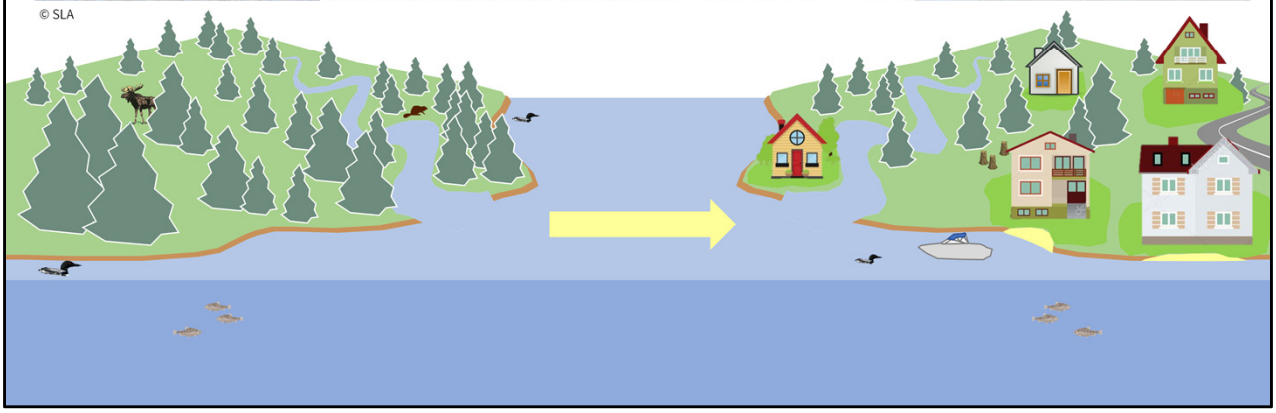

GREGG LAKE
WATERSHED MANAGEMENT PLAN
FB
environmental
Horsley Witten Group
Sustainable Environmental Solutions
DK Water Resource Consulting LLC
Water Quality Goal Meeting, 7/12/2019
L. Diemer


The Process
Watershed Management Planning
Elements of Successful Plans
Build Public Support
Establish Committee
Engage Stakeholders
Inventory the Watershed
Complete Field Surveys
Define the Problems
Complete WQ Analysis
Determine Assimilative Capacity
Run models
Set Goals & Develop Solutions
Set WQ Goal
Draft Plan
Create an Action Plan
Action Plan
Finalize Plan
Implement & Evaluate
Apply for Grants
Evaluate Plan Regularly

