Lake Augusta Feasibility Study

6.0 Lake Augusta Discussion Attachment

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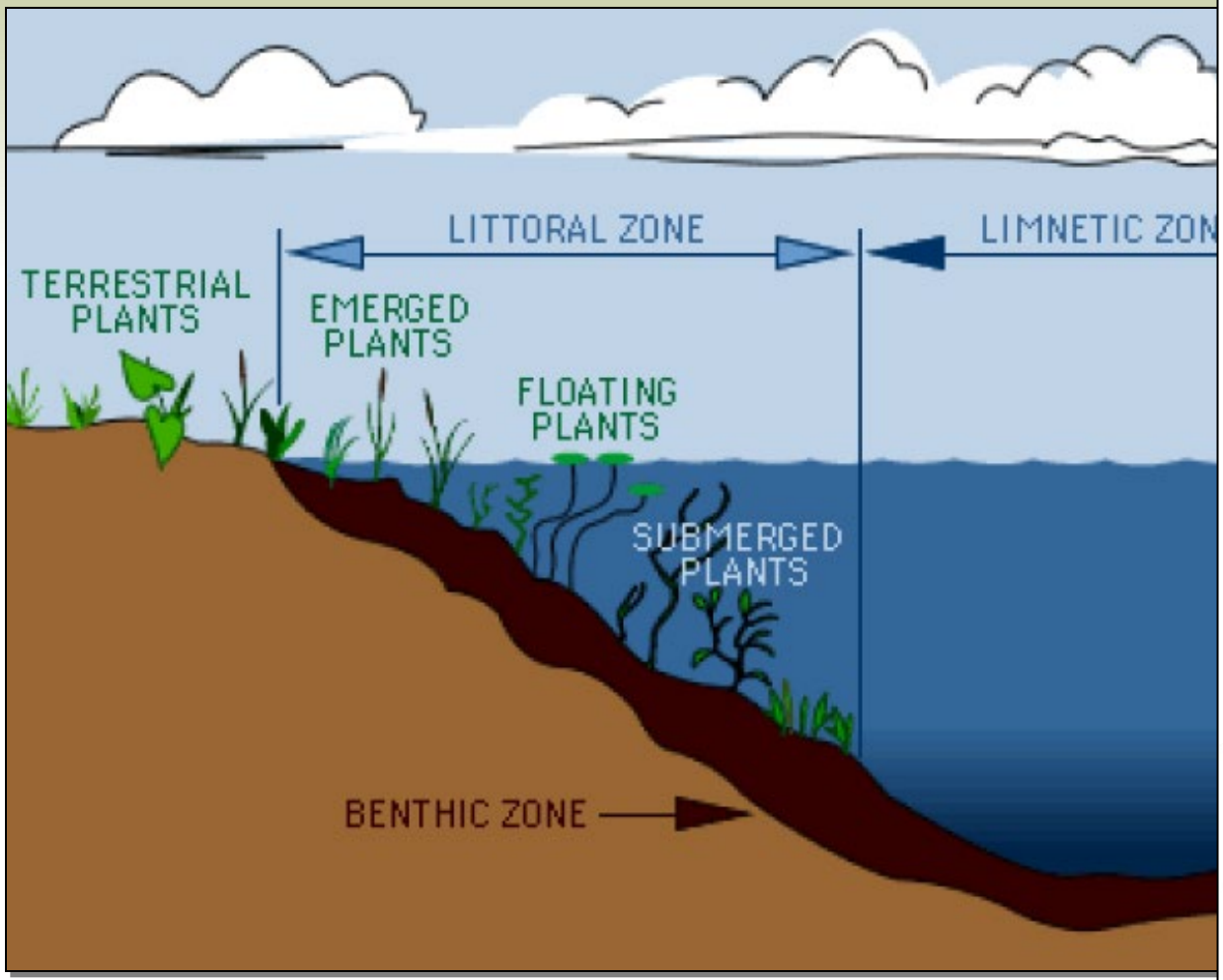
LMR WMO
LOWER MISSISSIPPI RIVER
WATERSHED MANAGEMENT ORGANIZATION

