Lake Augusta Feasibility Study

December 13, 2023

Greg Wilson, Barr Engineering

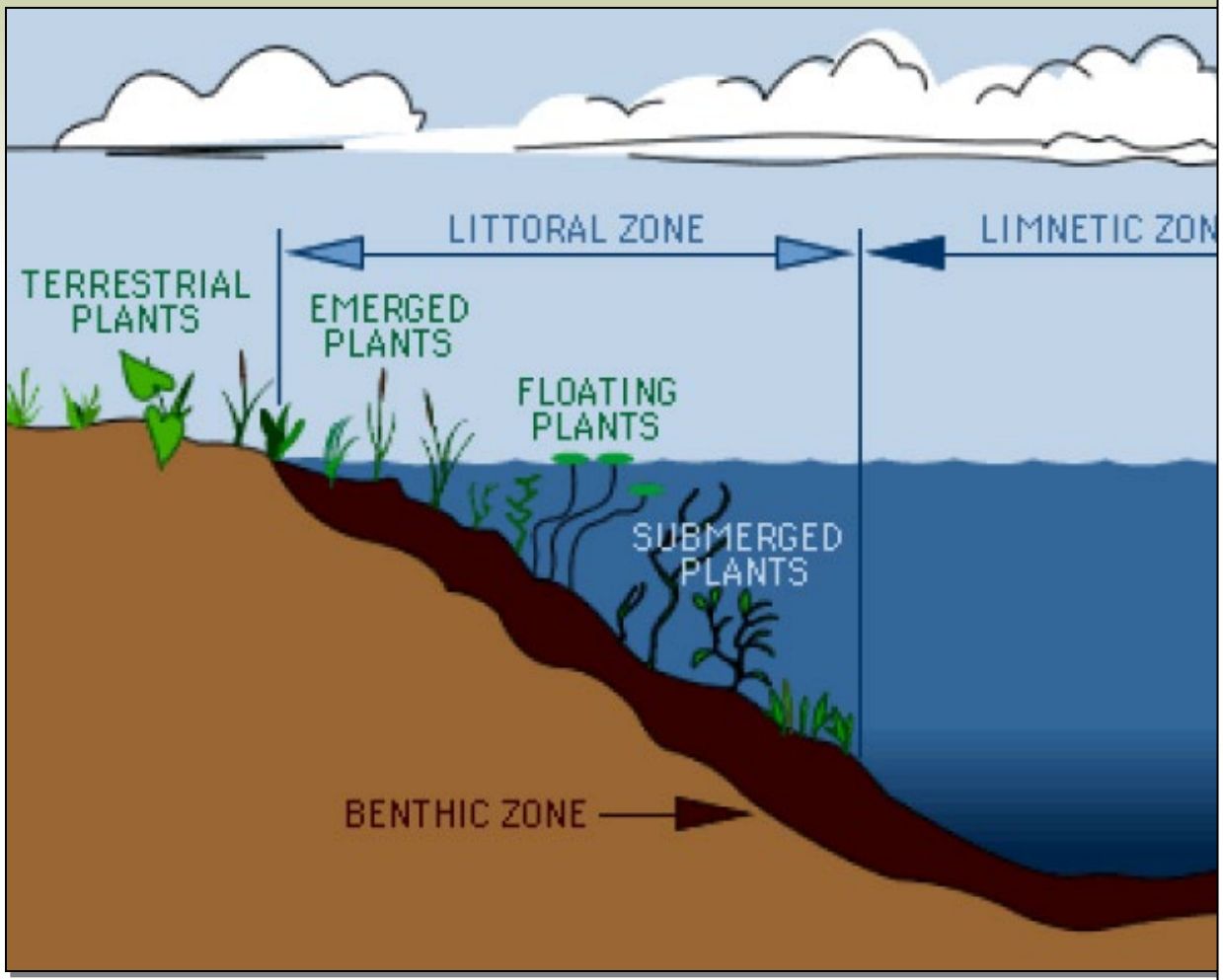
LMR WMO
LOWER MISSISSIPPI RIVER
WATERSHED MANAGEMENT ORGANIZATION

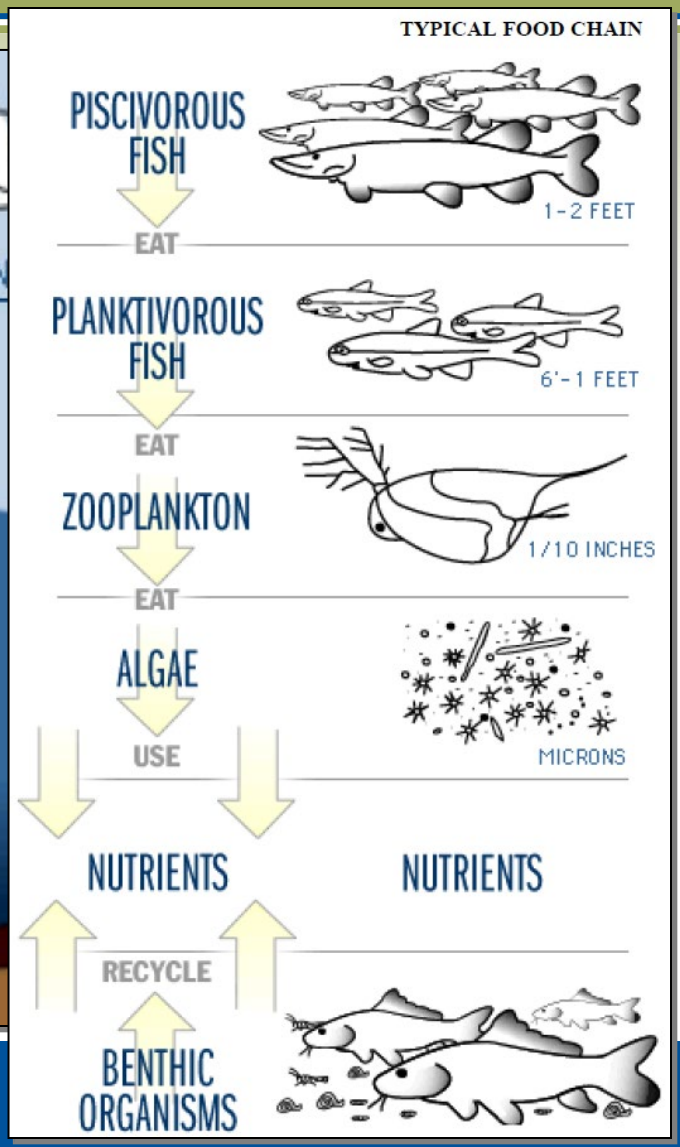
CLEAN WATER LAND & LEGACY AMENDMENT

Project overview

- Primer on lake ecology and water quality
- Phosphorus sources
- Lake water quality and watershed monitoring
- Updates to watershed mapping and modeling
- Lake water quality modeling
- Feasibility analysis
  - planning for water management/lake outlet