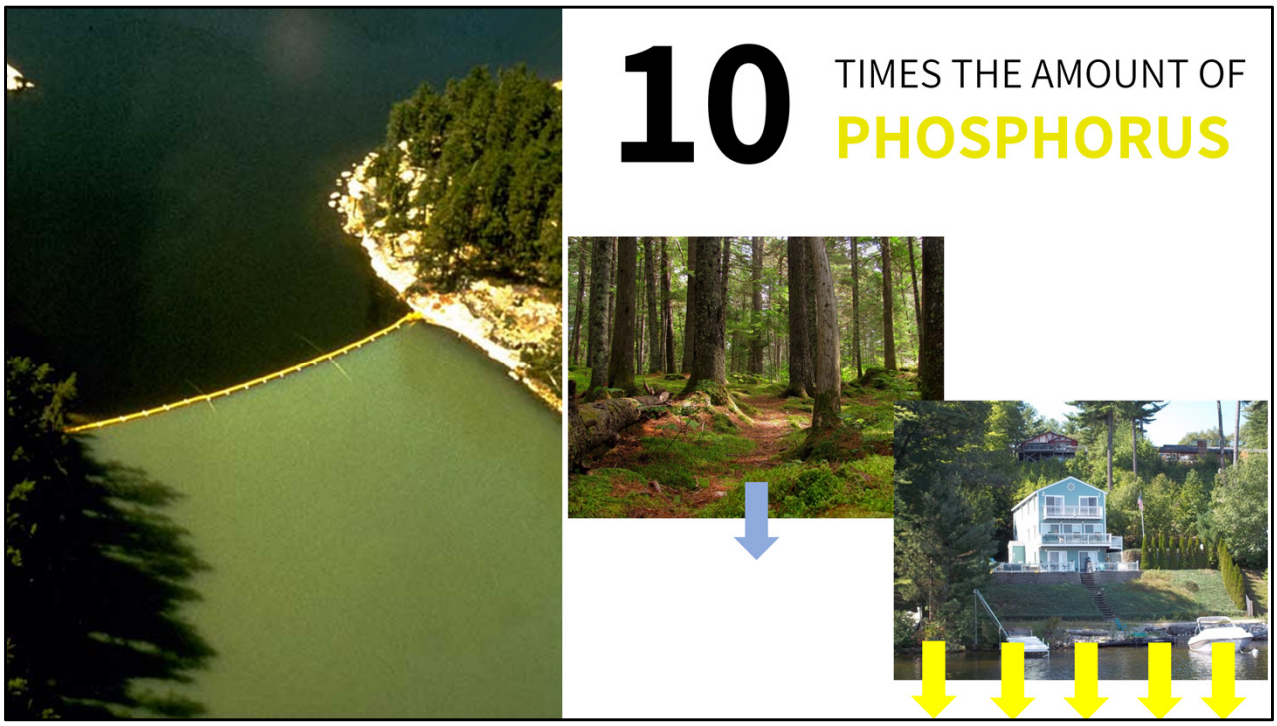
LANDSCAPE ALTERATIONS



Some of the things we are concerned about and what will be addressed in the WMP is the impact of development on water quality. When we start developing our shorelines by clearing formally-wooded parcels for our roads, homes, and lawns – when we put in beaches and docks, apply lawn fertilizers – we are generating more pollutants that are washing off the landscape and into our lakes, making these systems more vulnerable to water quality issues.

Road erosion issues, bank stability, lack of buffers, sediment carries phosphorus into the lake and river

General issues in the watershed – septic systems, development/stormwater runoff, road erosion, internal loading, pet waste, fertilizers, legacy contaminants from historic activities.



Which create water quality problems

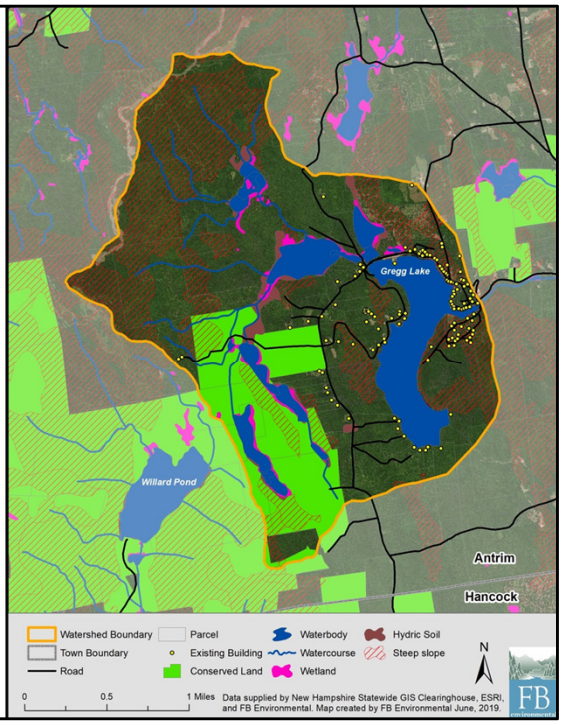
BUILD-OUT ANALYSIS

"Full Build-out" is a theoretical condition which represents the period when all "developable" land has been developed to the maximum conditions permitted by local ordinances.