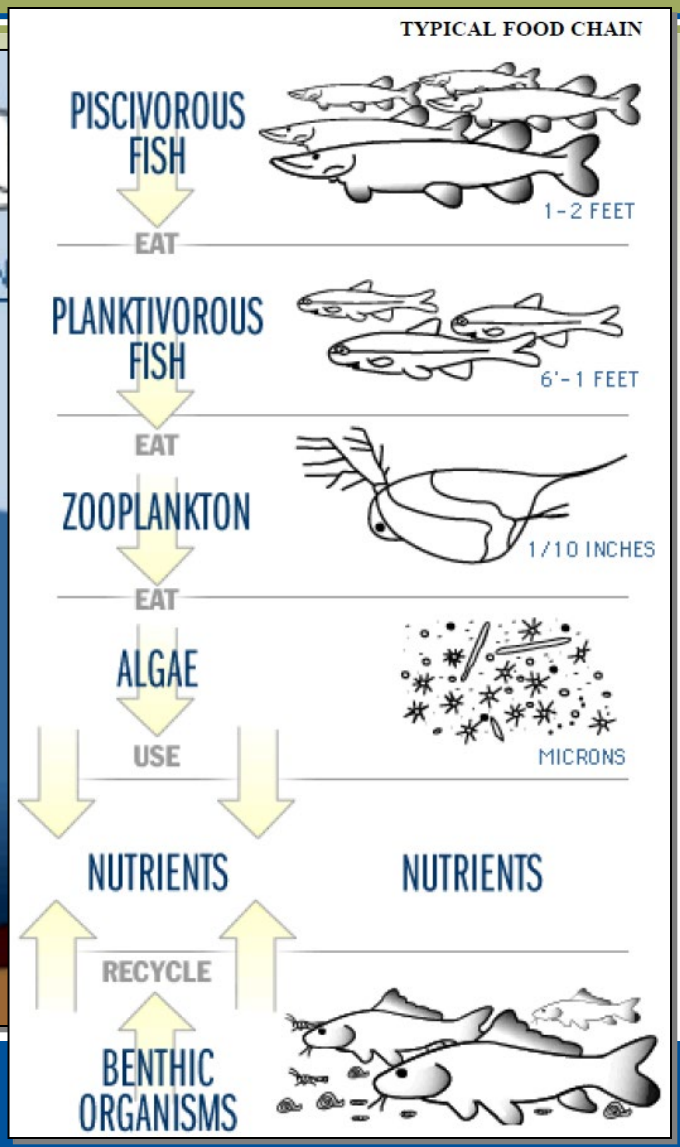
CLEAN WATER LAND & LEGACY AMENDMENT

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

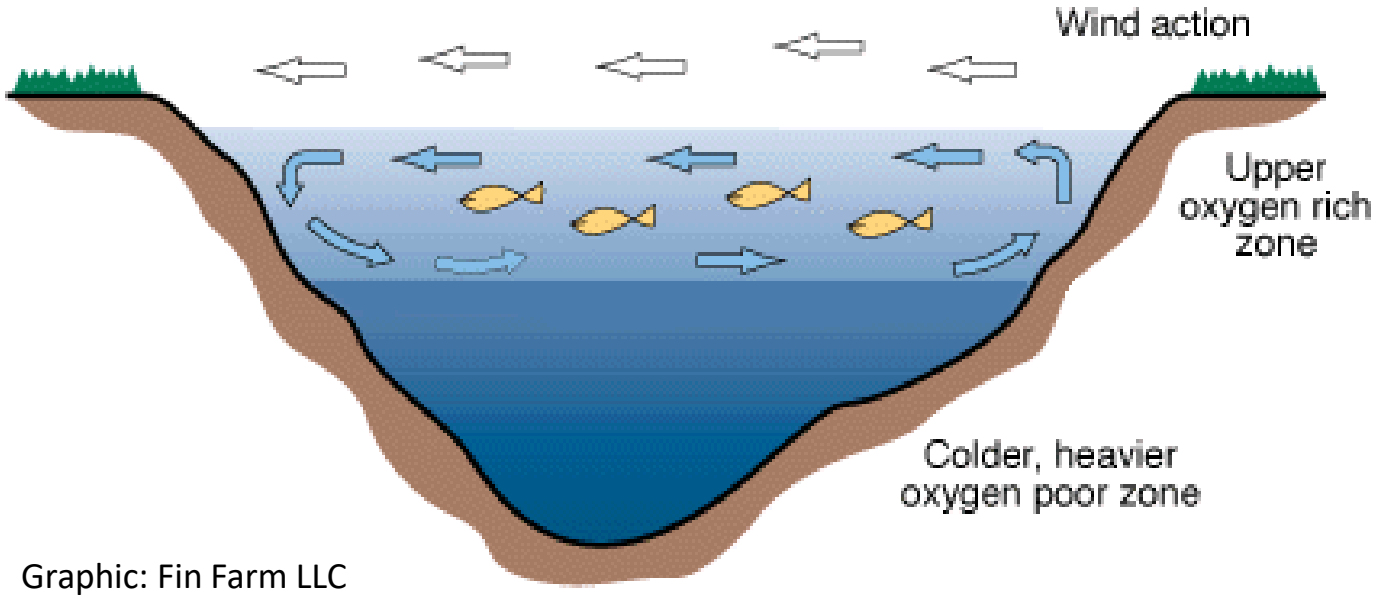
Background on Lake Ecology





Lake Stratification

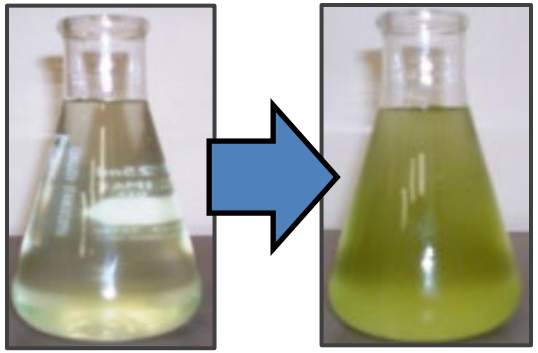
Deep lakes thermally stratify- separating into layers based on temperature



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?