  - water quality improvement options

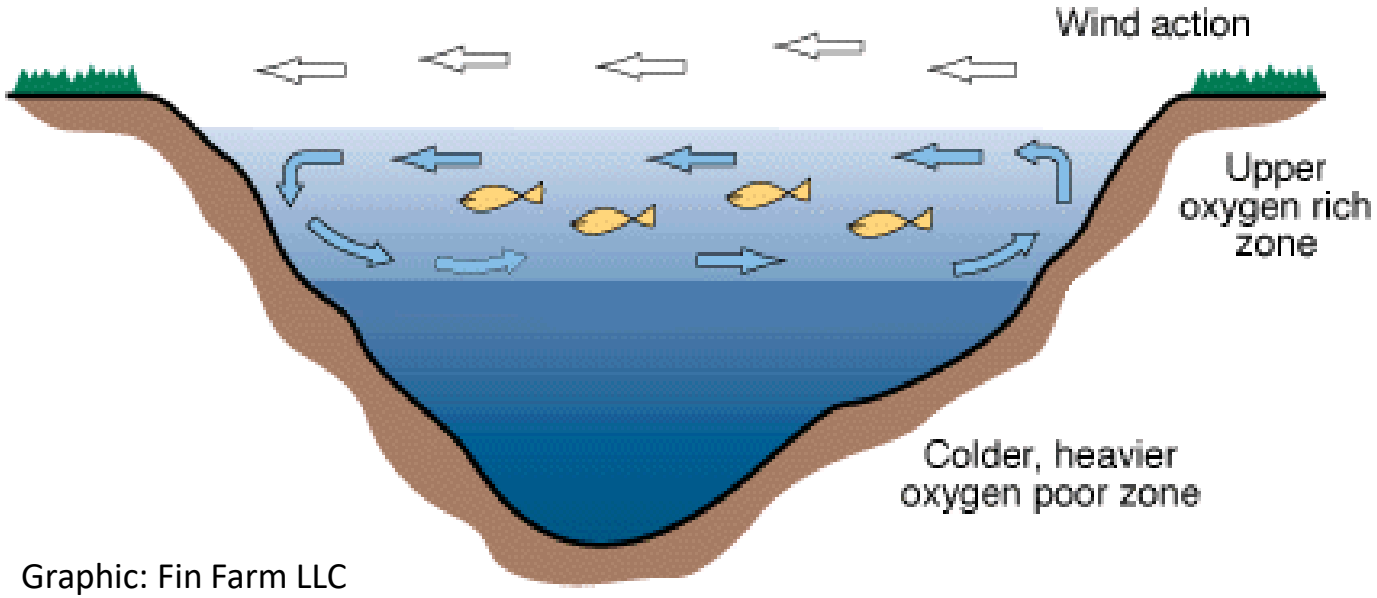
Background on Lake Ecology





Lake Stratification

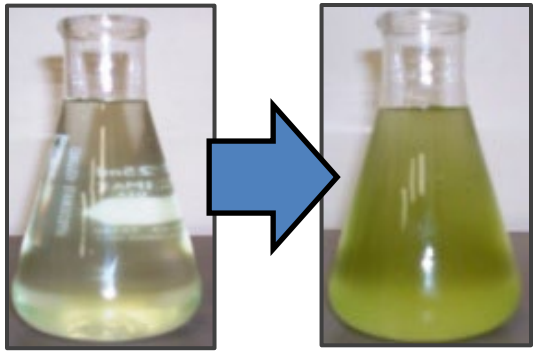
Deep lakes thermally stratify- separating into layers based on temperature



Graphic: Fin Farm LLC

Excess Phosphorus Means Poor Water Quality

- Phosphorus feeds algae and causes algal blooms
- Algae decreases water clarity
- Algal decay depletes dissolved oxygen near the lake bottom



Where Does the Phosphorus Come From?