Accounts for:

- Existing Buildings
- Conserved Land
- Water, Wetlands
- Hydric Soils
- Steep Slopes
- Current Zoning (minimum lot size, setbacks)

941 acres buildable in Antrim in watershed, most in rural conservation zoning district

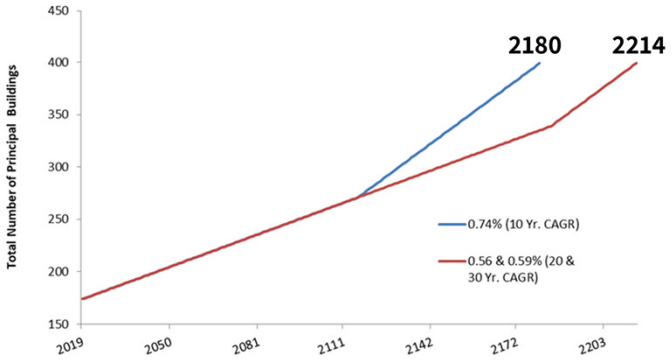


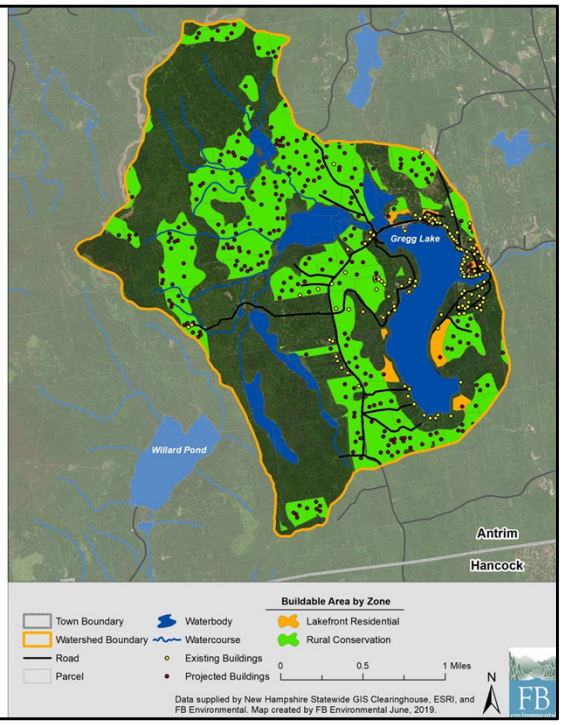
Future development is another concern.

BUILD-OUT ANALYSIS

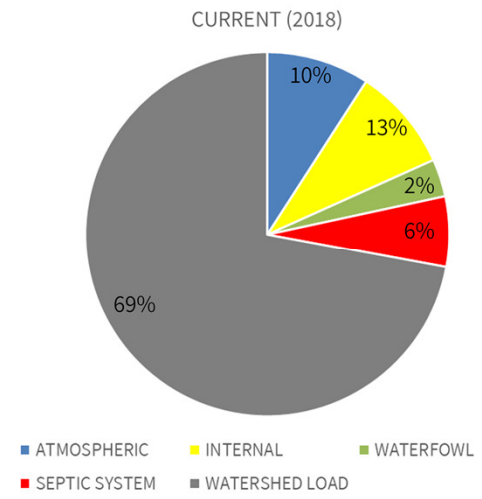
EXISTING BUILDINGS
126 (Antrim)

PROJECTED BUILDINGS
275 (Antrim)