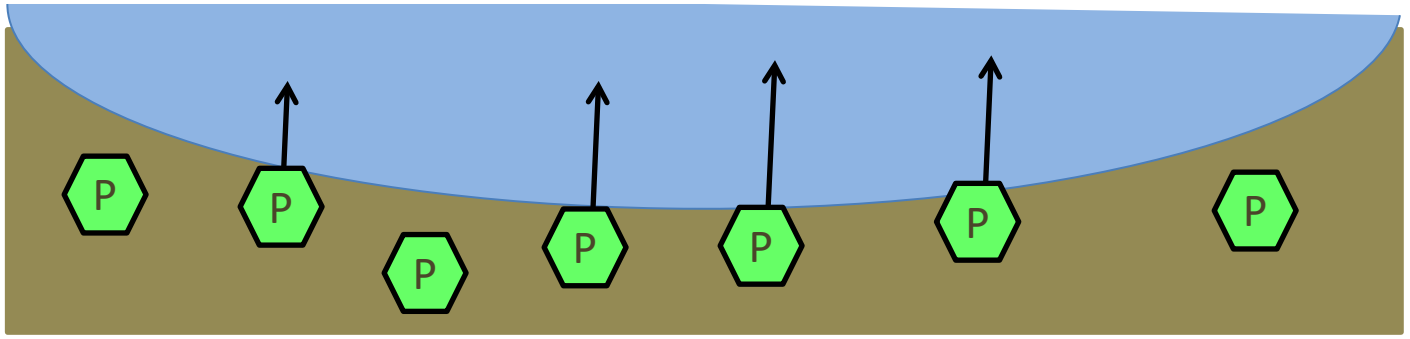
External Sources

- 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

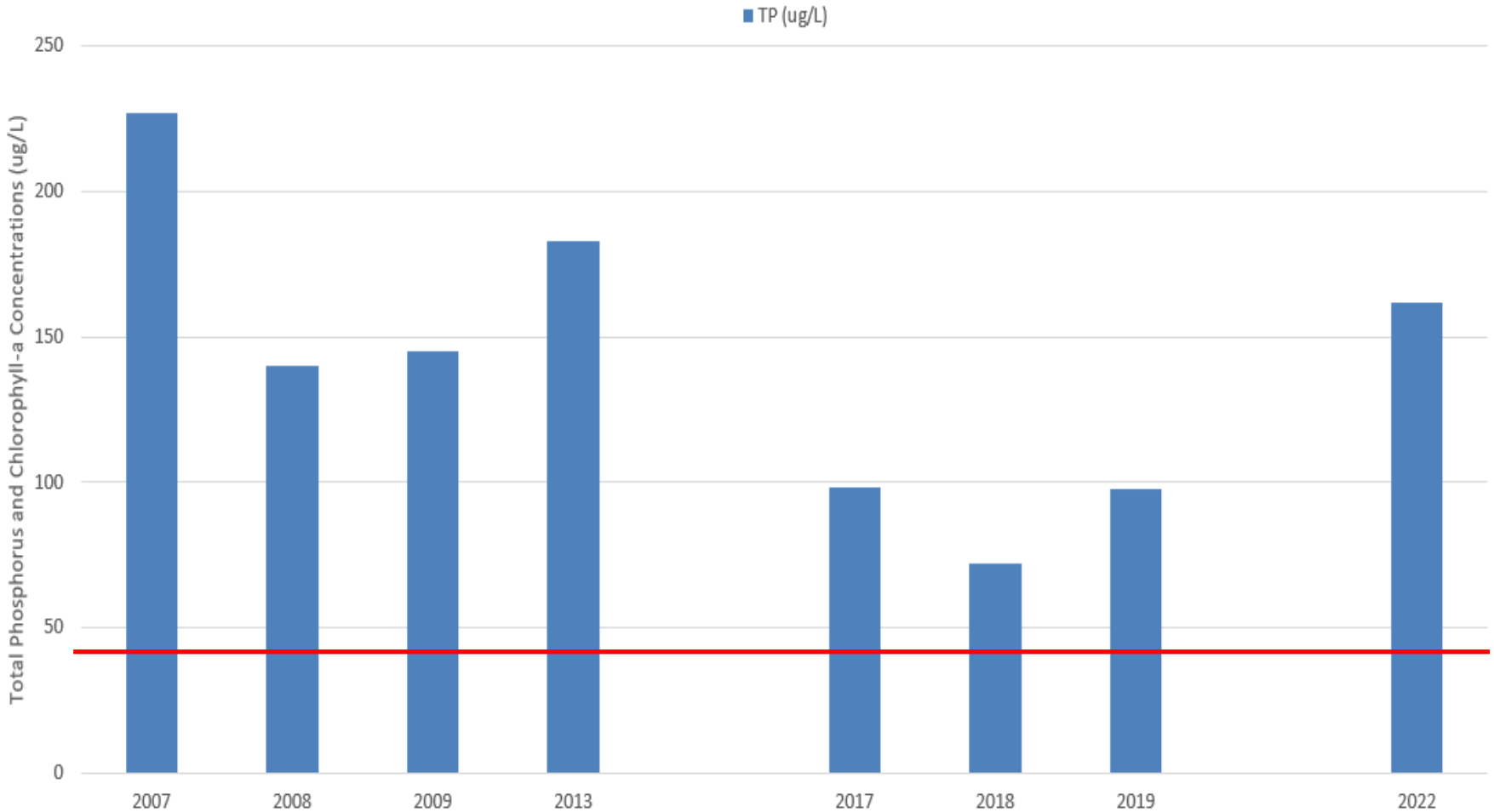
Table 2.2 Ten-year (2003-2012) average summer (June-September) water quality/ applicable standards for lakes in the Lower Mississippi River WMO WRAPS study area

