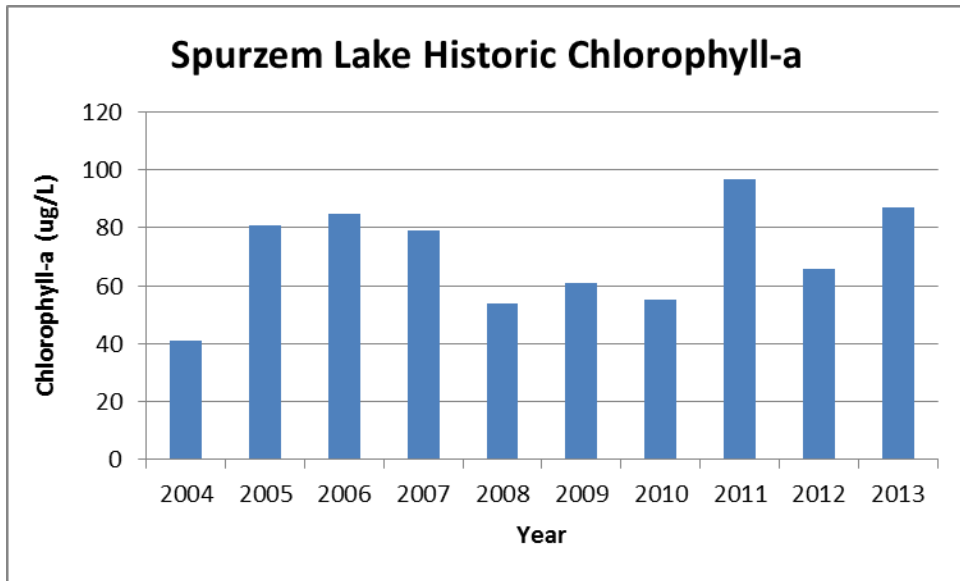
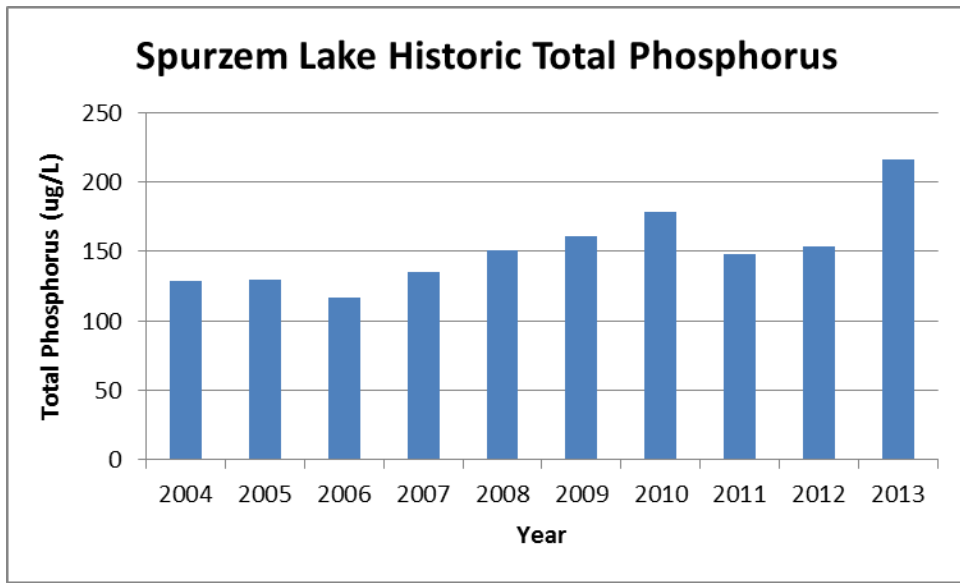


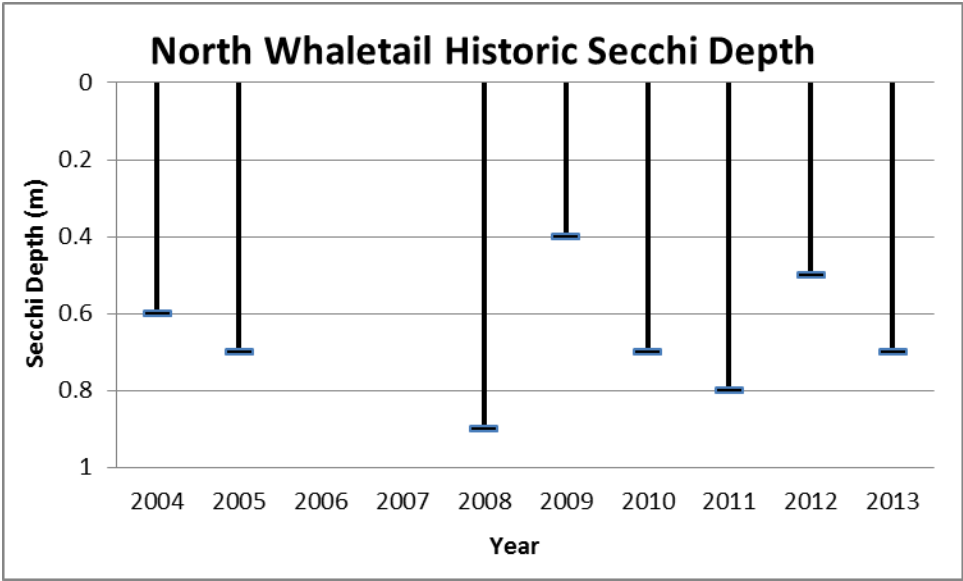
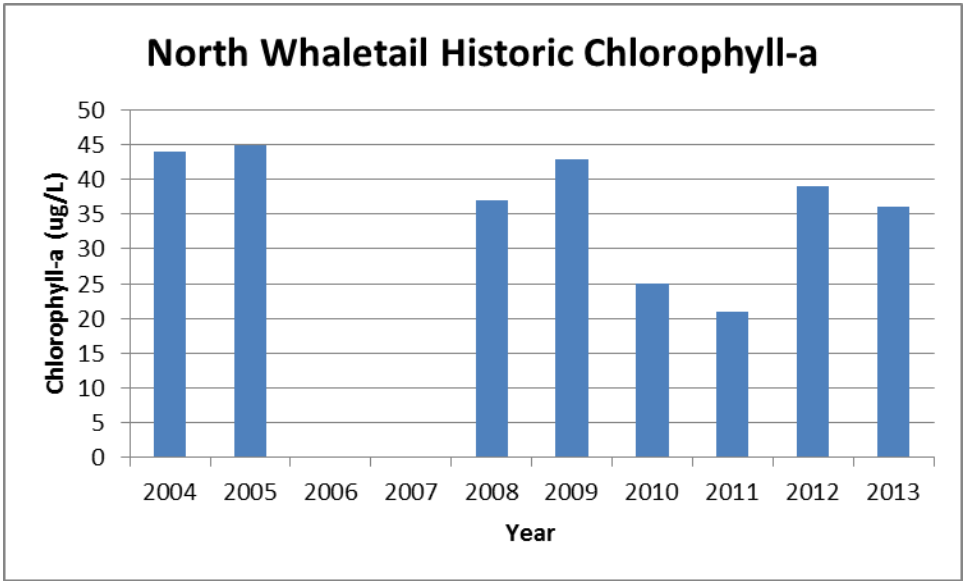
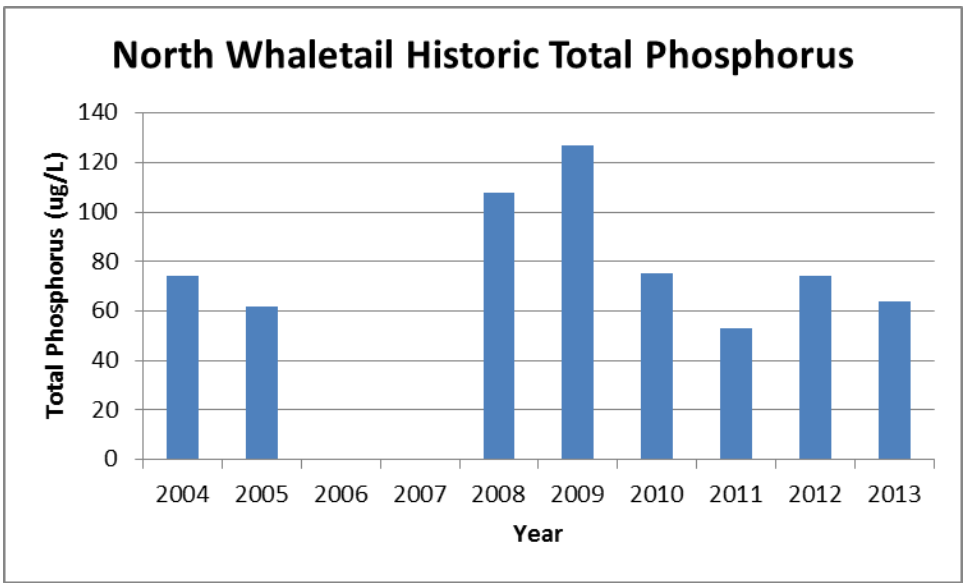


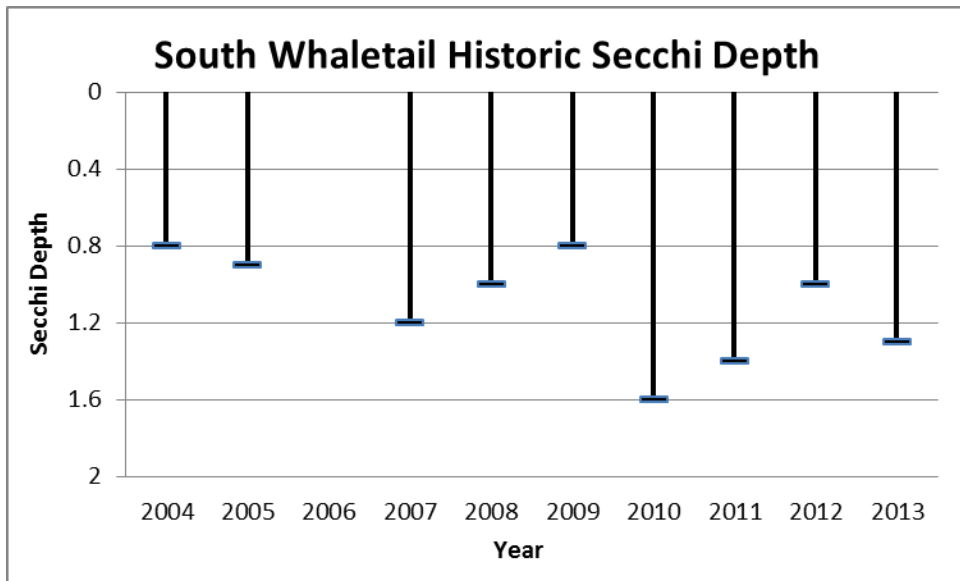
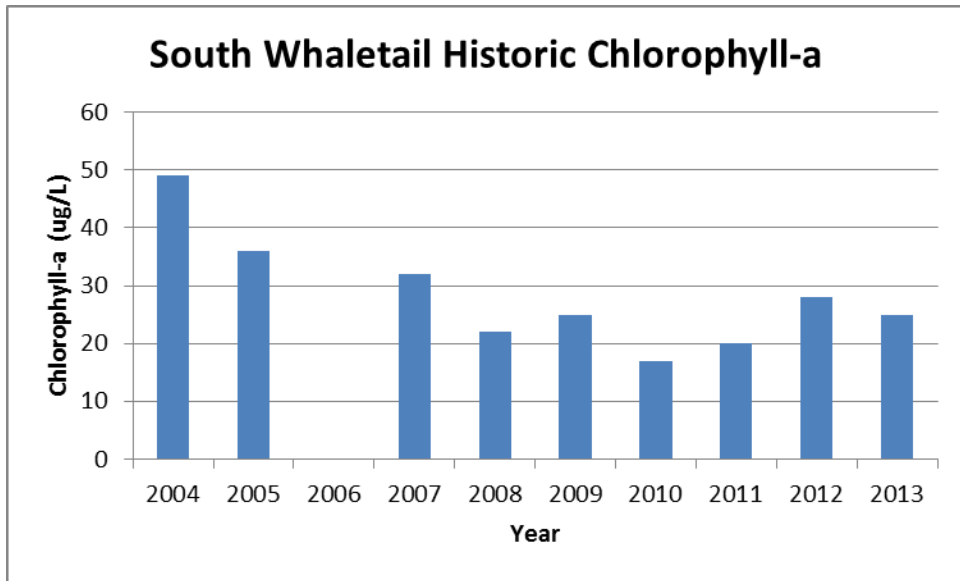
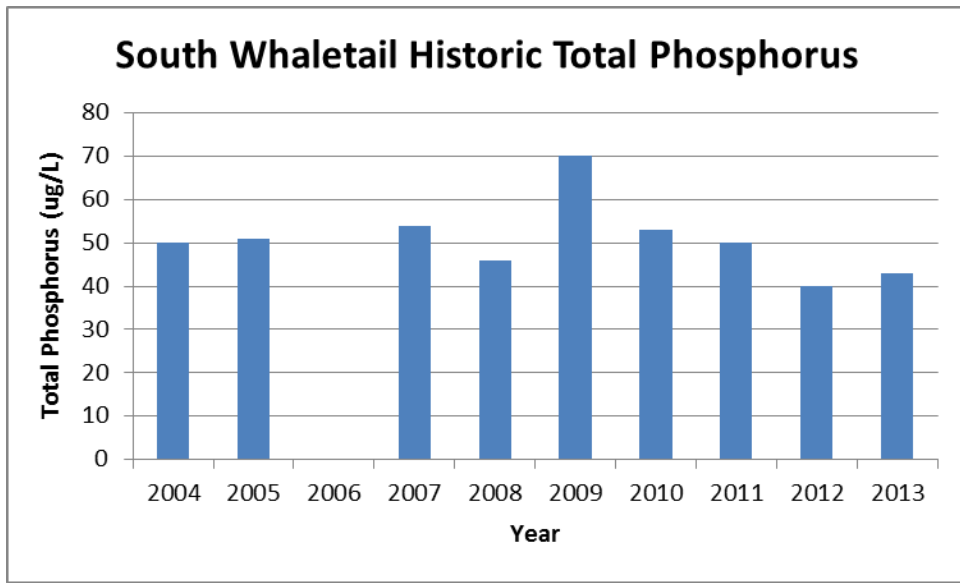