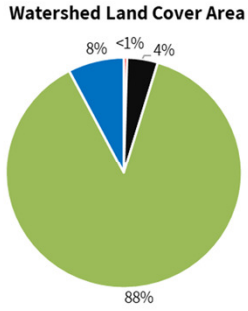


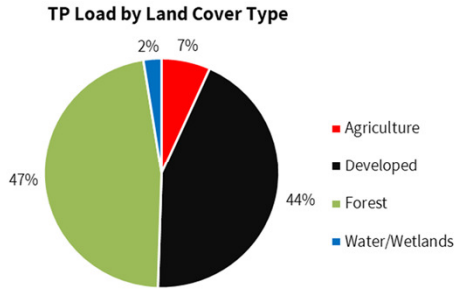


MODEL RESULTS

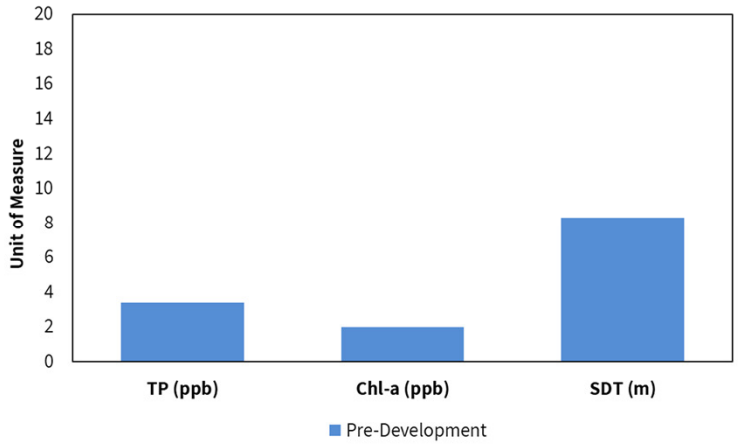


MODEL RESULTS

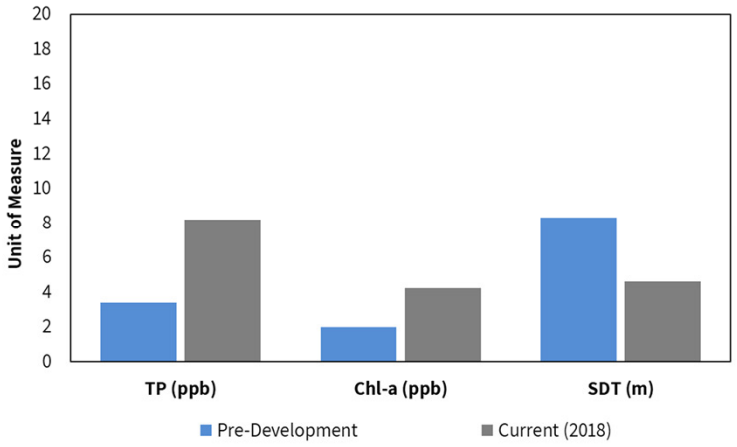




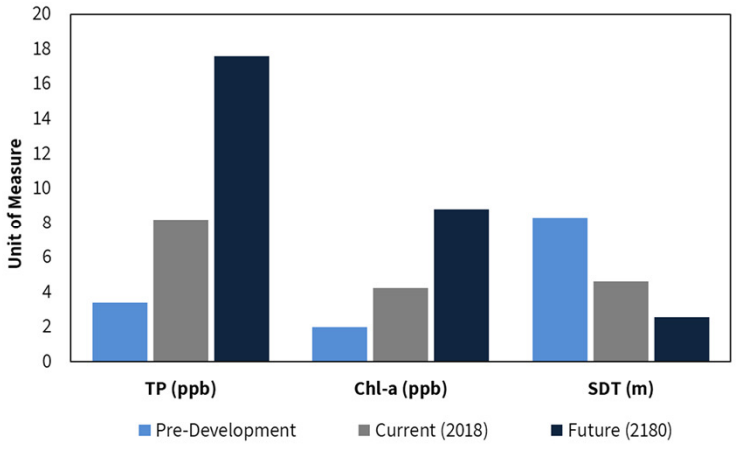
MODEL RESULTS



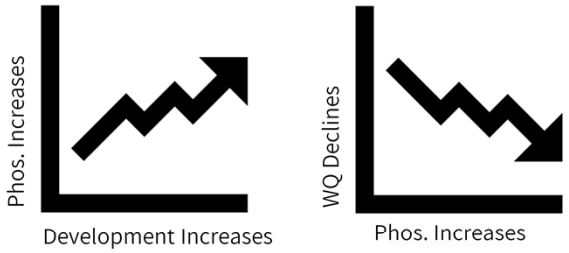
MODEL RESULTS

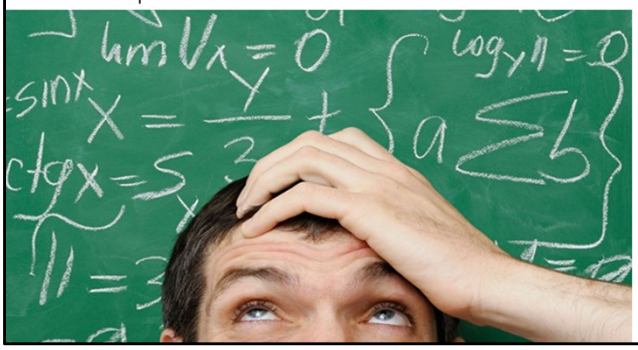


MODEL RESULTS



WATER QUALITY GOALS





1. Maintain current WQ to offset anticipated increases in total phosphorus from development in the next 10 years.

7 kg P/yr

WATER QUALITY GOALS

2

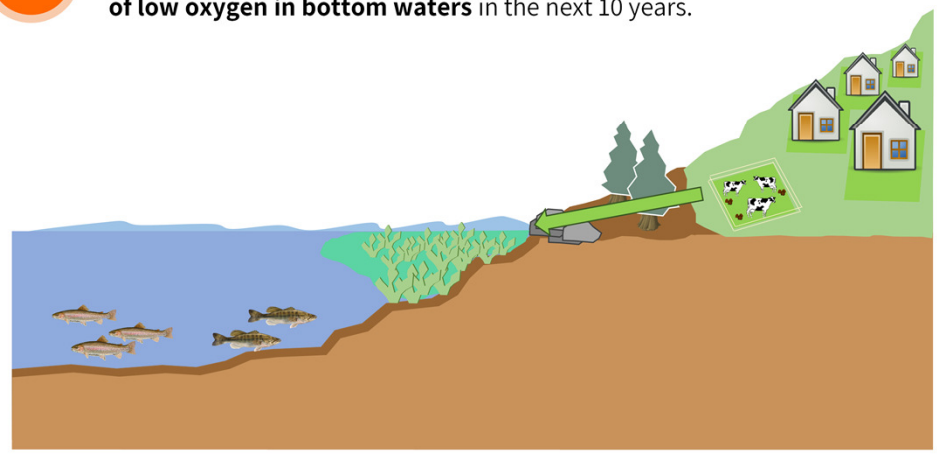