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

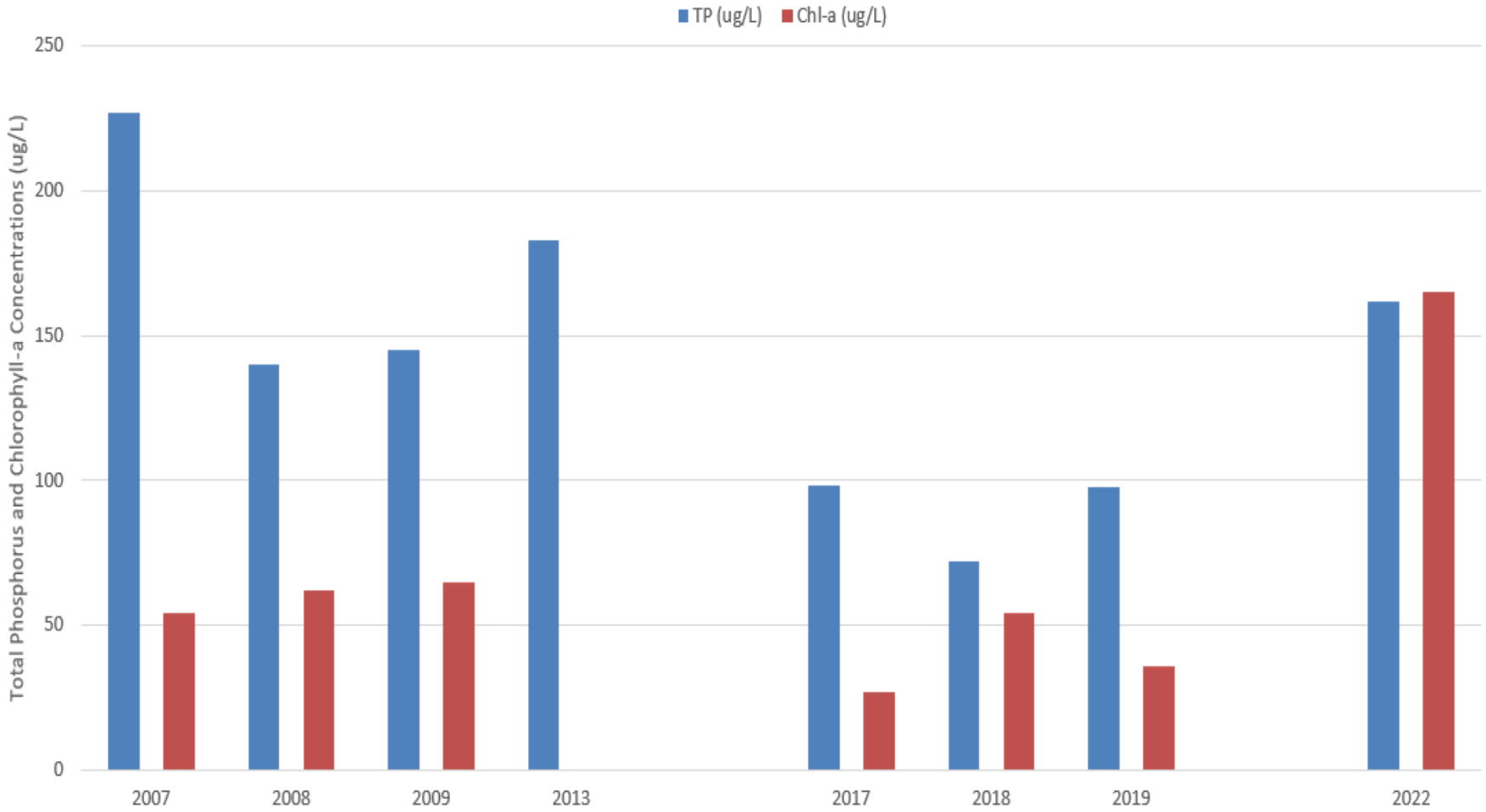
Shading indicates where applicable water quality standard is not being met