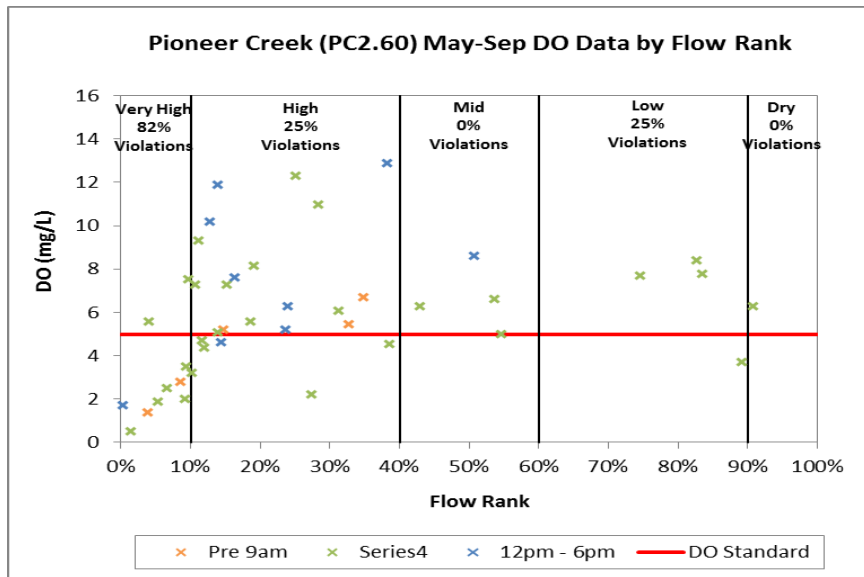
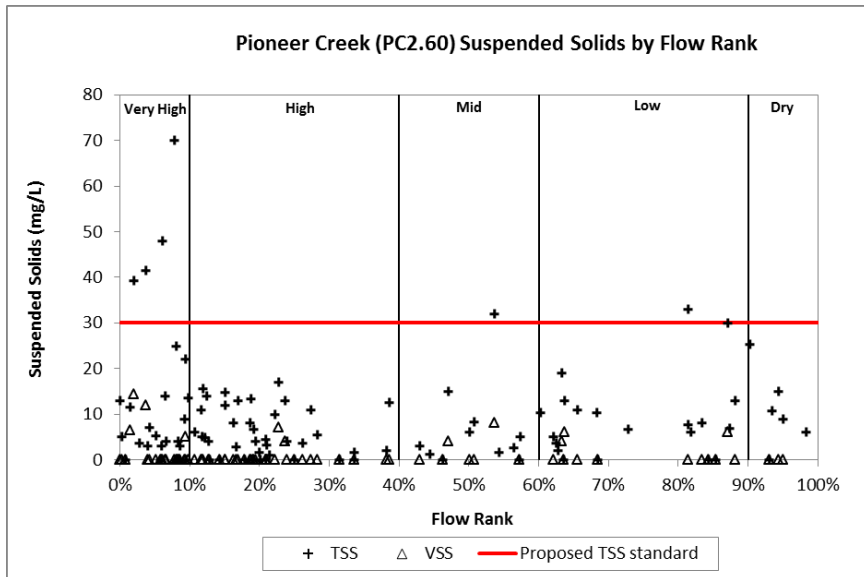
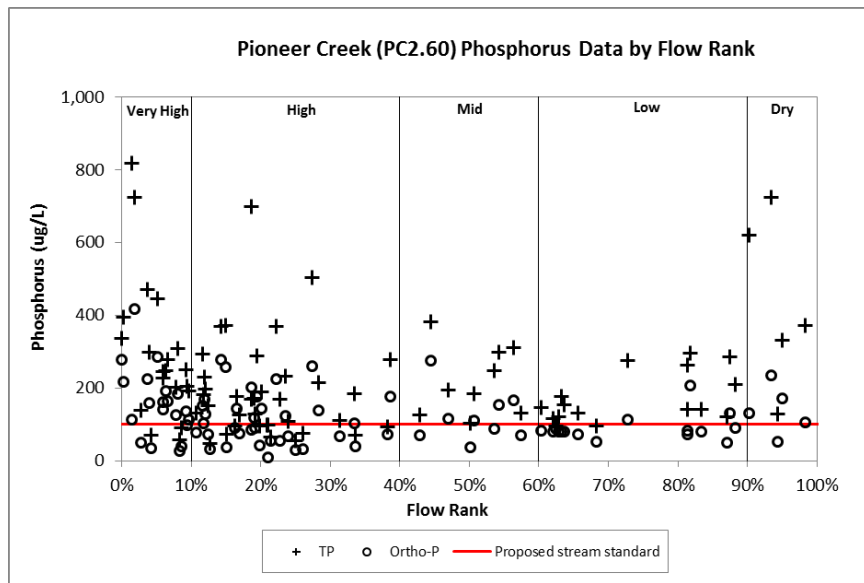
## Streams

There is a limited amount of stream water quality data, four biweekly or more frequent monitoring seasons of data on Pioneer and Sarah Creeks and two monthly monitoring seasons.