Improve current WQ to meet seasonal average chlorophyll-a concentration of 3.0 ppb or less and reduce the extent and duration of low oxygen in bottom waters in the next 10 years.

How do we achieve this goal?

WATER QUALITY GOALS

2

Improve current WQ to meet seasonal average chlorophyll-a concentration of 3.0 ppb or less and **reduce the extent and duration of low oxygen in bottom waters** in the next 10 years.

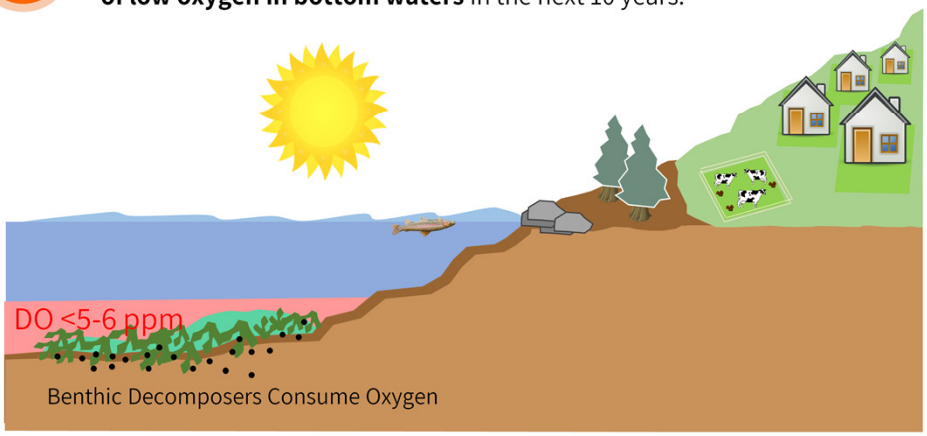


Typically, we can link low dissolved oxygen with excess nutrient loading. Development activities on the landscape leads to excess nutrient loading that feeds plant and algae growth in the lake.