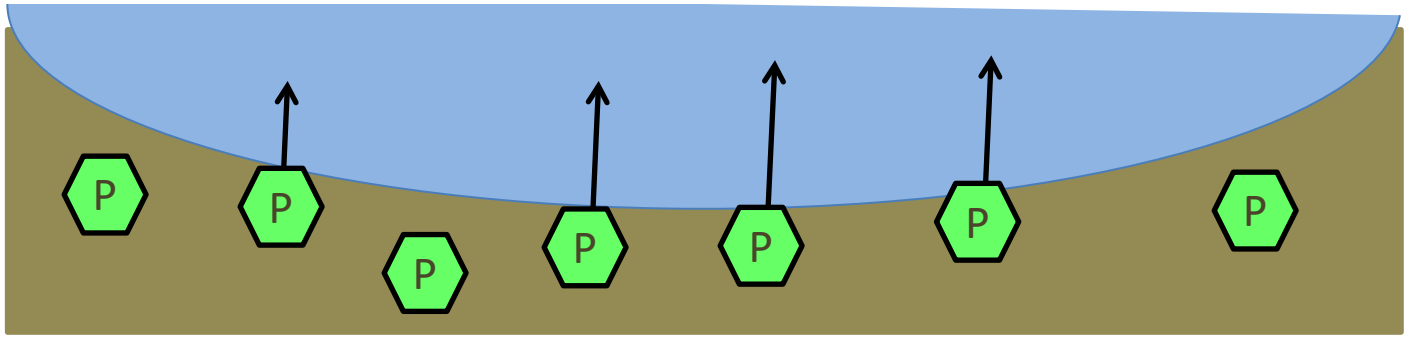
External Sources

- Storm water runoff from hard (impervious) surfaces
- Leaves & grass clippings
- Fertilizers
- Pet/animal waste
- Soil erosion
- Septic systems

Where Does the Phosphorus Come From?

Internal Sources

- Phosphorus can be stored in lake bottom sediments and released when oxygen levels are low
- Cormorants



Past lake water quality

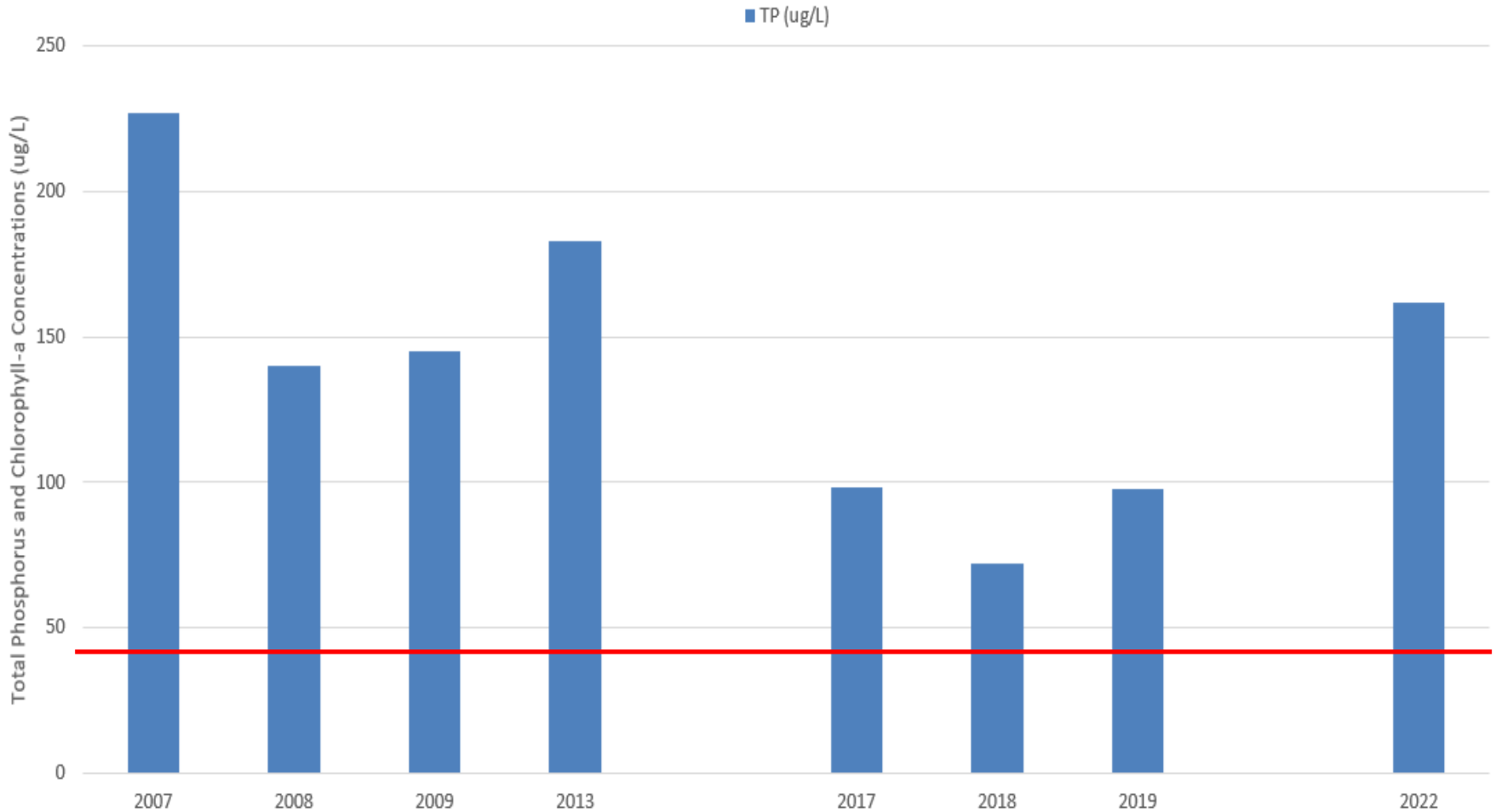
Table 2.2 Ten-year (2003-2012) average summer (June-September) water quality/ applicable standards for lakes in the Lower Mississippi River WMO WRAPS study area