Lake Augusta Watershed

Water Quality Patterns



Water Quality Patterns



Water Quality Patterns

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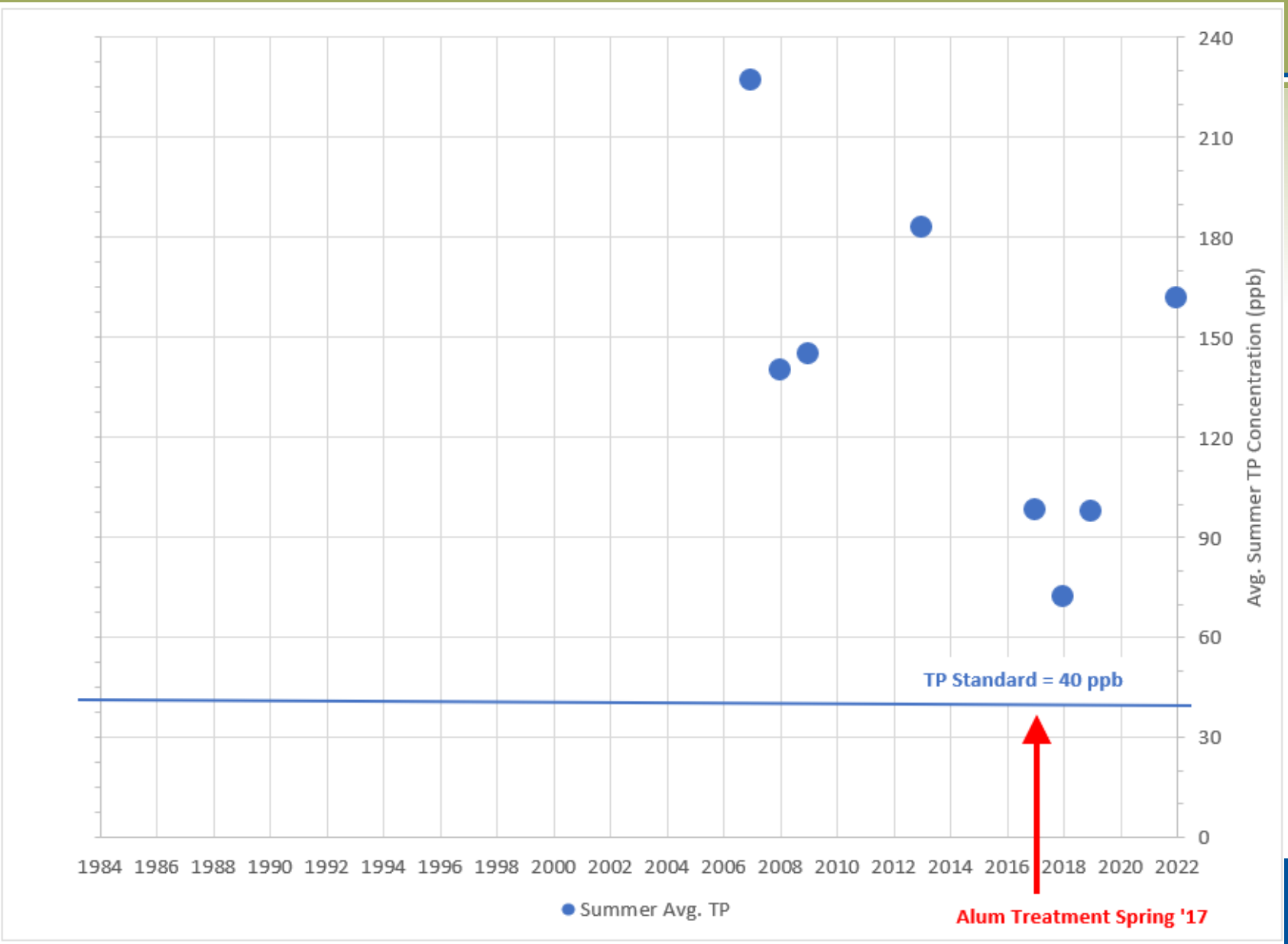
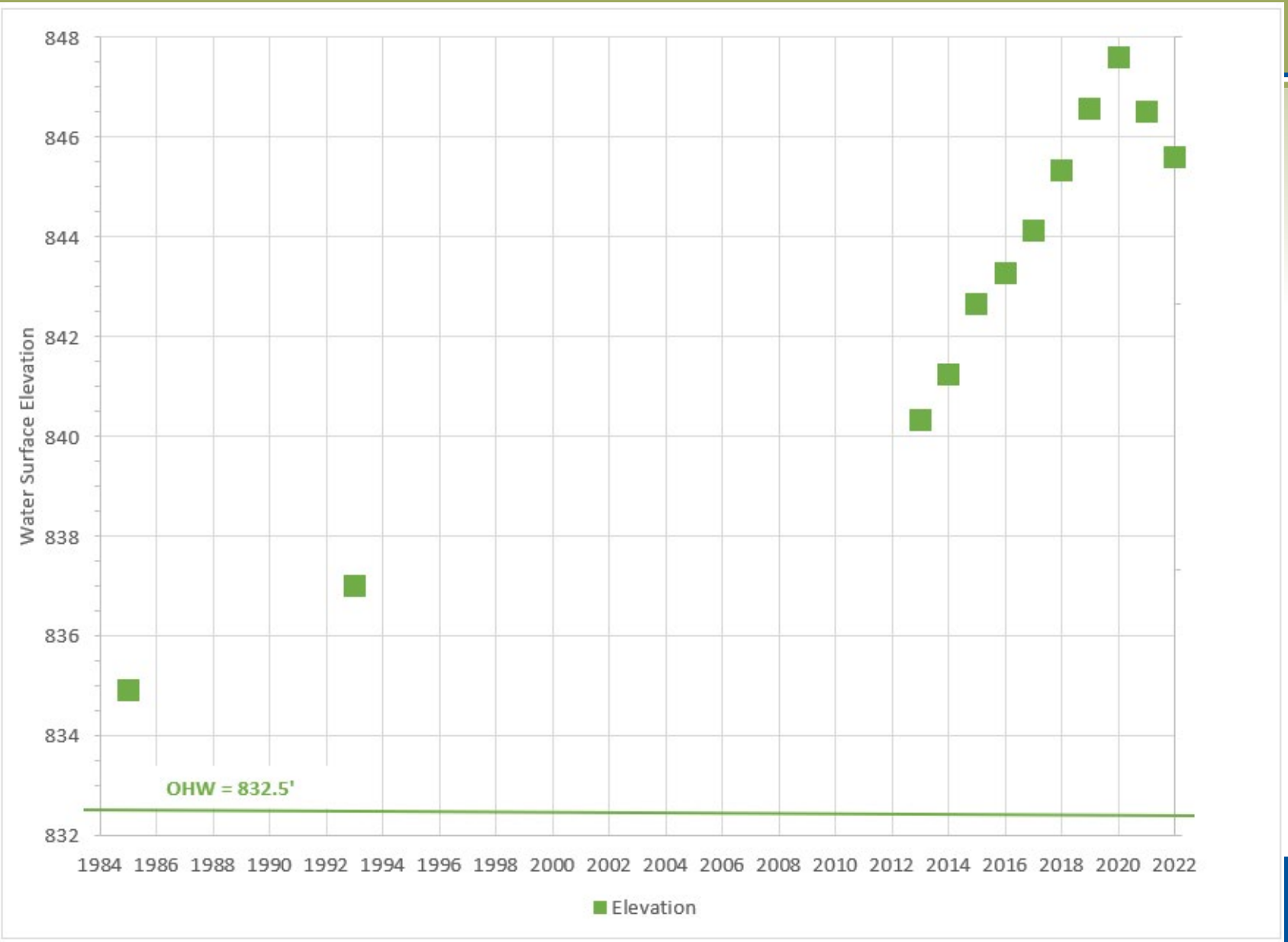