WATER QUALITY GOALS

2

Improve current WQ to meet seasonal average chlorophyll-a concentration of 3.0 ppb or less and **reduce the extent and duration of low oxygen in bottom waters** in the next 10 years.



The plants and algae die, settle to the lake bottom where they are decomposed. The decomposition process rapidly consumes oxygen, limiting desirable habitat for sensitive aquatic species.

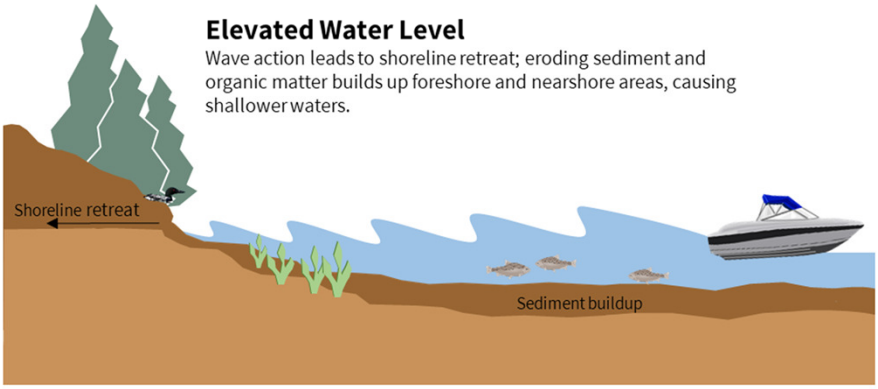
WATER QUALITY GOALS

2

Improve current WQ to meet seasonal average chlorophyll-a concentration of 3.0 ppb or less and **reduce the extent and duration of low oxygen in bottom waters** in the next 10 years.

May be linked to increasing turbidity and color

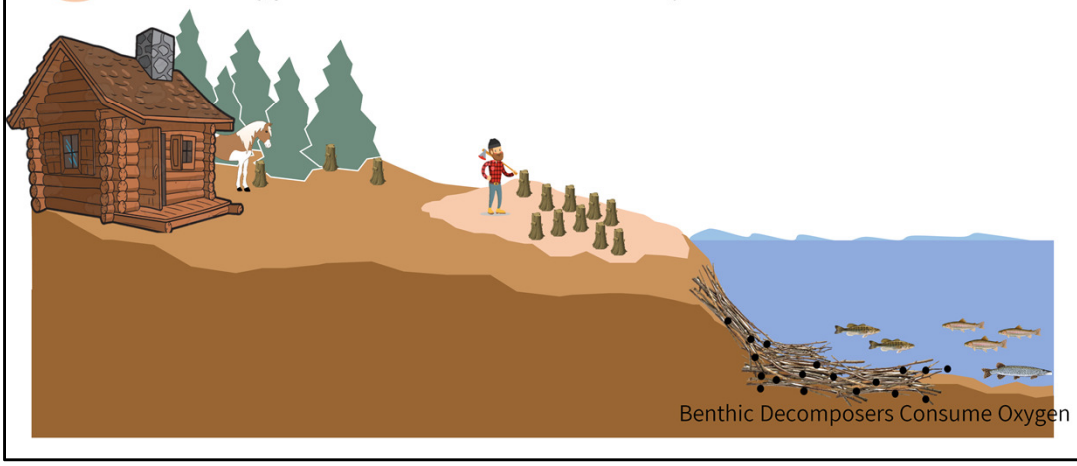
Other explanations: turbidity-algae link, color-DOC-acid rain recovery link



WATER QUALITY GOALS

2

Improve current WQ to meet seasonal average chlorophyll-a concentration of 3.0 ppb or less and **reduce the extent and duration of low oxygen in bottom waters** in the next 10 years.