Lake	TP (µg/L)	Chlorophyll-a (µg/L)	Secchi depth (meters)	Years Monitored
Deep Lake Standards	< 40	< 14	> 1.4	
Augusta	175	59	0.27	2007-2009

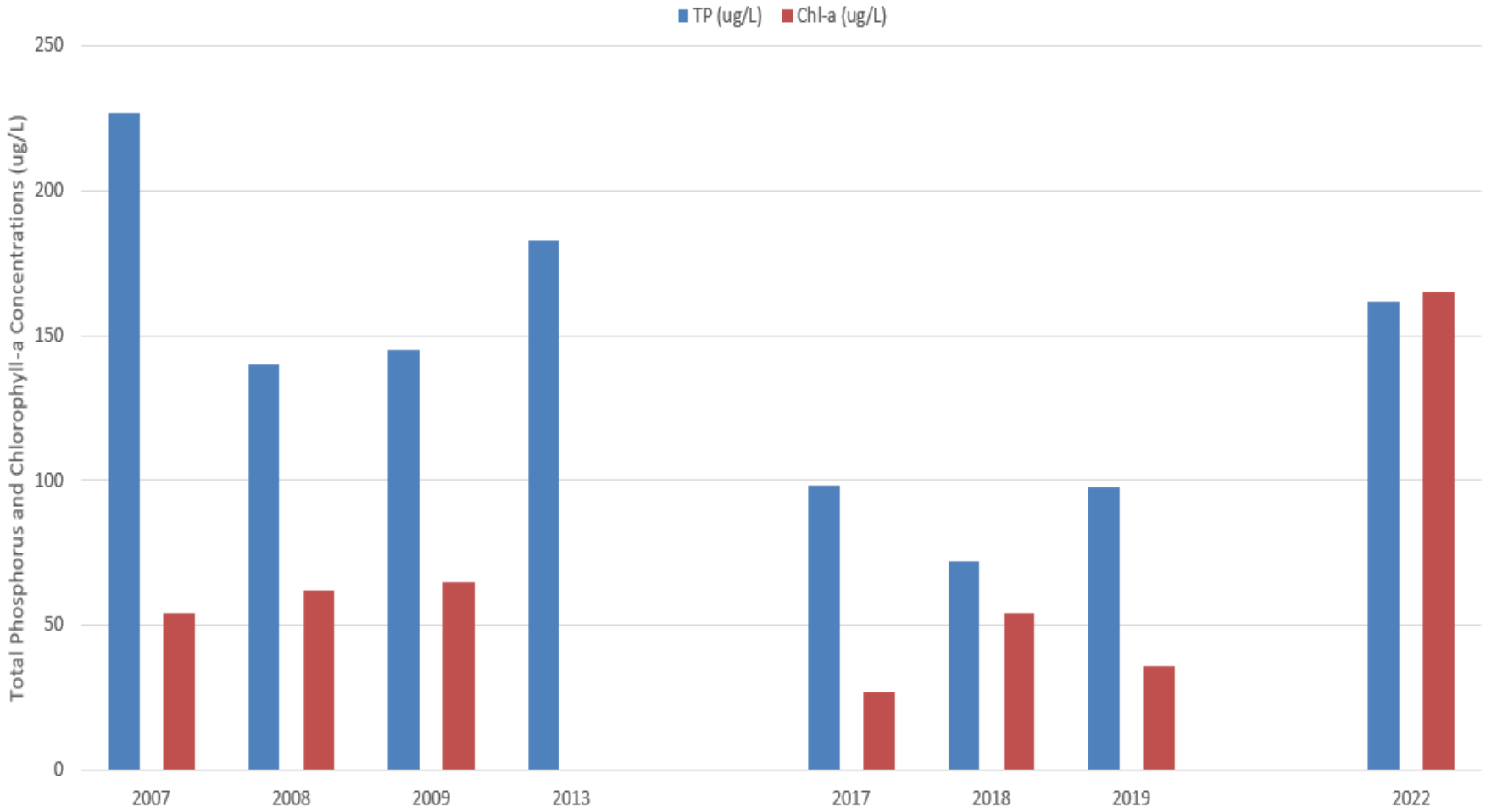
Shading indicates where applicable water quality standard is not being met