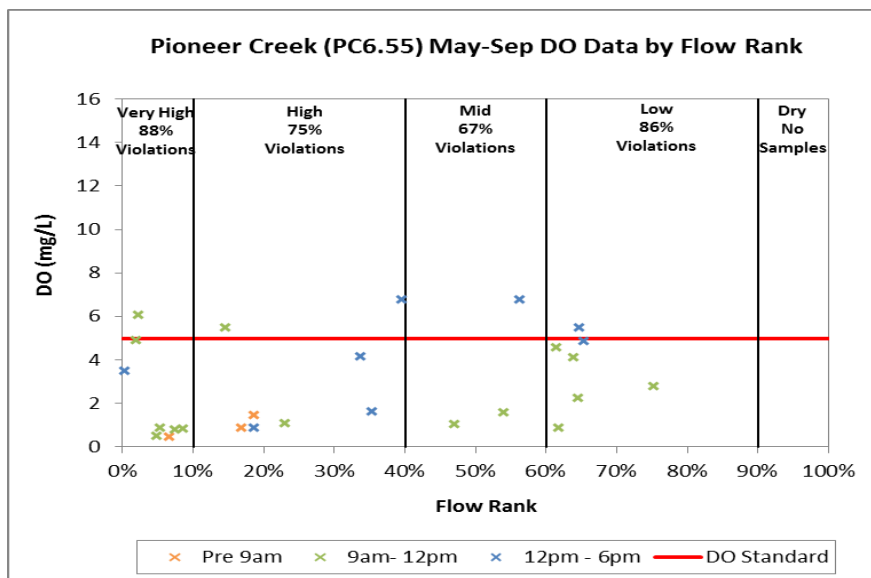
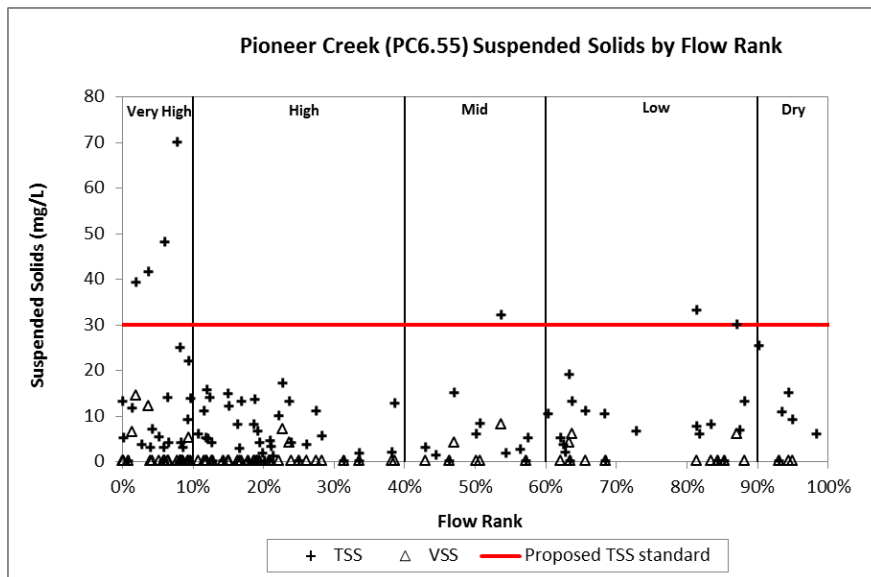
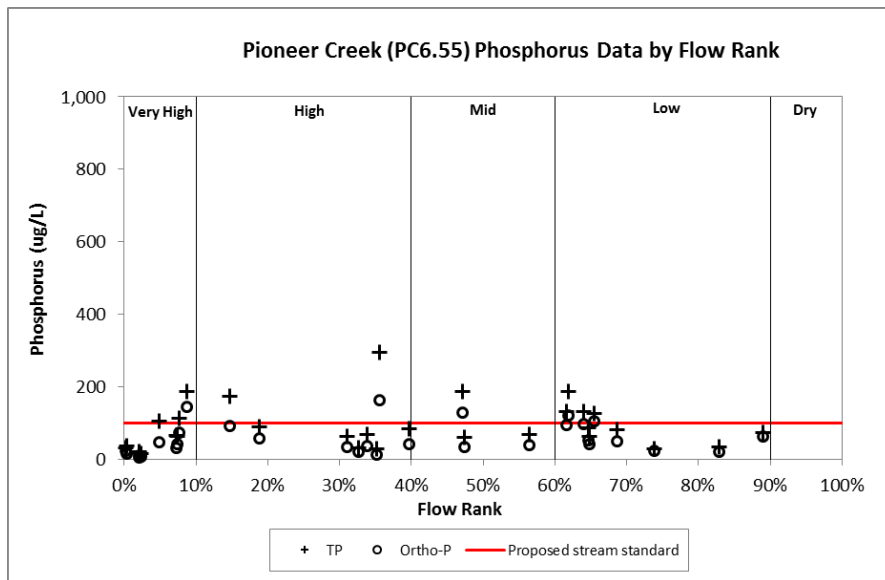
There are two monitoring stations on Pioneer Creek – one at the Copeland Road crossing at river mile 2.6 and one at the County Road 90 crossing at river mile 6.55. Pioneer Creek is the outlet of Lake Independence, and flows through a series of large wetland complexes before reaching the County Road 90 monitoring site. The wetlands significantly influence water quality at this site, with the creek very low in dissolved oxygen. At the Copeland Road site, Pioneer Creek is high in total phosphorus and suspended solids and during the monitoring period generally only fell below the 5 ug/L minimum standard during times of high flows, when low-oxygen water was being flushed out of the wetlands.

Sarah Creek exhibited better water quality during the monitoring period than pioneer Creek, but exceed the phosphorus and suspended solids proposed standards during low flow periods.

Both streams are Impaired Waters for *E. coli*, a bacterium, with exceedances of both the chronic standard and the acute standard.



**Water quality by flow rank for the Pioneer Creek Copeland Road monitoring site.**



**Water quality by flow rank for the Pioneer Creek County Road 90 monitoring site.**