There could also be legacy organic matter loading from historic clear-cutting and agriculture in the watershed. The high amount of organic matter loading may still be generating a high sediment oxygen demand as the materials are still being decomposed.

WATER QUALITY GOALS

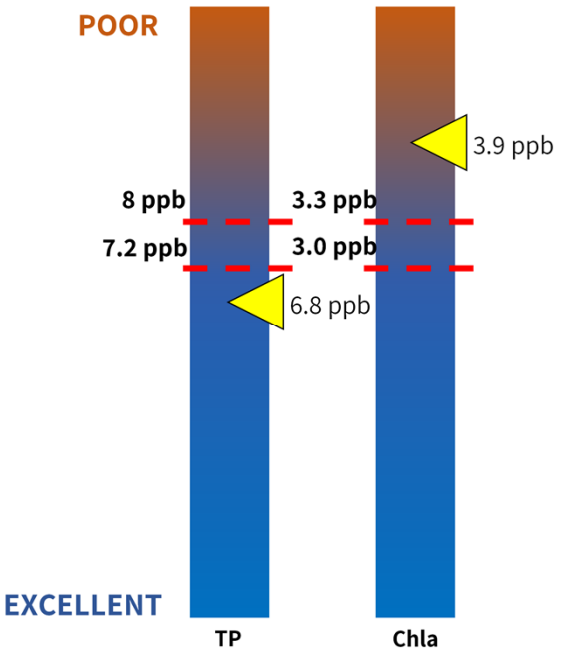
2

Improve current WQ to meet seasonal average chlorophyll-a concentration of 3.0 ppb or less and **reduce the extent and duration of low oxygen in bottom waters** in the next 10 years.

How do we achieve this goal?

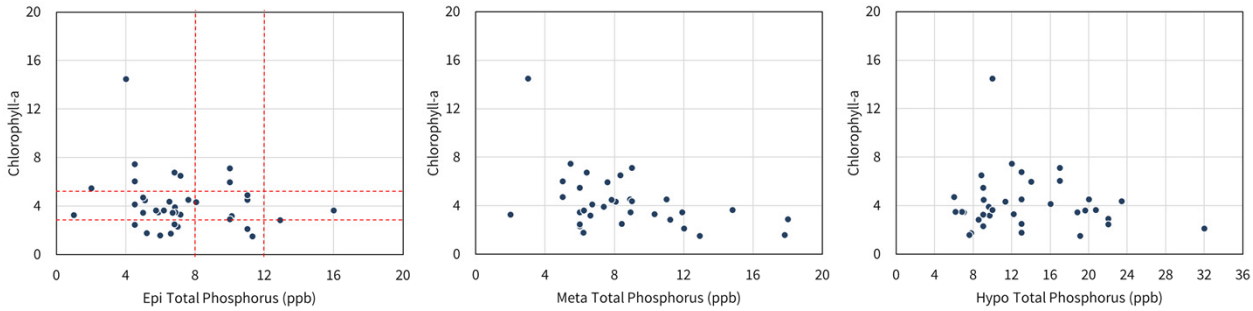
- Complete a study to determine if water levels are at an appropriate level to protect shoreline
- Consider a no wake area within 500 ft of the shoreline
- Reduce current pollutant loading to the lake to reduce plant and algae growth
  - 10% (10 kg P/yr) to achieve 1.0 ppb TP, 0.4 ppb Chl-a reduction, 5 days of bloom
  - 15% (15 kg P/yr) to achieve 1.4 ppb TP, 0.7 ppb Chl-a reduction, 3.6 days of bloom
  - 20% (20 kg P/yr) to achieve 1.9 ppb TP, 0.9 ppb Chl-a reduction, 2.5 days of bloom