Lake Augusta Watershed

Water Quality Patterns

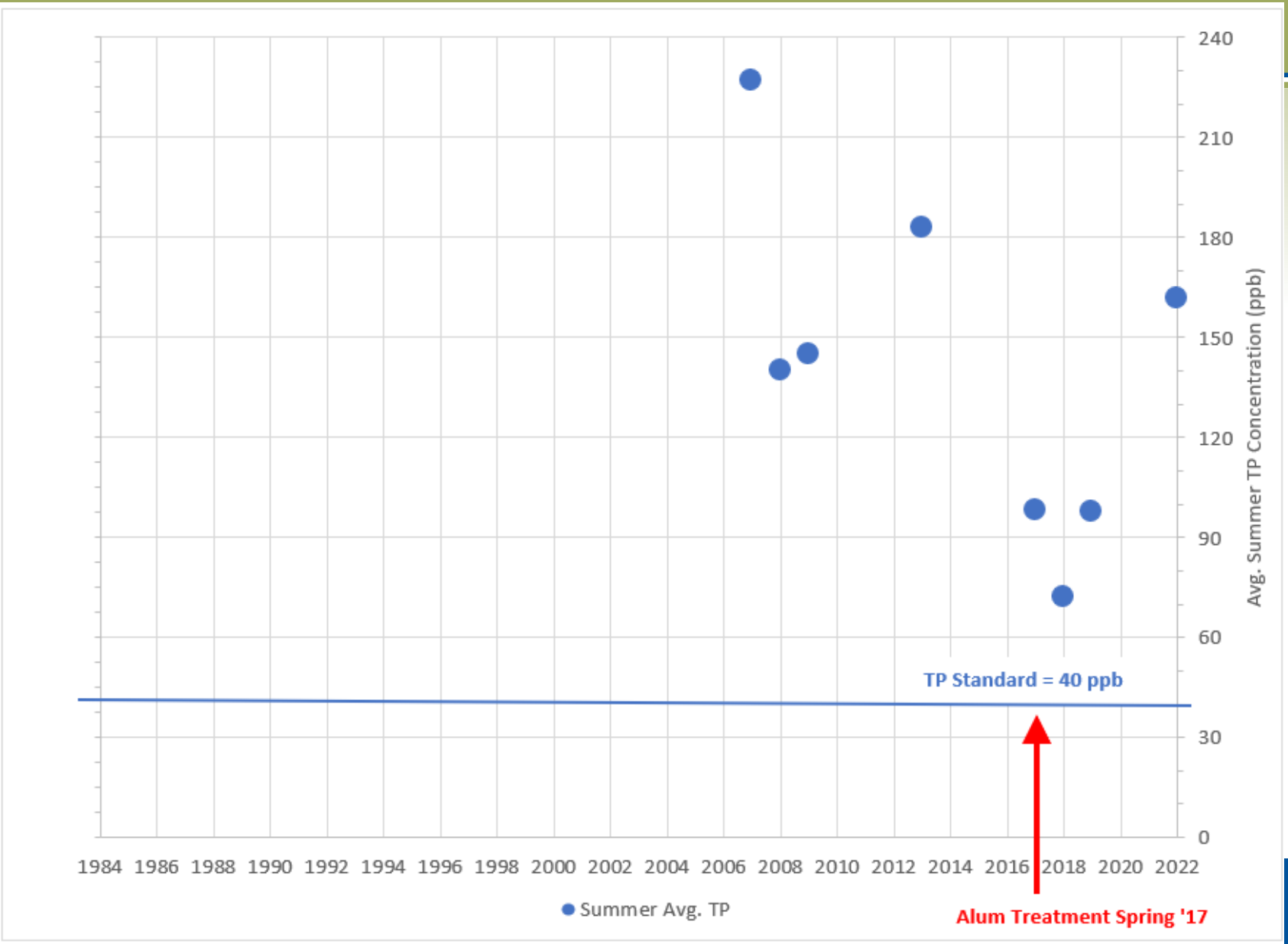


Water Quality Patterns

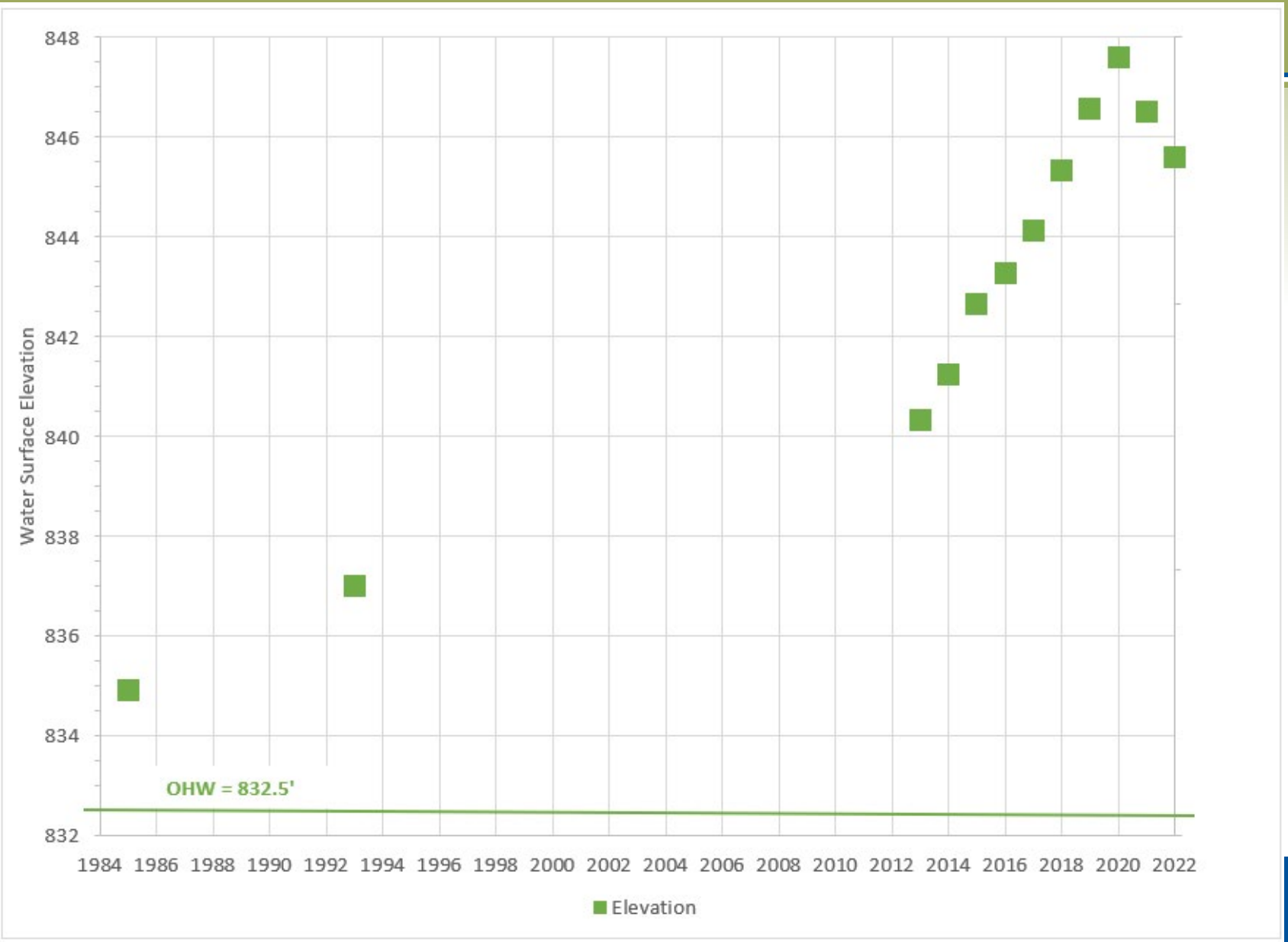


Water Quality Patterns

Water Quality Patterns



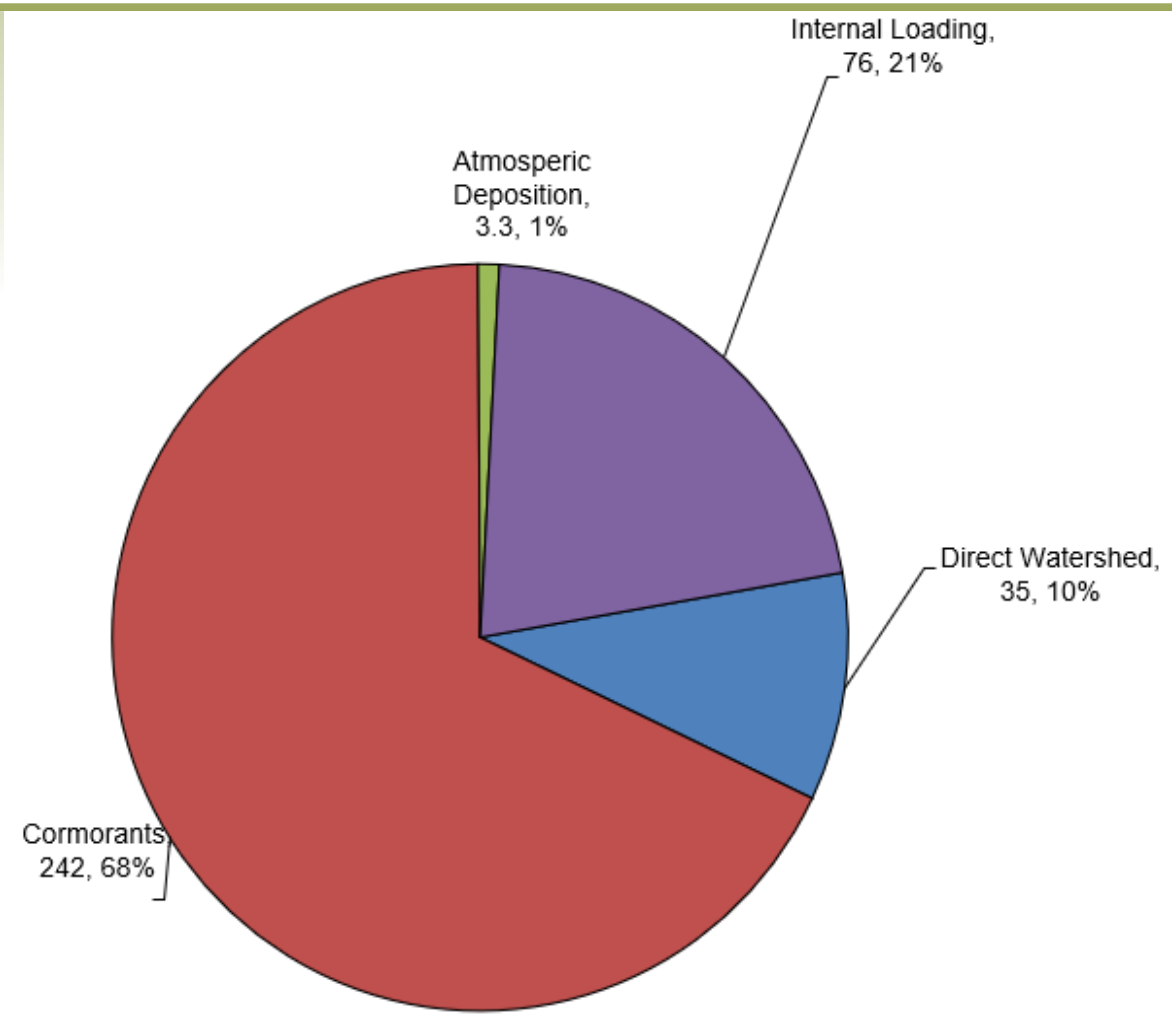
Lake Level Changes



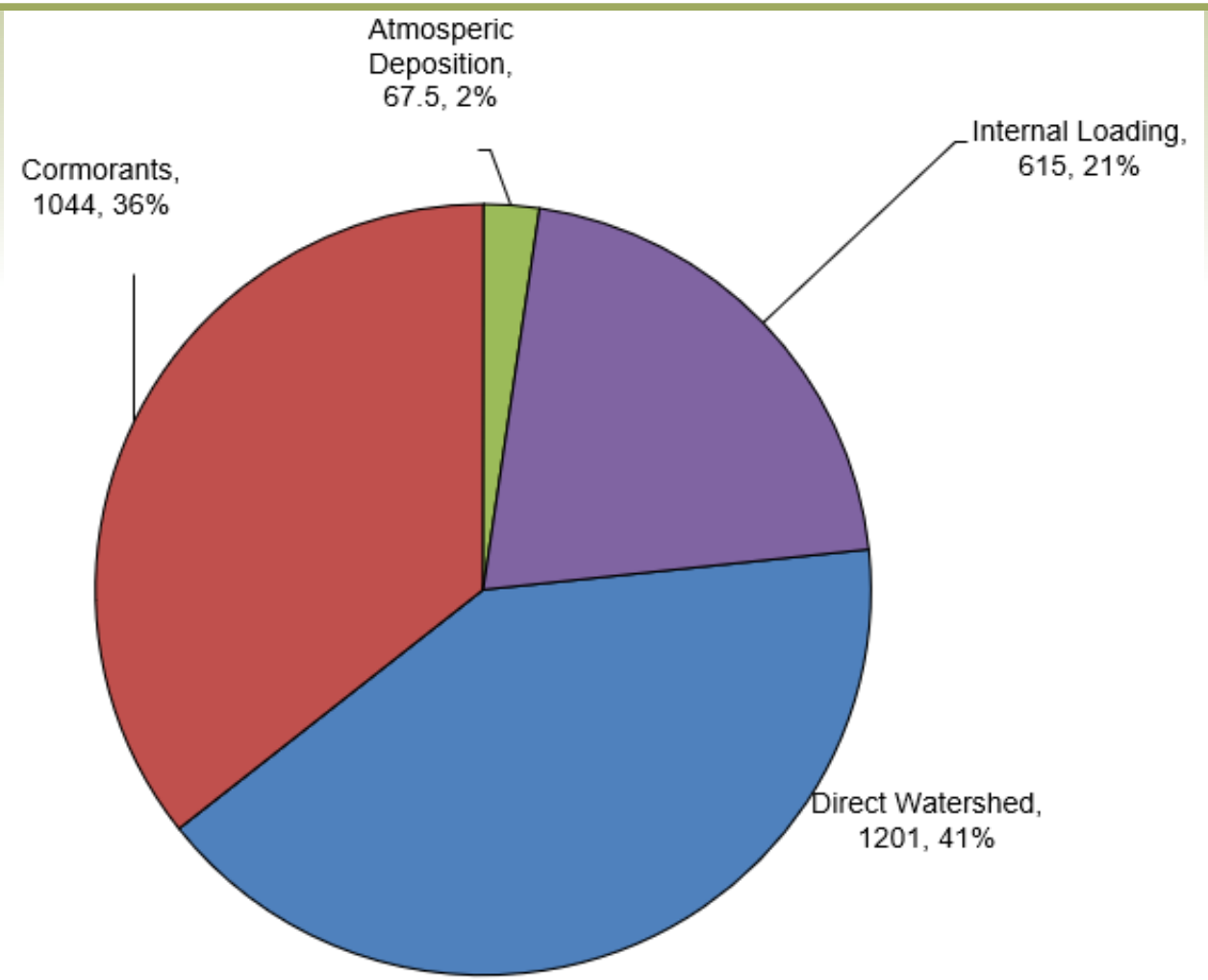