Lake Level Changes



Water Quality Impacts from High Water

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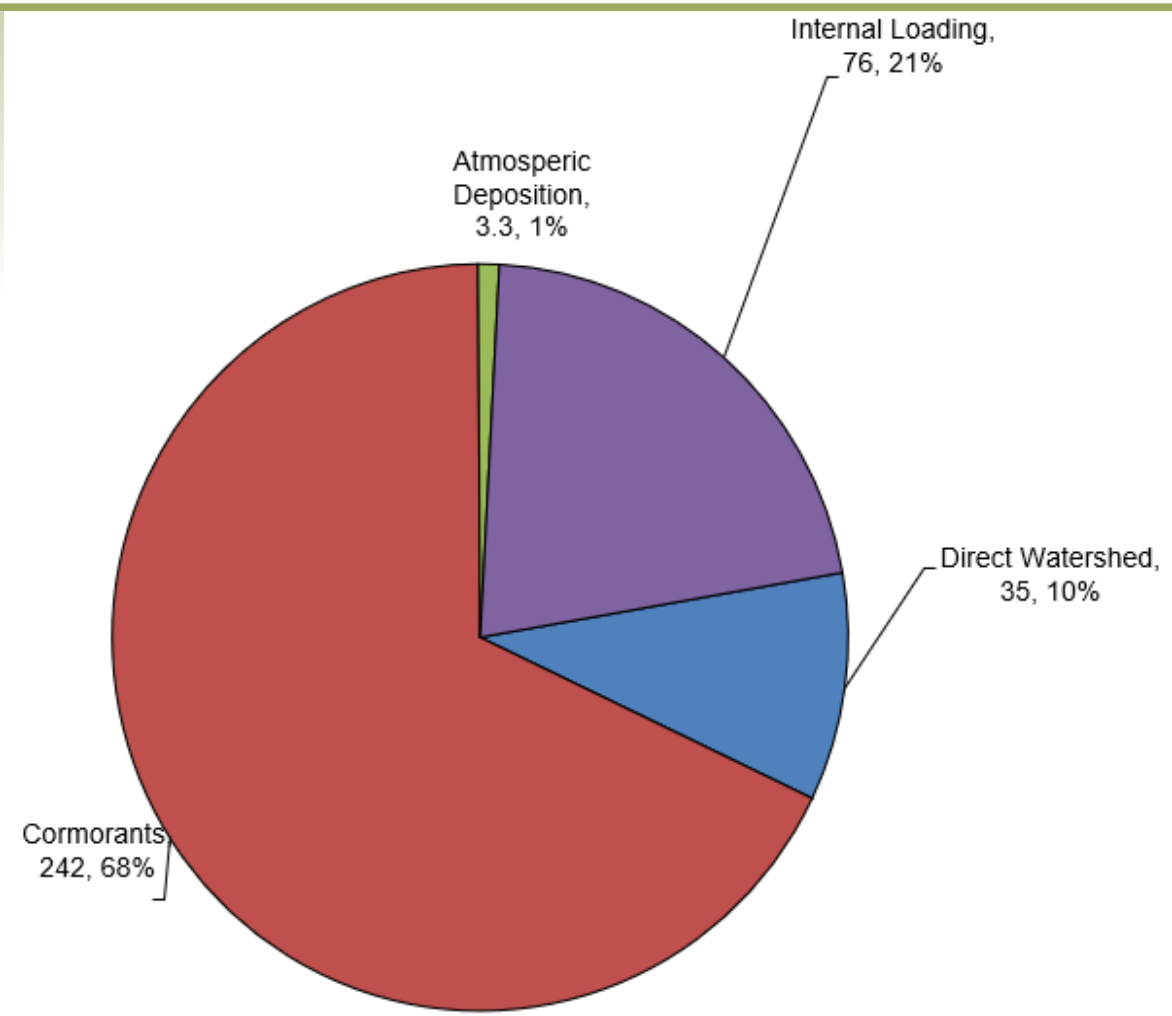