Phosphorus is important to control
but other factors may be at play

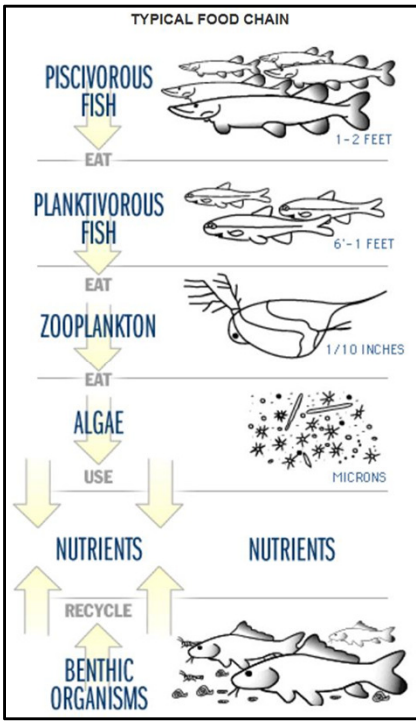


Reports of recent algal blooms in shallow waters and likely first cyanobacteria bloom in September 2018

So what's going on?



TP-Chla Relationship



OTHER EXPLANATIONS

- **Food chain out of balance:** large yellow perch population could be depleting zooplankton population (which would graze on phytoplankton)
- **Phytoplankton movement and concentration**: Cyano, gloeo know for vertical movement in water column, could be collecting hypo TP and bringing it up to epi/meta, then blowing/concentrating in shallow water areas
- **Nearshore nutrient sources:** shoreline erosion and runoff to shallow areas
- **Increase in other growth needs:** nitrogen, iron

WATER QUALITY GOALS

2

Improve current WQ to **meet seasonal average chlorophyll-a concentration of 3.0 ppb or less** and reduce the extent and duration of low oxygen in bottom waters in the next 10 years.

How do we achieve this goal?

- Complete a study that documents changes in the abundance and diversity of zooplankton over the course of a year; look for loss of larger-bodied Cladocerans like Daphnia, which are preferred prey
  - If study finds a food chain imbalance, then consider stocking the lake with piscivorous fish to control the planktivorous fish (which will increase zooplankton populations and decrease phytoplankton or algae)
- Integrate additional parameters to regular monitoring program, such as total nitrogen, total and dissolved organic carbon, iron, among others.

WATER QUALITY GOALS - DISCUSSION

1

Maintain current WQ to offset anticipated increases in total phosphorus from development in the next 10 years.

- Reduce current/future pollutant loading to the lake to reduce plant and algae growth
  - *7 kg P/yr to maintain current water quality*

2

Improve current WQ to meet seasonal average chlorophyll-a concentration of 3.0 ppb or less and reduce the extent and duration of low oxygen in bottom waters in the next 10 years.

- Reduce current pollutant loading to the lake to reduce plant and algae growth
  - *10% (10 kg P/yr) to achieve 1.0 ppb TP, 0.4 ppb Chl-a reduction, 5 days of bloom*
  - *15% (15 kg P/yr) to achieve 1.4 ppb TP, 0.7 ppb Chl-a reduction, 3.6 days of bloom*
  - *20% (20 kg P/yr) to achieve 1.9 ppb TP, 0.9 ppb Chl-a reduction, 2.5 days of bloom*
- Complete a study to determine if water levels are at an appropriate level to protect shoreline
- Consider a no wake area within 500 ft of the shoreline
- Complete zooplankton study, possibly stock lake with piscivorous fish to control planktivorous fish population
- Integrate additional parameters to regular monitoring program, such as total nitrogen, total and dissolved organic carbon, iron, among others.

WATER QUALITY GOALS - DISCUSSION

1

Reduce or offset phosphorus by 27 kg/yr to meet seasonal average chl-a of 3 ppb and reduce the extent and duration of low oxygen in the next 10 years.

2

Investigate other factors impacting water quality to meet seasonal average chlorophyll-a concentration of 3.0 ppb or less and reduce the extent and duration of low oxygen in bottom waters in the next 10 years.

- Complete a study to determine if water levels are at an appropriate level to protect shoreline
- Consider a no wake area within 500 ft of the shoreline
- Complete zooplankton study, possibly stock lake with piscivorous fish to control planktivorous fish population
- Integrate additional parameters to regular monitoring program, such as total nitrogen, total and dissolved organic carbon, iron, among others.