Water Quality Impacts from High Water

Water Quality Impacts from High Water

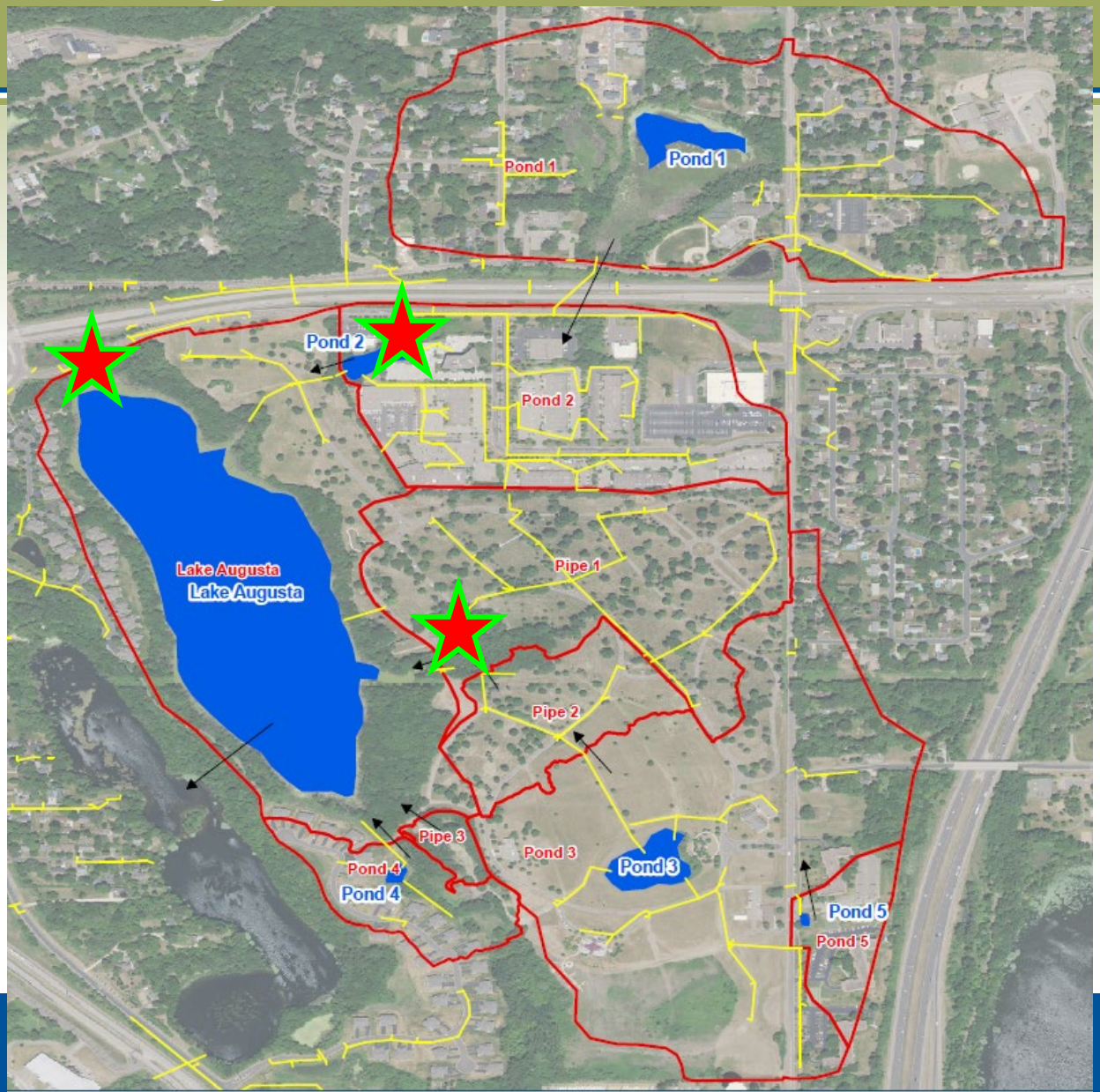
2022 Growing Season Phosphorus Loads



Est. Long-Term (2013-22) Phosphorus Loads



Lake Augusta Improvement Options



Lake Augusta Improvement Options

Average Summer Load Reduction and Modeled TP Following BMP Implementation

Modeled Parameter	Option 1: Lake Outlet and Shoreline Tree Removal	Option 2: Pond 2 Enhancements and New Cemetery Pond	Combination of Options 1 and 2
Watershed TP Load Reduction (%)	--	24	24
Cormorant TP Load Reduction (%)	80	--	80
Predicted TP (ppb) Following BMP Implementation	50	67	40

BMP ID/Location	Annual TP Removal (lbs/yr)	Planning Level Capital Cost Estimate	Annualized Cost-Benefit ($/lb TP Removed/yr)
Lake outlet and shoreline tree removal	84	$545,000	$540
Construct cemetery pond	12	$184,000	$1,300
Pond 2 enhancements	17	$650,000	$3,200

Questions?