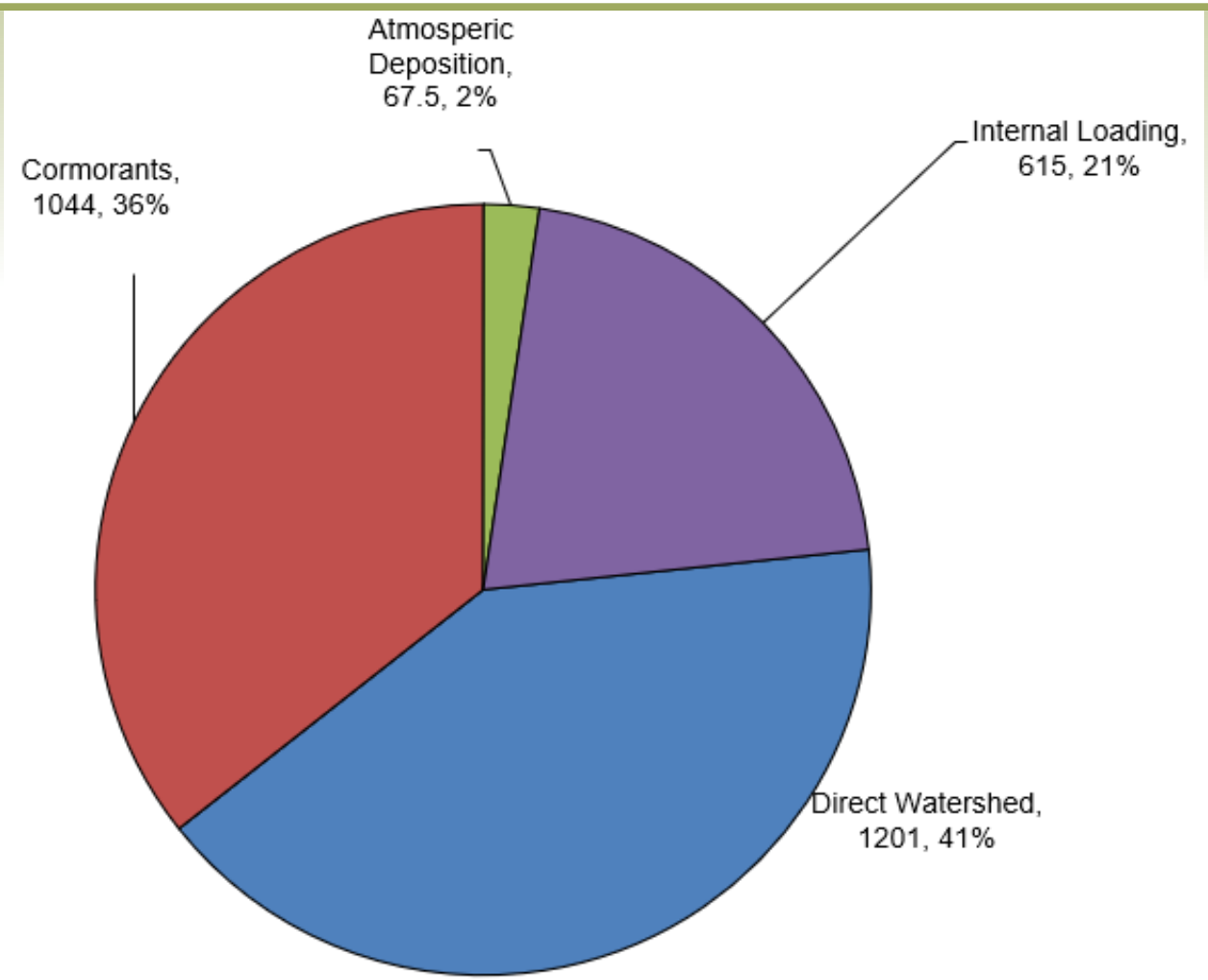
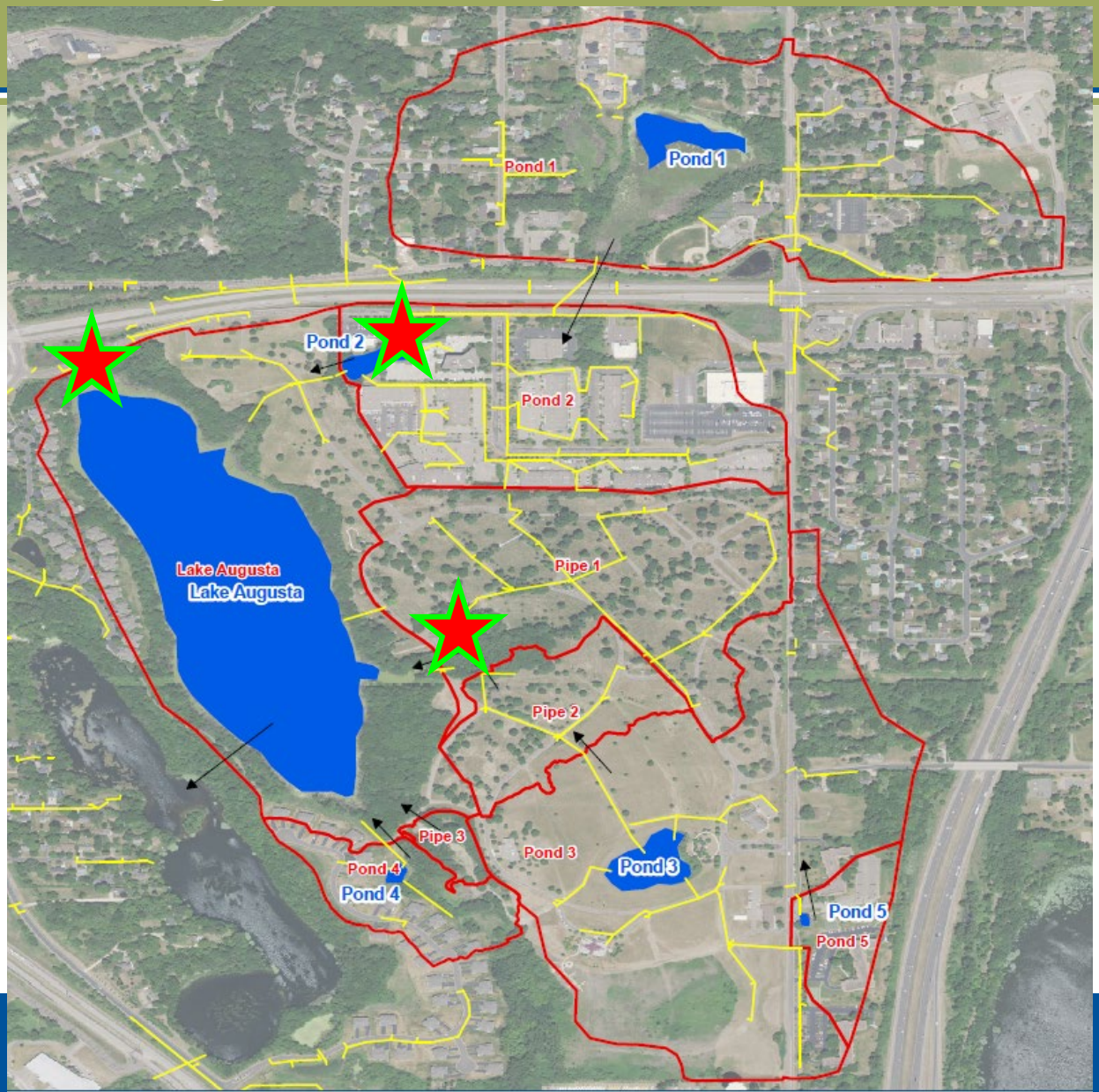
2022 Growing Season Phosphorus Loads



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?